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DELIVERED VIA EMAIL

February 28, 2025

Dear Ms. Fairbairn:

EA1213-02: Responses to Round 2 Information Requests for the Mackenzie Valley Highway Environmental Assessment

The Government of the Northwest Territories (GNWT) has completed responses to 49 Information Requests (IR) issued to the GNWT on January 17, 2025 by the Mackenzie Valley Environmental Impact Review Board (the Board) and parties of the Mackenzie Valley Highway (EA1213-02) Environmental Assessment (EA). These responses have been submitted via the Online Review System (ORS).

The preparation of responses to the remaining IRs issued on January 17 (119), and the subsequent IRs issued, February 19 (2) and February 24, 2025 (14) is ongoing. It is the GNWT's intent to submit these outstanding responses as soon as practicable, but no later than the Boards extended deadline of April 11, 2025, as outlined in the February 27, 2025, Notice of Proceeding. The GNWT commits to notifying the Board as additional IR responses are submitted through the ORS.

In addition, the GNWT is actively preparing an Addendum to the Developers Assessment Report (DAR) to capture all changes made to the project because of ongoing project planning, engagement activities, and information captured through Board processes to date. The GNWT acknowledges the Boards extension to the Addendum submission deadline to April 11, 2025, and is working toward this revised target.

Should you have any questions or if you would like further information, please contact me at (867)767-9082 ext. 31035, or by email at Seth_Bohnet@gov.nt.ca. Alternatively, you can reach out to Patricia Coyne, Manager MVH Environmental Affairs at (867) 767-9082 ext. 31033, or by email at Patricia_Coyne@gov.nt.ca.

Sincerely,

Seth Bohnet
Director, Strategic Infrastructure
Infrastructure

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Reviewer Comments and Proponent Responses

Project: Mackenzie Valley Highway
Board: Mackenzie Valley Environmental Impact Review Board
Proponent: GNWT-INF (Infrastructure)

File/EA #: EA1213-02
Deadline for Parties to Submit IRs: January 17, 2025
Deadline for Parties to Reply to IRs: February 28, 2025

No.	Topic	Reviewer Preamble	Reviewer Request	Response
Liidlii Kue First Nation (Ft Simpson) (LKFN) - Trieneke Gastmeier				
1	Vol 3, 1 of 13, 14.0 p 14- 2, 14A p 5, 15.0 p 1, 16.0 p3	The Sahtu Land Use Plan is included in this document, and though the Dehcho Land Use plan is still under development, documents will be forthcoming in 2025.	Please include the relevant portions of the Dehcho land use plan in this scope document as they become available, and address these in the following sections.	Please see attached response
2	Vol 3, 1 of 13, 14.0 p 14- 5; 14.0 p 14- 29	GNWT response to comments does not adequately address: "which affects the land and the permafrost and can influence the flow of creeks; Community engagement participants stated there are increased landslides and sloughing and permafrost thawing, accelerated by climate change." In the DAR, it is stated warm discontinuous permafrost found within the PDA is especially susceptible to degradation. Given the term of operation (and even the duration of construction), it is likely that the extent of warm discontinuous permafrost will increase over the course of the project. Consideration of the evolution of permafrost thaw over the course of the construction and operation phases are important.	Address anticipated but unpredictable changes to hydrologic systems (and ground stability) posed by climate change in proposed design. Implement monitoring for change detection and early warning system for landslides, permafrost thaw, and changes in hydrology. Consider that land types which are considered stable under current thermal conditions may not be stable in the future (directly or indirectly related to the project)	
3	Vol 3, 1 of 13, 14.0 p 14- 8, p 14- 17	Effect pathways for permafrost thaw are missing.	Add the following to effect pathways: permafrost thaw resulting from road use and maintenance (snow clearing and storage, grading, right of way maintenance, traffic, dust, surface wetting for dust control, vegetation clearing). Recommend adding a snow management and mitigation section to the PPP. Techniques such as snow compaction, clearing, fencing, and shields can all be used as mitigation techniques in thaw-sensitive areas. A plan for snow storage and reduced build up on shoulders should be discussed. Vegetation is a key factor preserving permafrost conditions, modifying canopy cover, and compacting organic soils have clear interaction with permafrost conditions. Lateral extension of permafrost thaw beyond	Please see attached response

No.	Topic	Reviewer Preamble	Reviewer Request	Response
			directly impacted ground regions through lateral heat transfer and advection with natural or altered groundwater systems. These factors will affect permafrost thermal conditions and should also be mitigated using a variety of passive and active techniques (e.g. snow clearing protocols, guidance on road surface wetting, thermosyphons, etc)	
4	Vol 3, 1 of 13, 14.0 p 14- 8; Vol 4, 23.5 p 23 - 8	Key measurement and monitoring of parameters for permafrost thaw are missing in several areas throughout the report. These are necessary to characterize the heterogeneity of permafrost in the project area and establish baseline conditions. For example, the proposed thermal regime monitoring may not fully capture permafrost health in "warm" (near freezing-point) permafrost.	Measurement of ground ice content through geotechnical measurement (ERT/GPR). Thermal regime monitoring may not fully capture permafrost health in "warm" (near freezing-point) permafrost.	Please see attached response
5	Vol 3, 1 of 13, 14.0 p 8 -9, 14A p 3 ; 15 p9, 16 p 12, a16 p 25; Vol 4, 24.3 p 24-16	The map of assessment area shows that RAA often encompasses the Mackenzie river, but not systematically, and there is no downstream monitoring proposed on this waterway. The discussion of permafrost degradation during the operation and maintenance phase does not include the potential for retrogressive thaw slumps and interactions with the Mackenzie river. LAA definition insufficient in some regions where hydrologic impact is notable: eg where icings may develop at culverts and redirect GW flow, where surface water networks are disrupted and effects are felt throughout the entire downstream catchment (which may extend beyond 0.5 km), and may also impact underlaying permafrost. The establishment of assessment areas for groundwater does not include the vertical depth to be assessed. Groundwater flow paths can extend up to 100s of meters in the subsurface depending on permeability, gradients, and heterogeneity. Inclusion of the scope of the assessment is essential. In addition, the lateral extend of groundwater impact is intimately linked with the depth of study - deeper flow paths operate on much larger lateral scales.	Justify the use of 500 m as the LAA, particularly where this overlaps with the MacKenzie River. Consider if this should be adjusted in areas where the alignment intersects water crossings, which will extend beyond 500 m up or downstream. Address the concern of changes in the course of the Mackenzie and allow either for bank cladding in areas where the road cannot be located a safe distance from the river, or consider locating the ROW sufficiently far from this watercourse, especially in regions where tributaries join the river (and it is most subject to change). Consider 3D assessment area for groundwater and contextualize the vertical extent with the lateral extent. Consider the diagram in appendix 16A (5.1) the regional GW flow network extends to the GW divide beyond the sline river formation, is this extent reflected in the RSA?	
6	Vol 3, 1 of 13, 14.0 p 14- 11	Description of timing includes no sensitivity with the example that winter activities do not impact frozen soils. Though there are no obvious direct impacts, indirect impacts are easily felt even when soils are frozen through compaction or alteration of snowpack, increased load on soils resulting in deformation etc.	Change this category to "low sensitivity" so as not to indicate that these activities should have no measurable impact on the system as they are likely to have a small impact	Please see attached response
7	Vol 3, 1 of	Data scarcity is a pervasive issue across the region, and existing data is	Extend reconnaissance to data sparse areas as well as regions	Please see

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	13, 14.0 p 14- 12 Vol 4, 24.4 p 24 - 20, PPP-17,14A - 22, 28 and throughout outdated data	often outdated (e.g. 1970s investigation reports for roadway alignment), but reconnaissance was completed for the borrow and quarry sites. Further reconnaissance is recommended for areas with poor data quality or missing data, as well as areas most susceptible to climate change to understand baseline conditions in more detail.Given the dated nature of figure 4.2 in 14A and the stated dependence on recent (2020) site investigations by tetratech, can you re-classify the reaches of the MVH based on permafrost type? Literature review is based primarily on technical reports and does not include recent scientific literature.	most susceptible to change at the assessment and design phase such that construction is not delayed by the discovery of unfavourable conditions. Use all available climate data to verify observed patterns and extrapolate trends across the specified regions. Extend literature review to include recent scientific findings, water quality data are out of date. Consider monitoring in maintenance activity and increase environmental data collection not only to determine impact of infrastructure development, but to predict changes to infrastructure. Extend ground temperature monitoring and include a map of current monitoring locations.	attached response
8	PPP - 17, monitoring	The assessment of sparse weather station data as a proxy for an interpretation of climatic data is inadequate and does not sufficiently complement ground temperature monitoring to establish the continued health of permafrost. An action plan to increase data availability to anticipate and predict changes to the road, and to enhance early detection of road failure through monitoring could be a key element to maintenance. It is unclear where current ground temperature monitoring equipment is installed, whether its coverage is adequate to interpolate the behaviour in each land cover type and region. Regardless of the existing installation, post-construction thermistor installation within the ROW, on the embankment, and on the road itself are invaluable tools for the early detection of thermal deterioration of infrastructure.	Include monitoring of: soil moisture, ground settlement, heave and subsidence, changes in surface albedo, visual evidence of cracking, deformation, sliding, water tracks and flow pathways changing over time, changes to permafrost stability (e.g. RTS) in RAA.	
9	PPP - 15	Training staff to identify issues may also be augmented by the appropriate selection of monitors with knowledge of local terrain	Partner with the Guardian program	
10	Vol 3, 1 of 13, 14.0 p 14- 13, 14A -9	Mapping was performed based on surface materials, expression, depth to bedrock, and processes, but not vegetation or permafrost probability/permafrost mapping/ice content mapping. Data describing soils along the route is drawn from coarse resolution and potentially outdated databases. Though data scarcity across the North is challenging, in the context of this project, the coverage of organic soils is critical to understanding thermal and mechanical properties. These soils change based on climate, slope stability, and wildfire among other processes. Many of the listed products are also not ground-truthed in the region of interest. Data on landslides is similarly at least 10 years old, which is	Include the following maps in the design of the alignment, and plan ground-based investigations and validation of soil texture: - Vegetation (important for ecosystem protected permafrost). - More recent permafrost distributions maps (e.g., Obu et al 2019, 10.1016/j.earscirev.2019.04.023). - Use of thermokarst mapping being conducted by NTGS. - The Canadian Water Resource Vulnerability Index to Permafrost Thaw (Spence et al 2020, 10.1139/as-2019-0028). - Ground ice map of Canada (O'Neil et al 2020). - Remote sensing mapping of Icings (both river and ground	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		potentially inadequate in a rapidly thawing permafrost environment.	icings can often be observed from late spring imagery, once snow has melted) - How do the 2020 measurements differ from the 1995/2000 mapping? Can you extrapolate from this difference to infer relative rates of change across the region? The assessment of permafrost is based on studies from 1991 by Nixon et al (table 4.5) which is even older than the data from figure 4.2. Given our knowledge of the evolution of this landscape, more recent data is needed.	
11	Vol 3, 1 of 13, 14.0 p 14- 19, 25	Table 14.5 - Terrain conditions may also be affected by permafrost thaw processes leading to failure of slopes, thaw slumps, active layer detachments, and failures in ground competency	Include these thermally-driven effect pathways, and consider re-alignment where they ocurr	
12	General comment on Permafrost and road alignment Vol 3, 1 of 13, 14.0 p 14- 30, PPP - 10, PPP - 11, PPP - Table A1 placement on frozen groundm 14A - Table 4.4 alignment ; 24.5 (p 24 -21	Geotechnical site investigation for the identification of ice-rich sediment is an invaluable resource in infrastructure design. Consider the recent re-alignment of the Alaska Hwy near Whitehorse (in the ibex valley) where the road was originally constructed on presumed ice-rich sediment, and thaw slumping along the Takhini river pose a risk to the road. It is noted that, "Additional geotechnical information to inform design will be collected once there is certainty of the alignment routing corridor (upon completion of the environmental assessment)". We have concerns that there is not enough flexibility in the design of the alignment route as new information becomes available and that current designs are relying on outdated baseline information. In particular, where new alignment sections are constructed, laying the road base on top of organic rich soils using a fill-only technique is more likely to cause adverse effects in the long-run. Thick (3-8m) organic deposits exist in this region with porosities of >80%. Considering the life-span of the project, it can be expected thaw will occur of these ice rich soils, leading considerable consolidation and ongoing maintenance and safety issues. In addition, the placement of construction material directly on frozen ground while it does protect the immediate integrity of the ground does not allow for detailed assessment of suitability of substrate materials, identification of segregated ice or ice-rich conditions, and does not consider the hydrologic and landscape function of a region. In addition, organic surface soils and vegetation are extremely prone to compaction and as they decompose will cause	The alignment routing must be defined based on the site investigation first, including the impact on permafrost, which cannot be ascertained until geotechnical information on permafrost conditions is known. Changes to road alignment must be possible once geotechnical data is acquired to adjust for unexpected permafrost conditions. Consideration of re-alignment to avoid particular terrain units or areas of concnern is recommended. Clarify if organic soils will be left beneath new sections of road or just on shoulders. Also clarify if the thickness of the soil will determine whether cut and fill methods are used. In wich cases will re-alignment be considered? Has consideration of road maintenace requiremetns factored into these calculations? Include a decision matrix for evaluating the appropriateness of excavation in any setting based on impact on permafrost, erosion, waterways, maintenance, and other factors. While placement of materials on frozen ground may facilitate access, subsequent de-watering of compacted soils, and assessment of their stability under increased load is included in construction techniques. It should be expected that the first thawing season will have significant effects on ice-bearing soils, and repairs and maintenance of initially laid road will be required, especially in terms of achieving design compaction. Where it is not possible to avoid ice rich	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		significant deformation of the road surface. Finally, throughout the report and PPP, it is often noted that mitigation measures will be employed "where possible" (e.g., "project design will avoid ice-rich areas where possible"), but there is not description of what will be done if measures are not possible.	permafrost areas or otherwise, please describe what mitigation or monitoring techniques will be employed (e.g., snow management and thermosyphons; realignment).	
13	Vol 3, 1 of 13, 14.0 p 14-19, 23, 25, 26 14A P 44	Drainage considerations do not include groundwater icings or culvert dimensioning and anchoring practices appropriate to permafrost environments. Icings exist in the LAA and further documentation of their locations will assist in culvert design and construction with groundwater movement considerations.	Elaborate on icings and culvert design and include icing mapping in preparation for final road alignment. Consider the effects of road freezing on groundwater flow regimes. Assessment of icing risks within the LSA and RSA would greatly improve confidence in design. Table 14A - 5.4 includes a length of road expected to be affected by seepage, but the manner in which this was determined is unclear.	Please see attached response
14	PPP - 18	By definition, ice-rich permafrost areas are sensitive to thaw when disturbed. It is likely that no ice-rich permafrost will be reliably thaw-stable over the lifetime of the constructed road.	Avoid ice-rich permafrost areas, and define monitoring and mitigation strategies where this is not posisble.	Please see attached response
15	Vol 4, 24,2 p 24- 6	Table 24.3 and 24.4 assume stationarity in climate data between 1981 and 2010. From work across the territory, there have been significant trends in both temperature and precipitation in similar regions, including Fort Simpson. Presenting aggregated summary data for this entire period when it is likely that a trend exists in the climate data provides an unreliable baseline condition.	Include the pre-construction climate trend to allow future comparison of rates of change in climate variable. This is a key comparison point for the following future climate scenarios	Please see attached response
16	Vol 4, 24,2 p 24- 10,11,18	The increase in precipitation for RCP 8.5 is given for the Fort Simpson A baseline but not the Norman Wells A baseline, is it expected to differ? Table 24.8 lists a predicted decrease in Freeze-Thaw days, but this contradicts many current studies indicating increased variability in weather patterns leading to an increase in midwinter melt events and to late/early - season snowfalls etc.	Consider broadening the data source informing this decrease. Similarly, there is evidence for an increase in severity of heavy rain and also drought in the territory, which may also be relevant to the considered regions; update predicted changes in precipitation.	Please see attached response
17	Vol 4, 24,2 p 24- 11	The geological hazards depicted relate largely to the interaction of permafrost and proposed infrastructure, but do not link to the climate change direction described above.	The described increase in precipitation and temperature (as noted in the document) are projected to lead to accelerated permafrost degradation. This is directly linked to the geological hazards presented here, and the cumulative impact of climate change and disturbance due to the Project should be considered.	
18	Vol 4, 24.3 p 24- 12,	Issues with the statement: " The Project will take approximately 10 years to construct, over a timeframe of up to 20 years. Consequently, climate	It is recommended that the understanding of climate change impact timing be revised.	Please see attached

