



**FINAL AMENDED
TECHNICAL
REVIEW OF THE
2021
DRAFT NUNAVUT LAND
USE PLAN**

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Prepared for: **NUNAVUT PLANNING COMMISSION**

Date: April 15, 2022

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INTRODUCTION

This report deletes and replaces the technical report submitted by the Kivalliq Inuit Association (KivIA) on October 8, 2021. The October 8, 2021 technical report was submitted prior to the Nunavut Planning Commission (NPC) postponing the fall 2021 hearings and was submitted to meet a deadline that was eventually changed. The KivIA has had more time to evaluate the 2021 Draft Nunavut Land Use Plan (2021 DNLUP) and this submission reflects that further evaluation. This submission expands on areas relating to caribou, community drinking water, community areas of interest, mineral exploration, mining, easements, and linear infrastructure.

KivIA represents the Inuit beneficiaries of the Kivalliq Region at the territorial and regional levels and supports sustainable economic development opportunities for Inuit beneficiaries. The 2021 DNLUP was developed by the Nunavut Planning Commission (NPC) as mandated for the Nunavut Settlement Area under Article 11 of the Nunavut Land Claims Agreement (*Nunavut Agreement*). The technical review completed by the KivIA was carried out at a high level with the mandate of:

- a) assessing whether the KivIA's comments and concerns outlined during the review of the 2016 Draft Nunavut Land Use Plan (2016 DNLUP) have been addressed, and
- b) identifying any issues or concerns in the 2021 DNLUP that might deter its implementation without further revision.

This mandate was meant to ensure that the scope of the 2021 DNLUP was compatible with the KivIA's mandate and responsibilities to the Inuit beneficiaries of the Kivalliq Region. The KivIA retained consultants from GeoVector Management Inc. (GeoVector) and Aurora Wildlife Research (Aurora) to assist in preparing this technical report.

This report uses the following land use designations, as taken from the 2021 DNLUP:

"Limited Use" Limited Use areas are characterized by year-round prohibition of one or more types of land use. They may also include conformity requirements, such as seasonal prohibitions on certain land uses or setback requirements around important features.

"Conditional Use" Conditional Use areas are characterized by conformity requirements such as seasonal prohibitions on certain land uses, or setback requirements around important features.

"Mixed Use" Mixed Use areas that have been identified for their potential to support a variety of land uses are characterized by no prohibited uses or conformity requirements. In Mixed Use areas, all uses are considered to conform to this Plan. Mixed Use areas important to certain Valued Ecosystem Components and Valued Socio-Economic Components are included in the 2021 DNLUP.

"Valued Ecosystem Component (VEC)" is an element of the environment identified in this Plan. It is usually an element that has been identified by residents or the Commission as being important to the natural environment.

"Valued Socio-economic Component (VSEC)" is an element of the environment identified in this Plan. It is an element that has economic, social or cultural significance.

1. **CONCERNS WITH OVERALL APPROACH OF THE 2021 DNLUP**

The KivIA continues to have concerns with the overall approach taken in the 2021 DNLUP and until the concerns are addressed the KivIA does not support the finalizing of the 2021 DNLUP. The changes being proposed in the 2021 DNLUP are significant and will have a negative impact on the way in which Inuit control and manage Inuit Owned Lands (IOL) and will result in lost economic opportunities for Inuit. The negative impacts that will result from the 2021 DNLUP were not what was contemplated for in the *Nunavut Agreement*.

Section 11.2.1 of the *Nunavut Agreement* states that:

The following principles shall guide the development of planning policies, priorities and objectives:

- a) people are a functional part of a dynamic biophysical environment, and land use cannot be planned and managed without reference to the human community; accordingly, social cultural and economic endeavors of the human community must be central to land use planning and implementation;
- b) the primary purpose of land use planning in the Nunavut Settlement Area shall be to protect and promote the existing and future wellbeing of those persons ordinarily resident and communities of the Nunavut Settlement Area taking into account the interests of all Canadians; special attention shall be devoted to protecting and promoting the existing and future well-being of Inuit and Inuit Owned Lands;
- c) the planning process shall ensure land use plans reflect the priorities and values of the residents of the planning regions;
- d) the public planning process shall provide an opportunity for the active and informed participation and support of Inuit and other residents affected by the land use plans; such participation shall be promoted through various means, including ready access to all relevant materials, appropriate and realistic schedules, recruitment and training of local residents to participate in comprehensive land use planning;
- e) plans shall provide the conservation, development and utilization of land;

- f) the planning process shall be systematic and integrated with all other planning processes and operations, including the impact review process contained in the Agreement; and
- g) an effective land use planning process requires the active participation of both Government and Inuit.

Section 17.1.1 of the *Nunavut Agreement* states that:

"The primary purpose of Inuit Owned Lands shall be to provide Inuit with rights in land that promote economic self-sufficiency of Inuit through time, in a manner consistent with Inuit social and cultural needs and aspirations".

In taking into account Inuit interests the NPC must balance the competing factors of development and conservation. Based on KivIA's review of the 2021 DNLUP, it is the position of the KivIA that the 2021 DNLUP does not balance the competing factors and instead disfavours development largely through restrictions on large areas of land. The 2021 DNLUP as drafted will curtail future development and prohibit the promotion of economic self-sufficiency, which is a primary purpose of IOL and identified in the *Nunavut Agreement*. The effect of the increased Limited Use designations in the 2021 DNLUP will be to eliminate approximately 45% of surface IOL and 56% of subsurface IOL in the Kivalliq Region from exploration and development. The KivIA is proposing that balancing the competing factors is possible with, for example, Mobile Measures for caribou combined with seasonal restrictions (not year-round), and adaptive management being required in the 2021 DNLUP. **Figures 1 and 2** identify the IOLs in the Kivalliq Region overlaid with the caribou related land use designation.

The KivIA is of the view that the NPC is minimizing the role that the Designated Inuit Organization ("DIO") play in being consulted with respect to the 2021 DNLUP. An example of the NPC minimizing the role a DIO has in the process is that the 2016 DNLUP section 1.2.1 stated:

"Section 11.8.2 of the NLCA states that the land use planning process shall apply to Inuit Owned Land and shall take into account Inuit goals

and objectives for Inuit Owned Land as represented by the *Designated Inuit Organizations*."

The NPC removed "as represented by the Designated Inuit Organizations" from the parallel section in the 2021 DNLUP. KivIA, as the DIO of the Kivalliq Region, pursuant to Article 39.1.3 of the *Nunavut Agreement* has the power and authority to manage lands in the region and as such KivIA's views with respect to the 2021 DNLUP are of paramount importance and should be given the utmost of consideration. The 2021 DNLUP must be shaped by Inuit objectives and goals for IOLs, and in particular those of Nunavut Tunngavik Incorporated (NTI) and the Regional Inuit Associations (RIA).

The community engagements to date were inadequate and did not take into account Inuit goals and objectives for IOLs. The KivIA is concerned that the NPC, through community consultations did not provide community participants with enough details to provide an informed position on certain matters. For example, KivIA is uncertain whether NPC outlined for the community participants what is meant by 'protection' as to whether caribou need seasonal, versus year-round protection on their calving grounds. At the prior community engagements held in the Kivalliq Region there was no mention of the impact that certain land use designations would have on the potential for economic development on IOLs while also providing adequate protection for caribou. Section 11.2.1(d) of the *Nunavut Agreement* specifically provides for active and informed participation. Active and informed participation includes being provided with all points of view, including the effects the land use plan will have on IOLs.

Furthermore, there has been no community engagements and consultation since the 2021 DNLUP was put out for comment on July 23, 2021. The community engagements in the Kivalliq Region did not provide the KivIA with the opportunity to provide submissions. It is the position of the KivIA that the community engagements appeared to pit development against conservation rather than focusing on explaining to the community how the two can co-exist. It is understood that further community engagements are not occurring until after April 15, 2022 (the deadline for this submission) and as such KivIA requests that the NPC permit a KivIA representative to attend the meeting to be fully informed as to the status of the community engagement sessions.

The 2021 DNLUP acknowledges that there are gaps in information, knowledge and expert advice that have restricted the consideration of land use options, but that this absence of information cannot impede the land use planning process. While it is recognized that the development of the 2021 DNLUP cannot wait until all information gaps have been filled, the 2021 DNLUP should strive to incorporate the best available information on an ongoing basis. Incorporating the best available information includes communicating with the RIA's to understand the on-the-ground concerns in each specific region and using up-to-date data. The KivIA remains concerned that much of the caribou data and the data used to determine valued socio-economic and valued socio-eco-system components are outdated. This submission will go into further detail on caribou below.

The KivIA is also concerned with the overall approach the NPC has taken to caribou landscape management and land use. The KivIA is responsible for managing surface IOLs in the Kivalliq Region. The KivIA is best equipped to manage land-use activities and caribou in the Kivalliq, therefore, the KivIA needs to be responsible at the regional level for land use planning for managing caribou on lands to which they manage. The KivIA is concerned that the NPC rejected a regional approach to caribou and their landscapes. KivIA is also of the view that adaptive management should be part of the 2021 DNLUP. This would allow for changes to the 2021 DNLUP based on assessing the impacts of the land use plan on caribou and land-use activities.

The KivIA continues to have concerns with assigning specific designations to IOL. IOL were vested in NTI and the RIA's pursuant to Article 19 of the *Nunavut Agreement*. Each IOL was selected for specific purposes, whether it was for socio-economic or socio-eco-systemic reasons, and it is for this reason that the KivIA continues to be of the view that restrictions should be seasonal, not year-round, for IOL and that any restrictions necessary should be implemented and provided for by NTI and the RIA's on a regional basis. The preference of the KivIA is that IOL should form a separate and distinct category of land in the 2021 DNLUP. The 2021 DNLUP as it currently stands will have adverse impacts on the Inuit right to manage IOLs. Inuit rights to land ownership and management are a fundamental aspect of Inuit self-determination and key to achieving Inuit self-sufficiency as contemplated in the *Nunavut Agreement*. The way that the 2021 DNLUP is currently drafted fails to respect section 17.1.1 of the *Nunavut Agreement*.

2. **CARIBOU PROTECTION**

Summary

The KivIA supports NPC's recognition in the 2021 DNLUP that caribou are a keystone species within the northern ecosystem and that the importance of caribou to Inuit is beyond question ¹. In developing the 2021 DNLUP, KivIA also acknowledges NPC's efforts to present all the varied viewpoints about how to balance protection for caribou without foreclosing on economic development ². KivIA also appreciates NPC's efforts to provide clarifications during phone calls in 2022 which has helped KivIA to update its submission.

KivIA's remaining main concerns with the 2021 DNLUP are threefold, and lead KivIA to recommend alternative land use designations to those proposed by NPC (Table 1). First, that the 2021 DNLUP reduces overall protection for caribou, because land-use designations are not balanced between highly restrictive protection for pre-calving, calving, post-calving and water-crossings, but essentially no protection for other seasonal ranges (Table 1), which is especially risky during a warming climate.

Second, the 2021 DNLUP does not integrate all available tools, including regional management and other regulatory tools, and is ambiguous about the application of Mobile Caribou Conservation Measures (Mobile Measures).

Third, NPC's reliance of designations with fixed boundaries and seasons is largely based on dated collared caribou data and less on IQ. The reliance places high importance on currently accurate mapping but NPC has not clearly identified a path forward on how to keep maps current to ensure adaptability in mapping boundaries and season dates. Caribou, especially as their numbers or their environment changes, often adjust their movements and their timing.

¹ 2021 DNLUP Section 2.2

² 2021 DNLUP Section 2.2.2.

Table 1. NPC and KivIA recommended caribou range land use designations, 2021 Draft Nunavut Land Use Plan.

Caribou seasonal range	Limited Use	Conditional Use	Mixed Use	Valued ecosystem components
1. Calving areas	NPC	KivIA		
2. Post-calving areas	NPC	KivIA		
3. Key access corridors	NPC	KivIA		
4. Freshwater crossings	NPC/ KivIA	KivIA		
5. Sea-ice crossings		NPC/KivIA		
6. Other seasonal ranges				
• Rutting areas			KivIA	NPC
• Migration corridors			KivIA	NPC
• Summer and late summer areas			KivIA	NPC
• Winter ranges (mainland)				NPC/KivIA
• Island caribou winter ranges	NPC/KivIA			
7. Peary caribou areas	NPC/KivIA			

In the following text, KivIA distinguishes between protecting caribou and protecting caribou habitat. KivIA considers that ‘protecting’ caribou means ensuring that land use activities do not directly harm caribou (traffic deaths, exposure to toxins) and do not indirectly harm caribou (interrupting movements and activity patterns). Caribou need ‘protection’ when they are present and exposed to disturbance, so for example, seasonal ranges typically do not require protection when the caribou are not present. Caribou habitat is the landscape needed for caribou to survive and raise their calves and includes, for example, vegetation, travel corridors, insect-relief areas such as eskers and wind-blown areas for winter foraging. A particular example is at water-crossings where the landscape such as eskers affect how caribou approach the water-crossing. Seasonal ranges reflect where caribou use habitat but are not synonymous with habitat. For example, caribou may use less than the available habitat or can be displaced onto unfavorable habitat.

KivIA's concerns with 2021 DNLUP

a) Unbalanced protection between seasons

KivIA supports NPC's recognition of the importance of calving areas which, in turn, accepts community comments which mostly emphasized protecting calving areas. The 2021 DNLUP recommends Limited Use (year-round, formerly Protected Area) designation to caribou calving and post-calving areas, Key Access Corridors, and freshwater caribou crossings (Table 1). However, this stringent level of protection for pre-calving to post-calving areas year-round is difficult to reconcile with the absence of almost any level of protection for the remainder of the year despite the importance of, for example, mid to late summer uninterrupted foraging³. For most of the year, caribou seasonal ranges (summer and late summer areas, rutting areas, mainland winter ranges and migration corridors) are designated as Valued Ecosystem Components (VEC; Table 1). A VEC only "requires proponents to consider Valued Components such as caribou when planning projects, identify anticipated impacts to VCs in project proposals submitted to the NPC, and annually report to the NPC on actual impacts to VCs"⁴. The 2021 DNLUP offers almost no guidance on how the actual impacts would be monitored. Thus, the VEC does not provide protection for most of the year on most of the caribou's annual range. This lack of protection is likely to be a problem if herds continue to decline as they are less resilient as global warming increases stress on caribou.

The KivIA is also concerned that while the NPC recognizes the importance of climate change, it did not recommend any specific terms⁵, which is a missed opportunity as Inuit are already seeing changes from a hotter climate. In Norway, for example, on wild reindeer ranges (wild reindeer are the same as caribou), adaptive land use planning is recognized as the key to allow the wild reindeer to adapt their movements to the warmer climate⁶. For caribou, if as predicted fall rain-on-snow events increase in frequency or severity^{7,8}, there will be a greater need for free passage for caribou across the landscape as caribou respond to ice-locked forage with unusual movements. Therefore, land use practices will need to be adaptable to ensure free passage of caribou during, for example, fall migration. During a hotter climate, heat and more severe insect harassment during summer increase stress on caribou, forage

³ 2021 DNLUP; Section 2.2.2.

⁴ 2021 DNLUP; Options and Recommendations - page 445

⁵ 2021 DNLUP; Options and Recommendations – Section 2.9.1.

⁶ Rosqvist, G.C., Inga, N. & Eriksson, P. 2022. Impacts of climate warming on reindeer herding require new land-use strategies. *Ambio* 51, 1247–1262.

⁷ Dolant, C., A. Langlois, L. Brucker, A. Royer, A. Roy, and B. Montpetit. 2018. Meteorological inventory of rain-on-snow events in the Canadian Arctic Archipelago and satellite detection assessment using passive microwave data, *Physical Geography*, 39:5, 428-444.

⁸ Pan, C.G. et al. 2018. Rain-on-snow events in Alaska, their frequency and distribution from satellite observations *Environ. Res. Lett.* 13 075004

quality is reduced and forage intake is also reduced. Summer heat and stress may amplify caribou responses to development and during the fall caribou will need uninterrupted foraging to regain condition prior to the rut and onset of winter. Despite the accelerating pace of climate warming on summer and fall ranges, NPC only designated them as VEC. In a VEC designation, the burden of proof shifts to the proponent to identify anticipated impacts and then to monitor to identify and report on actual impacts – in other words after the impacts have occurred.

b) Use of available tools

NPC states that land use planning in Nunavut will take an incremental approach which will require regional and sub-regional studies⁹ but does not offer how or when these studies will be undertaken. Given that Section 2.2.5 of the Options and Recommendations document acknowledges regional variation in caribou ecology which increases, then, the urgency for a regional strategy to the 2021 DNLUP¹⁰. Likewise, Section 2.2.6 (Regulatory Tools) has comments on the various regulatory tools available but not how to apply or integrate them. KivIA suggests that even though other tools exist, such as the *Nunavut Wildlife Act* and the Nunavut Impact Review Board's (NIRB's) project-by-project monitoring mitigation, gaps remain such as how to address cumulative impacts. While the DNLUP provides overall guidance for land uses¹¹, the KivIA continues to advocate an urgent need for a regional approach including a herd-specific approach and how other tools can be integrated including how to address cumulative impacts.