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	14	change effects are likely to be more pronounced during operation, since activities associated with operation are expected to continue for a much longer time." Work at the Scotty Creek Research Station shows current active permafrost thaw as a result of climate change, and simulations show significant projected loss of permafrost and hydrological regime shift over the next two decades.		response
19	General comment on Permafrost, 26.4.3 p 26 - 44, PPP - 12, PPP - Table A1	Much of the permafrost especially in the Dehcho region is ecosystem protected, meaning that any disturbance to current conditions is likely to lead to permafrost loss.	Re-consider the impact of some permafrost protection measures, e.g. mulching and replacing vegetation, in the context of the thermal regime of the permafrost. Prioritize some sensitive areas and areas of traditional significance for manual clearing in attempt to preserve what portions of the ecosystem can be left undisturbed.	Please see attached response
20	Vol 4, 24.3 p 24- 12	Table 24.9 summarizes mitigation measures, but these do not include monitoring techniques, preventative measures, or early warning systems	It is recommended that the proponent consider monitoring techniques and site investigation to identify areas of high risk and implement mitigation strategies early in the project life to avoid some of the anticipated maintenance requirements	Please see attached response
21	PPP - Table A1, 16	Issues with "deploy methods to limit thermal disturbance". Long-term mitigation and remediation measures such as snow management, thermosyphons, choice of construction materials based on thermal properties and other strategies are not included.	Consider more long-term solutions and ensure design is compliant with future required remediation techniques. Specify which techniques are under consideration in which types of permafrost	Please see attached response
22	14A - 17; 14A - 29, table 4.6; 14A - Figure 4.7; 16A p 9, 12	Supporting information missing or erroneous in description of permafrost systems.	Add ther following supporting information to relevant sections: 14A - 17: "moisture content and topographic location (Tarnocai, 1973)—higher moisture content and depression topography tend to result in lower soil temperatures" This is also related to climate regime. Though these soils generally have higher heat capacity and thermal conductivity causing them to be cooler in the summer, their thermal properties lead to increased heat transfer in the summer, snow accumulation in depression and insulation in winter, and the initiation of talik formation in permafrost environments (Devoie et al 2019). 14A - 29: An active layer is defined by seasonal freeze and thaw. Southward deepening of the "active layer" here can also be explained by	Please see attached response

No.	Topic	Reviewer Preamble	Reviewer Request	Response
			the presence of suprapermafrost taliks, which are common in discontinuous permafrost, especially when it is ecosystem protected or degrading. Active layer values in table 4.6 exceeding 2 m are improbable seasonal thaw depths, and indicate likely suprapermafrost talik formation. Comment on the prevalence of suprapermafrost talik features, and potentially use these as a metric to understand permafrost degradation. The inclusion of trumpet plots would greatly aid in the interpretation of borehole data. Figure 4.7 & 16A: does not depict the universally accepted definition of open and closed taliks, and the depiction of discontinuous permafrost as small regions mixed in a soil column is not in alignment with the current understanding of permafrost distribution in discontinuous permafrost regions. Consider updating. In the discussion of flow, suprapermafrost groundwater flow may continue overwinter in suprapermafrost talks, which should be included in the description of this process.	
23	Vol 3, 1 of 13, 14.0 p 14- 16	Issues with Table 14.4 - Road base placement, compaction and surfacing have no interaction.	In some locations this placement is not on the existing winter road and should include impacts in all three categories; otherwise compaction at least has a proven effect to increase the thermal conductivity of the soil and damage underlying permafrost	Please see attached response
24	Vol 3, 1 of 13, 14.0 p 14- 16/17	Issues with Table 14.4 - water extraction for construction and operational dust control. Unclear where the source of this water is coming from. Smaller water features and upstream sources alters the hydrology, soil moisture, and permafrost conditions.	Specify where water extraction is coming from. Is all water extraction proposed from the Mackenzie?	Please see attached response
25	Vol 3, 1 of 13, 14.0 p 14- 33	How does Little Bear River Quarry have no impact on Terrain or Soils? Even if it is an active quarry already, extraction of materials must at least modify the terrain?	Consider environmental effect	Please see attached response
26	Vol 3, 1 of 13, 14.0 p 14- 34, 35	Mining and exploration are listed to have no interaction, the same may apply the Enbridge maintenance camp	Clarify if this lack of impact is due to a lack of development, or revise - if mining or other exploration activities were to rely on this highway, the increase in traffic and loads would have a considerable effect on required maintenance and consequently require additional quarry materials, impacting soils, terrain, and permafrost	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
27	Vol 3, 1 of 13, 14.0 p 14- 39	We disagree with the following statement: "To some degree, effects such as thermal erosion or the thawing of permafrost is inevitable due to the change in thermal equilibrium that will be triggered by the construction. These effects, wherever they occur, are expected to be localized and of low magnitude. The extent of localized changes to terrain, soils and permafrost is difficult to predict, however, most likely to correspond to areas where surface disturbance will occur (i.e., PDA)." Hydrologic changes resulting from the road placement can have widespread effects to surface and subsurface systems, which would in turn alter permafrost conditions in the LAA or RAA.	Please reconsider this assumption and clarify how "low magnitude" was determined.	Please see attached response
28	Vol 3, 1 of 13, 14.0 p 14- 39	The prediction confidence is considered to be moderate to high, however it is based on in situ data collected in the 1990s at the latest, and many areas have undergone changes to permafrost conditions, while no geotechnical data for the site is available	Consider that the prediction confidence is likely not high.	
29	Vol 4, 24,2 p 24- 15	Given the moderate/low confidence in the predicted decrease in dry spells, and the current non-negligible dry conditions, it seems likely that low water condition may be present and have potential to affect the project progress as it relates to water availability	Address dry conditions more rigorously (similar to droughts observed in 2022, 2023, 2024)	Please see attached response
30	Vol 4, 24,2 p 24- 15	Though the project is not dependent on below-zero days, the change to Freeze thaw days is likely to prolong the ice-on and breakup periods, meaning that water crossings which are serviced by boats in summer and ice roads in winter will have longer delays for the shoulder season when machinery will not be able to cross, and delays to personnel etc. are expected	Consider the impact of longer ice-on and breakup periods	Please see attached response
31	Vol 4, 24.5 p24 - 23	Proposed remote sensing surveys and change detection on a frequency of 5 - 20 years is inadequate. Changes in hydrology and permafrost conditions due to the rapid warming in the Dehcho region occur at much shorter timescales and for this type of monitoring to be effective it should be implemented at least every 5 years and preferably annually.	Consider updating the frequency of remote sensing landscape change detection	Please see attached response
32	14A - 6	"More permafrost than before" - there is less, it is thawing in this discontinuous region.	Please provide context for this statement or correct if it is a typo.	Please see attached response
33	14A - 11	Issues with, "As a general rule, surficial materials occupying less than 20% of a polygon were not indicated in the terrain unit label". In the case of thermokarst features or geohazards, these should be mapped regardless of	Map small scale thermokarst features if not already doing so.	

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		their small fraction of the landscape as they indicate the presence of thawing permafrost.		
34	14A - 16	Need clarification on the statement "Within the RSA, organic deposits occur both as fens and as bogs. The fens range in thickness from 2 m to 3 m and the bogs from 1.5 m to 7 m. Surface water may be present in fens in the summer months and be unfrozen to depths of 3 m or more." These values are important for understanding permafrost thaw-induced landcover changes in this landscape, and are not adequately justified. In addition, the fens are quite narrow, and there is no mention of peat plateau (raised bogs?) in this classification.	Please provide references or clarification on how these values were determined. Why are fens so much shallower than bogs? Often they are directly adjacent and should therefor have similar organic deposits? Surface water is generally present in fens and thermokarst bogs, but may not be present on peat plateau. Bogs and fens are often permafrost-free features, or at least show deeper active layers, in contrast to the plateau, which should liketly therefore be described as a different land cover type.	
35	14A - 37	The discussion of thermokarst features does not include comment on their resilience to climate change and their interaction (thermal and hydrologic) with the landscape.	It is recommended to include context surrounding the interaction of thermokarst features with their environment (e.g., effect on rerouting of drainage networks), their stability in the context of climate change, and the trajectory of thermokarst landscapes in the region (see Carpino et al., 2021, https://doi.org/10.5194/hess-25-3301-2021)	Please see attached response
36	14A - p 46, 52	At the bottom of p. 46, it is stated that many small slope destabilization are present beneath the dense canopy cover, but on page 52 only large landslide features are considered as threats to the MVH.	Consideration of small-scale processes which may locally affect embankment in unstable regions would increase the resilience of the planned alignment	Please see attached response
37	Vol 3 15 p 10-11	the assessment of the magnitude of surface water and groundwater effects is challenging. Why is a % difference used for streamflow while 2m is used for groundwater?	Consider assessing magnitude of GW change based on % difference from mean, normalized by historic variance in GW levels. In a wetland, for example, where the water table is usually no more than 10cm from the surface, a change of 2m would be catastrophic, while a change of only 5 cm is significant.	
38	Vol 3 15 p 16, 24	In water bodies less than 1.5m deep, the interpretation of withdrawal should be reconsidered. If no withdrawals in the ice-on period occur for vulnerable lakes between 1.5 and 3 m deep, they should also occur in these shallower waterbodies. Aquatic life typically overwinters in mud at the bottom of these features, and is protected by the water and ice overlaying. If water beneath the ice is removed, this air gap is likely to be detrimental to this aquatic life	Reconsider interpretation for shallow water bodies, and the impact on non-fish aquatic species	Please see attached response
39	Vol 3 15 p31	The impacts of permafrost loss on GW are stated to be most important in extensive and continuous regions. This may be erroneous based on likely	Consider impacts on other permafrost regions	Please see attached

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		permafrost distribution in discontinuous regions. Ecosystem protected permafrost persists in (highly permeable) organic soils, while it is more readily lost from mineral soils with higher thermal conductivity (and lower permeability). This means that impacts to the ecosystem protected permafrost could significantly enhance recharge in discontinuous and sporadic permafrost regions.		response
40	Vol 3 16 p 10, 50	Temperature is not listed as one of the water quality metrics to be monitored. Temperature is a key control on dissolved oxygen and a habitat requirement for many fish and other aquatic species	Include temperature in water monitoring plan	Please see attached response
41	15A p 12	Many of the historic gauges available from the WSC network are no longer operational and thus pre- and post- construction timeseries cannot be compared. It is odd that the most recent data is from 2018. Are there no more recent records? It is critical to have pre-construction baseline data to directly compare with post-construction conditions.	Suggest updating available records to most recent available data (e.g. up to 2024 if available) and in particularly data scarce areas, extend WSC monitoring by re-installing the gauges	
42	15A p 18, 20+B79	The assessment of peak flow using an empirical relation is not recommended in a basin subject to climate change. This equation should not be used without an assessment of the temporal stationarity of flow in the respective catchments	Consider flow estimation tools more resilient to changing conditions observed in this region. The same is even more true for low-flow calculations which are strongly impacted by winter conditions.	
43	16A p 3	The RSA here is 10 km while in the report body it is 15km	Reconcile these values for consistency	Please see attached response
44	Appendix A, sub-Appendix B terrain mapping	Some planned ROW is outside the region of exploration for the fibre link and additional surveying is required	Complete data within RSA	
45	Vol 3, pg 15-18	The conceptual hydrogeological model does not consider the effects of permafrost thaw on the system. Development of suprapermafrost taliks from permafrost thaw (either from the project disturbance or climate warming) will accelerate permafrost thaw and alter the routing of surface and subsurface flow systems.	Consider changes to groundwater regimes driven by both project impacts and long-term climate warming trends, and the impacts over the lifespan of the project.	
46	Vol 3, pg 15-24	"quarry operations will be located a minimum of 100 m from the ordinary high-water mark of any waterbody" This seems arbitrary and should be dependent on the subsurface material.	Clarify how this was determined and consider how greater distances should be in place for higher hydraulic conductivity material.	Please see attached response
47	Vol 3, pg	It is not mentioned that "Bear Rock Sinkhole" is just 325 m from the	Address the role of karst in the mitigation plans	Please see

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	15-24, Table 15.8	Prohibition Creek Quarry and that Karst is well known in the area of borrow sources. Karstic features can lead to rapid changes in groundwater flow and contaminant transport.		attached response
48	Section 23.5.6	The Proponent has acknowledged that there is a lack of available baseline conditions in the surface water bodies that will be impacted by the Project in Section 23.5.6 and in their response to LKFN Comment 28 on the DAR. While this is to some extent understandable given the remoteness of many water crossings and the number of watercrossings, it is not possible for LKFN to accept that qualitative assessments are the only suitable means by which impacts to water quality can be assessed. Our members exercise their rights in the watercourses along the route and need to have confidence that it will continue to be safe for them to exercise their rights during the construction and operation of the MVH. Additionally, it is worth noting that water quality at some water crossings could be improved over current conditions by having a constructed crossing where there is currently an ice bridge on the winter road.	LKFN requests that the Proponent work with our Nation to co-develop a water quality sampling and monitoring plan that will be implemented by our Guardians (and Guardians from other impacted Nations) that is funded by the Proponent with the intended design to ensure that it continues to be safe for our members to exercise their rights in and around the Project area.	
49	Chapter 27	In many of the commitments of the commitments tables, the Proponent has stated that they will abide by a commitment "where possible", such as Commitment #21: "Project design will avoid ice-rich areas where possible" LKFN is not reassured by comments where the proponent states that they will honour a commitment "where possible", because this language is highly subjective and leaves the proponent immense discretion on what is considered possible. It is hard to trust that these commitments are indeed real when the proponent can argue in any instance that it is not possible to honour their commitment.	LKFN requests that the proponent either revise the language in the commitments to remove the term "where possible" or provide information on how what exactly they mean by "where possible" or "to the extent possible" in their various commitments. This applies to many commitments such as #02, 11, 21, 22, 23, 24, 38, 39, 40,	Please see attached response
50	Supportin g Memo	LKFN's technical consultants prepared the attached memo to summarize key concerns related to the permafrost technical comments LKFN has uploaded.		
No.	**Topic**	**Reviewer Preamble**	**Reviewer Request**	**Response**
Canadian Northern Economic Development Agency (CanNor) - Ms. Shannon Allerston				
1	Health Canada (HC) HC-01	References: Developer's Assessment Report (DAR), Volume 3, Section 12.0; Round 1 Information Requests: HC-02; DAR Public Review: HC-07. Health Canada (HC) acknowledges the rationale provided in response to Round 1 Information Request (IR) HC-02 and during the Technical Sessions	HC recommends adding additional details to the AAQMP including, but not limited, to: · The criteria that will be used to determine if, and where, temporary aerosol monitors (e.g., DustTrak) are installed.	Please see the attached response.