The KivIA continues to recommend that regional tools should include Mobile Measures to supplement land use designations. NPC appears to see them as a future tool requiring research first. However, KivIA believes that understanding of Mobile Measures needs to be updated and understood in the context of Inuit Qaujimajatuqangit¹² (for example, Pilimmaksarniq, Qanuqtuurunnarniq and Piliriqatigiingniq). Although Mobile Measures are not designed to address caribou habitat alteration, other tools to address critical caribou habitat include the Government of Nunavut (GN) *Nunavut Wildlife Act* as well as NIRB's project-by-project mitigation to, for example, minimize effects of dust on caribou habitat.

⁹ 2021 DNLUP; page 6

¹⁰ 2021 DNLUP; Options and Recommendations – pages 44-46

¹¹ 2021 DNLUP; Options and Recommendations – pages 46-50

¹² 2021 DNLUP; page 9

c) Seasonal range boundaries and mapping

NPC identified two key areas of disagreement for mapping land use designations based on caribou seasonal range boundaries. First, technical considerations need to address the time period for the telemetry data used to develop the range boundaries and the level of the kernel analysis (percent utilization distribution), as the GN had specified 80% for migratory routes and 95% for other seasonal ranges. Second, mapping of seasonal ranges has to ensure that Inuit knowledge is used. Unfortunately, NPC did not offer a way forward to resolve technical disagreements and how Inuit knowledge is to be used.

The KivIA is concerned firstly, that mapped seasonal ranges are still almost completely extrapolated from collared caribou using a single analytical tool (kernel density analysis) which do not take into account technical limitations such the number of collars and its changes over time. Only a few adjustments appear to have been made based on local knowledge. Consequently, KivIA believes what is needed is up to date Nunavut-wide range analysis to relate historical to current seasonal distribution with subsequent updates of the most recent 10-year of distribution data every 5 year or when other information such as IQ suggests changes. The 2021 DNLUP still does not propose a minimum standard for when mapping of caribou seasonal ranges will be updated even though NPC recommended against sunset clauses¹³.

KivIA's recommendations for 2021 DNLUP

In response to the 2021 DNLUP, KivIA has the following recommendations. KivIA does want to acknowledge the usefulness of NPC's detailed presentation of participants' views which helped KivIA refine its position on caribou protection. KivIA, in the following text, rationalizes why its recommendations are only partially similar to NPC's as KivIA is concerned that the year-round prohibitions in the Limited Use designation are beyond what is needed to protect caribou calving and post-calving. KivIA also recommends an increase in protection for caribou by applying Mixed Use rather than VEC to summer through to rutting areas. KivIA's recommended caribou land use designations are summarized in Table 1.

¹³ 2021 DNLUP; Options and Recommendations Section 6.2.9.1.

a) Conditional Use: Calving and Post-calving areas

The KivIA acknowledges community views about the high sensitivity of calving and recommends that the concentrated calving areas should be seasonally closed to all forms of development. The KivIA defines concentrated as the area used for the average peak of calving plus 3 weeks¹⁴ (the dates for which are herd-specific) and for greater clarity as measured over the previous 10 years. Therefore, KivIA recommends that the concentrated calving area be designated Conditional Use with seasonal restrictions with Mobile Measures applied outside the restricted season, and the surrounding historical calving area be designated Conditional Use with Mobile Measures to be applied during the calving period.

The KivIA recommends that post-calving areas also be given Conditional Use designation (seasonal prohibitions). Related land use prescriptions focusing on caribou protection and mitigation should be regionally developed, in consultation with the relevant RIAs, Regional Wildlife Organizations (RWOs), and HTOs. These would include restricting or not allowing exploration activities near caribou during the post-calving period and Mobile Measures to manage appropriate industrial exploration within post-calving areas outside of the post-calving period.

KivIA increasingly recognizes the need to balance caribou protection year-round rather than just intense protection during calving and post-calving. For this reason, KivIA no longer supports year-round protection inherent in the land use designation Limited Use. In particular, NPC noted that the Kivalliq-Manitoba linear infrastructure corridor cuts through a portion of calving and post-calving area which would be consistent with seasonal protection in Conditional Use. KivIA suggests that caribou protection is not reduced by allowing industry more certainty through operating outside the calving and post-calving seasons. Most mineral exploration serves to rule out the presence of economic deposits and for the infrequent instance of an economically viable deposit, a mine could possibly proceed as a Conditional Use with stringent conditions (such as not operating during calving and post-calving and being designed as an underground not open pit, and no satellite developments) and subject to cumulative effects thresholds as they are developed. A precedent for a seasonal mine

¹⁴ 2021 DNLUP; Section 2.2.3.

shut-down exists as proposed mitigation for the Sabina mine in the Kitikmeot Region (currently under construction) includes a shut-down if caribou calve in the vicinity¹⁵.

b) Key Access Corridors

The KivIA notes that the differentiation between Key Access Corridors (pre-calving migration) and Migration Corridors is confusing. The 2021 DNLUP states that Key Access Corridors are “the paths used by pregnant cow caribou to access the calving areas” despite NPC (and GN) stating that Key Access Corridors are also used by cows and calves leaving the calving grounds ¹⁶. The KivIA is uncertain whether the maps for Key Access Corridors also include migration off the calving grounds into post-calving areas, and whether Key Access Corridors are fully contained within post-calving ranges.

Further, all date ranges in Table 02 in the Options and Recommendations document for ‘calving grounds and Key Access Corridors’ fully encompass date ranges for ‘post- calving grounds’. This suggests that the Key Access Corridors are used prior to calving, but no dates prior to the original calving dates have been added to Table 02. KivIA is unclear where Key Access dates fit into the first column of Table 02, and why there is little differentiation in dates between calving/key access and post-calving. The KivIA notes that the sensitivity of cows migrating to or off the calving grounds differs because pregnant cows are highly motivated to reach their calving ground and migration is typically highly social with long files of caribou following each other. In contrast, migration or movements off the calving ground also involve large groups which are sensitive to disturbance as they have young calves with them.

The KivIA agrees with NPC’s designation that IOL within mapped calving areas outside of the core should be closed to all forms of development, but only between 15 May and 15 July (a likely range of dates to buffer pre-calving migration when the cows reach the calving area and when they leave the calving area)¹⁷. This would afford protection for pregnant cows when they arrive on calving areas prior to calving, through to 4–5 weeks post-calving which is when

¹⁵ Sabina. 2017. 170215 12MN036 FEIS Addendum Volume 10

¹⁶ DNLUP Section 2.2.2 and Options and Recommendation Document page 90 and Government of Nunavut (GN), 2015-06-19. NPC Public Registry File # 14-063E

¹⁷ Stated previously in Nunavut Tunngavik Inc. & The Regional Inuit Associations, 2018-11-26. NPC Public Registry File # 16-179E

the cows reach the peak of lactation¹⁸ and need for uninterrupted foraging, coinciding with when the cows with their newborn calves are especially sensitive to disturbance.

The 2021 DNLUP then states that Migration Corridors are “used by caribou for movement between important areas of caribou seasonal ranges” with text references to both spring and fall migration, but which NPC appears to mean fall migration only¹⁹. NPC appears uncertain whether types of migration corridors and should clarify our interpretation that Key Access Corridors refer to pre-calving migration and post-calving migration while Migration Corridors are all other migrations such as fall migration. Even though NPC indicated moderate confidence in how the Key Access and Migration corridors were mapped, KivIA is skeptical because collar data collected since 2012 were not included in mapping.

c) Freshwater caribou crossings

The 2021 DNLUP recommends a Limited Use designation within a 10 km buffer around freshwater crossings “as a compromise between the varying recommendations”. The KivIA continues to recommend that the immediate area around identified water crossings should be placed within year-round Limited Use status, with the size of the area perhaps 1–3 km radius and tailored to traditional caribou approach characteristics based on IQ. Around this Limited Use area of water crossings, the KivIA recommends a 10 km radius Conditional Use zone within which Mobile Caribou Conservation Measures would be applied.

d) Mixed Use and VECs

KivIA is concerned that not applying a land use designation to summer to rut areas ignores much that we know about the importance of those ranges for a cow to raise her calf and rebuild her body reserves²⁰. KivIA is also concerned about the practicality for land use operations within the VEC areas to assess their impacts on caribou. Instead, KivIA suggests that summer to the rut seasonal ranges be designated as Mixed Use. Although Mixed Use areas are to support a variety of land uses, they do not have prohibited uses or conformity requirements. KivIA considers that seasonally explicit Mobile Measures scaled to the type of operation be applied to summer to rut areas to reduce exposure of caribou and minimize interruptions to their foraging time. Winter ranges are the largest and least annually predictable in location. Given the short days and often severe weather, caribou are less likely

¹⁸ Gjølstein, Hallvard & Holand, Oystein & Weladji, Robert. (2004). Milk production and composition in reindeer (*Rangifer tarandus*): Effect of lactational stage. Comparative biochemistry and physiology. Part A, Molecular & integrative physiology. 137. 649-56. 10.1016/j.cbpa.2004.01.002.

¹⁹ 2021 DNLUP; Options and Recommendation page 112

²⁰ 2021 DNLUP; Options and Recommendation Section 2.2.2.

to be exposed to exploration and other land use activities. KivIA is satisfied that the VEC designation for winter ranges would be adequate.

e) Role of Mobile Caribou Conservation Measures

Previously, KivIA had recommended Mobile Measures for all seasonal ranges, as the operation of Mobile Measures includes seasonal adjustments, hence applicability year-round. KivIA envisages that Mobile Measures would be implemented as a condition of an exploration project proceeding subject to regulatory authorities to oversee. The KivIA regards Mobile Measures as key adaptable protection measures responsive to annual changes in caribou distribution, meaning the trade-off between protecting caribou in a large area versus the area used in any one year, and a more flexible approach to protect caribou in a smaller area (such as during exploration) but which is more responsive to shifts in caribou distribution. The KivIA stipulates Mobile Measures on relevant project leases and land use permits on IOL within the Kivalliq Region.

KivIA notes the progress made in a 2021 framework developed in the NWT for the Bathurst Range Plan which answers previous criticisms of Mobile Measures²¹. The framework and operational guides lay out an approach which is collaborative between government and industry representing the NWT and NU Chamber of Mines (K. Clark, Environment and Natural Resources, pers. comm.). In the NWT, Mobile Measures will be implemented using a rules-based approach, with monitoring primarily from height-of-land and other ground-based methods to minimize use of aircraft. Although the NWT government has been heavily involved in development of the project and will provide mapping and resources to land use operators, the main costs of implementation are to be borne by industry.

KivIA notes that NPC has already set a precedent for the role of permit holders in land use management as they are identified as being responsible for VEC monitoring which is similar, then, to permit holder responsibility for Mobile Measures. NPC correctly noted that Mobile Measures are suited for exploration activities rather than for mine construction and operation. The typical monitoring and mitigation requirements for developed mines are covered through NIRB's procedures and are part of a continuum to Mobile Measures which also use monitoring to trigger pre-determined levels of mitigation.

²¹ GNWT

Citing uncertainty how Mobile Measures would be implemented (“it is difficult to direct in a land use plan that they be implemented as a condition of proceeding with a project or a requirement put on regulatory authorities to themselves implement and monitor”; 2021 DNLUP; Options and Recommendations, pg 61), the 2021 DNLUP has steered away from recommending Mobile Measure be implemented within the DNLUP. However, for seasons not designated as Limited Use or Conditional Use, the 2021 DNLUP does acknowledge that “This could also be a circumstance where mobile CPMs may be suitable. These measures would not be administered or enforced by the NPC, but would be addressed by an appropriate regulatory authority” (e.g., 2021 DNLUP; Options and Recommendations, pg 110). Appendix 1 appended to this document elaborates on a working model for application of Mobile Measures in Nunavut.

f) Comments on defining seasons and mapping land-use designations

NPC’s Table 02 (the calving and post-calving [and possibly Key Access Corridor] seasonal date ranges used for analysis in the 2021 DNLUP) were derived from but are not identical to Nagy’s (2011)²² analyses based on 1993–2010 collar data. The concern is that since 2011 caribou numbers have changed (generally declined) and many seasonal ranges have shifted (often contracted), resulting in shifts in seasonal dates. The dates used to delineate seasons should be re-examined, revisited regularly and methods updated, if necessary. The KivIA offers to collaborate on the analysis and recommends that prior to the 2021 DNLUP being approved, this collaboration must take place. The KivIA notes that a possible template for the type of analyses needed for land use planning is a recent analysis completed for the Bathurst herd²³ which revealed the extent of changes in seasonal ranges. For example, Bathurst cows reached the calving grounds 8 days earlier and spend 13 days longer on the post-calving ranges by 2019 compared to 1997.

Mapping of calving areas was rated as moderate certainty in the 2021 DNLUP, which is surprisingly high given the differences of opinions about for how long and how to map the boundaries²⁴. How to map the calving areas has largely contributed to controversy over protecting calving areas. Misunderstandings about boundaries and interannual variation, especially the pattern of annual overlap, has complicated efforts to protect calving areas over many years, and the 2021 DNLUP still has not resolved the issues. Caribou calving areas

²² DNLUP; Options and Recommendations page 36

²³ Mennell, R. 2021. Spatial and temporal trends in range-use by the Bathurst Caribou during a population decline, 1997-2019. MS thesis, Queens University, Kingston, Ontario.

²⁴ DNLUP; Options and Recommendations Document page 66

used annually generally move within a larger bounded area over time, with not all areas within this larger historically used area occupied by breeding cows in any one or series of year. Recent information using detailed analyses and newer techniques such as aging cast antlers has supported the fidelity to and longevity of historical calving grounds^{25,26}.

As a path forward, the NPC should include a map of historically used calving areas, documented using collar data and IQ. The historical pattern typically shows how annual calving grounds may shift but as a rotation around a centrally used area, which is the pattern remarked on by Inuit from Rankin Inlet²⁷. Then, Conditional Use would be applied to the more recently used calving areas (e.g., using collar data over the past 10 years). Therefore, the outer historical calving area would give context to the more recent use.

The KivIA²⁸ and the Kitikmeot Inuit Association (KitIA)²⁹ were critical of the static boundaries for caribou ranges, especially calving grounds, supplied in the 2016 DNLUP. The 2021 DNLUP provides details on the methods used to develop geographic boundaries for caribou ranges, but does not clarify whether the boundaries were updated with recent (post-2012) collar data. Comparison between 2016 and 2021 ranges suggest that the 2021 ranges are essentially the same as those provided in 2016, with a few exceptions noted below, which were based on amalgamated collar data from 1993 to 2012.

Some additions to these 2016 ranges are noticeably, such as on the north side of the Bluenose-East calving area, the east side of Bathurst Inlet (presumably for the Bathurst calving area or individual cows switching herd fidelity), and a slight increase in a northern portion of the Qamanirjuaq calving ground. These additions appear to be hand-drawn onto earlier ranges and no data are presented or referred to in support of these changes, questioning the validity of the methods used to build these ranges. Some post-calving areas are also expanded (e.g., to the north and northeast for the Qamanirjuaq herd), yet there is no expansion of post-calving range on the east side of Bathurst Inlet. Caribou calving areas on Southampton and Coates islands are not mapped, possibly because collar data were not available (hence, showing the limitation of relying solely on collar data). Key Access and

²⁵ Miller, J.H., B.E. Crowley, C.P. Bataille, E.J. Wlad, A. Kelly, M. Gaetano, V. Bahn, and P. Druckenmiller. 2021. Historical Landscape Use of Migratory Caribou: New Insights From Old Antlers. *Frontiers in Ecology and Evolution*. 8. 10.3389/fevo.2020.590837.

²⁶ Cameron, M. D., K. Joly, G. A. Breed, C. P. H. Mulder, and K. Kielland. 2020. Pronounced Fidelity and Selection for Average Conditions of Calving Area Suggestive of Spatial Memory in a Highly Migratory Ungulate. *Frontiers in Ecology and Evolution* 8:564-567.

²⁷ DNLUP Options and Recommendations page 56

²⁸ Kivalliq Inuit Association (KivIA), Poole and Gunn, 2016-02-15. NPC Public Registry File # 14-134E.

²⁹ Kitikmeot Inuit Association (KIA), 2017-01-13. NPC Public Registry File # 16-067E.

migratory corridors for the Lorillard and Wager Bay herds are also not included, such as the areas of seasonal migration through the Meadowbank mine Road system.

Examples of how these static boundaries fail to protect calving caribou are found for the Qamanirjuaq herd. Calving by Qamanirjuaq cows in recent years has been further north than in the past such that the majority of collared caribou locations during the calving period in 2019 and 2020 occurred outside of the 2021 DNLUP mapped calving areas (J. Tulugak, KivIA, pers. comm.). The northern portion of active calving in 2017 was north of the current 2021 DNLUP calving area boundaries³⁰.

Many of the KivIA's original criticisms³¹ of the methods used to develop these ranges remain in the 2021 DNLUP:

- a) For the purposes of caribou protection and conservation, season designations and dates should be decided through a collaborative exercise.
- b) Concentrated calving areas should map the extent of calving (peak of calving plus 3 weeks) over the past 10 years (and updated at 5-year intervals), and should consider IQ and scientific (survey, collar) data;
- c) Satellite collar locations should not be arbitrarily buffered by a set distance (11-20 km with previous mapping), as the GIS mapping technique already applies buffers around locations and IQ may provide information on calving area boundaries. Brownian Bridge analysis³², for example, should be explored as a more robust method to map caribou distribution;
- d) For concentrated calving areas integrate GN's collar information with IQ and aerial surveys (including aerial surveys conducted for calving ground distribution or population estimates);
- e) Screen out non-breeding collared cows from calving area delineation; and
- f) Use only the most recent 10 years of collaring data and address annual trends in seasonal ranges, especially for calving/post-calving areas.