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	Monitoring and the proposed Adaptive Air Quality Management Plan (AAQMP)	for the exclusion of air dispersion modelling. However, HC maintains that the approach used by the Developer (Government of the Northwest Territories Department of Infrastructure; GNWT-INF) would not allow adequate assessment of potential impacts on human health from changes to air quality resulting from the Mackenzie Valley Highway Project (Project). In the absence of dispersion modelling, the Developer has developed an Adaptive Air Quality Management Plan (AAQMP). To ensure that the AAQMP is protective of health and that the principles of keeping clean areas clean and continuous improvement are maintained, proposed mitigation measures should be targeted towards reducing population exposure to fine particulate matter (PM2.5) and nitrogen dioxide (NO2) associated with the proposed Project. HC recommends that the AAQMP be described in further detail to confirm whether the proposed plan is sufficient to adequately mitigate the potential air quality impacts on human health. For instance, the AAQMP mentions that temporary aerosol monitors (e.g., DustTrak monitors) may be installed at some residences when Project activities are occurring within 1 km. As noted in HC-02, dust particles may settle within a 1-km buffer but PM2.5and precursor pollutants can travel large distances in the atmosphere and affect receptors within and beyond this buffer distance. The AAQMP should be updated to describe how such pollutants will be managed. Additionally, it is not clear from the current DAR what criteria will be used to determine if, and where, temporary aerosol monitors are installed.	· Details about the frequency of sampling and/or data points for continuous monitoring, locations of sampling sites, and quality assurance/quality control (QA/QC) plans to ensure accuracy of the data (e.g., maintenance of monitoring equipment, sample collection techniques, etc.). · Evidence-based trigger levels for corrective action (i.e., implementation of additional mitigation measures to prevent deterioration of air quality) for managing observed increases in contaminants of potential concern. These trigger levels should be informed by pre-Project baseline levels and other considerations such as reference guidance values, public complaints, wind speed and direction, and visual observations. · Identifying who is responsible for reviewing monitoring data to determine whether applicable criteria are being met and identifying any trends in the data. · Identifying how monitoring data will be made available to the public and plans for reporting. · Clarifying the components of the dust control plan mentioned in Section 12.4.2.2 of the DAR and in response to HC-02. · Listing regular maintenance schedules for vehicles and equipment. · Identifying approaches for discouraging or limiting equipment idling.	
2	Fisheries and Oceans Canada (DFO)	Reference: DAR Sections 11, 17, and 18. Aquatic Invasive Species (AIS) are not specifically addressed in GNWT-INF's DAR. Section 17, Table 17.8 notes that “machinery will arrive on-site and will be maintained in a clean condition and free of invasive species and	Please provide information on: · Which mitigation measures will be put in place to prevent the introduction of Aquatic Invasive Species and whirling disease during Project construction and during road operation (i.e., use	Please see attached response

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	DFO-01 Aquatic invasive species: lack of consideration for aquatic invasive species	noxious weeds". Aquatic invasive species and whirling disease can be introduced and spread through transporting water, sands, and sediments and using contaminated construction equipment – this could occur during construction but also during the operation of the MVH. The Canadian Aquatic Invasive Species Regulations under the Fisheries Act prohibits: · The importation, possession, transportation or release of aquatic invasive species. · The introduction of aquatic species into regions or bodies of water frequented by fish where they are not indigenous. In addition, whirling disease, a disease of finfish, caused by infection with a microscopic parasite called Myxobolus cerebralis, has been identified in Alberta. Whirling disease can cause death in the younger life stages of susceptible freshwater finfish. Affected finfish may exhibit any of the following signs: · whirling swimming pattern. · skeletal deformities of the body or head (i.e., shortening of the mandible and indentations on the top of the head). · tail may appear dark or even black.	by the public). · Whether monitoring will be conducted to detect a potential introduction of Aquatic Invasive Species and whirling disease. DFO recommends a section Aquatic Invasive Species and whirling disease mitigation and monitoring be developed as part of the Fish and Fish Habitat Protection Plan. To prevent the introduction and spread of Aquatic Invasive Species and whirling disease, DFO recommends the Developer: · Ensure all equipment arrives on site clean and free of invasive species. · Clean, drain, and dry any equipment used in the water. · Never move organisms or water from one body of water to another. Follow and encourage the public to follow best practices found on the Alberta Environment website (https://www.alberta.ca/stop-whirling-disease.aspx). · Place signage along the road to inform the public on risks and mitigation measures. DFO also recommends that monitors working on site during construction and monitoring of the MVH be familiar with Aquatic Invasive Species and signs of whirling disease in aquatic species so that evidence of introduction can be reported.	
3	Environment and Climate Change Canada (ECCC)	References: Responses to IRs: ECCC-01, ECCC-02, ECCC-03, MVEIRB #44, MVEIRB #51, MVEIRB #52; Technical Meeting Transcript; Federal Recovery Strategy (ECCC 2020) In IR ECCC-01, ECCC requested the Developer provide further rationale for the selection of the Local Assessment Area (LAA) 15 km buffer as the	ECCC requests the Developer provide, prior to interventions: a) A cumulative effects re-assessment at a geographic scale (RAA) which is appropriate for the characteristics of the caribou component; and	Please see attached response

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	ECCC-01 Caribou Assessment Area	relevant scale for the cumulative effects assessment area for boreal caribou. In IR ECCC-02, ECCC requested the Developer provide the rationale to exclude a Regional Assessment Area (RAA) from the assessment for boreal caribou and to have the LAA serve as the RAA. In IR ECCC-03, ECCC requested the Developer include Imperial Oil activities in the Norman Wells area in the cumulative effects assessment. The geographic scope of the Caribou LAA is not appropriate for the characteristics of the caribou component (ie. population), therefore the LAA is not an appropriate scale for a cumulative effects assessment and should not be a supplement for the RAA. The Developer's arguments in the IR response to MVEIRB #44 were that the Caribou LAA does not (and is not meant to) evaluate boreal caribou at the level of designated population units, and that regional environmental conditions beyond the Caribou LAA are too different in terms of habitat and disturbance levels to compare with conditions proximal to the Project. Project level effects can be assessed at the Caribou LAA, however, for an understanding of the cumulative effects of the Project, they must be put into context of the differing environments in the broader area used by the population or sub-population that could interact with the Project. The valued component is the population, not just individuals affected by the Project. Additionally, the Developer does not estimate the total % disturbance of the NT1 range or regional planning areas resulting from all reasonably foreseeable future developments. Section 7.2.3 in the Federal Recovery Strategy (ECCC 2020) states: "The cumulative effects assessment will: · Assess the impact of all disturbances (anthropogenic and natural) at the range-scale;	a) Given that there are no distinct herds in the NT1 range, an outline of how the Developer plans to capture the effects of the Project, and all reasonably foreseeable developments and their cumulative impacts, at the population or sub-population level.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		· Monitor habitat conditions, including the amount of current disturbed and undisturbed habitat (see Section 4.2.1), and amount of habitat being restored; · Account for planned disturbances; and · Assess the distribution of disturbance in large ranges for risk of range retraction in parts of the range." The list of all reasonably foreseeable developments should then be expanded to match the cumulative effects study area. This is particularly relevant as the Imperial Oil Operations in Norman Wells are currently pending an Environmental Impact Assessment. A key concern for the cumulative effects assessment is the risk of exceeding the disturbance threshold in this range in the near term.		
4	ECCC-02 Destruction of Critical Habitat	References: Responses to IRs: ECCC-05, ECCC-06, MVEIRB #44, MVEIRB #52, MVEIRB #60; Technical Meeting Transcript; Federal Recovery Strategy (ECCC 2020) In IR ECCC-05, ECCC requested the Developer define 'general' and 'selected' habitat, and clarify which biophysical attributes are anticipated to be disturbed and where they occur. In IR ECCC-06, ECCC requested the Developer calculate and provide (1) affected area (in ha) of undisturbed habitat, and (2) affected area of existing habitat, using the standardized equations as derived from the Federal Recovery Strategy, provide details on the factors included in this calculation, and describe the level of confidence in the data used to develop conclusions on the effects to boreal caribou individuals and critical habitat. The Developer has provided the majority of the information requested by ECCC in IR ECCC-05 with the exception of a habitat disturbance map overlaying the Project Development Area (PDA). The Developer provided, in the response to IR MVEIRB #52, a calculation of the % direct habitat disturbance before and after the Project using ECCC's	Prior to interventions, ECCC requests the Developer provide: a) A map that overlays the PDA to the biophysical attributes to show where the direct loss (i.e., Project footprint + 500 m) will occur, and the different ZOIs to show where the indirect loss will occur; and b) Effects to Critical Habitat from the Project and from all reasonably foreseeable developments in the range or regional planning area, based on the calculation provided in the response to IR MVEIRB #52.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		definition of Critical Habitat disturbance (ECCC 2020). However, a clear assessment of the Project-specific effects to areas of undisturbed habitat (i.e., Critical Habitat) and disturbed habitat is still missing. As noted above, a key concern for the cumulative effects assessment is the risk of exceeding the disturbance threshold in this range in the near term. Given the NT1 range is more than 65% undisturbed (Table G-1, ECCC 2020), the Federal Recovery Strategy (ECCC 2020) designates Critical Habitat as all undisturbed habitat. If the threshold is surpassed, Critical Habitat would be all existing habitat (i.e., it would include non-permanent disturbances). The biophysical attributes were outlined in Table 26-1, as requested in ECCC-05. The Developer's interpretation of biophysical attributes, and the explanation provided in the Developer's response to IR MVEIRB #60, are consistent with work occurring in multiple Provinces and Territories in the country. While land cover and biophysical attributes are not necessarily synonymous, it is the most common approach used to mapping them, given data limitations. The mapping provided identifies biophysical attributes of boreal caribou habitat versus general habitat for different seasons. The Developer discusses the land cover present in the 94.3 ha that is anticipated to be a direct loss, however the Developer has not overlain the PDA to show where the direct loss will occur, nor have they overlain the different zones of influence (ZOIs) to show where the indirect loss will occur. For ECCC-06, the Developer should consider the risks of the population not being self-sustaining due to Project effects and cumulative effects. To evaluate these risks, ananalysis should be done to determine how much undisturbed habitat (i.e., Critical Habitat) will be destroyed directly by the Project footprint and indirectly by the habitat functionally removed. The Developer's IR response to MVEIRB #44 claims that "Human disturbance to the south is widely distributed across the Southern NWT, whereas the Project occurs in a corridor of human disturbance." This claim could be supported by an assessment of changes in undisturbed habitat resulting from the Project.		

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		As stated in ECCC-06, based on the current amount of disturbance in the NT1 Caribou Management Area, and the fact that there is no range plan in place for all parts of the range (ECCC 2020), all currently undisturbed habitat is Critical Habitat, and any Project activity resulting in the loss, degradation or fragmentation to that undisturbed habitat (direct or indirect) is a destruction of Critical Habitat (see also Section 7 of the Amended Recovery Strategy for factors exacerbating the likelihood of destruction of critical habitat).		
5	ECCC-03 Caribou Movement	References: Responses to IRs: ECCC-04; Technical Meeting Transcript; Federal Recovery Strategy (ECCC 2020) In IR ECCC-04, ECCC requested the Developer discuss any further planned baseline analyses of boreal caribou movement to supplement their analysis of individual female boreal caribou movement, impacts to crossing accessibility, and impact on movement and connectivity compared to the winter road. The Developer has not provided a clear, scientifically defensible rationale as to why additional boreal caribou movement analyses are not needed. Instead, the Developer has referred back to the EDI (2024) analysis that ECCC reviewed and found to have insufficient information. During the Technical Meeting (November 19 to 21, 2024), ECCC stated that the information regarding the caribou movement analyses currently provided is insufficient because: · The assessment was based solely on collar data, which represents a small portion of the population (n = 14). · Information is only relevant to collared animals and cannot discount different movement behaviors that may occur in the uncollared population. The population model was built from the bootstrapped average of the individual models, so assumes the collared dataset is representative of the population, without justification. The validation of	ECCC requests the Developer, prior to interventions, outline: a) How they plan to improve predictions, how the Project will act as a barrier to movement and how the impacts are anticipated to spread along the route; and b) How they plan to analyze monitoring data collected from the Tłı̨chǫ All Season Road (TASR) Project and apply the findings to the current Project predictions. ECCC requests that: c) The movement analysis and its findings be reframed as a baseline analysis throughout the DAR; and d) The Wildlife Monitoring and Mitigation Plan (WMMP) include explicit plans to monitor the parameters and reassess movement through the life of the Project, and gaps in the analysis and assessment of impacts of the Project on movement and connectivity be more clearly acknowledged within the effects characterization section of the DAR.	Please see attached response

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		the population model is done using the same collar data, so it does not validate whether it is representative of the actual population, only that it is representative of those collared individuals. · Only females were collared, so there is no inference to males or calves. Males are known to have different movement patterns than females. · There was no consideration of variation due to season. · Without a representative sample of the population, we cannot infer total population movement. There was high individual variation in movement, as shown through the individual based models. This means individuals not represented in the sample (i.e., non-collared individuals) could have a large impact on the resulting population level movement estimates. · Caribou on the east side of the road were targeted for collaring. This may bias the sample to those that do not cross the road due to the sampling selection for the east side. It does not inform whether the road may act as a barrier for caribou moving west to east across the road.		
6	ECCC-04 Caribou Habitat Disturbance	References: Responses to IRs: ECCC-06, ECCC-07, MVEIRB #47, MVEIRB #52, MVEIRB #56; Technical Meeting Transcript; Federal Recovery Strategy (ECCC 2020) In IR ECCC-06, ECCC requested the Developer calculate habitat area loss using the standardized equations as derived from the Federal Recovery Strategy. In IR ECCC-07, ECCC requested the Developer provide justification for the adequacy of existing habitat information in the absence of Project-specific baseline data for caribou. The Developer has calculated habitat area loss, but the calculations are based on an unsuitable buffer size for indirect habitat loss, and use of selected habitat only for direct habitat loss. All areas disturbed by the Project in the Project Development Area (PDA) in the caribou range should be considered direct habitat loss. Further, while a sensitivity analysis was done, the Developer hasn't followed it through the assessment of effects	ECCC requests the Developer commit to a reassessment of indirect habitat loss with a more appropriate buffer size: a) Carry the resulting buffer through the assessment and provide the updated assessment prior to interventions; b) Confirm whether the 5 km buffer will be used for a final assessment on significance of impacts to caribou from indirect habitat disturbance; and c) Outline the plan to reconcile the calculations for direct habitat loss with the Project effects assessment; adjust the conclusions on the effects to boreal caribou individuals and critical habitat and discontinue reliance on the RSF model. ECCC requests that indirect habitat loss calculations be made	Please see attached response

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		and significance. To assess indirect habitat loss, the Developer applied a 500 m buffer to the PDA and calculated the full area of habitat types boreal caribou select, according to a Resource Selection Function (RSF) model used to identify habitat selection by collared animals. The 500 m buffer discussed in the Federal Recovery Strategy (ECCC 2020), which should be used for calculating total direct habitat disturbance for a range, is based on model results specific to a range-level analysis of disturbance impacts on boreal caribou at the National scale and is therefore not appropriate for assessing Project-specific impacts on boreal caribou. Instead, indirect habitat loss calculations should be made within an area around the PDA which is justified by literature identifying the zones of influence for effects from the Project. The Developer responded during the Technical Meeting (November 19 to 21, 2024) that they did use a range of buffer sizes as outlined in the response to MVEIRB #47. Response to MVEIRB #47 is a sensitivity analysis on selected boreal caribou habitat using variable buffer widths. The response to MVEIRB #52 is an analysis update on total area disturbance calculations using a 500 m buffer. Calculating the indirect habitat loss using the different buffers is a good start. It is clear from this exercise that the 5 km buffer shows a much larger impact. However, the Developer is still using the RSF habitat model RSF >/= 0.6. That is useful in terms of understanding the importance of the habitat types impacted, but the total amounts should be considered in the indirect habitat loss. This exercise does not address the incorrect usage of the 500 m buffer in the indirect habitat loss analysis. To assess direct habitat loss in the DAR, the Developer calculated caribou "selected habitat" according to an RSF model. In the response to IR MVEIRB #52, the Developer re-calculated direct habitat loss using ECCC recommended definitions of disturbed habitat and the Federal Recovery Strategy formulas (ECCC 2020). However, the data used to develop	within an area around the PDA which is justified by literature identifying the zones of influence for effects from the Project instead of the 500 m buffer discussed in the Federal Recovery Strategy. The Developer should clearly identify the buffer size which will apply to the assessment of the Project's potential effects and significance that will be carried throughout the assessment.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		conclusions on the effects to boreal caribou individuals and critical habitat is still partly based on "selected habitat" according to the RSF habitat model. While caribou may select types of habitats at the scale of the PDA, caribou is a landscape scale species that requires continuous tracts of undisturbed habitat. They occur in low densities throughout their distribution to reduce the risk of predation (Section 3.3.1 ECCC 2020). Connectivity within and between ranges is essential for boreal caribou persistence on the landscape (Section 3.3.2 ECCC 2020). While caribou may select (i.e., use more than available) specific types of habitats (represented in the DAR by landcover data), at the scale of the PDA, all areas directly disturbed should be considered habitat loss, not only those land cover types used preferentially. The relative amounts of the selected/avoided habitat within the PDA area are informative (e.g., risks of impacts are higher if the habitat disturbed is all preferred) however caribou may move through any of the habitat types present within their range, and thus, the loss of those areas, particularly as small patches interspersed with selected habitat types, can be expected to impact caribou. Details on the amount of direct habitat loss that is selected, avoided, and used equal to availability provides more context for the scale of possible impacts, and so ECCC recommends that all disturbed areas in the PDA caribou range be considered direct habitat loss, unrelated to RSF value.		
7	ECCC-05 Avian Baseline Survey Methods	References: Responses to IRs: ECCC-08, ECCC-09; Technical Meeting Transcript In IR ECCC-08, ECCC requested the Developer outline how baseline data was used to estimate Project effects, inform mitigation measures and adaptive management, and discuss the details of the 2022 Bird Study, covering: · Predictive modelling and the use of Boreal Avian Monitoring Project models; · Guidance on the number of sample sites per land cover class;	ECCC requests the Developer: a) Re-assess the effects to breeding and migrating birds with predictive modeling for species occupation and density in place of using the HBA; and b) Use ECCC-CWS's and co-management partners' ARU data, and some waterfowl collaring data, along with additional baseline data the Developer collects, to conduct the assessment. The Developer stated during the Technical Meeting that they	Please see attached response