³⁰ Boulanger et al. 2018. Estimating Abundance and Trend of the Qamanirjuaq Mainland Migratory Barren-Ground Caribou Subpopulation - June 2017. Government of Nunavut, Department of Environment, Technical Summary – No: 01-2018 Figs. 8 and 9.

³¹ Kitikmeot Inuit Association (KIA), 2017-01-13. NPC Public Registry File # 16-067E.

³² Mennell, R. 2021. Spatial and temporal trends in range-use by the Bathurst Caribou during a population decline, 1997-2019. MS thesis, Queens University, Kingston, Ontario.

3. MINING INDUSTRY

Important Consideration of the Mining Industry in the Kivalliq Region, as well as Nunavut

The mining industry is by far the largest contributor to the economy of Nunavut outside of transfer payments from the Federal government. The 2020 Natural Resources Canada (NRCAN) annual statistics indicates that mineral production and related activities, such as mineral exploration and building mines, comprise 53% of the taxation, employment and investment income for the territory.³³ The 2020 dollar value of the Nunavut income from mineral production and related activities totals \$2.4 billion dollars (CDN). There are currently no other industries, either singly or cumulatively, that will provide these levels of contribution to Nunavut's economy. This importance is well recognized by the GN, through its annual Gross Domestic Product (GDP), NTI, through its trust holding of mineral royalty payments, and by the KivIA, through its administration of surface and subsurface IOL.

The mining industry is recognized as a valued socio-economic activity in land use planning, but "Evidence of Mineral Potential" overlaps with "Limited Use" areas. This creates a direct conflict between "Limited Use" and it's associated VEC's with mineral exploration, mining, transportation, linear infrastructure and the associated VSEC's. The NPC must balance these competing interests instead of choosing one to the detriment of the other. Based on the 2021 DNLUP, the use of hard geographic boundaries for conservation have been chosen by NPC. The use of Mobile Measures would better assist in balancing these competing interests if hard geographic boundaries continue to be used (although hard geographic boundaries are opposed by the KivIA).

2021 DNLUP consideration for Mineral Exploration, Mining, Energy, Transportation and Communication

The KivIA notes that NPC responded to earlier criticisms and requested Government of Canada provided an updated map of mineral potential in 2017³⁴. However, KivIA finds that the approach of the 2021 DNLUP still fails to properly consider all the data required to define areas for mineral potential. The use of geographic boundaries which are based on surface

³³ NRCAN, 2020. Gross domestic product by industry: Provinces and Territories, 2020. <https://mmsd.nrcan-rncan.gc.ca/expl-expl/annual-eng.aspx> and NRCAN, 2020. Exploration and Deposit Appraisal Statistics for Northern Canada. <https://mmsd.nrcan-rncan.gc.ca/expl-expl/annual-eng.aspx>

³⁴ DNLUP Options and Recommendations p. 373.

ecosystems instead of geoscience layers, which are dominantly in the sub-surface, is problematic. The use of geoscience data is very important because it will better define the location and the quality of the “mineral potential” as opposed to the “geography” approach which only defines quantum’s of land based on surface landscape. Determining mineral potential requires the use of all available geoscience data (i.e., geology, geochemistry and geophysics) within a region. These data are then integrated with the use of Geographic Information System (GIS) software which allows for a qualitative assessment of the geoscience data in order to identify areas of known mineral deposits. This approach can then be used to identify new areas of favorable mineral potential which can lead to the discovery of new economic mineral deposits. The 2021 DNLUP recognizes areas with evidence for mineral potential (Map B2.11). The ‘inputs’ used appear to consist only of mineral showings, prospective geology and mineral tenure in relation to IOL. These data inputs are from a compilation of pre-1997 geological information.³⁵ The use of outdated geological data without the support of geochemical and geophysical data, even though also dated, does not allow for a robust approach to determining mineral potential.

The 2021 DNLUP does not address the need for the mining industry to explore wide areas to ensure exploration success. While mineral exploration requires access to very large areas to conduct its activities, an operational mines activity covers a very small area in relation to the total area of the Kivalliq Region. It is not possible to predict within the 2021 DNLUP where these small mining areas will be until exploration occurs. Nor can it be predicted which valued mineral species may be searched for and extracted to bring economic benefit to Nunavut.

The 2021 DNLUP is framed to implicitly assume that in areas of overlapping value the strictest conditions for access and usage will apply. As currently drafted the 2021 DNLUP leaves virtually no areas in the Kivalliq that are free access for exploration, and therefore no areas for future mining extraction. As can be seen from **Figure 3** the vast majority of the area designated as Limited Use also has significant mineral potential based on the prospectivity analysis and known mineral occurrences. **Figure 4** identifies the mineral potential in the Kivalliq region overlaid with the caribou land use designations.

³⁵ Wheeler, et.al., 1997. (comp). Geology Map of Canada. Geological Survey of Canada. Map D1860A. 1:3.5 million scale.

Recommended Changes to the DNLUP to Address Mining Concerns

- a) Recognize in the 2021 DNLUP that mining is the primary valued socio- economic activity in Nunavut.
- b) Except for specific valued areas (Territorial or National Parks) the 2021 DNLUP should not limit access to areas for mineral exploration. KivIA recommends that the same Land Use designations as recommended for caribou protection will also support mineral exploration and development (Conditional Use for calving and post-calving then Mixed Use for summer to rutting/fall). This recommendation will require the NPC to use updated caribou data as advocated for in the caribou sections above and will require the NPC to adopt Mobile Measures.
- c) The KivIA has completed a mineral potential study of the Kivalliq Region to allow all participants in the land use planning process to better understand the importance of using all geoscience data inputs to inform the land use planning process.³⁶ This approach can also be used by the other RIA's and NPC to better inform the decisions being made. The KivIA is recommending that the NPC review the mineral potential study conducted by the Kivalliq Region and revise the 2021 DNLUP to take into account the data that are outlined.

In summary, mining activity covers a very small area in relation to the total territory of the Kivalliq Region. But, to find these small areas requires access to large areas for mineral exploration. It is not possible to predict within the 2021 DNLUP where these small mining areas will occur. Nor can it be predicted what valued mineral species may be searched for and extracted to bring economic benefit to Nunavut. An example of this would be the demands for "green metals", such as Rare Earth Elements (REE's), that will be required to transition to the "green economy." Three decades ago these same REE's were considered largely valueless, but today they are key drivers in the green economy.

³⁶ Kivalliq Inuit Association, 2022. Updated Mineral Potential of the Kivalliq Region ,See Appendix 2

4. KIVALLIQ- MANITOBA LINEAR INFRASTRUCTURE CORRIDOR

The KivIA and the Governments of Canada, Nunavut and Manitoba through the Hudson Bay Regional Roundtable and the Canada-Manitoba Economic Development Partnership Agreement see implementation of the proposed new road and power corridor (i.e., a Linear Infrastructure Corridor or LIC or "Kivalliq-Manitoba linear infrastructure corridor), as a means of supporting the objectives of healthy communities, unity and self-reliance. The proposed Kivalliq- Manitoba linear infrastructure corridor including the fibre optic line are expected to enhance opportunities for resource development such as mining and tourism, benefit employment, small business development, standard of living; and reduce the cost of transporting people and goods between the Kivalliq Region and urban centers in Manitoba.

The KivIA appreciates that the NPC included in the 2021 DNLUP specific details with respect to the Kivalliq-Manitoba linear infrastructure corridor and that it has specifically been included in a Map appended to the 2021 DNLUP. However, the KivIA is concerned that the NPC did not take its comments into consideration when determining that the Kivalliq-Manitoba linear infrastructure corridor be deemed a Limited Use area. In 2016 the KivIA stated that the proposed Kivalliq-Manitoba infrastructure corridor be granted Special Management Area status with appropriate Mobile Measures. This was supported by the other RIA's and NTI. Instead of agreeing with what KivIA proposed the NPC has chosen to place the Kivalliq-Manitoba linear infrastructure corridor in a Limited Use designation although no entity in fact proposed this option.³⁷ It is concerning the NPC considered comments from interested parties with respect to designating this area as Conditional Use but that NPC still determined that the area should be Limited Use. NPC recognized that communities and participants supported development of the Kivalliq-Manitoba linear infrastructure corridor but NPC rationalized that support as requiring "prohibition of uses incompatible with the development of the road". KivIA disagrees and instead recommends that Conditional Use is more consistent with community support balancing economic development with other land uses.³⁸

The wording of section 5.3.1-1 as it now stands is confusing and susceptible to misinterpretation, and clarity is needed to confirm whether in fact infrastructure and construction supporting linear infrastructure is permitted within the designated area. There is

³⁷ NPC Options and Recommendations page 397

³⁸ NPC Options and Recommendations p. 399

also no mention in the 2021 DNLUP of fibre optic within this corridor although the potential for a fibre optic project has been raised by the KivIA in its prior written submissions.

If the intention is to allow for the development and construction of permanent facilities and infrastructure supporting the use of the corridor the plan should clearly state what use is permitted instead of just saying what are prohibited uses. It must be understood that the Kivalliq-Manitoba linear infrastructure corridor needs clients willing to pay to use it. This means that, in addition to the communities it would serve, development projects, such as mines, will be the main economic drivers for this type of infrastructure. The communities and the one mining project (i.e., Meliadine) in close proximity to the current corridor location will likely not justify the expenditure for this infrastructure from either/or the private sector, territorial, federal governments and RIA's if activities are restricted. Ensuring that mineral exploration and mining are allowed within the buffer zone (**See Figures 5 and 6**) of the proposed Kivalliq-Manitoba linear infrastructure corridor is necessary should the NPC determine this area remain Limited Use as it will ensure that there is an actual economic basis for the corridor. Should the NPC agree with the KivIA that the Kivalliq-Manitoba linear infrastructure corridor be designated as a Conditional Use Area the same designation would extend to the buffer zone and be protected by Mobile Measures.

If the NPC is insisting on having the Kivalliq-Manitoba linear infrastructure corridor in a Limited Use designation (although this is opposed by KivIA), the recommendation of KivIA is that section 5.3.1-1 be amended to state:

"The Kivalliq-Manitoba linear infrastructure corridor shown on Map A is a Limited Use area within which all uses other than the following are prohibited:

- (a) permanent facilities and infrastructure, support facilities and any other related systems associated with the construction and use of the corridor;
- (b) linear infrastructure, including fibre optics;
- (c) all weather and seasonal roads; and
- (d) quarries."

The recommendation above would add the clarity necessary, but it does not solve all concerns of the KivIA. Notwithstanding the above, KivIA is recommending that the Kivalliq-Manitoba linear infrastructure corridor be designated as Conditional Use.

Another significant concern is the way the Kivalliq-Manitoba infrastructure corridor would intersect with existing interests under section 6.1.8 of the 2021 DNLUP and plan amendments under section 6.1.5.1-1 of the 2021 DNLUP. The 2021 DNLUP exempts projects listed in Appendix A from complying with the prohibitions under the plan solely as it relates to mineral exploration and mining development. While it is appreciated that the 2021 DNLUP provides mineral exploration and production with an existing interest exemption, without the ability to connect to other linear infrastructure the economic viability and the scope of the Kivalliq-Manitoba infrastructure corridor would be limited. The reason being is that if an existing interest holder wanted to connect to the power grid via linear infrastructure at a site addressed in Appendix A (which is also located in a Limited Use area), they would be prohibited from doing so as linear infrastructure is prohibited within a Limited Use area. The result of this would be that every potential site would have to provide its own power generation which would increase the costs and add to the greenhouse gas emissions. The best way to remedy this situation would be allow all uses at existing interest sites rather than just allow mineral exploration and production. This would assist the proponent of a site listed in Appendix A in avoiding the extra step of seeking a plan amendment to develop additional linear infrastructure. On April 6, 2022 the NPC circulated a 2021 Draft Nunavut Land Use Plan Q&A document.

Question 7 states:

Will projects with existing rights and interests be exempt from prohibitions (i.e., quarries or linear infrastructure associated with mineral exploration and development) within their footprint?

The Answer the NPC has given indicates that associated activities such as quarries, or all weather roads will be exempted but does not answer the question with respect to linear infrastructure. As indicated above, it is the position of KivIA that linear infrastructure associated with an existing interest project be exempt from the prohibitions. The KivIA demands clarification from the NPC on this important issue.

The KivIA recommends that expansion and/or extension of the Kivalliq- Manitoba linear infrastructure corridor outside the proposed corridor to connect to existing and subsequent mineral development projects be permitted in the 2021 DNLUP .

Section 6.1.5.1 of the 2021 DNLUP outlines the requirement for a plan amendment to develop linear infrastructure in a Limited Use area. Clarification is required from the NPC as to whether a plan amendment would be required for the Kivalliq-Manitoba linear infrastructure corridor to expand outside of the designated corridor. It is the position of the KivIA that a plan amendment should not be required for Kivalliq-Manitoba linear infrastructure corridor expansion that is required for the purpose of connecting to an existing and subsequent mineral development projects. Requiring a plan amendment to the land use plan will potentially delay and prohibit any project from proceeding.

Recommended changes to address concerns relating to the Kivalliq-Manitoba linear infrastructure corridor

- a) That the Kivalliq-Manitoba linear infrastructure corridor be designated as Conditional Use;
- b) That expansion and/or extension of the Kivalliq- Manitoba linear infrastructure corridor outside the proposed corridor to connect to existing and subsequent mineral development projects be permitted in the 2021 DNLUP and that no plan amendment be required; and
- c) If the NPC refuses to accept KivIA's recommendation (a) then amend section 5.3.1-1 to state:

"The Kivalliq-Manitoba linear infrastructure corridor shown on Map A is a Limited Use area within which all uses other than the following are prohibited:

 - (a) permanent facilities and infrastructure, support facilities and any other related systems associated with the construction and use of the corridor;
 - (b) linear infrastructure, including fibre optics;
 - (c) all weather and seasonal roads; and
 - (d) quarries."

Questions to the NPC relating to the Kivalliq-Manitoba linear infrastructure corridor

- a) Is a plan amendment required for the Kivalliq-Manitoba linear infrastructure corridor to expand outside of the footprint of the current corridor to existing and subsequent mineral development projects?
- b) The 2021 DNLUP has narrowly defined the location of transportation and communication corridors. Flexibility on the location of infrastructure is essential for the future benefit of the Kivalliq Region in particular, and to Nunavut in general. In particular, limiting the extent of the Kivalliq-Manitoba infrastructure corridor, ignores the fact that energy, transportation and communication corridors will be needed wherever there is an activity that requires them. For any development to be economically viable it will require access to energy, transportation and communication corridors. Will there be recognition in the 2021 DNLUP of the need for these corridors to be addressed individually as opportunities arise aside from seeking a plan amendment?
- c) Is the construction and infrastructure supporting the proposed Kivalliq intercommunity road initiative being added to the 2021 DNLUP? ³⁹

5. DRINKING WATER

Access to fresh drinking water is a priority for the KivIA; whether it be in communities or in the broader Kivalliq Area. For the management of community drinking water, the 2021 DNLUP provides a Limited Use designation for watersheds that lie outside of their respective municipal boundaries, with the exception of Baker Lake and Kugluktuk, which have been designated as Valued Socio-Economic Components. In general, the KivIA supports a mixed approach to manage community drinking water.

Notwithstanding the above, the KivIA is concerned with the Limited Use designation assigned to the community of Arviat. The Options and Recommendations document provides its rationale for choosing Limited Use for community drinking water supply outside the municipal boundaries by stating that there is a relatively low non-renewable resource potential in that area. Figure 3 and Figure 5 suggests that this area actually has a high potential for non-renewable resources. An exception should be made to this aspect of the 2021 DNLUP.

³⁹ Burnett, s., 2022. Nunavut News. Infrastructure tops legislative topics.

Portions of the proposed linear infrastructure corridor may go in this area and as such a Limited Use designation for this area is opposed. Furthermore, there are surface and sub-surface IOLs and existing mineral claims in this area. A Limited Use designation would be contrary to the interests of the KivIA as it will prevent KivIA from managing those lands in a way that leads to economic self-sufficiency. Attached at **Figure 7** is a map that shows the mineral claim status and land ownership around the community of Arviat.

As is seen from Figure 7, the designation of the community water supply watersheds outside of municipal boundaries (which includes Arviat) as Limited Use will be contrary to the best interests of the KivIA. Measures can be put in place to protect the community drinking water supply while at the same time allowing IOL to be managed in accordance with Inuit interests, mineral claims to be pursued, and linear infrastructure projects to proceed. The proposal would be that the community water supply watershed of Arviat outside of municipal boundaries be designated as a Conditional Use Area.

6. COMMUNITY AREAS OF INTEREST

Duke of York Bay (Limited Use)-

This area overlaps with approximately 139 km² of surface IOL. It was previously requested that Duke of York Bay be designated as a Special Management Area and as such KivIA is against Duke of York Bay being designated as Limited Use. The KivIA would like to see this area as a Conditional Use Area. In the event the NPC does not agree with KivIA's request, KivIA proposes that the area encompassing the 139 km² of surface IOL be designated as a Conditional Use Area. Currently this area is subject to IIBA negotiations due to the potential of Oil and Gas in and around the coast. If this area is designated as Limited Use KivIA could suffer a loss of potential benefits should development activities be prohibited.