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		· Standardized point count data to account for imperfect detection; · Use of bird song recognizers; and · Data sharing. In IR ECCC-09, ECCC requested the Developer provide the rationale for relying only on Autonomous Recording Unit (ARU) data and desktop modelling (Boreal Avian Modeling [BAM], eBird) for the DAR conclusions on migratory birds, and discuss the limitations of the data used and the conclusions drawn from it. The Developer has not followed ECCC's previous advice provided on the bird study design, and additional advice was not incorporated into the 2022 Bird Study. Instead, the Developer is proposing exclusive use of a "habitat-based approach" (HBA) to the effects assessments to birds, which, as described below, relies on assumptions and is not applicable at smaller scales. During the Technical Meeting (November 19 to 21, 2024), ECCC described how the Developer is proposing exclusive use of a HBA to assess the Project's potential effects to birds. This approach is a desktop exercise which uses broad scale models (BAM, e-bird), with data collected mainly from southern portions of the provinces, to infer population consequences in the Northwest Territories based on how the Project contributes to the loss of presumed suitable habitat. The Developer is unaware of which bird species (and their abundance) migrate through the RAA, and therefore what birds are associated with each habitat type and how the Project might affect hunted waterfowl (spring and fall hunts), and other bird species during migration. Further, ARUs (sound recorders designed specifically to capture vocalizing songbirds) provide good count data for territorial species such as songbirds, but do not allow estimating abundance of breeding waterbirds, waterfowl and shorebird populations (i.e., colonial, semi-colonial or	are willing to use the data to validate species habitat associations or to contribute to the future monitoring programs. ECCC requests the Developer expand on how the data will be used.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		aggregating species). BAM data used in this HBA are only modelling breeding density and only provide estimates for most of the songbird community (not all songbird species and no waterfowl, waterbirds or shorebirds). BAM's predictions are not considered suitable for use as "baseline data" to infer potential Project effects. Baseline field data (informed by proper power analyses) would address important data gaps (appropriate sample size per habitat type for breeding and migrating birds). This is particularly true for part of this specific assessment because there is very limited "local" northern data in these national data sets. ECCC expert advice is to use predictive modeling, using proper baseline data for species occupancy and density, to assess Project impacts on migratory bird populations. As previously offered, the Canadian Wildlife Service (CWS) and co-management partners have ARU data, and some waterfowl collaring data, to share with the Developer to assist in this type of modeling exercise, but additional data from the study area would still be required to conduct an informative assessment of the proposed Project effects on migratory birds.		
8	ECCC-06 Future Avian Survey Plans	References: Responses to IRs: ECCC-11, ECCC-12; Technical Meeting Transcript In IR ECCC-11, ECCC requested the Developer discuss plans for waterfowl GPS collar data collection and further migratory bird surveys. In IR ECCC-12, ECCC requested the Developer discuss any plans for additional survey work for migratory birds to supplement the 2022 bird surveys, and to provide the survey methods to account for interannual variation. The Developer has no plans to conduct further avian surveys, and ECCC disagrees with the Developer's assessment that a "habitat-based approach" (HBA) that uses large-scale models without appropriate baseline data for the RAA is appropriate to assess Project effects on birds. At the Technical Meeting (November 19 to 21, 2024), the Developer noted that there is a gap in waterfowl data. Instead of using collar data, the	ECCC requests the Developer commit to collect additional collaring data and conduct further migratory bird surveys.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		Developer identified Important Bird Areas (IBAs) in the RAA and assessed the effects of the Project on waterfowl in these areas. The Developer anticipates that the HBA on wetlands and on water is enough to address the effects on waterfowl at that level. The quality/timing of use of migratory stopover sites and anticipated Project effects to migratory species remains unknown, given habitat models do not typically account for species using such habitat for short (but critical) times. Autonomous Recording Units (ARUs) are sound recorders designed specifically to capture vocalizing songbirds. ARUs can detect the presence of some migratory species (night flight calls and other calls/songs) but cannot estimate bird abundance, so it is challenging to properly estimate relative intensity of use by waterfowl and shorebird species that do not vocalize in the same way songbirds do. ECCC is still of the opinion that additional baseline data collection (avian surveys not only using ARUs) within the RAA is required to make accurate predictions of effects to all migratory bird species. ECCC-CWS and co-management partners have limited waterfowl collaring data which can be shared with the Developer, but additional data would still be required, and power analyses are needed to inform sample size (per habitat type or number of birds per species tracked) requirements. Further, while collecting baseline data is important for an impact and effects assessment, the data alone is not much use without proper analyses and modeling to quantify Project effects. ECCC is concerned that, without proper baseline data and reliable Project effect assessments, it will not be possible for the Developer to properly monitor how the Project affects bird occupancy and density. ECCC disagrees with the methods that the Developer has used for bird data collection and analysis; there is still ample uncertainty in the impacts of the Project to birds.		
9	ECCC-07 Avian Assessme	References: Responses to IRs: ECCC-10; Technical Meeting Transcript In IR ECCC-10, ECCC requested the Developer describe how the migratory bird assessment accounts for and assesses effects on avian species present	ECCC requests the Developer describe how they plan to clearly identify and address data gaps and model limitations for inferences at the RAA level.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	nt Area	in and/or potentially using habitats within the RAA during spring and fall migration, including arctic-breeding waterfowl and shorebird species. Using a "habitat-based approach" (HBA) also does not address community concerns over change and uncertainty in migration movements and patterns, which includes spatial and temporal changes. The Developer is unaware of which arctic migrants (if any) are using the corridor, and therefore what birds are associated with each habitat type as part of the "habitat-based approach" to the assessment. ECCC expert advice is that the HBA provides insufficient information about the quality and timing of use of migratory stopover sites and anticipated Project effects. The Developer assessed effects to arctic migrants only in the LAA and then intends to compare those effects to the RAA as the control as part of a cumulative effects assessment. The problem with this approach is that the Developer does not have appropriate baseline data that would allow them to make such a comparison. For the RAA, the Developerhas not appropriately analyzed baseline data, nor monitored changes in documented patterns through time. If the Developer did have migratory bird density and distribution data from the RAA, these data could show effects over the long term and could be used to feed into a cumulative effects assessment. Instead, the Developer is proposing to do a cumulative effects assessment with only limited habitat data.		
10	ECCC-08 Changes to Climate and Landscape	References: Responses to IRs: ECCC-10, ECCC-14, MVEIRB #2; Technical Meeting Transcript In IR ECCC-10, ECCC requested the Developer describe how the effects of climate change are incorporated into the analysis of effects. In IR ECCC-14, ECCC requested the Developer clarify the age of the data-sources used to derive land cover classes, describe the confidence in the accuracy of the landcover classifications, taking into account its age, and how they considered potential change in species demographics,	ECCC requests the Developer use updated land cover classification baseline data to properly infer current conditions. Describe how and when the Developer plans to ground truth the habitat classification data.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		accelerated effects of climate change, and recent forest fires. The data being used for considering climate change at different scales are ~30 years old. Considering the dramatic landscape changes that have occurred in the Northwest Territories in the past 2 years alone, further on-the-ground baseline data collection and a re-visit of habitat classification work is warranted to ensure it is a true representation of RAA in today's landscape for accurate predictions of effects to migratory bird species. The Developer has clarified that the data originates in whole from the 2007to 2013 dataset and notes that the land-cover data used represents the best available land cover mapping at approximately 80% accuracy, but that little satellite data has been processed into a usable form for land cover determination. This 80% accuracy was calculated when the data were new, so the age of the data was not considered in the Developer's response (i.e., how accurate is it now, given it is over 10 years old). ECCC considers this data set out of date, and therefore not reflective of current land-cover conditions in the Northwest Territories, which have undergone dramatic changes in the past few years alone, including due to wildfire. The Developer is not using land cover variables in any modeling attempt to try to quantify species-specific land cover association in the RAA. ECCC expert advice is that a more prescriptive analytical approach is needed to predict what areas in the LAA and RAA are more vulnerable to changes in climate (areas that might become less suitable, remain stable or of higher quality for some migratory birds in the future). It would also be important to have maps of anticipated changes in landcover. Projected changes (and corresponding uncertainty) in land cover for the LAA and RAA have not been provided. The Developer has stated in the response to MVEIRB #2 that "Regardless of the distribution of future landcover types in the LAA and RAA, with the mitigation for Project effects on vegetation presented in the DAR, there are no anticipated changes to the conclusions in the DAR, Section 18." ECCC suggests that mitigation cannot account for any and all future		