Walrus Island (Limited Use) –

KivIA agrees that Walrus Island be designated as a Limited Use Area.

Essential char fishing rivers (Limited Use).

This area overlaps with approximately 373 km² of surface IOL and 15 km² of subsurface IOL. It was previously requested that essential char fishing rivers be designated as a Special Management Area (and not Limited Use). The KivIA would like to see this area designated as a Conditional Use Area. The Limited Use Designation surrounding the 373 km² of surface IOL and 15 km² of subsurface IOL is contrary to the interests of the KivIA.

Diana River (Limited Use).

This area overlaps with approximately 7 km² of surface IOL and 3.4 km² of subsurface IOL. It was previously requested that Diana River be designated as a Special Management Area (and not Limited Use). It is possible that infrastructure may be needed to be erected in this area as part of the Kivalliq-Manitoba linear infrastructure corridor and it is possible that quarrying will need to occur and as such a Limited Use Area designation is opposed as quarrying would be prohibited under the current 2021 DNLUP. KivIA recommends that this area be designated as a Conditional Use Area and that quarrying be permitted within this area.

7. EASEMENTS

The KivIA notes that Article 19.6.3 of the Nunavut Agreement correlates to Schedule 19-11 of the Nunavut Agreement which is a list of recognized public easements. These easements were included in the Nunavut Agreement for specific purposes and as such the KivIA submits that it is necessary that the public easements recognized in Schedule 19-11 of the Nunavut Agreement be incorporated into the Existing Interest Schedule A of the 2021 DNLUP and further considered and addressed in the overall development of land use designations for the 2021 DNLUP. Attached as **Figure 8** is a map of the Schedule 19-11 public easements that are located in the Kivalliq Region.

8. CONCLUSION AND RECOMMENDATION

It is acknowledged that the NPC has had a difficult task to manage conflicting interests over a vast geographic space. This review of the 2021 DNLUP has highlighted several shortcomings and areas where improvements are necessary before the 2021 DNLUP can be approved. Significant adjustments are required prior to the KivIA supporting the 2021 DNLUP. The KivIA recommends that the 2021 DNLUP not be adopted in its current form until proper consideration has been given to the comments and recommendations provided to the NPC by the KivIA, NTI and other RIA's. The NPC's failure to take into account the considerations, goals, and objectives for IOLs of the KivIA, NTI and other RIA's must be corrected. The 2021 DNLUP should not be approved until a regional approach has been taken into account in the 2021 DNLUP to the management of caribou, which would include Mobile Measures.

The recommendations and comments in this report should be adopted or the NPC should provide justification as to why these recommendations and comments have been disregarded or rejected and propose alternative solutions.

9. FIGURES

Figure 1- Kivalliq Region Inuit Owned Lands (IOL)

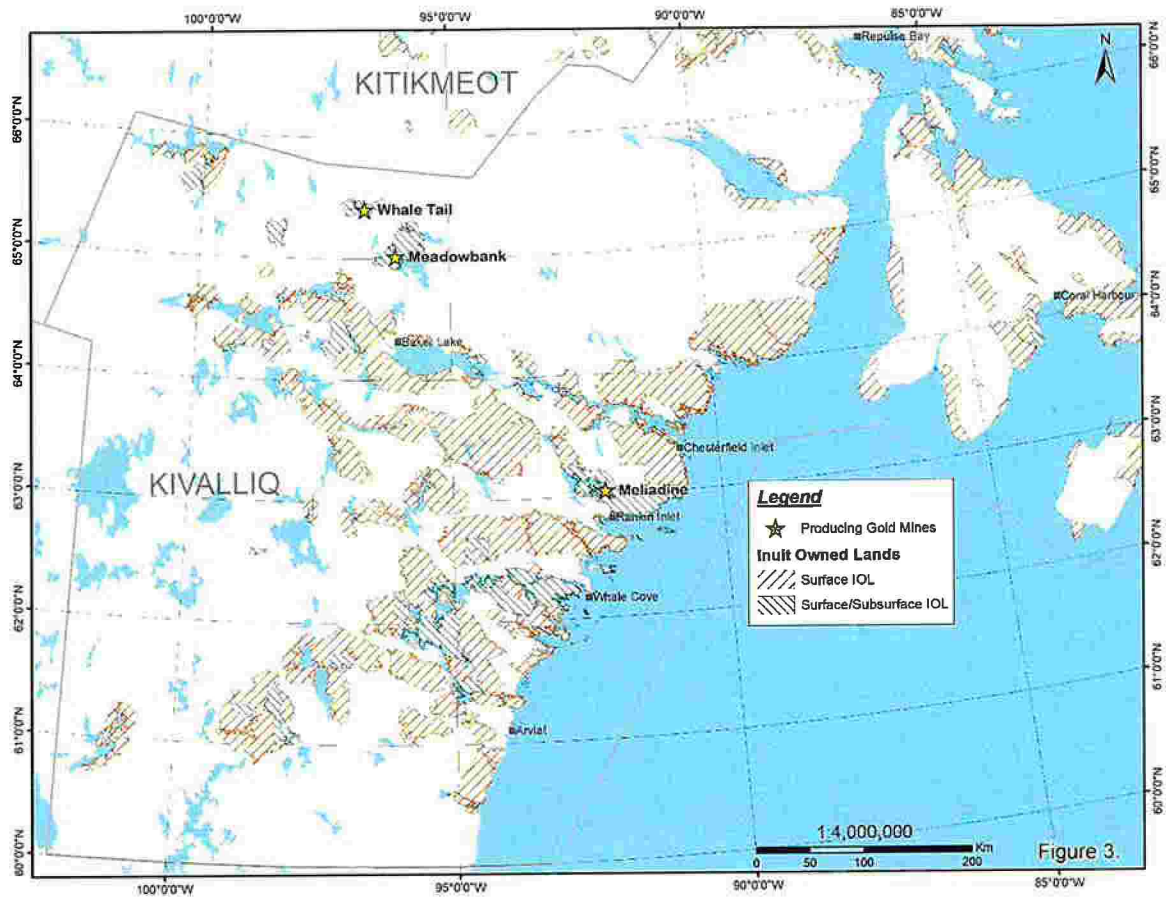


Figure 2- Caribou Related Land Use Designations over Kivalliq Region IOLs

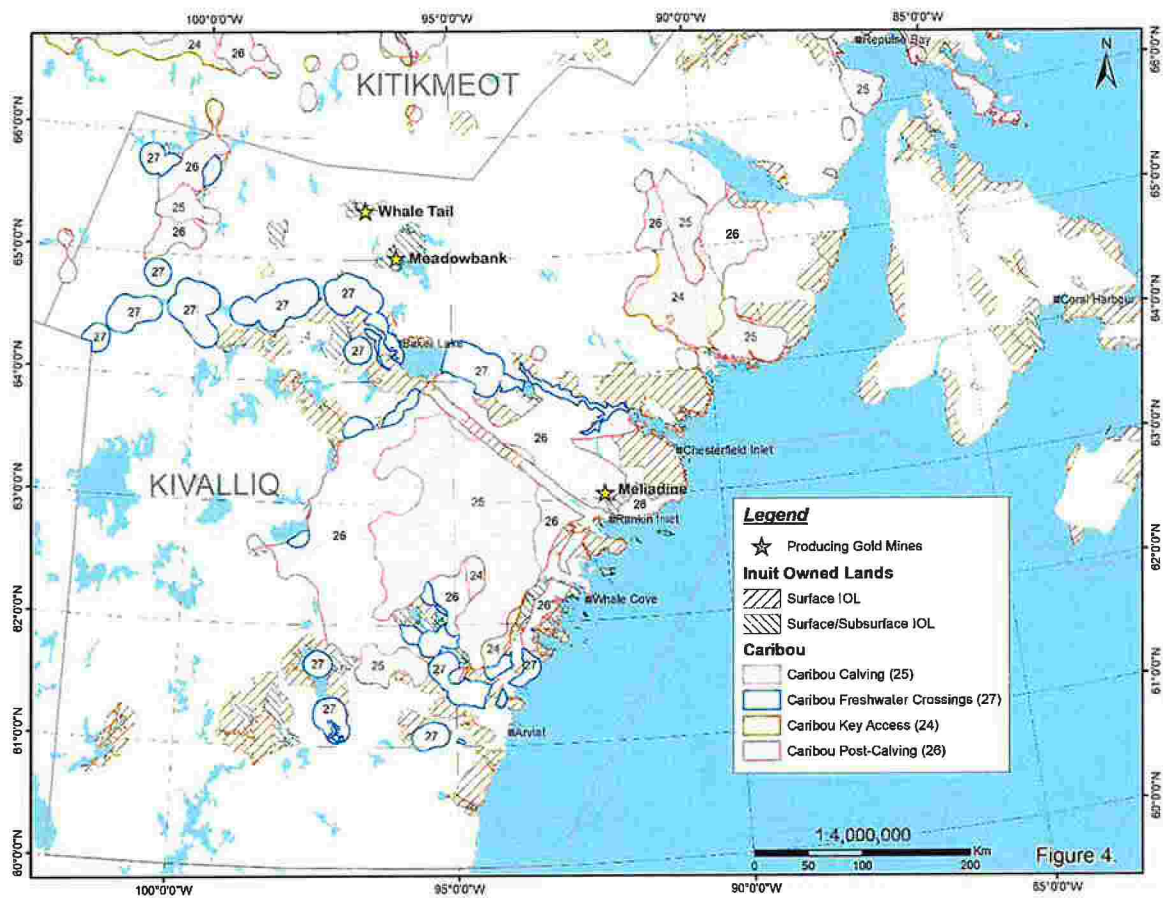


Figure 3- Mineral Potential of the Kivalliq Region

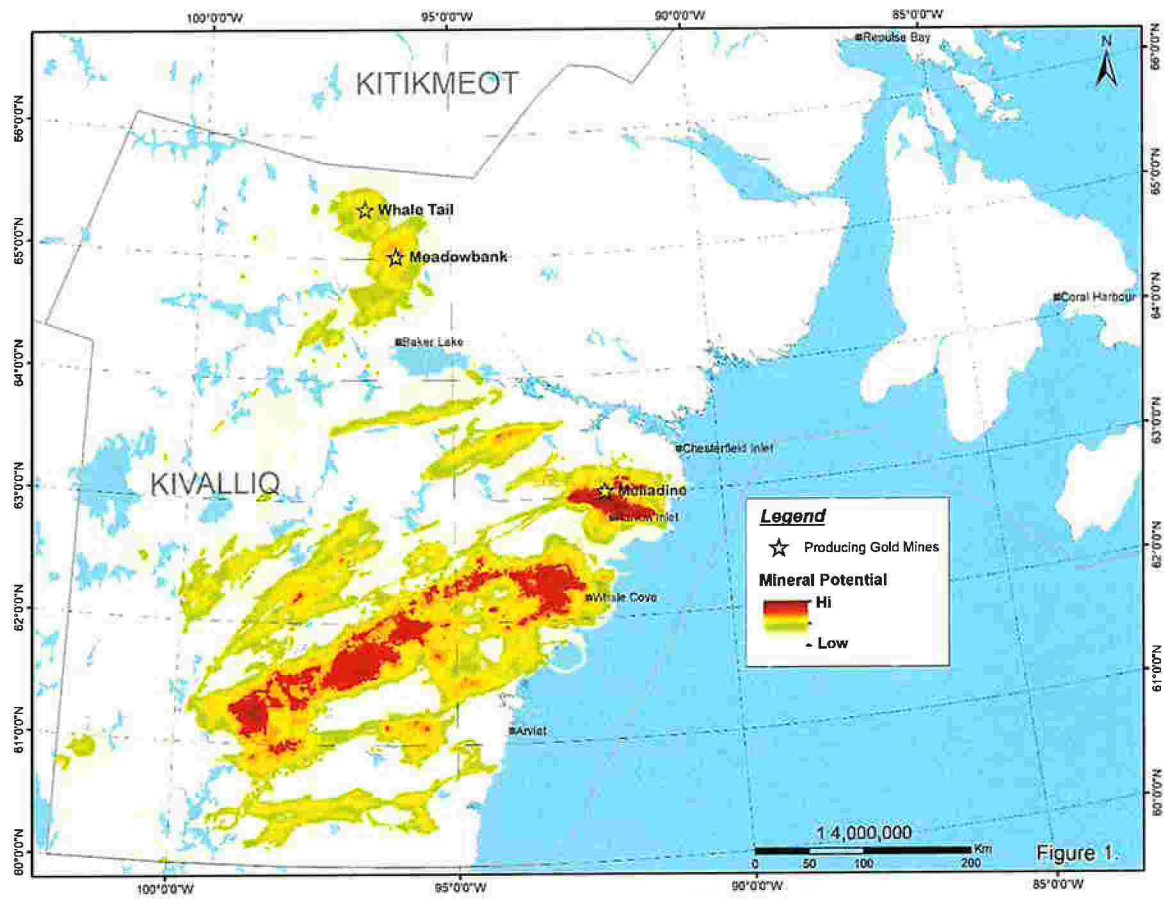


Figure 4- Caribou Related Land Use Designations over Mineral Potential for the Kivalliq Region