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		scenarios, with such a high degree of uncertainty for future conditions. Uncertainty cannot be considered grounds for making any conclusion. ECCC recommends that uncertainty be quantified, and plausible future scenarios be described. Instead, the Developer should quantify this uncertainty and present outcomes from different plausible future scenarios. Models/data should be used to make specific predictions on effects to bird species for the RAA and discuss specific conclusions. Anticipated changes in anthropogenic disturbances could be better assessed if an evaluation of anticipated cumulative impacts of climate change and human disturbances were modeled as part of this environmental assessment. ECCC maintains the position that a model-based approach to addressing these questions, and quantifying all the uncertainty, is warranted.		
11	ECCC-09 Land-Use Change	References: Response to IR: ECCC-18 In IR ECCC-18, ECCC requested the Developer use a minimum Tier 2 approach to estimate emissions from land-use changes and incorporate specific regional values for the biomass and land characteristics. ECCC acknowledges that the Developer used a Tier 1 approach to the Land Use Change (LUC) estimate, however a Tier 2 or higher estimate would be more accurate. The Developer uses the soil organic content (SOC) value (116 t C/ha) from Intergovernmental Panel on Climate Change (IPCC) 2019 Chapter 2 Table 2.3 for the IPCC Climate Zone "Boreal Moist/Dry" and for the IPCC soil class "Wetland soils". Values in Table 2.3 are likely not accurate for use for this Project, largely because Table 2.3 presents SOC for mineral soil, whereas the Project is likely on organic soil (peatlands, wetlands and bogs are usually organic soil). In addition, Table 2.3 only presents SOC values for the first 30 cm of depth, while peatlands, wetlands and bogs are generally much deeper. Lower SOC values are likely to result in an underestimation in the LUC emissions for the Project. ECCC re-iterates the recommendation for specific regional values to be	ECCC requests the Developer: a) Use a minimum Tier 2 approach to estimate emissions from land-use changes as per the Federal Strategic Assessment of Climate Change (SACC) and Technical Guide, and incorporate specific regional values for the biomass and land characteristics; and b) Review the SOC value to account for the presence of organic soil deeper than 30 cm in the Project area and update the estimate of emissions from land-use changes, since lower SOC values are likely to result in an underestimation in the LUC emissions for the Project.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		incorporated into the LUC calculation, through the use of research documents or studies done in the Project area. This would increase the accuracy of the LUC estimate.		
12	ECCC-10 Carbon Sinks	Reference: Response to IR: ECCC-19 In IR ECCC-19, ECCC requested the Developer update the carbon sink assessment. ECCC acknowledges that the Developer followed the Mackenzie Valley Environmental Impact Review Board 2015 Terms of Reference for the environmental assessment, however the methodology used by the Developer is likely less accurate than that presented in the Strategic Assessment of Climate Change (SACC) and Technical Guide. In addition, the Developer has examined the impact on carbon sinks for forested land in the Project area, but has not provided a value for the wetland area. ECCC re-iterates the recommendation to use the methodology presented in the SACC and Technical Guide, and recommends the use of specific regional values to be incorporated into the carbon sinks calculation, through the use of research documents or studies done in the Project area. ECCC suggests the Developer refrain from referring to their carbon sink estimate as 'conservative', as the methodology that is used introduces uncertainties, meaning that the result may not be conservative.	ECCC requests the Developer update the carbon sink assessment using specific regional values from research and/or studies conducted in the Project area. ECCC requests the Developer considers wetland areas in their carbon sink assessment, in addition to forest lands.	
13	Consolidated Comments and Cover Letter	See attached	See attachment	
No.	**Topic**	**Reviewer Preamble**	**Reviewer Request**	**Response**
Deline Renewable Resources Council - Ms. Stephanie Kearns				
1	Development and	The Draft Wildlife Monitoring and Management Plan (WMMP) for the Mackenzie Valley Highway Project (hereafter “the Project”) outlined in	Ensuring Indigenous Leadership in the MVHP WMMP	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	implementation of a workable and useful Wildlife Management and Monitoring Plan (WMMP) for the Mackenzie Valley Highway Project (MVHP)	Section 5 and 6 of Volume 5 of the Developer's Assessment Report (DAR) is intended to provide a foundation on which to monitor and evaluate the potential impacts of the Project on wildlife and habitat and direct mitigations to address any observed impacts. We believe there are several substantial shortcomings and gaps in the current WMMP that undermine its ability to achieve its stated goals from both Western Science (WS) and Indigenous Knowledge (IK) perspectives. Although many of these concerns were raised both in the first round of Information Requests and during the technical sessions held on November 19-21, 2024, we do not believe the developer's responses were adequate to address our concerns. As the WMMP is currently in draft, and the proponent, the Government of the Northwest Territories (GNWT), has expressed a willingness to collaborate with communities to refine the WMMP, we are requesting additional information to better understand the proponent's perspectives, identify opportunities for improvement, and ensure the final WMMP aligns with the priorities and expectations of the Délı̨nę Renewable Resources Council (DRRC). A primary concern is the lack of clarity on how the WMMP will be implemented to achieve meaningful results. Key questions remain unanswered: how and when data will be collected, who will collect and analyze it, what funding will be allocated, and how IK and community leadership will be meaningfully integrated. For instance, Section 5.2 on Wildlife Effects Monitoring prioritizes GNWT-ECCC leadership while offering limited recognition of Indigenous expertise. Similarly, Section 6 of the DAR addresses adaptive co-management but lacks clarity or substance on how communities will be meaningfully involved in decision-making and monitoring. This is especially concerning given the GNWT's obligations under Section 13.8.40 of the Sahtú Dene and Métis Comprehensive Land Claim Agreement (SDMCLCA) to directly involve Renewable Resource Councils (RRCs) and Sahtúot'ı̨nę harvesters in wildlife research and monitoring activities. Without a stronger emphasis on Indigenous leadership, the WMMP risks reducing IK and community	1.1 Throughout Section 5.2 of the DAR Draft WMMP, the Wildlife Effects Monitoring section lacks sufficient Indigenous collaboration and participation. In light of the GNWT's stated commitments to reconciliation, please clarify how IK and community leadership will guide the development and implementation of the WMMP? 1.1.1 Will the GNWT commit to use a community-driven WMMP framework, where Indigenous leadership is central to the monitoring and decision-making processes? 1.2 In section 5.2, eight of the ten subsections on wildlife effects monitoring explicitly state that the monitoring and analyses will be carried out by GNWT-ECC or GNWT-INF. 1.2.1 What is the GNWT's rationale for excluding comprehensive Indigenous participation in these processes? 1.2.2 How does the GNWT's exclusion of Indigenous participation from these monitoring processes align with the GNWT's reconciliation commitments? 1.2.3 How does the GNWT's exclusion of Indigenous participation from these monitoring processes meet the GNWT's treaty obligations? 1.3 What specific mechanisms will the GNWT implement to ensure community-driven identification of culturally appropriate monitoring questions and the establishment of culturally relevant information collection protocols? 1.4 How does the GNWT plan to ensure that IK and community participation are integrated as equal or leading components of the WMMP, rather than being supplemental to government-led efforts?	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		participation to token gestures rather than essential, treaty-protected components. We are advocating for a community-driven WMMP where Indigenous partners lead monitoring and decision making processes. This approach can more fully accommodate IK Systems and community priorities while ensuring culturally relevant and ecologically robust information shapes the WMMP in a way that fosters reconciliation. The draft WMMP also fails to address the lack of baseline data, which is critical for effective mitigation and adaptive co-management. Relying on limited or absent baseline information substantially weakens the ability of the WMMP to achieve its objectives. Immediate monitoring to establish pre-construction benchmarks is essential, and proactive collaboration with communities – who hold invaluable Indigenous and local knowledge – would significantly strengthen the plan. The gaps identified in the WMMP, as presented in the DAR and made evident during the technical sessions, highlight the need for greater collaboration. The Project has the potential to set a precedent for how reconciliation and resource management can coexist. However, achieving this requires more than surface-level commitments; it demands the inclusion of Indigenous voices and perspectives at every stage of the WMMP. By addressing these gaps now, the GNWT can create a plan that is not only scientifically rigorous but also culturally appropriate and that respects the rights of Indigenous communities.		
2		Same as IR 1	Adequately Resourcing Community-Driven Monitoring 2.1 The DAR proposes the creation of a “Renewable Resources Officer” (RRO) position to conduct harvest monitoring and enforcement. While we feel this is a positive step, one position appears insufficient given the scope of work. 2.1.1 What is the anticipated workload for the RRO position and what is the geographic coverage for this position? 2.1.2 What are the specific timelines for when the RRO position	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
			will be advertised to be filled? 2.1.3 How will the GNWT evaluate the success of one RRO position to conduct harvest monitoring and enforcement for the entire length of the road and how will Indigenous governments and RRCs be included in that evaluation process? 2.2 What specific mechanisms will the GNWT implement to ensure Indigenous harvesters and land users are fairly compensated for sharing harvesting and monitoring data, and how will these mechanisms be transparent, consistent, and developed in collaboration with RRCs?	
3		Same as IR 1	Prioritizing Robust Baseline Information and Inclusive Monitoring Practices 3.1 In section 5.1 of the Draft WMMP, it is stated that mitigation measures will be implemented to avoid or reduce project effects on wildlife habitat during construction, operations, and maintenance. Given the lack of robust baseline data on infrastructure and wildlife in the region: 3.1.1 How does the GNWT intend to establish adequate baseline data to assess the effectiveness of these mitigation measures? 3.1.2 Will the GNWT commit to beginning baseline monitoring immediately, or at a minimum one-year pre-construction, to ensure sufficient pre-construction data? 3.2 Section 13.8.40 of the SDMCLCA requires direct involvement of the Renewable Resource Councils (RRC) and Sahtúot'ı̨nę harvesters in wildlife research and harvesting studies. What specific processes will the GNWT use to directly involve the RRCs and participant harvesters to the greatest extent possible in monitoring the effects of the Project? 3.3 The RRCs have repeatedly expressed to the GNWT their strong opposition to intrusive wildlife monitoring methods such	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
			as caribou collaring and helicopter surveys. Despite this, Section 5.2 of the DAR focuses almost exclusively on these invasive techniques, and only for a limited range of species (caribou, moose, and species at risk). While we acknowledge the value of these data, there are many other well-established, less invasive monitoring methods, such as remote camera traps, genetic sampling, or acoustic monitoring, that can offer robust data across a broader range of species. Additionally, these methods are more conducive to community participation, aligning better with the values and priorities of the RRCs. 3.3.1 Will the GNWT commit to only using monitoring methods that are supported by the RRCs? 3.3.2 If not, will the GNWT provide a clear rationale for rejecting the implementation of these widely studied, less invasive wildlife monitoring methods that can deliver data for multiple species while enabling meaningful community participation and that are acceptable to RRCs? 3.4 Section 5.2 of the DAR focuses narrowly on the immediate road corridor (PDA and LAA), despite extensive evidence from both WS literature and IK demonstrating that ecological processes such as animal movement, seasonal migration, habitat selection, and inter- and intra-species interactions occur across broad spatial and temporal scales. Additionally, roads are well-documented to impact these processes far beyond their physical footprint. In the Tłı̨chǫ Traditional Knowledge Study for the Proposed All-Season Road to Whatì (2015), it was found that focusing on both the immediate study area and its ties to a larger geographic context provided critical insight into travel routes and animal migration. This dual focus not only highlighted the importance of localized impacts but also emphasized the significance of broader spatial connections for understanding cultural and ecological systems. If this approach is vital for informing IK work, it stands to reason that baseline data collection and ecological monitoring under the WMMP	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
			should adopt a similarly broad perspective, particularly within an Indigenous research framework. 3.4.1 What is the GNWT's rationale for limiting the study area to the immediate road corridor, despite extensive evidence from both WS and IK demonstrating that ecological and cultural processes unfold on much larger spatial scales? 3.4.2 If Indigenous participants continue to express that the defined corridor is insufficient as a study area, will the GNWT commit to broadening the scope to align with both scientific and Indigenous perspectives on landscape-scale processes?	
No.	**Topic**	**Reviewer Preamble**	**Reviewer Request**	**Response**
Pehdzeh Ki First Nation (PKFN; Wrigley) - Jane Henderson				
1	Clarifications re existing Dehcho watercrossings	The existing watercrossings on the proposed route are outside the scope of the Project. However, they are within the scope of the EA as existing infrastructure affecting the Project. PKFN seeks to understand what watercrossing upgrades or replacements can reasonably be anticipated, and when. GNWT-INF has stated that the watercrossings in the Dehcho have a design life of 75 years,[1] meet all-season use requirements, and that although they were built for the winter road, "consideration of future utilization would have been built into the design".[2] GNWT-INF states in its response to MVRB IR 66 that: "Ochre River Bridge, Whitesand Creek Bridge, Vermillion Creek South Bridge, Blackwater River Bridge, and Saline River Bridge were built in 2001 (Blackwater in 2010). These, and most other bridges along the MVWR built since 2014 have a design life of 75 years" [emphasis added], and "the GNWT's intention is to retain the existing bridges located along the MVWR that are functioning as intended, and that accommodate the design criteria of the highway" [emphasis added].	Which bridges built along the MVWR in the Dehcho, if any, do not have a design life of 75 years?	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		[1]"PR262 Responses", GNWT response to MVRB IR 66, s. B, at pdf p. 20. [2] "PR283 Transcription – Technical sessions Day 1", Seth Bohnet for GNWT-INF at p. 84, lines 2-3.		
2	Clarifications re existing Dehcho watercrossings	Same as previous	Is it correct to infer that the estimated lifespan for each watercrossing is 75 years minus the current age listed in Table DFO021?	
3	Clarifications re existing Dehcho watercrossings	Same as previous	Which bridges in the Dehcho, if any, do not accommodate the design criteria of the Project?	
4	Clarifications re existing Dehcho watercrossings	Same as previous	GNWT-INF has commissioned a bridge study, to be completed in 2025. Please provide details about the scope, purpose, and anticipated completion date.	
5	Contradictions in Project statements and watercrossing permit applications	The land use and water permitting applications for the watercrossings in the Dehcho listed in the DAR[1] do not describe potential future all-season use. Each proejct's rationale states that the purpose is to improve the winter road.[2] Potential all-season use is not mentioned in the applications, in their consideration by the Land and Water Board, or in the GNWT's communications to PKFN. There is one exception, in the 2010 Water Licence and Land Use Permit applications for the permanent Blackwater Bridge, which state that "use of the bridge is only anticipated between December and April each year for the foreseeable future."[3]	Please provide documentation explaining how all-season use was considered in the Dehcho watercrossings' original design and/or upgrading, given that it is not explicit in project applications or MVLWB reasons, and was not communicated to PKFN.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		However, these watercrossings now determine the MVH route. [1] MV2010L8-0010, MV2010X0003, MV2010L8-0002, MV2004L8-0004, MV2004X0047, MV2000E0050, and MV2000E0048 (DAR, Table 26.2). [2] MV2010L8-0010: GNWT Department of Transportation, Environmental Impact Report, s. A, p. 1 (pdf p. 8), in MV2010L8-0010 - Revised WL Application - Nov29-10.pdf, MVLWB Registry MV2010X0047: GNWT Department of Transportation, Environmental Impact report, s. A, p.1, (pdf p. 8) in MV2010X0047 - Revised LUP Application - Nov29-10.pdf MV2010X0003: "Land Use Permit Application" s. 5(a), "Summary of operation", pdf p. 4-5, in MV2010X0003 LUP Application Feb10-10.pdf, MVLWB Registry. MV2010L8-0002: "Application for a new Water licence, Amendment of Licence, or Renewal of Licence", s. 4, "Description of Undertaking", pdf. 12, in MV2010L8-0002 WL Application Feb10-10.pdf on MVLWB Registry. MV2004L8-0004: "GNWT Department of Transportation" Environmental Information Report, s. 3.1 "Rationale", pdf p 22 in Application-MV2004L8-0004-Blackwater Bridge-Oct04.pdf posted Sept 30, 2004 to MVLWB Registry ; and "Application for extension", pdf p. 3, posted Jan. 9, 2008, in "MV04L8-04 - Amendment Request for Review - Jan24-08.pdf", MVLWB Registry. MV2010L8-0002: "Application for a new Water licence, Amendment of Licence, or Renewal of Licence", s. 4, "Description of Undertaking", pdf. 12, in MV2010L8-0002 WL Application Feb10-10.pdf on MVLWB Registry. [3] MV2010X0003: "Land Use Permit Application" s. 5(a), "Summary of operation", pdf p. 4-5, in MV2010X0003 LUP Application Feb10-10.pdf, MVLWB Registry; and MV2010L8-0002: "Application for a new Water licence, Amendment of Licence, or Renewal of Licence", s. 4, "Description of Undertaking", pdf. 12, in MV2010L8-0002 WL Application Feb10-10.pdf on MVLWB Registry.		
6	Contradictions in Project statement	Same as previous	How does the GNWT account for the failure to notify and consult with PKFN regarding the potential all-season use, routing implications, and all-season impacts of these watercrossings?	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	s and watercrossing permit applications			
7	ISC bridge standards	ISC policy is clear that single-lane bridges are not acceptable for roads connecting Indigenous communities.[1] Most bridges on the proposed route are single-lane. [1]Canada, Indian Programs Manual, vol. 1, "Capital Facilities Maintenance: Roads and Bridges", Appendix B: "Levels of Service Standard: Bridges", s. 2.3. Available online: https://www.sac-isc.gc.ca/eng/1100100010628/1533652010591	What will the GNWT do to bring the Project watercrossings to ISC's standard, and when?	
8	ISC bridge standards	Same as previous	What are the implications for GNWT's funding requests to Canada for the Project if the existing infrastructure that the Project relies upon does not meet ISC's standards?	
No.	**Topic**	**Reviewer Preamble**	**Reviewer Request**	**Response**
R(E)C Consulting AB - Ruari Carthew				
1	Inadequate assessment of barren-ground caribou and the Bluenose-East herd	The DAR offers contradictory statements on the how the Project will interact with the Bluenose-East barren-ground caribou herd. In section 8.3.3 of the DAR (PR96:27), it states that the Project overlaps with the herd's historical range. Figure 10.3 of the DAR (PR96:362) describes the historical range as between 1996-2009. This range overlaps with the caribou and moose LAA. In section 10.2.2.2 (PR96:360), harvest sites along the Mackenzie Valley winter road are identified, which place barren-ground caribou in the PDA. The following points are acknowledged by the DAR in section 10.2.2.2: · the species is threatened status under the NWT Species at Risk Act · the species is considered threatened by the Committee on the Status of Endangered Wildlife in Canada · The Advisory Committee for Cooperation on Wildlife Management (ACCWM) has determined that the Bluenose-East herd has passed a threshold requiring all management actions from their 2014 management	1. Complete a residual effects assessment of the Bluenose-East caribou herd that properly considers the cyclical nature of the herd and its movements over time and how these interact with the permanent nature of the Project. This assessment should consider and identify a Project zone of influence. 2. Complete a valued-centric cumulative effects assessment of how the Project's direct and indirect effects, including the potential for induced development in the Central Mackenzie Valley, will affect the resilience and recovery efforts of the Bluenose-East caribou herd. 3. List additional management actions the GNWT will take or has taken in relation to the Project to protect and promote the health and vitality of the Bluenose-East herd according to the ACCWM 2014 Management Plan. Identify appropriate monitoring and mitigation measures for barren-ground caribou	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		plan to apply. · the historical range of the Bluenose-East herd overlaps with the Caribou and Moose LAA · the Bluenose-East herd is at a historically low level but may be stabilizing · adult female survival rates are still too low for recovery needs · herd movement patterns are cyclical and may fluctuate, with avoidance of areas over several decades · improved access from the Project could result in additional harvesting and an increase in mortality rates · new roads and trails built as part of the project or from induced activities (i.e., from direct or indirect project effects) can increase access for harvesters and predators, lead to increased energetic disturbances and alter movement and migration routes · Such activities may adversely affect the population and impede their recovery. Despite these findings, the GNWT determined that barren-ground caribou should be excluded from the residual effects assessment. The listed rationale is that the current annual range has no direct interaction with the Project (PR96:363). The GNWT did consider the species in the cumulative effects assessment. However, the GNWT relied on current range movements to discount any Project effects on the species because "the current range of the Bluenose-East Herd does not overlap with the Caribou and Moose LAA" (PR96:429, DAR 10.5). GTC is very concerned with how barren-ground caribou have been removed and discounted from the effects assessment. The GNWT appears to be using a double standard in its interpretation of time and place when deciding which valued components are assessed. In this case, the GNWT has taken a current snapshot in time to determine that barren-ground caribou have not recently been observed within 15km of the MVH corridor. However, they have discounted the fact that barren-ground caribou have existed and been observed along the MVH corridor, that their natural cycles could well bring them back to the area for winter and fall foraging, and that the Project is intended to be in place indefinitely. The indefinite nature of the Project increases the likelihood that barren-ground caribou will return to the area and interact directly and	for this Project in consultation with ACCWM members.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		indirectly with the Project. This probability increases should herd recovery occur. Regardless of the above, GTC strongly disagrees with the narrow scope the GNWT has applied for its cumulative effects assessment. As discussed during the technical sessions and as mentioned elsewhere in GTC's round 2 information requests, GTC finds the cumulative effects assessment inadequate for all valued components of interest to the GTC. An appropriate cumulative effects assessment for a permanent highway that runs through recognized and potential barren-ground range should consider potential direct and indirect Project effects, including those arising from anticipated induced development. Barren-ground caribou are part of an essential resource and central to the social, economic, cultural, and spiritual well-being of the Gwich'in. The GNWT's identified baseline data on barren-ground caribou describes a species that has passed a point of significance and could be adversely affected by the Project. The timing of potential Project disturbances is important to consider as it could hinder recovery efforts. For example, the Bluenose-East herd is thought to be stabilizing. Potential new disturbances must be properly assessed for how they might affect herd vitality and resilience. This applies directly to the Bluenose-east herd through increased harvest pressure, disturbance from the highway, and potential increase in predation success from the new linear corridor. Indirect adverse affects are likely over the operational period of the highway to the Bluenose-East and Bluenose-West herds and to boreal caribou north of Norman Wells. Habitat alteration from induced land use activities poses the largest threat to boreal caribou (Environment and Climate Change Canada 2020) and additional adverse effects to barren-ground caribou recovery efforts throughout the herds' range. Table 3 of the 2014 ACCWM management plan lists management actions across multiple areas to help preserve and restore the herd (ACCWM 2014). These categories include education, habitat, land use activities, predators, and harvest. All management actions are currently intended to be appropriated and followed by ACCWM members. The GNWT is an active member of the ACCWM through its participation in the Wildlife Management Advisory Council (NWT). GTC is discouraged that the GNWT		