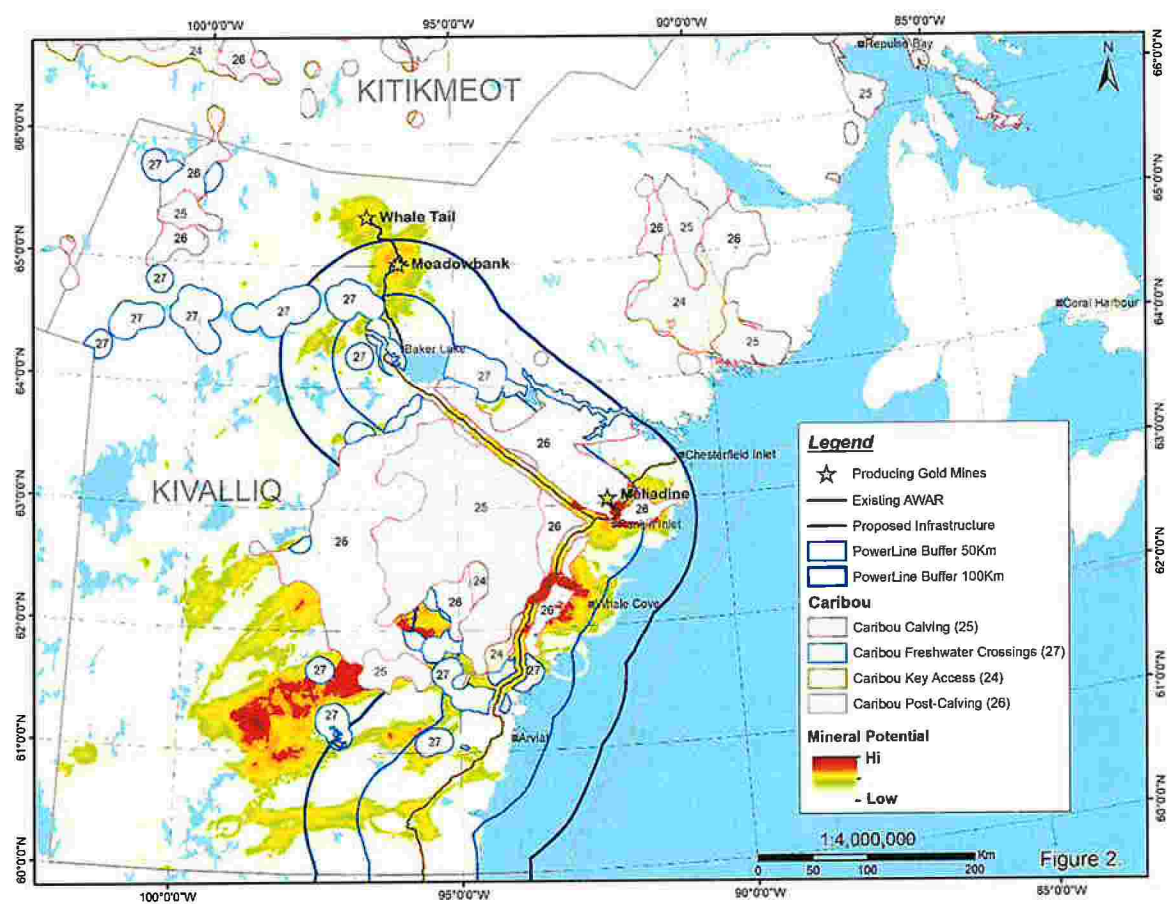


Figure 5- Linear Infrastructure in the Kivalliq Region

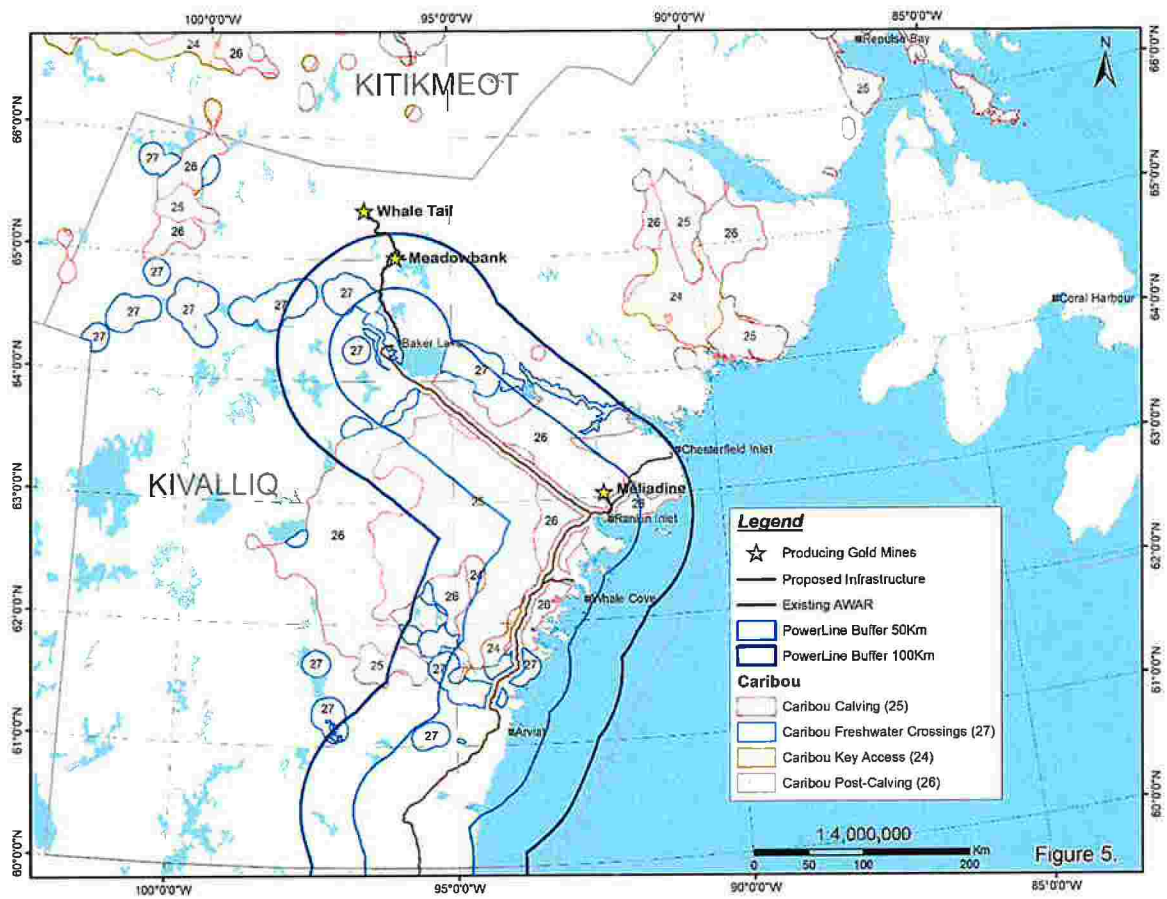


Figure 6- Caribou Related Land Use Designations over Linear Infrastructure in the Kivalliq Region

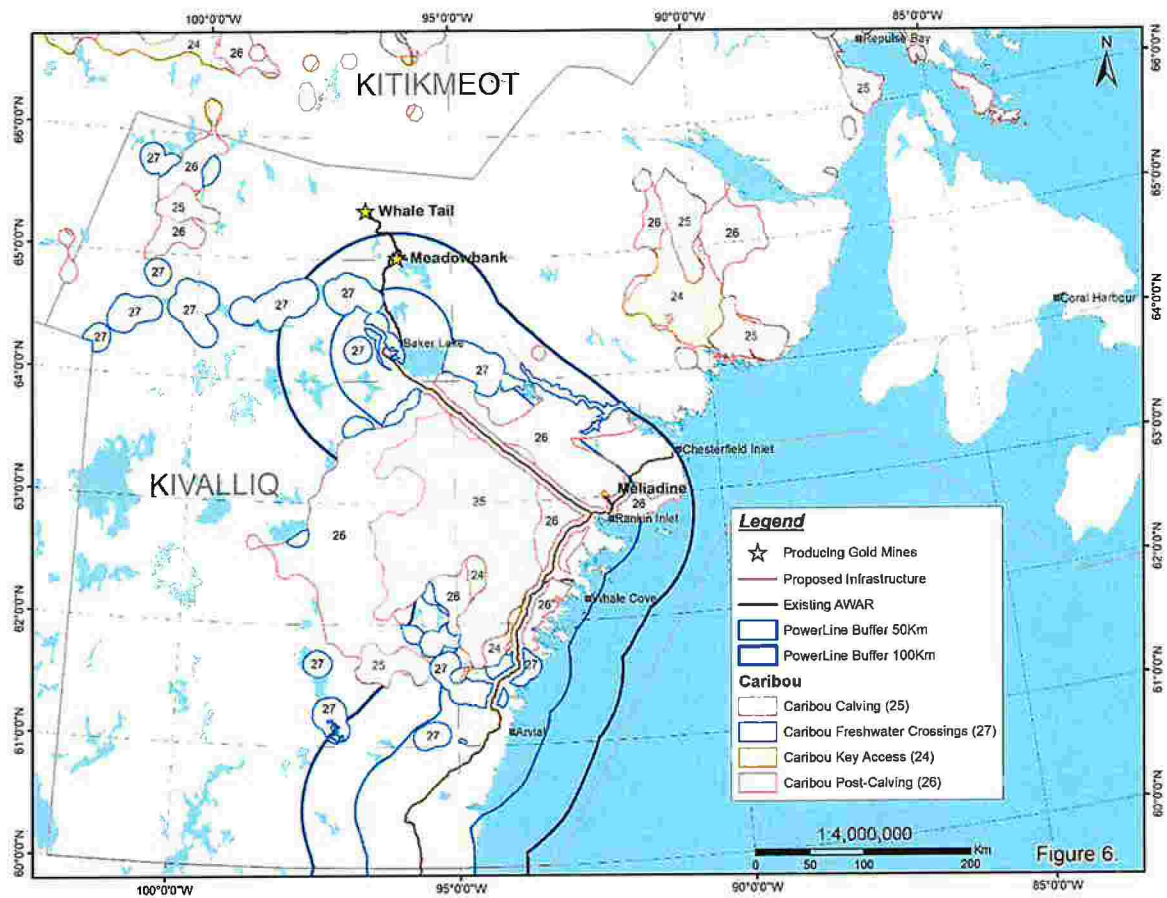


Figure 7- Community Watershed Map with Mineral Claim overlay

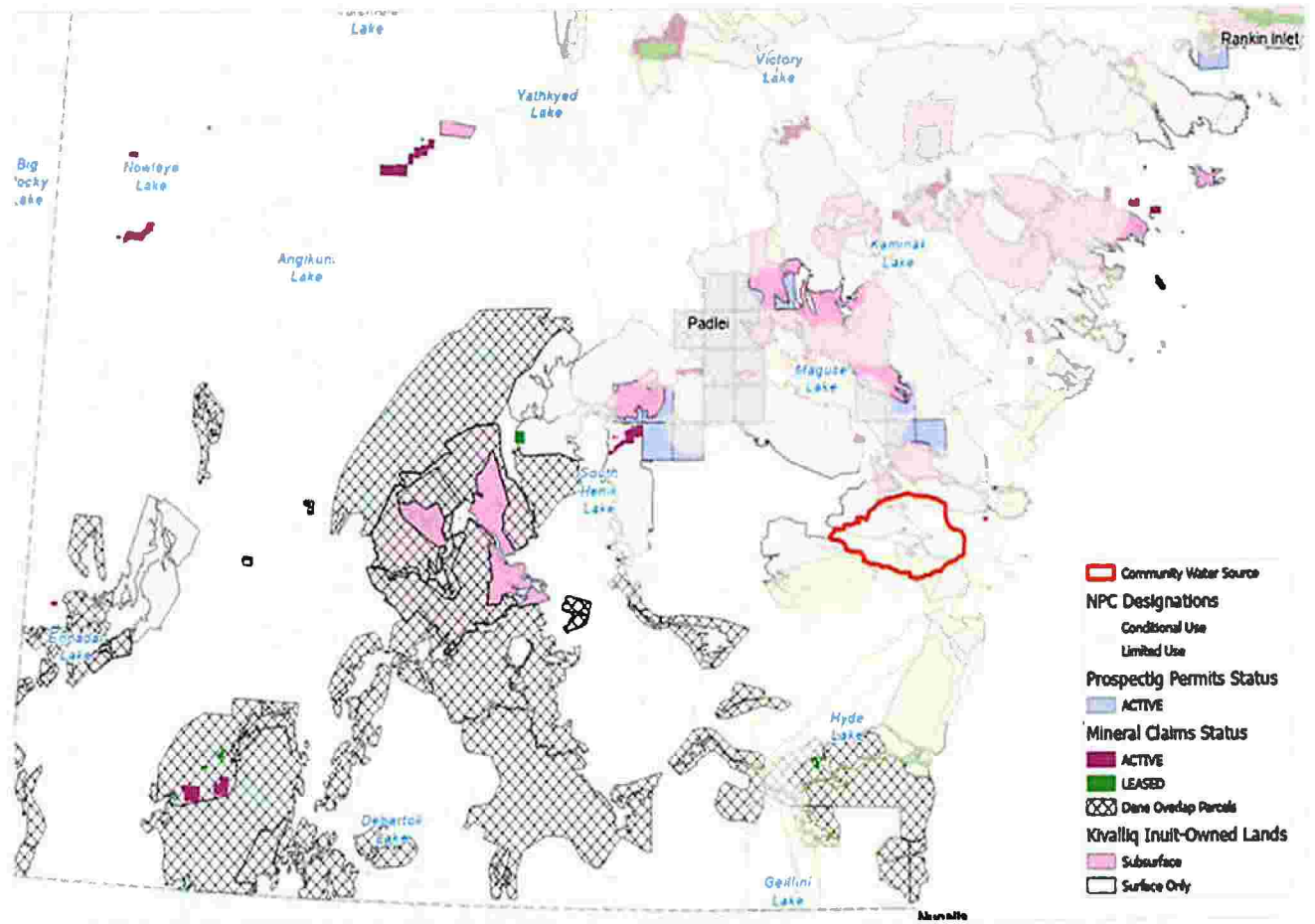
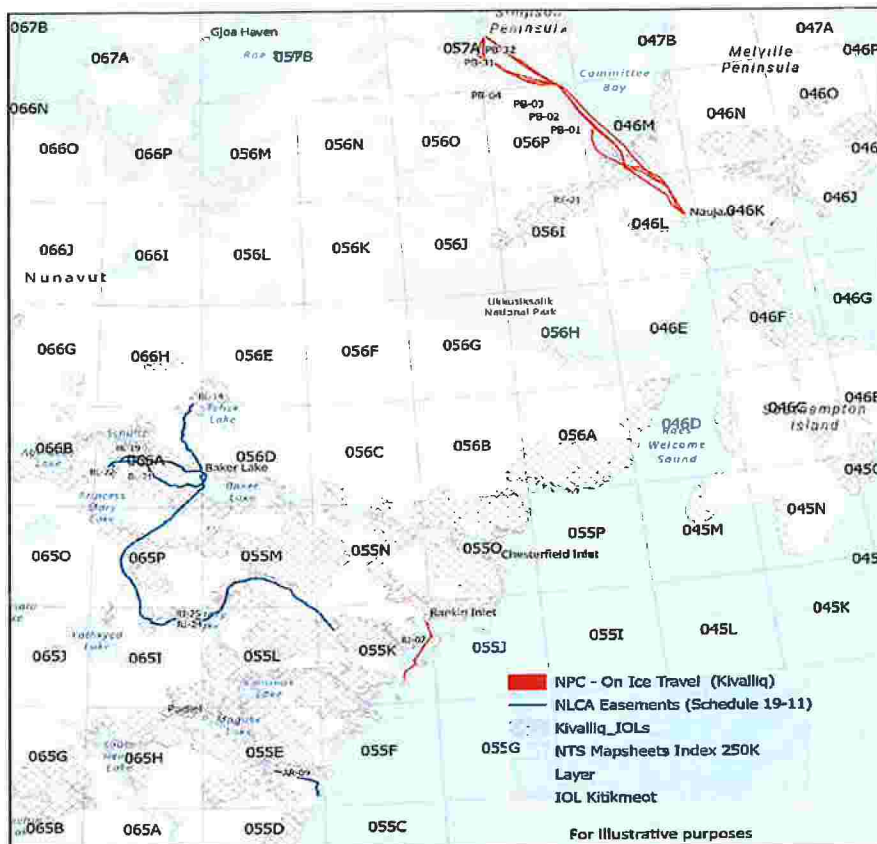
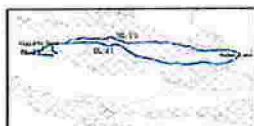


Figure 8- Schedule 19-11 public easements in the Kivalliq Region



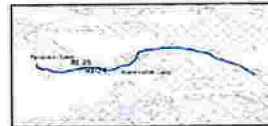
Easements, schedule 19-11 NLCA



4. A public transportation route, the location to be based on the location of the winter road routes used in the years 1980 to 1990 between Baker Lake and the Kiggavik area. Affected Parcels: BL-19/66A, BL-21/66A, BL-22/66A



5. A public transportation route, the location to be based on the location of the winter road routes used in the years 1980 to 1990 between Baker Lake and the Meadowbank River area. Affected Parcels: BL-14/56D, 56E, 66A, 66H



7. A public travel route along the overland portion of the existing winter road between Ferguson Lake and Kaministiquia Lake. Parcels affected: RI-24/55L, 65I, RI-25/55L, 65I, 65P



6. A public travel route between Arviat and Magu Lake. Affected Parcels: AR-09/55E



8. A public travel route across Pangnirtuq Peninsula between Rankin Inlet and Whale Cove. Affected Parcels: RI-07/55J, 55K



9. A public transportation route between Pelly Bay and Repulse Bay. Affected Parcels: RE-21/46L, 46M, 56I, PB-01/56P, PB-02/56P, PB-03/56P, PB-04/56P, PB-31/57A, PB-32/57A

Appendix 1. Working model for application of Mobile Caribou Conservation Measures in Nunavut

Summary

Mobile Caribou Conservation Measures (Mobile Measures) are a flexible tool to minimize and avoid effects on caribou when exposed to human disturbance wherever the caribou are and in any season. Mobile Measure can be implemented in concert with land use designations and are designed to address exploration activities covered under Land Use Permits, such as exploration or drill camps. Mobile Measures link monitoring with site-specific tiered mitigation triggered by thresholds (numbers and proximity of caribou to development coupled with seasonal sensitivity and movement rates). Mobile Measures have evolved since their first application in the 1980s. Recently, a collaboration between government and industry in the Northwest Territories added considerably more implementation details. This collaboration led to development of framework and operational guidance documents, although COVID-19 postponed pilot projects in 2021. Implementation of Mobile Measures is the responsibility of the proponent, with guidance and support of the government and Regional Inuit Associations (on Inuit Owned Lands). Mobile Measures in Nunavut will depend on Inuit Qaujimajatuqangit and can be collaboratively implemented and adaptively used as an effective land use planning tool.

Background

The recently released 2021 Draft Nunavut Land Use Plan (DNLUP) Options and Recommendations document (Nunavut Planning Commission (NPC) 2021) noted that since 2015 the Kivalliq Inuit Association (KivIA) are among the participants who support Mobile Caribou Conservation Measures (Mobile Measures; also referred to as mobile Caribou Protection Measures (CPM)) as a tool to protect caribou⁴⁰. Mobile Measures are a flexible tool to minimize and avoid effects on caribou when exposed to human disturbance wherever the caribou are in any season (Poole and Gunn 2015, 2016). Mobile Measures can be implemented in concert with Limited, Conditional or Mixed use land use designations and are designed to address exploration activities covered under Land Use Permits, such as exploration or drill camps. Mobile Measures link monitoring with site-specific mitigation, and are based on thresholds (numbers and proximity of caribou to development coupled with seasonal sensitivity and movement rates) for enhanced monitoring and tiered mitigation. The monitoring component is flexible and can accommodate innovative technologies including drones or ground-based surveillance. The approach relies on monitoring of specific zones at development sites to give early warning to mitigation to avoid and minimize interaction between caribou and development.

Despite broad-based support, the 2021 DNLUP rejected implementation of Mobile Measures noting “*there is insufficient evidence that mobile CPMs [Mobile Measures] could be effectively used as a land use planning tool for caribou calving and post-calving habitat management in the NLUP*”⁴¹. However, for seasons not

⁴⁰ 2021 DNLUP Options and Recommendations – page 71

⁴¹ 2021 DNLUP; Options and Recommendations Document- page 71

designated as Limited Use or Conditional Use, the 2021 DNLUP does acknowledge that *“This could also be a circumstance where mobile CPMs may be suitable. These measures would not be administered or enforced by the NPC, but would be addressed by an appropriate regulatory authority”*⁴².

Mobile Measures are being increasingly accepted in the NWT and Nunavut. The KivIA stipulates Mobile Measures on relevant project land use permits on Inuit Owned Land in the Kivalliq Region. A pilot project in the NWT is collaborative between government and industry representing the NWT and NU Chamber of Mines (GNWT 2022). Framework and operational guidance documents are available with desktop pilot projects (field tests were postponed in 2021 because of COVID-19). In the NWT, Mobile Measures are being implemented using a rules-based approach and monitoring is primarily from height-of-land and other ground-based monitoring to minimize use of and reliance on aircraft. Although government has been involved in developing the project and will provide caribou distribution maps to land use operators, the main costs of implementation will be borne by industry. Here we present a working model, based largely on the KivIA and NWT experiences, for how Mobile Measures could be implemented in Nunavut.

Working model for implementation of Mobile Measures in Nunavut

The main points for the planning, operation and assessment of Mobile Measures can be summarized as follows:

1. Depend on application of Inuit Qaujimajatuqangit (IQ): *Pilimmaksarniq* - development of skills through observation, mentoring, practice, and effort; *Kajuqtigiinniq* - working together for a common cause; *Qanuqtuurniq* - being innovative and resourceful; and *Avatittinnik Kamatsiarniq* - respect and care for the land, animals and the environment.
2. A Framework document provides the rationale, considerations and general approaches for implementing Mobile Measures.
3. An Operational Guidance document sets out how land use operators can implement and report on Mobile Measures at their sites.
4. Government of Nunavut staff and Regional Inuit Associations (RIAs; on Inuit Owned Lands) will work closely with land use operators to share all necessary information such as data sharing agreements for caribou telemetry and maps with likely caribou seasonal duration of exposure, and provide advice and support as required.
5. Caribou will be monitored within zones surrounding a project site, and the monitoring results compared to pre-assigned trigger levels. When a trigger is met, pre-determined mitigations are applied with increasing intensity as caribou approach the project, to avoid or minimize any potential sensory disturbance to caribou.
6. Once monitoring detects caribou have moved away and numbers and distribution of caribou close to a project site are reduced, mitigation will be stepped down.
7. Operators will report annually using a standard template, enabling assessment of the effectiveness of the Mobile Measures including consideration of costs, personnel requirements and achievement of desired outcomes.

Where do Mobile Measures apply?

Mobile Measures would be applied within mapped caribou seasonal ranges in Nunavut. Seasonal ranges (and seasonal dates) provided in the 2021 DNLUP would have to be updated to reflect more recent collar

⁴² 2021 DNLUP; Options and Recommendations Document- page 110

data and IQ. Mobile Measures would be applied outside of periods and areas when prohibited incompatible uses are in effect (e.g., in Limited, Conditional and Mixed Use areas for listed activities).

How do they work?

Monitoring in zones

Mobile Measures operate within two concentric zones, with increasing surveillance effort to assess the likely arrival or presence of caribou. Figure 1 represents a single point site of project activity, such as a camp. These zones may be established and combined around a number of sites of activity, to reflect the extent of activity of a single operation.

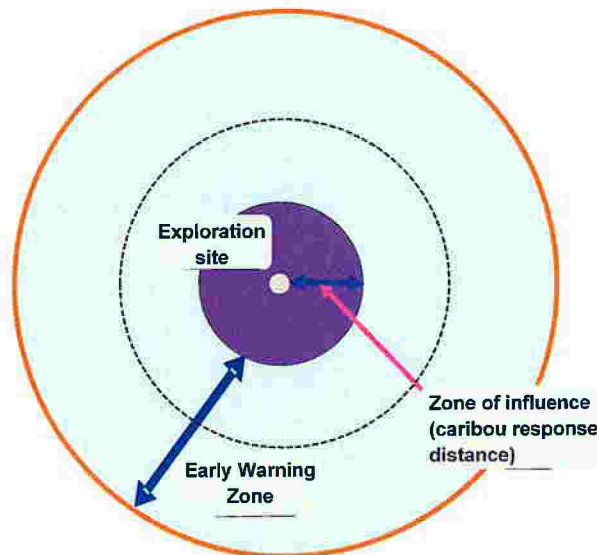


Figure 1. Schematic relationship between a project (exploration) site, Zone of Influence, Early Warning Zone, and monitoring survey area (outer orange line). Note the Early Warning Zone is split into an inner and an outer zone.

An 'Early Warning Zone' varies in size with caribou season reflecting relative sensitivity of caribou to disturbance during that season and movement rates (this table will be developed as herd-specific; as modified from the NWT experience). For example, a smaller Early Warning Zone is used during winter when movement rates are generally lower and less directional. A larger Early Warning Zone is used during spring migration when distances moved daily are generally higher and more directional. The Zone of Influence is the area around a project site where the behaviour and distribution of caribou may change in response to the site's activities, in effect, the caribou response distance.

Thresholds

The threshold numbers of collars or observed caribou that would trigger mitigation is influenced by seasonal susceptibility and the size of the Early Warning Zone. The intent is to afford protection from disturbance for a majority of caribou that may be near the project site.

Information from collared caribou will likely be used as the first line of monitoring in combination with incidental observations made during project-related flights. Coordination and data share agreements with

the Government of Nunavut Department of Environment (GN-DOE) will be required to ensure sharing of caribou collar maps two or three times a week during periods when caribou are likely to be in the broader area.

Tiered mitigation

If monitoring (collar locations, aerial surveys if used, incidental observations) in the Early Warning Zone or monitoring within the Zone of Influence (height of land surveys and other ground-based monitoring, incidental observations), reveals that the number of collars or caribou exceeded the designated thresholds, then mitigations are applied to the land use operation in three levels. Generally, the first two levels aim to adjust flight paths to reduce or avoid flying over or landing near caribou. Where the operator declares that delays to land use operations are not feasible or practical, discussions between the land use operator and GN-DOE (or the relevant land manager) should occur. The operator is expected to make every possible effort to modify their program to minimize potential impacts to caribou.

Who does what and when?

Application of Mobile Measures has three components: (i) monitoring, the results of which are compared to pre-assigned thresholds; (ii) the thresholds trigger decisions about the intensity of tiered mitigation; and (iii) mitigation. The tiered mitigations are implemented to avoid or minimize any potential sensory disturbance to caribou. In turn, monitoring can be used to gauge the effectiveness of the mitigation.

Coordination among GN-DOE, RIAs and land use operators will be critical to successful implementation of Mobile Measures. Land use operators will be provided with Mobile Measures documentation early in their planning and made aware that it is expected that they will follow the intent of the Mobile Measures to avoid and minimize potential disturbance to caribou. The land managers will share maps of caribou seasonal distribution relative to the locations of the land use activities to help the land use operator have a more predictive idea of what to expect in terms of caribou exposure before the field season starts. This is especially important to smaller, early exploration projects where regular internet may be lacking in the field. The land managers will share with land use operators maps (local knowledge, caribou collars) in relation to project sites two or three times a week. The land use operator is responsible for understanding the Mobile Measures as they apply to the specific project, to implement mitigation actions, and to provide an annual report on activities. An overview of actions and responsibilities is provided in Table 1.

Table 2. Suggested progression of activities for a land use operation using Mobile Caribou Conservation Measures within Nunavut caribou range.

	Task	Government Land Agency	Land Use Operator
1	Planning	GN-DOE and RIAs (on Inuit Owned lands) publicizes need for Mobile Measures through Chamber of Mines, Mining Records Office, GN website, RIAs, etc.	Land use operator is made aware of requirements for Mobile Measures through Chamber of Mines, Mining Records Office, GN website, RIAs, etc.

	Task	Government Land Agency	Land Use Operator
2	Planning	GN-DOE/RIAs has point of contact for Mobile Measures oversight.	Land use operator contacts GN-DOE (or RIA on Inuit Owned Land).
3	Planning	GN-DOE/RIAs provides and discusses Operational Guidance document and clarifies expectations/requirements.	Discusses Operational Guidance document and clarifies expectations/requirements.
4	Planning	Discusses and determines location relative to range assessment area and season of proposed operation.	Discusses and determines location relative to range assessment area and season of proposed operation.
5	Planning	Summary of expected seasonal caribou abundance and residency provided in Operational Guidance document.	Reviews caribou information and responds with proposed schedule of operations.
6	Planning	Size of Early Warning Zone and trigger levels of caribou are discussed and understood.	Size of Early Warning Zone and trigger levels of caribou are discussed and understood.
7	Planning	Reviews and agrees upon suggested list of tiered mitigations.	Provides potential list of tiered mitigations based on mineral cycle stage and type of activity.
8	Planning	Ensures project site contact information is received for information sharing.	Provides project site contact information to GN-DOE/RIAs for information sharing (e.g., emailing collar location maps).
9	Operations	GN-DOE/RIAs provides timely emails with maps of collar locations relative to Early Warning Zone, Zone of Influence and project site.	Receives emails with maps of collar locations relative to Early Warning Zone, Zone of Influence and project site.
10	Operations	GN-DOE/RIAs available to respond to any questions or concerns during operations.	Monitors collar locations in the Early Warning Zone; conducts an aerial survey if desired.
11	Operations	GN-DOE/RIAs expects the operator to implement mitigation, and is available to respond to any questions and concerns during operations.	If caribou threshold exceeded, the land use operator will implement mitigation; monitoring within the Zone of Influence is required.
12	Operations	GN-DOE/RIAs available to respond to any questions and concerns during operations.	Continued monitoring and mitigation until caribou move out of the Early Warning Zone.
13	Reporting	GN-DOE/RIAs to provide an annual report on Mobile Measures-related activities within caribou ranges.	Land user to provide an annual report on Mobile Measures-related activities.
14	Review	Assesses the effectiveness of the Mobile Measures including consideration of costs, personnel requirements and achievement of desired outcomes.	Assesses the effectiveness of the Mobile Measures including actions taken, costs, personnel requirements and consequences to operations.

There are advantages to application of Mobile Measures in Nunavut, including:

- a) Flexibility (i.e., follow the caribou) and predictability for land-use operators;
- b) Offers protection to caribou during all seasonal ranges with thresholds scaled to caribou seasonal sensitivity; and
- c) Greater balance between protection for caribou (minimizing sensory disturbance) and potential economic benefits from industry, which is especially important for Inuit Owned Lands.

However, Atkinson (2016) outlined potential problems with Mobile Measures which were also summarized in the 2021 DNLUP Options and Recommendations document⁴³. Since 2016, considerable progress has been made on a framework and implementation for Mobile Measures which clarifies misunderstandings and dated information. Our experience is that collaboration among land managers and users and the flexibility of the Mobile Measures will allow their application as an effective tool to minimize and avoid any effects from mineral exploration on caribou.

Conclusions

KivIA recommends that Mobile Measures should be further tested and applied in Nunavut to build experience and confidence in them as an effective land use planning tool. The testing should be collaborative, based on IQ and build on GNWT's (2022) approach. The application of Mobile Measures currently underway in the NWT can be used as a guide for further applying Mobile Measures within Nunavut to minimize and avoid any effects from mineral exploration on caribou while not foreclosing on potential economic benefits from industrial development.

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⁴³ 2021 DNLUP; Options and Recommendations Document- pages 54, 60, 61

Appendix 2 – Updated Mineral Potential Assessment of the Kivalliq Region

MINERAL POTENTIAL ASSESSMENT
of the
KIVALLIQ REGION
for the
KIVALLIQ INUIT ASSOCIATION

March 31ST, 2022

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EXECUTIVE SUMMARY

GeoVector Management Inc. (GeoVector) has prepared an updated mineral potential assessment that is centered on the Kivalliq–Manitoba linear infrastructure corridor as defined in the 2021 Draft Nunavut Land Use Plan (DNLUP). This work was completed at the request of the Kivalliq Inuit Association. This assessment was completed within 50-kilometre and 100-kilometre buffers of the proposed linear infrastructure corridor. This mineral potential assessment identified five (5) LG, one (1) VMS and two (2) diamond target areas that fall within the 50-kilometre and 100-kilometre buffers of the proposed linear infrastructure corridor.

This mineral potential assessment used Geographic Information Systems (GIS) software and analysis in conjunction with a combination of:

1. Traditional geoscience data sets, and
2. Knowledge from known mineral deposits to determine effective predictors for economic mineral deposits.

The major strength of using GIS software is the ability to integrate and combine multiple layers of geoscience data into mineral potential maps, which can define known mineral deposits, but more importantly show areas away from known mineral deposits that can be favourable for mineral exploration. This often leads to the discovery of new economic mineral deposits. The knowledge driven mineral potential models predicted 100% of the current and past producing gold deposits and the known base metal deposits in the Kivalliq Region. Given the positive results these models were used to identify areas of moderate to high mineral potential within the Kivalliq Region.

The Kivalliq Region is covered mainly by the Rankin–Ennadai greenstone belt (REGB), which extends for 700km from northern Saskatchewan to the western shore of Hudson Bay. The REGB covers approximately 175,000 square kilometers and is the second largest greenstone belt in Canada outside of the Abitibi Greenstone Belt (AGB) of north-western Quebec and north-eastern Ontario. The AGB is the largest greenstone belt in the world and also the most prolific for production from Lode Gold (LG) and Volcanic Massive Sulphide (VMS) deposits over the past 110 years. The metals found in VMS deposits is dominantly copper and zinc, however, significant additional silver, gold and lead and important accessory minerals, such as gallium, germanium, indium and tin, can also occur in economic concentrations. Comprehensive mineral exploration has occurred in the AGB for over 110 years, while the REGB remains largely unexplored, having only seen sporadic, low levels of mineral exploration over the last 65 years (1957 – 2022). During this period four gold deposits have been discovered, Cullaton Lake, Meadowbank, Meliadine and Whale Tail. These gold mines have a combined production of 13.814 M oz of gold. The Meliadine and Whale Tail gold mines continue to produce and each have a life of mine that will continue into the 2040's. Volcanic Massive Sulphide deposits have also been discovered during the last thirty years (1992-2022). The most significant is the Heninga Gemex which has an historic mineral resource estimate of 5.0 Mt with 8.5% zinc, 0.2% copper, 110.0 g/t silver and 1.0 g/t gold (Goff, 1996).

Given that the Kivalliq Region contains the second largest greenstone belt in Canada which has seen limited mineral exploration, it is reasonable to assume that the discovery of new economic gold and base metal deposits will happen in the next 10 to 20 years. The discovery of other deposit types, such as diamonds and REE's is also very possible. It is recommended that the results of this mineral potential assessment of the Kivalliq Region be used in order to better determine the impact of the DNLUP on mineral exploration, mining, linear infrastructure and other development.

This approach was used in order to better determine the impact of the DNLUP on linear infrastructure and other development within these respective buffers.

Overlaying the mineral potential with the Land Use designations for caribou from the 2021 DNLUP impacts on a significantly large area of mineral potential. The linear infrastructure corridor currently in the 2021 DNLUP provides access to very limited areas of mineral potential. It must be understood that the linear infrastructure corridor requires clients that will pay to use the hydroelectric and fiber optic services that it is intended to provide. This will require, in addition to the Kivalliq communities, development projects and their associated activities, such as mineral exploration and mines, to be the main economic drivers for this type of infrastructure. The current communities and the one current mining project (i.e. Meliadine) will likely not justify the expenditure for financing and building this infrastructure. Ensuring that mineral exploration and mining is allowed within the buffer zone of the linear infrastructure corridor will ensure that there is an actual economic basis for this and future infrastructure.

In addition, the Limited Use designation in the 2021 DNLUP covers 45.70% of surface IOL and 56.76% of sub-surface IOL in the Kivalliq Region. These high percentages reflect the selection of highly mineral prospective areas in the known greenstone belts by the Inuit negotiators of the Land Claim Agreement (LCA). The LCA anticipated the economic advantages in the selection of these IOLs, with the intention for the economic benefit of future generations of Nunavummiut. The 2021 DNLUP will seriously jeopardize the realization of this economic potential.

It is recommended that the results of this mineral potential assessment of the Kivalliq Region be used to better determine the impact of the DNLUP on mineral exploration, mining, linear infrastructure and other development.

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1.0 Introduction

GeoVector Management Inc. (GeoVector) has prepared an updated mineral potential assessment that is centered on the Kivalliq–Manitoba linear infrastructure corridor as defined in the 2021 Draft Nunavut Land Use Plan (DNLUP). This work was completed at the request of the Kivalliq Inuit Association. This assessment was completed within 50-kilometre and 100-kilometre buffers of the proposed linear infrastructure corridor. This approach was used in order to better determine the impact of the DNLUP on linear infrastructure and other development within these respective buffers.

The Kivalliq Region is covered mainly by the Rankin–Ennadai greenstone belt (REGB), which extends for 700km from northern Saskatchewan to the western shore of Hudson Bay. The REGB covers approximately 175,000 square kilometers and is the second largest greenstone belt in Canada outside of the Abitibi Greenstone Belt (AGB) of north-western Quebec and north-eastern Ontario. The AGB is the largest greenstone belt in the world and also the most prolific for production from Lode Gold (LG) and Volcanic Massive Sulphide (VMS) deposits over the past 110 years. The metals found in VMS deposits is dominantly copper and zinc, however, significant additional silver, gold and lead and important accessory minerals, such as gallium, germanium, indium and tin, can also occur in economic concentrations.