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		has not been more proactive in its use of the precautionary principle and knowledge of the pressures facing the herd to recommend responsible stewardship actions. The GNWT appears instead to have ignored reasonably foreseeable adverse interactions with the Project and indirect impacts to this vital species. It calls into question the nature of the GNWT's "one government" approach of participating in this EA and how decisions are weighted internally by the GNWT regarding the health and well-being of assessed flora and fauna, land and water. Reference: Advisory Committee for Cooperation on Wildlife Management. 2014. Taking Care of Caribou: the Cape Bathurst, Bluenose-West, and Bluenose-East barren-ground caribou herds management plan. Yellowknife, NT. Environment and Climate Change Canada. 2020. Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xiii + 143pp. Available online at: Woodland Caribou, Boreal population (Rangifer tarandus caribou): amended recovery strategy 2020 - Canada.ca		
2	Cumulative Effects Management and stewardship role of the GNWT	GTC believes it is important to acknowledge the basin opening nature of establishing a highway into the Central Mackenzie Valley. This is deliberately omitted from the Cumulative Effects Assessment. GTC has traditional rights and interests that might be affected by the Project's activities, which are likely to be affected in the future by development activities spurred by the expansion of the MVH. It is a constitutional right of Indigenous peoples to pursue an Indigenous way of life and to exercise their treaty and title rights. Cumulative effects of resource development represent a threat to Indigenous groups of the Central Mackenzie Valley. The 2021 Blueberry Decision by the British Columbia Supreme Court (2021 BCSB 1287 Yahe v British Columbia) found that the province had failed to uphold the honour of the Crown and breached their Treaty promises. In the Blueberry decision, cumulative effects of industrial development authorized by the province had significantly diminished the ability of Blueberry members to exercise their rights. The province's lack of action despite clear warning signs, concerns	1. Will the GNWT commit to developing a proactive oversight group with all communities of the Mackenzie Valley to specifically oversee and manage cumulative effects of industrial activities in the Central Mackenzie Valley? 2. How will the GNWT proactively fulfil its fiduciary responsibility to manage Indigenous treaty and constitutional rights from potential cumulative effects of development in the Central Mackenzie Valley over the lifetime of the Project?	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		and appeals from Blueberry First Nation over a ten-year period was deemed an infringement. Those events have stained relations between Indigenous groups and the government, and put resource development activities at risk as the Province works to redress the situation. GTC would like to see a responsible plan put forward by the GNWT to ensure that this sad story is not repeated in the Central Mackenzie Valley. The GNWT is not a standard proponent building a project, but a Government with responsibilities to protect the rights and interests of residents of the Northwest Territories, to ensure responsible and sustainable development of its resources, and to uphold the rule of law within its borders. It is a basic expectation and measure of good governance to consider how affected Indigenous communities can maintain their resilience and values in the face of future development pressures. These considerations and discussions should start today and not in one generation's time, when important values have been irreversibly affected. Residents of the NWT and Indigenous communities have the experience of the diamond mines to draw lessons from on how to plan for and manage undesired effects of induced development. In the Environmental Assessment of the Jay Project, EA1314-01, the Review Board found that 30 years of diamond mining had resulted in adverse cumulative impacts associated directly or indirectly with diamond mining and affecting diamond mining communities. These impacts were an ongoing source of significant concern to residents of affected communities. The Review Board's finding suggests that the GNWT failed to critically investigate how diamond mining was affecting communities and failed to respond to observed and worsening conditions. Insights from that experience should inform any future industry booms or basin opening activities. For this Project, the GNWT has limited its cumulative effects assessment to a Project-centred approach and to an arbitrary future scenario that excludes induced development. This raises concerns that the GNWT is failing to adequately consider responsible stewardship of the Central Mackenzie Valley and its fiduciary duty to protect the ability of Indigenous groups to continue their way of life in this region. The communities and Indigenous peoples of the Central Mackenzie Valley		

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		will share the direct and indirect effects (positive and adverse) that will result from an opening up of the Central Mackenzie Valley basin to development opportunities. It is important protections exist from undesired effects of such development – that the opportunity can build positive legacies for all. Mechanisms to achieve this goal must exist from the start.		
3	Cumulative effects methodology	The description of the methodology for cumulative effects says (PR93:85) that the Project Inclusion List "does not include other contributing sources to changes on VCs, such as traditional and non-traditional land and resource use, climate change, forest fires, and regional policies and programs." The intent of a Cumulative Effects Assessment (CEA) is to understand the consequence and interactions of past, present, and reasonably foreseeable future conditions on a valued component. CEAs are meant to amalgamate and consider all known and likely stressors that will affect a VC with and without the proposed Project. This broader consideration is necessary for responsible and sustainable development. The GNWT's chosen methodology is project-focused and not VC-focused. The current approach is contrary to best practices of standard Canadian IA/EIA guidelines, including those of the Review Board and the Impact Assessment Agency of Canada. The cumulative effects assessment is incomplete until all known stressors acting on a VC (past, present, and reasonably foreseen future) are put together and interpreted relative to a healthy baseline for each VC.	1. How are the contributing factors of change (e.g., such as traditional and non-traditional land and resource use, climate change, forest fires and regional policies and programs) considered in the significance determination? 2. Describe what a healthy baseline is for valued components and discuss the significance determination in relation to that healthy baseline. 3. How do these contributing factors of change interact and synergize with the cumulative impacts of other residual effects identified in the DAR? 4. Provide an updated interpretive discussion by subject matter experts on what the implications of these contributing factors are on future resilience and well-being of VCs.	
4	Adaptive management: Decision-making structure and agency of participants	The Tłı̨chǫ Highway working group is frequently mentioned as a reference for how MVH working groups might be established. Please describe the power sharing structure between the GNWT and involved Indigenous Governments in that working group. There is particular interest in describing the agency of participating Indigenous Governments in the decision-making process to inform collaborative arrangements proposed for this Project.	1. Describe the agency of the Indigenous Governments (IGs) involved in the Tłı̨chǫ Highway Working group. Discuss how much influence IGs had in the selection of monitoring indicators, the design of monitoring methods, participation in the monitoring process, interpretation in monitoring results, and input into appropriate management responses to address undesired observations. How were differences in opinion between the GNWT and IGs weighted in decision-making? 2. Comment on how the agency of participating Indigenous Governments allowed them to meaningfully participate and influence the working group's activities and achievements.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
			3. Has the Tłı̨chǫ Highway Working Group relied explicitly on existing programs and services, or have new recommendations or initiatives been developed in response to monitoring results and observed changes? If new initiatives have taken place, please describe them and what led to their development.	
5	Adaptive management: Response time and learning process	Adaptive management (A-M) is an appropriate tool when working with complexity, uncertainty, and risk. However, to remain an effective tool, its design must incorporate best practices to specifically address elements of complexity, uncertainty, and risk. Fischenich et al, 2019, provide a robust assessment of what effective adaptive management looks like. They describe adaptive management as "learning by doing, monitoring, evaluating results, making difficult decisions, adjusting if necessary, and repeating" (Fischenich et al. 2019:vii). Successful A-M requires a systematic process to translate the observation of changes into effective management strategies. Things change with time and the adaptive management process must continually adjust to new stressors and pressures. The commitment to continual improvement and the authority required to initiate a timely and effective response by senior decision-makers are key A-M components. The proposed Project remains at a 25% design phase, implying that many project-specific details are unconfirmed or yet unknown (e.g., who will be the contractor, the timeline, mobilization details, final route selection, location of important water crossings, etc.). There also remains large gaps in baseline data to valued Indigenous components and an avoidance of assessing the long-term consequences and cumulative effects associated with the establishment of a permanent road into the Central Mackenzie Valley. At the same time, Indigenous Governments have expressed concerns over the current state of health for valued components relative to existing threats and stressors like climate change or induced development activities. To address these uncertainties and unknowns, the GNWT intends to rely heavily on adaptive management and continued collaboration in monitoring activities with affected Indigenous Governments. But they have not articulated how adaptive management will be carried out or structured. The adaptive management approach will	1. Describe the adaptive management structure and process the GNWT will use to address unanticipated impacts and undesired change associated with the project and its impact predictions. Include specific details on the proposed planning, implementation, evaluation, and adjusting/adapting phases of the plan and how the GNWT intends to work with its partners at each phase to ensure undesired changes are managed in real time and in a "learning by doing, monitoring, evaluating results, making difficult decisions, adjusting if necessary, and repeating" manner.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		obviously be affected and refined by the participants – it will be unique to the MVH Project. However, it is important that its design contains all key elements and phases of a robust adaptive management process (i.e., four key phases: planning, implementation, evaluation, and adjusting/adapting). Based on the public record, the GTC is concerned that the GNWTs approach to adaptive management will not be sufficiently robust. GTC is particularly concerned about the potential selection of indicators and how management will respond to changes. The GNWT has made inferences that it will rely on existing programs and services to inform its adaptive management process and response. For example, the GNWT has proposed a Community Readiness Strategy to "provide the means by which the GNWT and communities can work collaboratively to respond to the socio-economic effects of the Project" (GNWT response to 'DFF-02 – Socio-economics: financial impacts on fly-in communities and mitigations'). The GNWT goes on to describe its adaptive management approach as relying on "ongoing monitoring and leveraging existing programs to mitigate potential effects of the Project" (ibid). The GNWT's response to 'MVEIRB-05 – Food Security and Country Foods' places additional emphasis on the use of existing programs and strategies. It reiterates that it is not planning to undertake specific baseline studies on food security. It does reference, instead, a voluntary Indigenous harvest and monitoring and reporting program as an example data set to assist discussions on interpreting monitoring results and adaptive management strategies. That same data is described as "limited in that it is only collected every 5 years" (ibid). Detecting a trend from such data could take 20 to 40 years. Conversely, the volume of additional potential influences on harvesting patterns and food security over that time period would prohibit any conclusive links on causality or could contradict any observed trend. Hoping to establish causality of an observed change on a complex system is a handicap to swift and effective responses to undesired impacts. In the adaptive management cases described, the strategy fails to address components of complexity, uncertainty, and risk. The proposed approach also suggests a very rigid approach to the planning, implementation, and adjusting/adapting phases of adaptive management. This approach to		

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		adaptive management reduces the confidence level that the GNWT will effectively and responsibly respond to undesired changes to GTCs valued interests over the lifetime of the Project. Reference: Fischenich, J.C., S.J. Miller, and A.J. LoSchiavo. 2019. A Systems Approach to Ecosystem Adaptive Management: A USACE Technical Guide. US Army Corps of Engineers. Available online at: https://erdc-library.erdc.dren.mil/jspui/bitstream/11681/34855/1/ERDC-EL%20SR-19-9.pdf		
6	Addressing uncertainty of impact predictions	Parties to this EA process have expressed broad support for the Project to proceed. However, they want to make sure that the Project is carried out responsibly and in a manner that minimizes undesired impacts. We are currently being asked to accept an incomplete project plan with inadequate baseline information and incomplete impact characterizations. There is too much uncertainty to have confidence that any proposed mitigation measure will be effective. It is not a criticism so much as a reality of the existing situation. The only way to responsibly address that is for increased scrutiny in monitoring, robust adaptive management of undesired observed impacts, and the commitment to pivot and resolve undesired changes when they are first encountered. The level of risk and uncertainty must be matched by a proportional increase in public oversight and influence. This requires built-in agency of public interest and participation in the design, implementation, and decision-making of monitoring, mitigation, and adaptive management processes.	1. Discuss how the GNWT might increase public trust and confidence in its proposed monitoring and adaptive management processes to counter existing concerns and uncertainty? 2. What examples can the GNWT describe where it has shared decision-making authority with other Indigenous governments or communities in the design, implementation, and decision-making process of mitigation measures for a major Project or undertaking. a. What form did the shared decision-making take? b. Elaborate on how this format influenced the success or failure of those mitigation measures to address undesired change. c. Comment on the effect of those collaborations on public trust and support for the project.	
7	Participation in monitoring activities	GTC interests on treaty and Indigenous rights extend to valued components that may be directly or indirectly affected by the construction and operation of a permanent highway to Norman Wells. GTC is particularly concerned over potential synergistic and cumulative effects operating at a regional scale and how these may affect the health and well-being of important Gwich'in interests. The GNWT is currently limiting its assessment of potential project impacts to the Project footprint. However, this ignores the permanent nature of the road and the likely inducement of resource development in the Central Mackenzie Valley. GTC is concerned	1. Will GNWT update the Indigenous and environmental monitoring commitment to include engagement and participation of GTC and Gwich'in participants? 2. What are the current timelines associated with the proposed monitoring plans (e.g., the WMMP, water quality monitoring, permafrost protection, socio-economic working groups, etc.)? How were these timelines selected? 3. Recognizing that the MVH will be a permanent structure, comment on the ability of monitoring programs (e.g.,	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		that cumulative impacts arising from a future with the Project might jeopardize the health and well-being of GTC valued components like water, fish, caribou (boreal and barren-ground), migratory birds, and other traditional land and resource use values. GTC has stewardship responsibilities and a mandate to make sure Gwich'in values and interests are being managed responsibly. The current structure of project monitoring excludes Gwich'in participation and engagement. GTC recognizes that the project is in an early stage of design. Site-specific details or baseline studies to qualify potential project effects and undesired impacts are currently inadequate. Some studies will be carried out over time, which will allow resource managers to improve their management actions. However, many of the mitigation measures and commitments proposed by the GNWT rely on future efforts to observe, monitor, and adapt to undesired impacts. Given the long-term nature of the project and the potential of some impacts to materialize or worsen with time (e.g., synergistic impacts related to climate change, the project, and induced development), GTC expects to stay informed and acknowledged on resource management activities that intersect with GTC interests. GTC therefore expects to be engaged by the GNWT on monitoring and adaptive management activities. On Day 3 of the technical sessions, the GNWT said they would consider whether to update the Indigenous and environmental monitoring commitment (Commitment # 277) to include engagement and participation of GTC and Gwich'in participants (e.g., PR285:57). GTC has not yet heard back from the GNWT on this topic and would like a response.	via use of western science and traditional knowledge) to confidently detect short and long-term trends of Project-related effects on valued components over the planned duration of monitoring programs?	
8	Dealing with uncertainty in design (general comment using permafrost as an example)	Discussions from the technical session emphasized the importance of soils encountered along the finalized route and that the GNWT does not consider permafrost a significant barrier to the cross-section design of the road (e.g., PR285:119-120). GTC further understands that geotechnical studies will be undertaken once the final route selection is made and, upon establishing the thermal conditions, appropriate design features will be incorporated. The GNWT is developing a permafrost protection plan to describe how ice-laden soils will be managed over time. This plan will be subject to community collaboration and participation, though precise details are not yet known. Another concern raised at the technical session	1. Using permafrost as an example, describe how conditions and understanding of the route might change between now (i.e., at 25% design phase) and start of construction (i.e., at 100% design phase). 2. Under what conditions would the assumptions used to establish the permafrost plan and its mitigations be altered? 3. How will the GNWT continue to work with interested parties to ensure their continued support of the plan should the design change? If a majority of parties disagree with the changes, how does the GNWT propose to fairly resolve this	Please see attached response

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		was ditching and controlling the flow of water around areas of permafrost (PR285:125). How climate change will affect soils and slumping were further causes of concern and how it might affect road safety and maintenance (e.g., PR285:128). Of concern to GTC is that the details required to complete the plan and road design will not materialize until "well after the [environmental] assessment" (PR285:127). This appears a common theme in the EA, where most of the design (e.g, 75%) is not confirmed and uncertainty for impact predictions and baseline conditions remains high. The EA process is significantly weakened when Parties are unable to review the actual project or the plans that are intended to render it publicly acceptable. Parties are asked to put a lot of faith in the proponent to do what is right. This translates into foregoing the safety of the EA process – where Parties can raise concerns on issues of significance and expect those issues to be objectively addressed. Rather, Parties are asked to accept a premature decision by the Review Board on how the Project should proceed, and hope that future collaborations will be meaningful and Indigenous interests upheld. It is a tall ask. More so given the lack of details on how collaborations will be made meaningful or how Indigenous input will influence interactions between the Project and Indigenous rights. It is unlikely the GNWT would accept such an imposition were it participating in the EA as a reviewer. Using permafrost as an example, GTC would like to hear from the GNWT on how it can match the intent of its plan and proposed mitigation measures to actual conditions and observations encountered during the construction and operational phase of the project.	difference in opinion? 4. How does the GNWT intend to make use of traditional knowledge in the development of final road design (for example, understanding the flow of surface and groundwater flows at important water crossings)?	
9	Inadequate assessment of migratory birds	Migratory birds are of concern to GTC. In the original PDR (PR#14:134), seventeen species of waterfowl were identified as important harvested species by Gwich'in members. Black duck, geese and swans were identified as particularly important VCs (PR#14:125), and they remain an important GTC interest, including for harvesting rights. The Travaillant Lake area provides key waterfowl staging and breeding areas and is an important Traditional Land and Resource Use area for Gwich'in members that lies adjacent to the original MVH access corridor. This area lies along the migratory corridor for birds in their spring and fall journeys. These birds	1. Work with Environment and Climate Change Canada (ECCC) and traditional knowledge holders to improve the baseline understanding of existing conditions and stressors affecting migratory birds traveling through the Project area. 2. Update the effects assessment based on the additional data acquired from ECCC and traditional knowledge holders. 3. Complete a valued-centric cumulative effects assessment of how the Project's direct and indirect effects, including the potential for induced development in the Central	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		must pass through and over the currently proposed Project along their migratory route. This means that they are at risk from direct and indirect Project effects impacting their survivability. GTC has also expressed concerns related to induced development activities and how those might affect its interests. The Central Mackenzie Valley basin has significant oil and gas reserves that will become more lucrative and feasible to develop if the Project goes ahead. Such projects could adversely affect the suitability of staging areas, migratory routes, or water and air quality on a regional level. During the IR1 Information Requests, ECCC (PR#266) issued a variety of questions to the GNWT regarding the characterization of Project effects and baseline conditions of migratory birds (e.g., ECCC-08 to 15). ECCC expressed concern over the quality of baseline data, the use of methodology, and the interpretation of project effects. In ECCC-09 (PR#266:45), CWS writes that the data used by the GNWT to assess impacts on birds in the study area has "limited, or no data presented for waterfowl and shorebirds". Conversely, the GNWT writes – in their response to ECCC-13 (CANNOR34) (PR#266:33), that "construction will result in an increase in sensory disturbance, which could reduce habitat use of migratory stopover sites. Waterbirds, shorebirds and waterfowl most likely to be affected are those in smaller wetlands adjacent to the PDA." We are therefore presented with one regulator saying that no site-specific data on waterfowl or shorebirds has been assessed, and another regulator saying that stop-over sites along the PDA, including wetlands, may be affected. Despite this, the GNWT – as the proponent – has provided no further discussion or elaboration on how these birds might be affected, nor on how project-related disturbances are likely to combine with future climate related stressors and observed changes in migratory movements and abundance. The technical sessions delved into these topics further, with Environment and Climate Change Canada (ECCC) confirming their concern that the Project may directly or indirectly affect migratory birds. Representatives from ECCC did not believe the GNWT had followed appropriate methodology to characterize potential impacts to migratory birds and found the assessment of Project effects inadequate (e.g., PR284:18). ECCC	Mackenzie Valley, may affect migratory birds.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		had identified helpful baseline data that had not been considered by the GNWT and encouraged its inclusion into the effects assessment. The GNWT played down the potential impacts of the Project on migratory birds during the technical sessions. The argument amounted to the pathways of effect from the Project that might affect birds are few and the number of birds likely affected by the Project very small relative to the larger population, which will remain healthy (i.e., PR284:22,167). However, this line of thinking was not supported by community observations or corroborated by traditional knowledge. Comments from the Tulita Renewable Resources Council (TRRC) identified cumulative threats affecting migratory birds in the form of climate change and increased intensity and frequency of forest fires, (PR284:23). It is not clear that the GNWT has made use of traditional knowledge in their effects assessment nor considered these larger stressors of change in their cumulative effects assessment. Section 4.6 of the DAR discusses the methodology employed for assessing cumulative effects. The GNWT states that the Project Inclusion List "does not include other contributing sources to changes on VCs, such as traditional and non-traditional land and resource use, climate change, forest fires, and regional policies and programs," (PR93:85). This critique is raised by GTC in its information request regarding cumulative effects. This implies that the main impacts affecting baseline and future conditions to migratory birds identified by traditional knowledge have been excluded from consideration by the GNWT in their cumulative effects assessment. GTC does not agree with the project-centred assessment of migratory birds and supports ECCC's determination that the characterization of how the Project will affect migratory birds is inadequate.		
10	Water quality and dust suppression	The GNWT has said in PR#217:128, that it will use calcium chloride and the chemical additive DL10 in dust suppression activities.	1. What monitoring efforts will be taken to ensure that these chemicals do not adversely affect nearby watercourses? 2. How does the frequency of application affect risk to aquatic organisms and vegetation?	Please see attached response
11	Mobilization and resupply	The question of barges arose several times during the technical sessions. On Day 1, details were sought from the GNWT on where potential barging would mobilize from (e.g., PR283:42-43). On Day 3, comments arose	To representatives of the GNWT's ITI division of Marine Transportation Services. 1. Why were supplies bound to Tulita and Norman Wells rerouted from the Hay River terminal	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	of construction materials	regarding climate change and how it was having a significant impact on transport (e.g., PR285: 5, 100). On the one hand, barging activities have been seriously compromised by low water levels, reducing the reliability of shipping by barge to communities along the Mackenzie River. On the other hand, climate change was reducing the length of the winter road season, making it difficult to get adequate supplies into the communities before the roads erode. This stresses delivery of goods and materials to communities along the Makenzie River year-round. Climate change remains a key driver for developing an all-season road. However, it is not clear how conditions are likely to be at the time of construction. Neither is it clear what measures and precautions the GNWT will take to ensure safe and timely mobilization of supplies to meet project timelines. There is a current dichotomy between existing conditions and the proposed plan: on the one hand, the GNWT and communities are unable to adequately supply communities today. On the other hand, the Project requires substantial supply needs that could strain existing transport options while simultaneously contending with a reducing operational period to deliver goods and materials. The interaction between climate change and logistics is an important knowledge gap. Relevant to this knowledge gap is understanding the limitations of weight and traffic load restrictions on winter roads and the feasibility of transporting goods via barge north to south (i.e. from Little Chicago or the Inuvik shipping terminal) or south to north (e.g., from the Hay River shipping terminal). Since 2017, the GNWT has operated Marine Transportation Services (MTS) as a division within the Department of Industry, Tourism and Investment (ITI). MTS moves deck cargo and bulk petroleum products to communities along the Mackenzie River and Arctic coastline. MTS has a head office and main terminal in Hay River. MTS typically supplies materials to Tulita and Norman Wells from their Hay River terminal. For the summer of 2024, cargo directed to Norman Wells was redirected from Hay River to the Tuktoyaktuk Terminal. Presumably this was due to low water levels between Great Slave Lake and Norman Wells. The ability to transport goods south from the Tuktoyaktuk or Inuvik terminals suggests that barging from North to South remains a viable alternative. GTC asked the	to the Tuktoyaktuk or Inuvik terminals by the GNWT's Marine Transportation Services (MTS) during the summer of 2024? 2. Does barging from the Tuktoyaktuk or Inuvik terminals southward to Tulita and Norman Wells offer additional reliability for long-term planning under climate change scenarios as compared to barging from the Hay River terminal or Wrigley landing? 3. Related to climate change: a. Over the past ten years, how have water levels changed in the Mackenzie River? How has this affected the shipping season and barging? b. What are the projected trends and long-term changes expected for barging activities along the Mackenzie River over the next 17 years? To the GNWT 4. Can existing winter roads to Tulita and Norman Wells currently accommodate existing community needs? How are these conditions expected to change over the next 17 years (e.g., changes in population and demand for winter resupply, weight allowance on the roads, needs from other projects and developments, etc.)? a. What was the duration of the winter road season 10 years ago? What was the duration of the winter road season in 2023/2024? What is the expected duration of the winter road season in 17 years? 5. Anticipating climate change scenarios and a construction timeline for the Tulita segments of the Project commencing in 7-17 years, are these winter roads likely to accommodate the additional truck loads required to mobilize and re-supply the Project? Use the numbers provided in the Project construction and alternative timeline scenarios in Table 2-2 of PR251:10 for this assessment. 6. Anticipating climate change scenarios and a construction timeline for the Tulita segments of the Project commencing in 7-17 years, can the GNWT comment on the viability of using the Inuvik terminal to transport materials by barge to Norman Wells and Tulita versus from the Wrigley barge landing? Consider the barge loads anticipated in Table 2-2 of PR251:10 under both development scenarios.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		GNWT about this during the technical session, but the GNWT appeared dismissive of exploring this as a feasible logistics option. The GNWT provided no clarity during the technical sessions on how climate change predictions would affect mobilization and resupply efforts. However, it is clear that climate change has had a significant impact on community resupply efforts during summer and winter seasons. And all climate modelling predictions provided by the GNWT indicate that climate trends will continue and likely exacerbate existing realities during the construction period (i.e., 2027 to 2046). In the DAR, the GNWT anticipates a construction schedule for Tulita commencing in 2032 and finishing 2042 (PR93:126, Figure 5.3). This includes mobilization in 2032 and 2038, and annual resupplying between 2033 and 2041. Given climate change constraints and the need to consider viable solutions to mobilize supplies along the project, GTC would like to know how this timeline interacts with climate change and mobilization and resupply. It is a relevant to know how bulk materials can be transported to site despite reducing winter road operational seasons and despite changing water levels. This is especially relevant given that barging is a proposed mitigation measure of the GNWT's to reduce reliance on trucks using Highway 1 for construction resupply and thus reduce residual effects associated with non-traditional land and resource use (i.e., PR96, 236, Table 9.2.1). Pending a critical assessment of how mobilization can occur, and to make good on its proposed mitigation to reduce trucking along Highway 1, the GNWT may need to consider mobilizing Project supplies from Tuktoyaktuk or Inuvik. This consideration should be included in the updated DAR Addendum.		
12	Economic business case for the project	On Day 2 of the technical session, the GNWT was questioned by the Review Board's expert advisor on economics, Graeme Clinton, relating to labour statistics and standards (e.g., PR284:81-84). The GNWT was to provide a response on what information can be expected in the updated business case for the Project, and when this might be ready for review. This response remains outstanding. The GNWT was also asked by PKFN how it had incorporated the 1995 Barcon report into the design and consideration of job training and employment for the Project. The report was commissioned by the GNWT	1. Please make the cited outstanding responses to Graeme Clinton and PKFN regarding labour, training, and the updated economic business plan available for public review and consideration. Parties should have the ability to review and consider these important elements prior to preparing their submissions for the Public Hearing. 2. Please identify the number of positions employed by local/regional workforce on the Tłı̨chǫ Highway, the Inuvik to Tuktoyaktuk Highway, and the Dehcho Bridge and use best	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		in anticipation of extending the MVH (from Wrigley to Inuvik) in the 1990s. The report's findings were critical of the GNWT's plan for training and maximizing socio-economic potential for communities. The GNWT has not, to GTCs knowledge, provided a response on this topic. Both outstanding questions raise concerns that efforts to maximize employment and economic opportunities will run into timing and implementation challenges. It also suggests that the GNWT's focus on maximizing northern participation ends at the Sahtu and Dehcho border. Nowhere in the DAR, for example, does the GNWT give reference to the skillsets and experience of Gwich'in, Inuvialuit, and Tłı̨chǫ workers in highway construction and operation. Nor is there reference to skillsets and capacity acquired from constructing the Dehcho Bridge. The absence of a strategy to maximize existing regional and Territorial expertise to assist with the Project is disconcerting. Section 5.4.14 of the DAR (PR93:147) estimates a required workforce of 198 to 326 personnel, plus administration and management personnel. It is not clear what assessment of the local and territorial labour pool has been done to see how much of these positions might be filled with existing NWT expertise, and how much through targeted training programs.	estimates from NWTs Bureau of Statistics to make a best-guess estimate of the available labour pool from those regions. 3. Please identify the anticipated job categories required for the Project and contrast that with the known data from NWT Statistics on the available labour pool by job sector in the NWT. 4. Anticipating the Project might occur as early as 2027 and be completed by 2042 or 2046, what additional labour sources are anticipated from the closure of diamond mines during this period? 5. Comment on the likely ability to fill Project employment needs with an NWT labour supply. 6. Please identify a strategy to maximize employment and contracting opportunities outside of the Dehcho and Sahtu regions. 7. If an objective of the Project – and rationale for extending the construction season over 20 years – is to maximize territorial employment and socio-economic benefits from the Project, discuss what strategies the GNWT will employ to ensure contracting adheres to that goal. 8. Has the GNWT considered partnering with other NWT Indigenous governments and development corporations to collectively deliver the Project?	
13	Economics of the Project and reasonably anticipated forecasting of Project costs	The economic assessment of the Project is being updated and is not yet available for review. Nor is it clear when this report will become available and if will be open for comment prior to the closing of the Public Record. This limits the ability of Parties to meaningfully consider the cost and implications of the Project to the GNWT and on the residents of the NWT. A $700 million figure was estimated in 2015, which is now outdated. Nonetheless, it is the closest figure parties have to consider for what the Project will cost. Understanding the costs of recently completed highway construction projects would be useful for Parties while waiting for the updated economic business case. More importantly, these past projects can give valuable insight on anticipated versus actual costs of a Project, and thus a practical filter through which to view the coming business case.	9. Provide an update on what $700 million is in 2025 dollars, inclusive of inflation. 10. Please provide accurate numbers from recently completed infrastructure projects for Parties to consider in the context of the MVH. List the approved original budget at the start of construction and contrast it with the final cost (i.e., actual spent amount) of the completed project. Provide a break-down of this final cost by kilometre of road (i.e., $/km). Please include the following recent highway infrastructure megaprojects: o The Dehcho Bridge o The Inuvik to Tuktoyaktuk Highway	Please see attached response

No.	Topic	Reviewer Preamble	Reviewer Request	Response
			o The Tłı̨chǫ All Season Road	
14	Project interactions with the Mackenzie Valley Fibre Optic Line	During the technical sessions, the question was asked of the GNWT if they had conducted a risk assessment for direct and indirect risk to the MVFOL. They responded that they had not but would work with the owners to mitigate risks to infrastructure, and to develop a formal agreement on appropriate mitigation measures (e.g., PR283: 40). On Day 3 of the session, the GNWT acknowledged that it was the owner of the MVFOL. As the owner, the GNWT is well positioned to gauge the risk of the line to linear disturbances and construction activities. It is also well positioned to report on the risks associated with maintenance or breaks of the MVFOL. If the GNWT is unable to respond to these questions now, GTC seeks a commitment for the information to be included in the updated DAR Addendum.	1. Please provide an economic risk assessment of a line break to the Mackenzie Valley Fibre Optic Line through the lifetime of the Project. This would include: a. The anticipated frequency of line breaks or maintenance issues due to construction activities or due to accidents or increased access along the road during operations; b. The average cost to date to fix a generic break, and the average duration of lost- or reduced service until the line is restored. c. An estimate of the induced loss to businesses (e.g., from loss of network access and lost productivity during the length of the break)?	Please see attached response
15	Project Benefits to National Security and Arctic Sovereignty	During the Technical Session, GTC asked the Government of Canada on the Project's role in National Security and Arctic Sovereignty (e.g., PR284:127). GTC is thankful for the response provided by CANNOR (e.g., PR285:173) and the invitation to more specific information of Global Affairs Canada and the Department of National Defence. GTC understands that the originally proposed highway through the Mackenzie Valley, which would connect Wrigley to Inuvik, plays an important role in advancing National Security interests and Arctic Sovereignty. These reasons have been advanced as supporting factors for a highway to proceed. However, based on the DAR, the GNWT's discussions on cumulative effects, a narrow scope on reasonably anticipated foreseeable developments, the general lack of consideration of induced projects, and the extended timeline within which to complete the Project, future plans to extend the highway to Inuvik appear unreasonable. It is therefore relevant to question the value of the Project to National Security and Arctic Sovereignty.	Directed to the Government of Canada – Global Affairs Canada and the Department of National Defence 1. If the Highway stops in Norman Wells and does not continue to Inuvik, what contribution and value will it have to National Security and Arctic Sovereignty?	As noted in the response provided by the Canadian Northern Economic Development Agency during the Technical Session on November 21, 2024, the Government of Canada's Arctic and Northern

No.	Topic	Reviewer Preamble	Reviewer Request	Response
				Policy Framework (ANPF) includes amongst its goals enhancing economic opportunity and prosperity for northerners by closing transportation infrastructure gaps and strengthening the North's regional infrastructure to help exercise Canadian sovereignty. The Government of Canada

No.	Topic	Reviewer Preamble	Reviewer Request	Response
				generally agrees with the Developer that the Mackenzie Valley Highway, as proposed, could support Canadian sovereignty in the North by providing reliable access to a relatively isolated region of the territory, incentivizing resource exploration and development, and promoting social and economic opportunit

No.	Topic	Reviewer Preamble	Reviewer Request	Response
				ies. The Mackenzie Valley Highway could significantly facilitate transportation for residents, businesses, and emergency services, as well as help to unlock new economic opportunities, stimulate investment, and strengthen the regional economy and food security. This is particularly relevant in the

No.	Topic	Reviewer Preamble	Reviewer Request	Response
				context of climate change and recent challenges posed by wildfires, reduced durations for winter road use, and low water levels (which limit the ability of barges to resupply communities). The continued safety and security of the North depends on strengthened emergency management and community safety

No.	Topic	Reviewer Preamble	Reviewer Request	Response
				(as noted in the ANPF), which the Mackenzie Valley Highway has the potential to enhance. Officials are still working to receive further information from Global Affairs Canada and the Department of National Defence relating to this request and recognize that a fulsome response from

No.	Topic	Reviewer Preamble	Reviewer Request	Response
				those departments would be beneficial. Once the additional information is received, officials will ensure that it is shared to the Gwich'in Tribal Council as well as to the Board's public registry.
No.	**Topic**	**Reviewer Preamble**	**Reviewer Request**	**Response**
Sahtu Renewable Resources Board - Catarina Owen				
1	Fish and Fish Habitat	Questions for GNWT - fish & fish habitat		Please see the attached responses
No.	**Topic**	**Reviewer Preamble**	**Reviewer Request**	**Response**
Gwich'in Tribal Council - Kanda Gnama				
1	Economic diversification	Follow-up from the technical sessions.	What value will the project have for economic diversification and development if the anticipated project benefits are limited to the same 15km corridor as the PDA and RFDs?	Please see the attached response.