Comprehensive mineral exploration has occurred in the AGB for over 110 years, while the REGB remains largely unexplored, having only seen sporadic, low levels of mineral exploration over the last 65 years (1957 – 2022). During this period four gold deposits have been discovered, Cullaton Lake, Meadowbank, Meliadine and Whale Tail. These gold mines have a combined production of 13.814 M oz of gold. The Meliadine and Whale Tail gold mines continue to produce and each have a life of mine that will continue into the 2040's. Volcanic Massive Sulphide deposits have also been discovered during the last thirty years (1992-2022). The most significant is the Heninga Gemex which has an historic mineral resource estimate of 5.0 Mt with 8.5% zinc, 0.2% copper, 110.0 g/t silver and 1.0 g/t gold (Goff, 1996).

In summary, on a Canada wide scale, the Kivalliq Region compares very well with the main gold camps, such as the Timmins, Kirkland Lake, Yellowknife and Red Lake camps. It also compares very well with the base metal camps in Quebec, Ontario, Manitoba and Saskatchewan. All of these camps have also used mineral potential assessments to identify the signatures of the currently known deposits in order to select new areas for mineral exploration that have similar signatures as the known gold and base metal deposits.

2.0 Mineral Potential Methodology

A definition for mineral potential is “The aim of mineral potential analysis is to de-risk mineral exploration decision making by making use of large geospatial datasets and the latest minerals systems knowledge.” This allows the qualitative assessment of geology, geochemistry and geophysical data to identify areas of economic mineral potential within an area, region or country. Mineral potential can be generated that highlight potential exploration targets on a regional (100's square kilometers) and greenstone belt scale (1000's square kilometers).

This mineral potential assessment used Geographic Information Systems (GIS) software and analysis in conjunction with a combination of:

1. Traditional geoscience data sets, and
2. Knowledge from known mineral deposits to determine effective predictors for economic mineral deposits.

The major strength of using GIS software is the ability to integrate and combine multiple layers of geoscience data into mineral potential maps, which can define known mineral deposits, but more importantly show areas away from known mineral deposits that can be favourable for mineral exploration. This often leads to the discovery of new economic mineral deposits.

This can lead to the discovery of new economic mineral deposits. A mineral potential map is also referred to as a prospectivity or favourability map in GIS literature (Harris, et.al, 2006).

The mineral deposit model is the most important part of the modeling process as it determines what exploration criteria will be used to create evidence maps from the raw geoscience data. The criteria extracted is placed in several GIS layers and spreadsheet software where the weightings for each data layer are combined and analysed using Weights of Evidence (Tables 1 and 2).

The more data that is available then the more robust the modeling, and therefor, the more robust the model predictions. This data driven approach requires that a prior knowledge exists in the form of known mineral deposits, prospects or occurrences for the study area. This prior knowledge is the “prior probability” that is used in the models. Spatial relationships between the input data, or evidence maps, and the spatial location of the known mineral deposits, prospects or occurrences are used to establish the importance, or weight, of each evidence map. This study used weights of evidence as outlined in Bonham-Carter (1994).

In this study the Mesothermal Lode Gold (LG) and Volcanic Massive Sulphide (VMS) models were used. Both of these deposit types were modeled using weights of evidence for all the data layers outlined in Tables 1 and 2, which are considered the best predictors for LG and VMS deposit potential in greenstone belts.

2.1 Gold Targeting Model (Figure 1)

Lode Gold (LG) deposits occur in the numerous greenstone belts in Canada and around the world. These deposits are structurally controlled, occur in mafic volcanic rocks, sedimentary rocks and felsic to mafic intrusive rocks; and are often characterized by free gold in quartz veins with varying degrees of sulphides (Dube, et.al., 2007). The past producing gold mines of Cullaton Lake and Meadowbank, produced 3.1 M oz. The current producing gold mines of Meliadine and Whale Tail are expected to produce in excess of 10.0 M oz with projected life of mine that will continue into the 2040's. The criteria and weightings used for each data layer are outlined in Tables 1 and 2.

2.2 Base Metal Targeting Model (Figure 2)

Volcanic Massive Sulphide (VMS) deposits occur in the numerous greenstone belts in Canada and around the world. These deposits occur in mafic to felsic volcanic rocks and sedimentary rocks. They typically occur as lenses of polymetallic massive sulphides with the main sulphide minerals being pyrite, chalcopyrite and sphalerite (Dube, et.al., 2007). In addition, significant additional silver, gold and lead and important accessory minerals, such as gallium, germanium, indium and tin, can also occur in economic concentrations.

There are over 100 known VMS occurrences in the REGB (Goff and Kerswell, 1999) within the Kivalliq Region. The most significant VMS discovery to date is the Heninga Gemex deposit. There is an historical mineral resource estimate of 5.0 Mt with 8.5% zinc, 0.2% copper, 110.0 g/t silver and 1.0 g/t gold (Goff, 1996). The criteria and weightings used for each data layer are outlined in Tables 1 and 2.

2.3 Diamond Targeting Model (Figure 2)

There are known diamondiferous kimberlite pipes and dykes in the REGB near Rankin Inlet and east of Baker Lake. Two of the diamondiferous kimberlite pipes on the Dunnedin Ventures Inc. property near Rankin Inlet has reported a total of 3,987,000 tonnes at 1.01 carats per tonne (cpt) for a small inferred mineral resource of 4,018,000 carats. This inferred mineral resource is not large enough to become an economic diamond mine. In addition, the current geoscience information is limited to the known occurrences of diamondiferous kimberlite pipes and dykes. Therefore, it is very difficult to complete an analysis of the mineral potential as part of this mineral potential assessment of the REGB. However, the presence of diamondiferous kimberlite pipes and dikes indicated that there is reasonable exploration potential for diamonds within the Rankin–Ennadai greenstone belt (REGB).

3.0 Mineral Potential Results

The knowledge driven mineral potential models predicted 100% of the current and past producing gold deposits and the known base metal deposits in the Kivalliq Region (Figure1; Table 3). Given the positive results these models were used to identify areas of moderate to high mineral potential within the Kivalliq Region. In particular, within 50-kilometer and 100-kilometer buffers of the proposed linear infrastructure corridor.

This mineral potential assessment identified five (5) LG, one (1) VMS and two (2) diamond target areas that fall within the 50-kilometre and 100-kilometre buffers of the proposed linear infrastructure corridor (Figure 3).

4.0 Conclusions

Given that the Kivalliq Region contains the second largest greenstone belt in Canada which has seen limited mineral exploration, it is reasonable to assume that the discovery of new economic gold and base metal deposits will happen in the next 10 to 20 years. The discovery of other deposit types, such as diamonds and REE's is also very possible.

The prospectivity exercise for the Kivalliq Region validated the currently known LG and VMS deposits. Given the positive results these models were used to identify areas of moderate to high mineral potential within the Kivalliq Region.

It is reasonable to assume that given the Kivalliq Region contains the second largest greenstone belt (REGB) in Canada, the potential for discovering economic gold deposits will happen in the next 10 years. In addition, the REGB is very under explored compared to the AGB, which adds significantly to the upside potential for economic discoveries.

Overlaying the mineral potential (Figures 4, 5 and 6) with the Land Use designations for caribou from the 2021 DNLUP impacts on a significantly large area of mineral potential. The linear infrastructure corridor currently in the 2021 DNLUP provides access to very limited areas of mineral potential. It must be understood that the linear infrastructure corridor requires clients that will pay to use the hydroelectric and fiber optic services that it is intended to provide. This will require, in addition to the Kivalliq communities, development projects and their associated activities, such as mineral exploration and mines, to be the main economic drivers for this type of infrastructure. The current communities and the one current mining project (i.e. Meliadine) will likely not justify the expenditure for financing and building this infrastructure. Ensuring that mineral exploration and mining is allowed within the buffer zone of the linear infrastructure corridor will ensure that there is an actual economic basis for this and future infrastructure.

In addition, the limited Use designation in the 2021 DNLUP covers 45.70% of surface IOL and 56.76% of sub-surface IOL in the Kivalliq Region. These high percentages reflect the selection of highly mineral prospective areas in the known greenstone belts by the Inuit negotiators of the Land Claim Agreement (LCA). The LCA anticipated the economic advantages in the selection of these IOLs, with the intention for the economic benefit of future generations of Nunavummiut. The 2021 DNLUP will seriously jeopardize the realization of this economic potential.

5.0 Recommendations

It is recommended that the results of this mineral potential assessment of the Kivalliq Region be used by the NPC to better determine the impact of the DNLUP on mineral exploration, mining, linear infrastructure and other development.

6.0 Data Sources

The geoscience data used (Tables 4 and 5) for the Kivalliq mineral potential assessment was taken from the currently available public databases and reports from Natural Resources Canada (NRCAN), Geological Survey of Canada (GSC) and Nunavut Geoscience Office.

7.0 References

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Harris, J.R., Sanborn-Barrie, M., Panagapko, D.S., Skulski, T. and Parker, J.R. 2006. Gold Prospectivity Maps of the Red Lake Greenstone Belt: Application of GIS Technology. Canadian Journal of Earth Sciences, vol. 43, pg. 865-893.

Table 1: Layer Weighting Summary

Layer	Weight	Contents
Mines	1	Active and past-producing mines; Advanced exploration projects.
Mineral Occurrences	0.9	Past and present exploration, target metal, project progress.
Rocks	0.8	Gold, copper and zinc in compiled geochemistry.
Tills	0.7	Gold, copper and zinc in compiled glacial till samples, previously highlighted till anomalies.
Major Structures	0.6	Major structural features in geology, highlighting areas likely to be prospective.
Airborne Magnetics	0.5	Magnetic highs often coincide with mineralization.
Gravity	0.4	Gravity highs, particularly the edges of the highs
Geology	0.3	General geology weighted by likelihood to carry economic deposits.

Table 2: Sub-Layer Weighting Summary

Layer	Sublayer	Buffer Distances (km)	Buffer Weights	Sublayer Weight	Layer Weight
Mines	Active and Past-Producing mines	5, 10, 25, 50	1, 0.75, 0.5, 0.25	1	
Mines	Advanced Exploration Projects	5, 10, 25, 50	1, 0.75, 0.5, 0.25	0.7	1
Mineral Occurrences	Au, Cu, Zn as primary target	1, 2.5, 5, 10, 25	1, 0.8, 0.6, 0.4, 0.2	1	
Mineral Occurrences	Primary target is not Au, Cu, Zn	1, 2.5, 5, 10, 25	1, 0.8, 0.6, 0.4, 0.2	0.5	
Mineral Occurrences	Advancement of exploration to drill stage	1, 2.5, 5, 10, 25	1, 0.8, 0.6, 0.4, 0.2	1.5	0.9
Rocks	Binned interpolation of Au, Cu, Zn values from individual samples	2km search distance	n/a	1	0.8
Tills	Binned interpolation of Au, Cu, Zn values from individual samples	2km search distance	n/a	1	
Tills	Anomalies highlighted during 1990s-era exploration	1.25, 2.5, 5, 10	1, 0.75, 0.5, 0.25	0.4	0.7
Major Structures	Major crustal faults	1, 2.5, 5, 7.5	1, 0.75, 0.5, 0.25	1	
Major Structures	Local features in major and secondary faults likely to create favourable conditions for ore deposition	0.5, 2, 5, 7.5, 10	1, 0.8, 0.6, 0.4, 0.2	0.65	0.6
Airborne Magnetics	Magnetic highs selected as strong exploration targets - using the edges of the features rather than the full feature	1.25, 2.5, 5, 7.5, 10	1, 0.8, 0.6, 0.4, 0.2	1	0.5
Gravity	Edges of gravity highs - transitions between high and low Bouguer gravity readings	1.25, 5, 10, 15, 20	1, 0.8, 0.6, 0.4, 0.2	1	0.4
Geology	Bedrock geology, weighted by likelihood of rock type to host economic deposits	n/a	n/a	1	0.3

Table 3: Kivalliq Region Mineral Potential Targets

Target Number and Name	Commodity	Deposit Type
1 – Whale Cove	Gold	LG
2 – Whale Cove West	Gold	LG
3 – Arviat 1	Gold	LG
4 – Arviat 2	Gold	LG
5 - MacQuaid	Gold	LG
6 – Rankin Inlet	Diamonds	Diamonds
7 – Baker Lake East	Diamonds	Diamonds
8 - Heninga	Copper and Zinc	VMS

Table 4: Mineral Potential Data Sources

GIS Data Layer	GeoVector file name	NRCAN file name	Data Source	Data Site/Author
Geochemistry				
Till Geochem	Kivalliq South Till Sampling Compilation	Compilation of Govt files and open files	Data compilation by GeoVector Management, Source data - https://geochem.nrcan.gc.ca/cdogs/content/tables/list_svy_en.htm	See reference list in report on mineral potential
Till HMC gold grain counts	Kivalliq South Till Sampling Compilation	Compilation of Govt files and open files	https://geochem.nrcan.gc.ca/cdogs/content/tables/list_svy_en.htm	See reference list in report on mineral potential
Lake Sed Geochem	Kivalliq South Lake Sediment Sampling Compilation	Compilation of Govt files and open files	https://geochem.nrcan.gc.ca/cdogs/content/tables/list_svy_en.htm	Reference list is on NRCAN website link
Rock Geochem	Kivalliq South rock sample Compilation	Compilation of Govt files and open files	https://geochem.nrcan.gc.ca/cdogs/content/tables/list_svy_en.htm	Reference list is on NRCAN website link
Geology				
Geology	A Series Map 1860A	Geological Survey of Canada	https://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/fulle.web&search1=R=208175	Wheeler, J O; Hoffman, P F; Card, K D; Davidson, A; Sanford, B V; Okulitch, A V; Roest, W R
Mineral Showings	Mineral Occurrence showings in Nunavut	NUMIN_Showings	http://nunavutgeoscience.ca/	Reference list is on Nunavut Geoscience website link
Geophysics				
Bouguer Gravity	GSC Bouguer Gravity shaded image.tif	Canada 2 km - GRAV - Bouguer - Bouguer	http://gdr.agg.nrcan.gc.ca/gdrdap/dap/index-eng.php?ver=1579797919	
Magnetics	GSC 1VD Residual TMI shaded image.tif	Canada - 200m - MAG - 1st Vertical Derivative - Dérivée 1ère verticale	http://gdr.agg.nrcan.gc.ca/gdrdap/dap/index-eng.php?ver=1579796595	
Interpretations				
Gravity High - Interpretation	Bouguer_gravity_highs_line.shp		Digitized Gravity Highs by GeoVector Management	
Magnetic High - Interpretation	1VD_TMI_Highs_line		Digitized Magnetic Highs by GeoVector Management	
Till anomaly interpretation	Till data Interpretation GeoVector		GeoVector Management	
Structural Interpretation	Using the Geophysical layers for Residual Shaded TMI and gravity		GeoVector Management	
Target Areas	Using all available data		Digitized Target boxes of Areas of High Mineral Interest by GeoVector Management	

Table 5: Other Data Sources Continued

GIS Data Layer	GeoVector file name	NRCAN file name	Data Source	Data Site/Author
Nunavut Mineral Tenure			-	-
Oil and Gas Rights	Used active Rights only	Droit_petrolier_et_gazier_Oil_and_Gas_Right_SHP	Oil and Gas Rights - Open Government Portal (canada.ca)	Government of Canada-Open Government Portal, Distributor:Indigenous and Northern Affairs Canada
Coal Exploration Licences	Used active Licences	Licence_exploration_houille_NU_Coal_Exploration_Licence_SHP	Mineral Tenure in Nunavut - Coal Exploration Licences - Open Government Portal (canada.ca)	Government of Canada-Open Government Portal, Distributor:Indigenous and Northern Affairs Canada
Mineral Claims	Used active Claims	Claim_minier_NU_Mineral_Claim.shp	Mineral Tenure in Nunavut - Mineral Claims - Open Government Portal (canada.ca)	Government of Canada-Open Government Portal, Distributor:Indigenous and Northern Affairs Canada
Prospecting Permits	Used active Permit	Permis_exploration_NU_Prospecting_Permit_SHP	Mineral Tenure in Nunavut - Prospecting Permits - Open Government Portal (canada.ca)	Government of Canada-Open Government Portal, Distributor:Indigenous and Northern Affairs Canada
Mining Leases	Used active Leases	Bail_minier_NU_Mining_Lease_SHP	Mineral Tenure in Nunavut - Mining Leases - Open Government Portal (canada.ca)	Government of Canada-Open Government Portal, Distributor:Indigenous and Northern Affairs Canada
2021 DNLUP				
Caribou Data	Caribou Calving, fresh water crossing, key access, Post-calving	2021DNLUP_MAPA_DESIGNATIONS.shp	https://lupit.nunavut.ca/portal/registry.php?public=docs&g=16&c=1043&searchtext=	NPC Public Registry-Nunavut Planning Commission
Inuit Owned Lands - Nunavut	Aboriginal Lands of Canada Legislative Boundaries	AL_TA_NU_SHP_eng	https://ftp.maps.canada.ca/pub/nrcan_rncan/vector/geobase_al_ta/shp_eng/AL_TA_NU_SHP_eng.zip	https://ntilands.tunngavik.com/maps/

Figure 1: Kivalliq Region Gold and Base Metal Mineral Potential

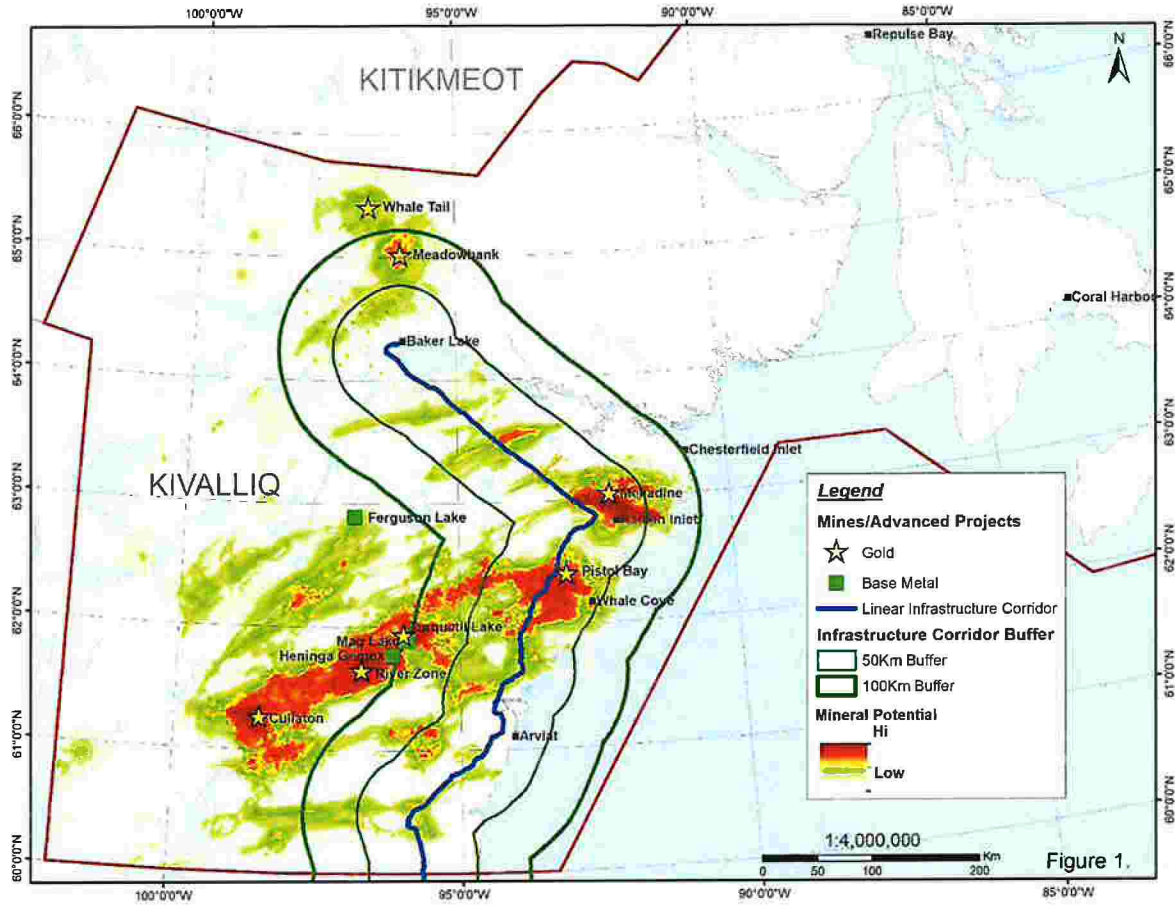


Figure 2: Kivalliq Region Diamond and REE Mineral Potential

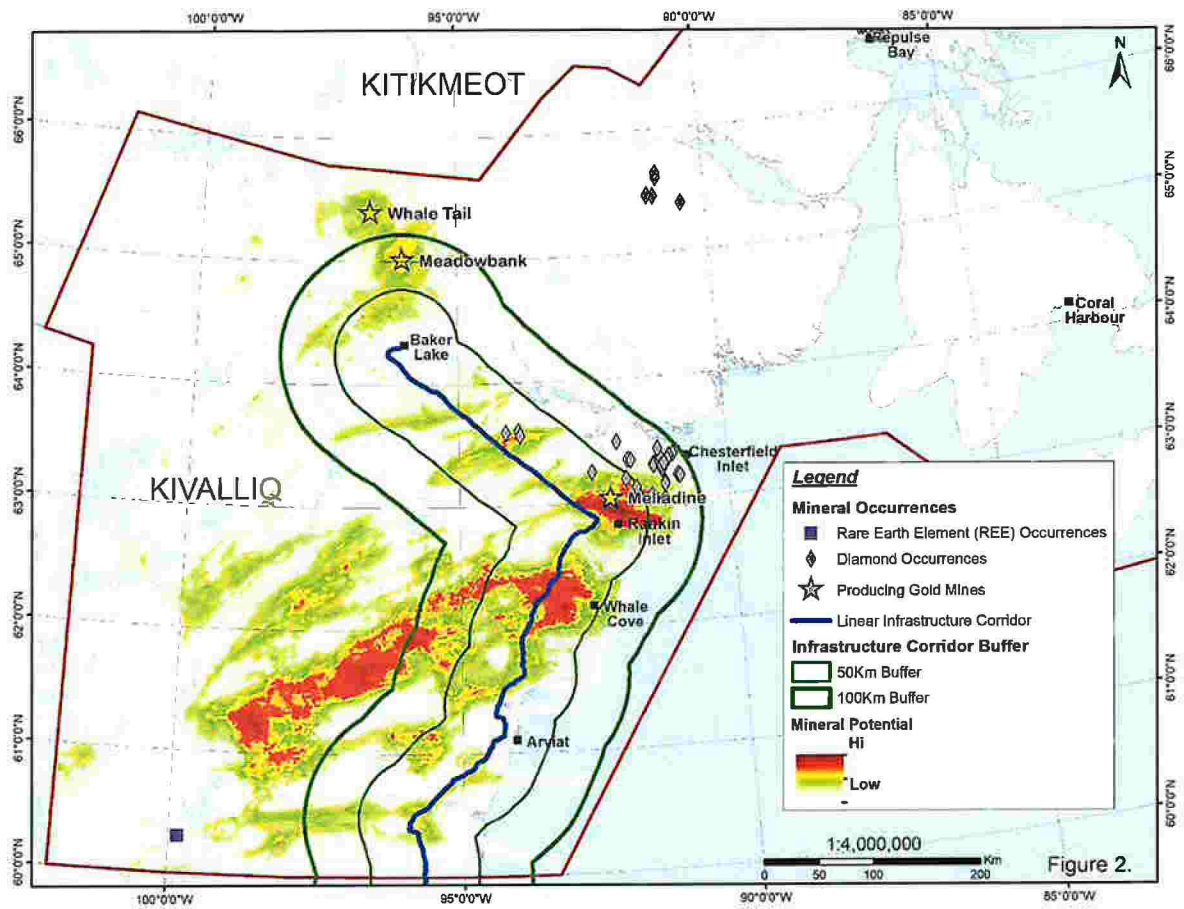


Figure 3: Kivalliq Region Mineral Potential Targets

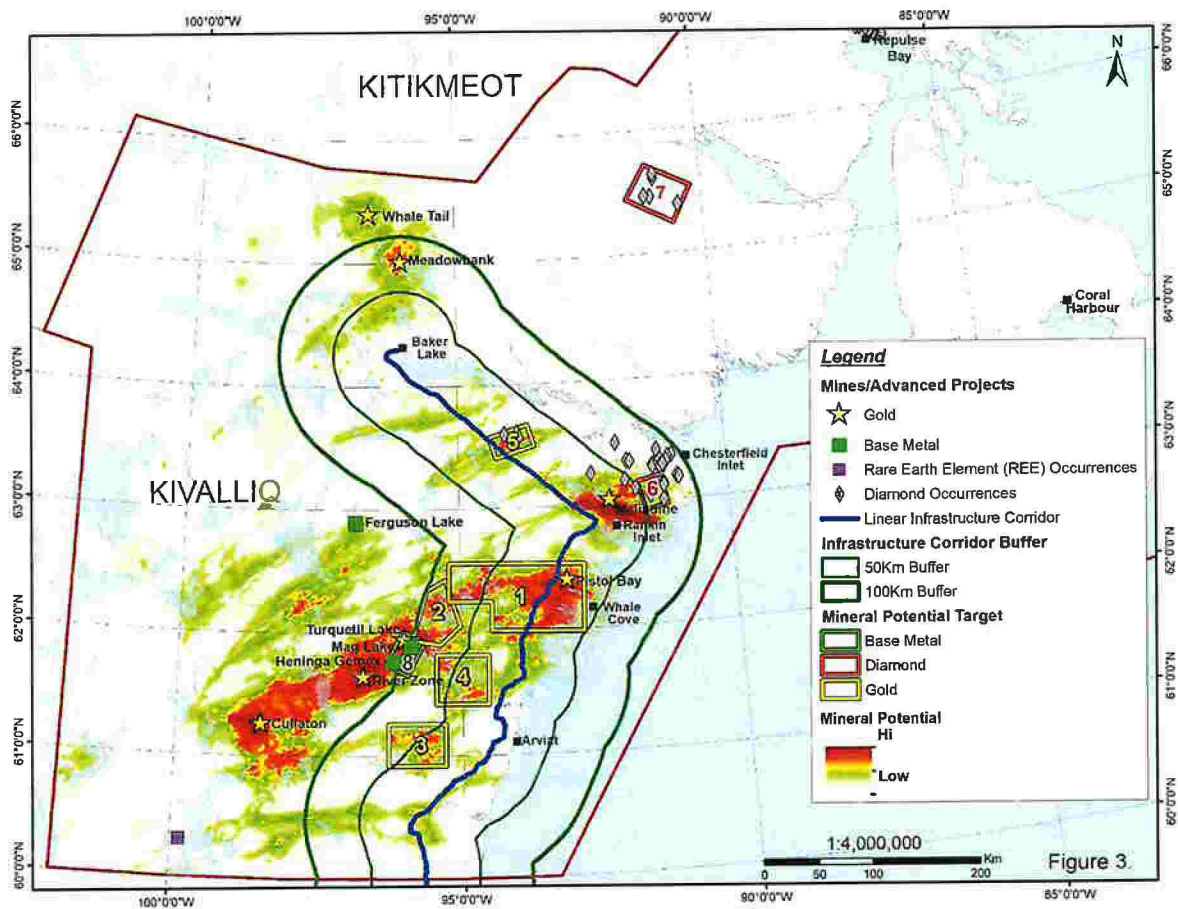


Figure 4: Kivalliq Region Caribou Land Use Designations

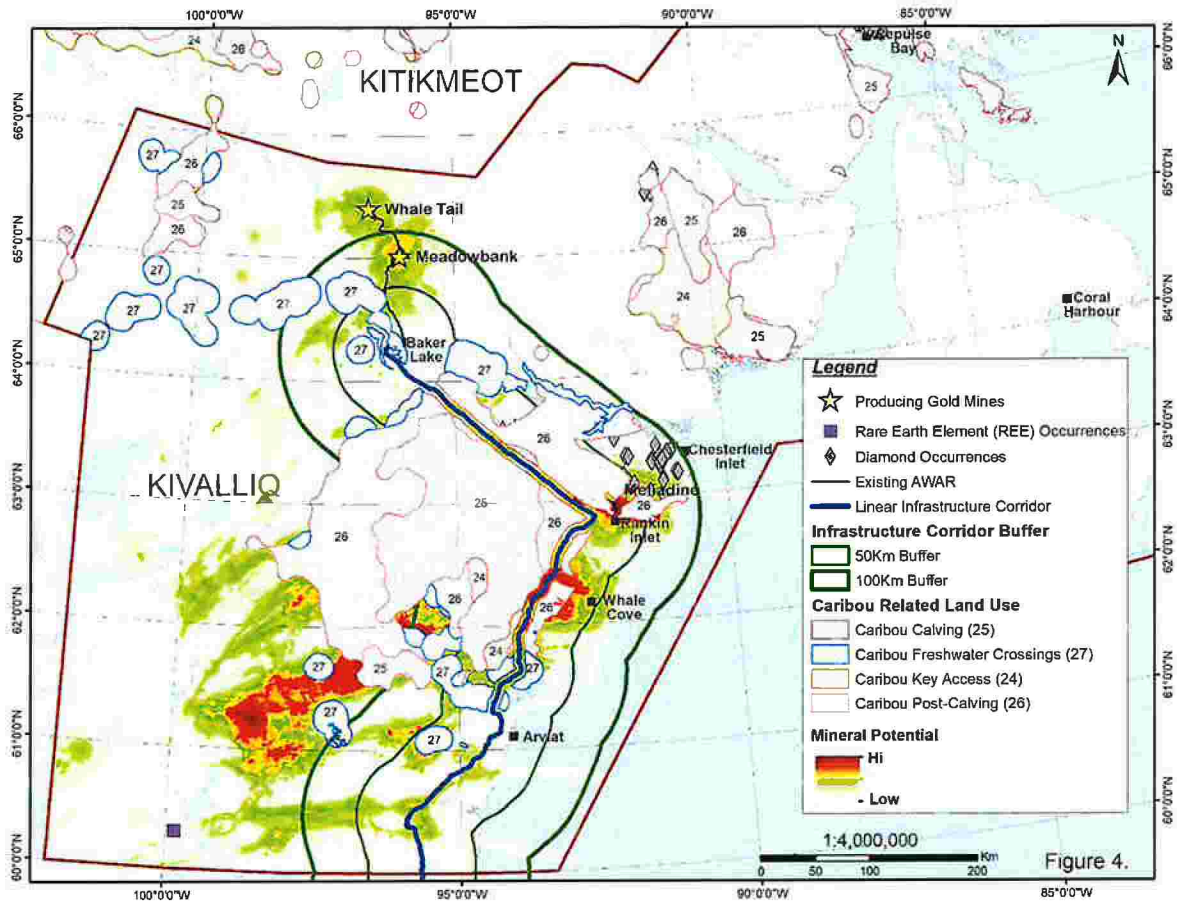


Figure 5: Kivalliq Region Caribou Land Use Designations vs Mineral Potential

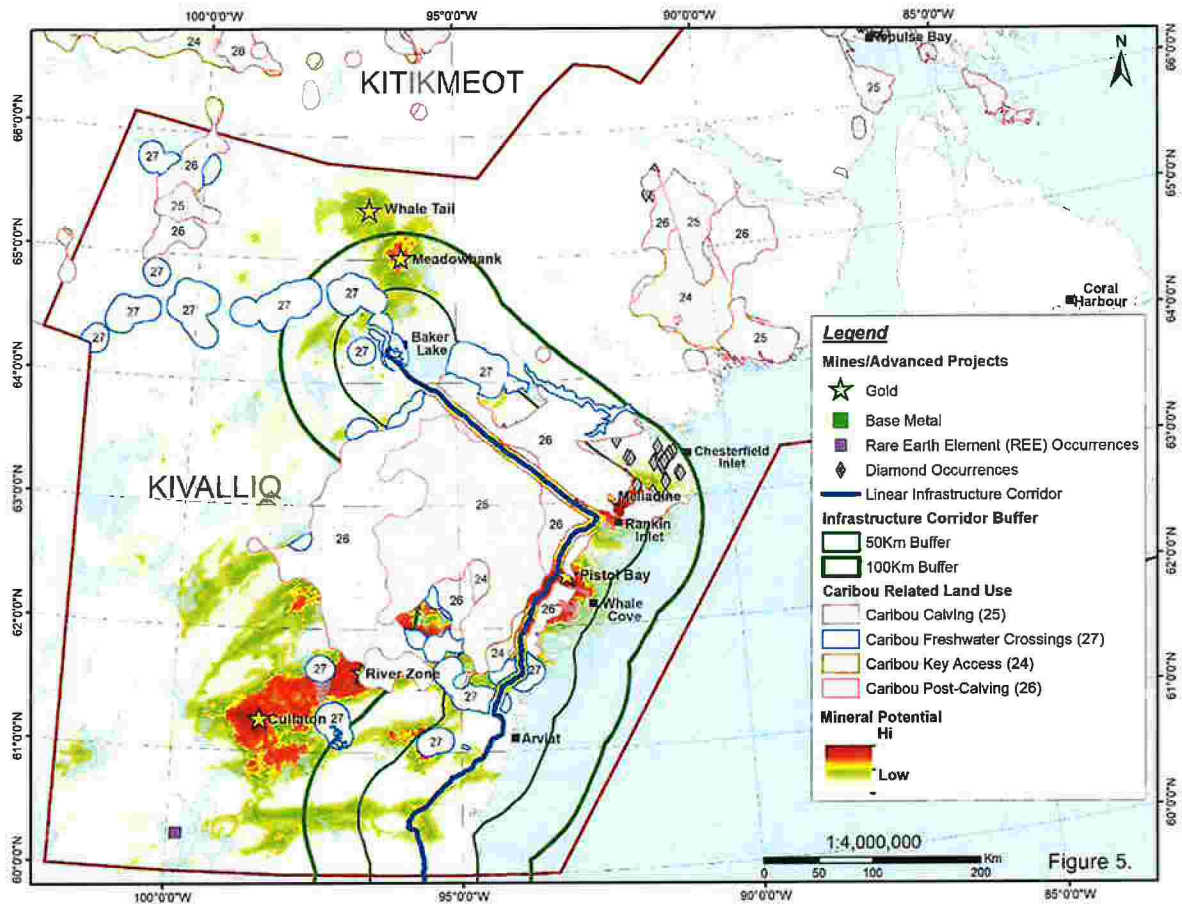


Figure 6: Kivalliq Region Caribou Land Use Designations vs Mineral Potential Targets