No.	Topic	Reviewer Preamble	Reviewer Request	Response
2	Climate Change	Follow-up from the technical sessions.	1. Describe how climate change and the Project will interact in the PDA and LAA to affect vegetation species composition and snowpack along the right-of-way? 2. Compared to current conditions, what will be the expected composition of shrubs, and what will be the difference in snow pack? 3. How are these changes likely to influence the thawing regime and permafrost? The response should consider the timeline from which construction occurs (e.g., habitat is disturbed) and increments of time corresponding to climate change scenarios (e.g., 2050 and 2080, as per the PR#232 and PR#233 climate change assessment predictions).	Please see the attached response.
No.	**Topic**	**Reviewer Preamble**	**Reviewer Request**	**Response**
Pehdzeh Ki First Nation (PKFN; Wrigley) - Chief Jamie Moses				
1	Socio-economic impacts	Follow-up to the technical sessions.	Provide case studies or reports on the socio-economic impacts of the effects of road construction on communities of similar size to Wrigley.	Please see the attached documents.
2	Mitigation measures - programs and services	Follow-up to the technical sessions. - This follows a request from PKFN for GNWT to commit to nurse, mental health, and RCMP positions in Wrigley. - GNWT said it would commit to discussion and mentioned the intergovernmental working group. - Review Board staff mentioned an interest in what creative, innovative options the GNWT is suggesting and requested the developer to provide more information.	Describe how the intergovernmental approach will be used to get PKFN access to the programs and services that they have already identified as critical mitigation measures.	Please see the attached response.
3	Mitigation measures	Follow-up to the technical sessions. - Barcon Ltd, The Mackenzie Highway Extension as a Pilot/Demonstration Employment & Training Project (1995), online (pdf): Government of the Northwest Territories Infrastructure	How has GNWT incorporated the findings of the Barcon report into the DAR? If this has not been done, how will it be done?	Please see the attached response.

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		https://www.inf.gov.nt.ca/sites/inf/files/resources/the_mackenzie_valley_highway_extension_as_a_employment_and_training_project_-_barcon_ltd_-_june_15_1995.pdf at 8–11. - Original Question: The GNWT proposed similar, aspirational plans for education, job training, and employment in the 1992 Implementation Plan for the Mackenzie Valley Highway Extension.[1] The plans included training programs of up to 4 years, construction contracts tailored to the capacity of local businesses, and business development support customized for individual communities.[2] However, the 1995 Barcon report, commissioned by the GNWT, heavily criticized the plan as unlikely to bring significant socio-economic benefits for Indigenous communities. The Barcon report also criticized project-related training initiatives in the NWT for being poorly planned and being implemented too late to be effective.[3]		
4	Harvesting - Poaching	Follow-up to the technical sessions. - PKFN members have already observed increased illegal hunting, fishing, and harvesting in their territory in recent years. Members also recall illegal hunting by out-of-region workers when the highway was being built to Wrigley, which caused conflict, distrust, and protests. - Mitigation ideas mentioned: establishing and supporting Guardian Programs, and Dene Zhatie signage that includes information about appropriate conduct for visitors in PKFN's territory, and what visitors must do to be able to hunt in the area	Describe what will be done to prevent increased poaching. How effective will it be considering the unknowns?	Please see the attached response.
No.	**Topic**	**Reviewer Preamble**	**Reviewer Request**	**Response**
Mackenzie Valley Environmental Impact Review Board - Clémentine Bouche				
1	Socio-economics: mitigations	Follow-up to the technical sessions.	Provide evidence that proposed mitigation for impacts to public safety and social pressures will be effective. Describe if the GNWT is looking at new policies and the path of where those new policies would need to go in government, so they can be implemented in a timely manner.	
2	Socio-economics: project cost	Follow-up to the technical sessions.	Provide estimates of maintenance cost projections based on similar projects.	Please see the attached response.

No.	Topic	Reviewer Preamble	Reviewer Request	Response
3	Socio-economics: working groups and plans	Follow-up to the technical sessions.	Provide information about how long it took for working groups for the TASR, or similar projects, to prepare all the plans and strategies.	Please see the attached response.
4	Wildlife: WMMP	Follow-up to the technical sessions.	Describe the details of indicators to be monitored in WMMP, in terms of frequency and scale related to measuring sustainability and determining if things are becoming unsustainable.	Please see the attached response.
5	Harvesting, food security, Follow-up to technical session Day 3, pp 68-70	Follow-up to the technical sessions.	Describe details of any baseline study or plans for future studies on food security, household harvester, and/or use of country foods or traditional foods that the GNWT can use to compare any future changes to food security or country food use against.	Please see the attached response.
6	Notice of Proceeding	Notice of Proceeding introducing the information requests to parties about routing.		
7	Project desccription: Alternatives and Scope of Development	Pehdzeh Ki Frist Nation has consistently raised the issue of proposed reroutes, outside of the proposed corridor, during the environmental assessment. Starting in Table 5.2 in section 5.2.3 of the DAR, the Dehcho community recommendation in row two of this table is to "move the highway away from the river onto 'the bluff'. This section also mentions moving the project at least 5 km from the river. At the technical sessions, PKFN mentioned both a Traditional Land and Resource Use study and a study on its proposed rerouting of the project. The Review Board understands that PKFN is in the process of finalizing these documents and is open to working with the Review Board to submit both under confidential cover. In the meantime, the Review Board is interested in knowing enough	1. Describe discussions with GNWT about rerouting around Bear Rock and at Big Smith Creek. Is the current alignment around Bear Rock and at Big Smith Creek acceptable? a. Is the proposed re-routing sufficient to address all concerns? 2. Are there any additional reroutes required to address concerns raised by individuals or organizations in Tulita?	See attachment

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		about the proposed reroutes, beyond the winter road corridor, to support the Review Board in asking more questions of the developer about potential impacts of any alternate routings. Knowing the PKFN will likely be submitting more detailed documents in the future, could PKFN please consider the questions in this IR and answer in whatever detail it can without compromising any Traditional Knowledge PKFN wishes to keep confidential. The Review Board asks that PKFN respond by January 30th.		
8	Project desccription: Road re-alignment at Bear Rock and Big Smith Creek	This IR is directed to all Tulita organizations who wish to respond. Section 7.2.3.3 of the DAR states that the Bear Rock Alignment Option is the preferred option for Indigenous organizations along this portion of the project route, but that the GNWT has not made a decision yet about which route to advance. The Bear Rock alignment was discussed during the technical session. The transcripts describe individuals or organizations in Tulita working with GNWT on a route two km to the north. The transcripts also include a discussion between GNWT and individuals or organizations in Tulita on the road routing options at Big Smith Creek. The Review Board wants to confirm road routing. The Review Board asks for responses by January 30th.	1. Describe discussions with GNWT about rerouting around Bear Rock and at Big Smith Creek. Is the current alignment around Bear Rock and at Big Smith Creek acceptable? a. Is the proposed re-routing sufficient to address all concerns? 2. Are there any additional reroutes required to address concerns raised by individuals or organizations in Tulita?	On behalf of the Tulita Working Group: Describe discussions with GNWT about rerouting around Bear Rock and at Big Smith Creek. Is the current alignment around Bear Rock and at Big Smith Creek acceptable

No.	Topic	Reviewer Preamble	Reviewer Request	Response
				? The Tulita Working Group appreciates the GNWT's recent visit to the community on this topic. a. Is the proposed re-routing sufficient to address all concerns? The re-routing is sufficient to address routing-specific concerns. 2. Are there any additional reroutes required to address concerns raised by individuals

No.	Topic	Reviewer Preamble	Reviewer Request	Response
				or organizations in Tulita? The Tulita Working Group is not aware of any further routing specific concerns.
9	Project desccription: Road re-alignment at Bear Rock and Big Smith Creek	Section 7.2.3.3 of the DAR states that the Bear Rock Alignment Option is the preferred option for Indigenous organizations along this portion of the project route, but the GNWT has not yet made a decision about which route to advance. The Bear Rock alignment was discussed during the technical session. The transcripts describe Tulita working with GNWT on a route to the north that avoids Bear Rock. The transcripts also include a discussion between GNWT and Tulita on the road routing options at Big Smith Creek. The Review Board wants to confirm road routing. The Review Board asks for responses by January 30th.	Confirm results of engagement with Tulita regarding road re-alignment around Bear Rock and on routing at Big Smith Creek. Describe any resolution on re-alignments at these two locations.	Please see the attached documents.
10	Project desccription: Road Route	This IR is directed to all Indigenous organizations (other than PKFN and Tulita organizations) that wish to respond. The developer's preferred route primarily follows the existing winter road corridor. In the DAR, the developer also identified an alternative upland route in response to concerns. The Review Board is working with parties to receive relevant Traditional Land and Resource Use studies that may include information about Traditional Knowledge relevant to routing.	1. Please describe any concerns your organization has raised regarding routing, and how those concerns were addressed by the GNWT. 2. Please describe any reroutes your organization has identified as necessary that have not been incorporated into project design by the GNWT, and what has been incorporated.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		In the meantime, the Review Board wishes to hear from parties about the engagement that has been done on the proposed route to date. The Review Board asks for responses by January 30th.		
11	Bridges - lifespan	In the DAR, the developer states that the lifespan of the bridges along the Mackenzie Valley Highway is 75 years. The Review Board understands that the GNWT is currently undertaking a study into the on-going lifespan of the bridges, with the results expected in summer 2025.	1. How great is the variance in bridge lifespan? That is, is 75 years the approximate expected lifespan of each bridge, or will some likely need to be replaced much sooner? 2. When are the earliest replacements likely to start? 3. What happens if they do need replacement sooner?	
12	Bridges - direction	According to the permits, the bridges on the existing winter road were built to extend the winter road season. It is unclear to the Review Board if the bridges meet the standards for an all-season road under any applicable standards. The Review Board understands that the GNWT is currently undertaking a study into the bridges, with the results expected in summer 2025.	1. Why does the developer conclude that the bridges built to extend the season of the winter road are appropriate for the long-term operation of the all-season road? 2. Do the roads meet all applicable standards for all-season road? 3. Are there limitations to the use of these bridges by some types of traffic (for example, wide-loads, heavy industrial traffic, or school buses)?	
13	Caribou and Moose - WMMP update	During the technical session, GNWT committed to submitting an updated WMMP with its DAR Addendum submission. Suggested mitigation and monitoring approaches were discussed during the technical sessions. An updated WMMP should include greater detail and specifics on mitigation and monitoring. Responses to this IR can be used by the GNWT when it updates the WMMP in greater detail. Note: The Review Board reviewed responses to outstanding questions from the technical sessions received on January 15, 2025, including the ones about indicators to be monitored in WMMP. The Review Board is looking for more detail and critical thought as to how GNWT will determine whether there is an issue with harvest levels of caribou or moose becoming unsustainable in the area intersected by the MVH. Thresholds are provided (such as “one caribou or moose killed or injured because of construction activities”), but the Review Board would like to	In advance of updating the WMMP, please propose specific mitigation and monitoring actions to reduce impacts on wildlife, based on: • experience with successful mitigation in the Tlicho Hwy WMMP • information received from parties to date during the analysis phase for the MVH, including information requests and discussion during the technical session Specifically, propose early warning indicators to include in Section 6 of the WMMP (Adaptive Management) that will be monitored to identify when mitigation and management action(s) is needed to be adjusted to meet goals and objectives. Responses to this information request should be used to inform the preparation of an updated WMMP. Where possible, please include the kinds of details found in the TASR annual reports	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		know about mitigations or management actions that would carried out if the threshold is exceeded. We note that the GNWT mentioned it would consult on the implementation of mitigation. The Review Board would like to see examples of actions that might take place. The GNWT does not need to commit to these actions but simply list the ones that they think would be effective. Reference: DAR Volume 5	and WMMP, such as monitoring plans, sustainable harvest levels, thresholds for traffic volume that would require management programs under the WMMP.	
14	Caribou and Moose - Maps	The GNWT brought new caribou maps to the technical sessions in Yellowknife in November. It seemed to be a compilation of all collar data and key habitat values for caribou. During the Technical Session, (19 Nov, p. 127, lines 19-27; p. 128, lines 1-2), James Hodson, GNWT, indicated that collars put out on boreal caribou for the MVH assessment and recent data up to this year were not included in the DAR.	Please provide copies of all caribou maps presented at the technical sessions, along with any updated technical assessments and relevant information.	Please see the attached response
15	Caribou and Moose - Study area and monitoring	During the technical session GNWT stated that: “the WMMP is draft still… there's room for discussion and refinement of the study area for moose if people have ideas about how that should happen in the future. Results would be compared against other moose surveys in other areas as well to get the more holistic picture of what's going on.” Reference: Technical session, Nov 19, p 130 (PR#283)	1. Please confirm whether the RSA/LSA and survey area delineated by Pathmanathan & Chan (2024) will be the spatial scale for monitoring and co-management of moose along the MVH. Please describe how monitoring of moose population health (such as trend and movements) and annual harvest will be used to assess harvest sustainability and evaluate impacts of the MVH. 2. Please provide a comparison of the proposed MVH study area scale to other moose survey areas in the NWT; and assess whether the MVH study area scale is sufficiently large so that population trend is not strongly influenced by immigration or emigration.	
16	Caribou and Moose - Caribou collars	Power analyses of moose and caribou monitoring MVEIRB asked “…has the GNWT conducted a power analysis of its proposed program of caribou collars and composition surveys and the periodic routes aerial surveys that it mentions in reference to the WMMP?” (21 Nov transcripts, p. 65, lines 22-25).	1. Please provide power analyses of the proposed moose and caribou population monitoring along the MVH as a basis for evaluating impact predictions from the DAR, and effectiveness of mitigation actions and harvest management. A. With respect to moose, please assess: • a recommended survey interval relative to expected	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		Mike Setterington (21 Nov, p66, lines 1-5) acknowledged the question, but indicated he would need to confer to get a specific answer. Heather Sayine-Crawford (21 Nov transcripts, p. 66, lines 7-11) indicated: …have we done power analyses on moose surveys and detecting trends for moose? No. We, and in terms of how often we will do moose surveys along this route, we just completed one... In 2020 and 2021. And so that was the first moose survey done in the Sahtu in quite a long time. And we are looking to repeat that type of survey regularly, four to five years, give or take, and depending on community consultation and budgetary restraints. Heather Sayine-Crawford (21 Nov transcripts, p. 66, lines 9-18) stated: "For boreal caribou, the power analysis that we have done is that basically we need at least 20 collars on female boreal caribou to give us an idea of survival". James Hodson (21 Nov transcripts, p. 88, lines 8-25) stated that trend for boreal caribou would need to be assessed over a 5 year period. reference: Technical session Nov 21, p 66 (PR#285)	range in precision to determine an optimal survey frequency for detecting changes in numbers and estimating rates of growth or decline; and, • define the minimum change in population size that would probably cause some change in management strategy, that is, the consequential difference of interest (sensu Gasaway et al. 1986*) B. With respect to monitoring population health of boreal caribou, please provide the following: • a technical basis for maintaining a sample size of collars on boreal caribou cows to estimate annual survival and recruitment rates within the MVH study area; • an assessment of how annual collar sample size influences precision of survival and recruitment estimates for boreal caribou; • an assessment of the magnitude of decline over a 3 or 5 year period that would be considered a cause for management concern; • an assessment of whether the recommended sample size for monitoring collared caribou would be sufficient to detect the rate of decline that would be considered a management concern; and • an assessment of whether the recommended sample size for collared boreal caribou females is sufficient for evaluating population-level effects of the MVH and effective implementation of the WMMP as it relates to evaluating barrier effects of the MVH on caribou and proximity and movements of collared caribou females relative to the MVH during calving and post-calving. *Gasaway, W. C., S. D. DuBois, D. J. Reed, and S. J. Harbo. 1986. Estimating moose population parameters from aerial surveys. Biological Papers of the University of Alaska No. 22. Institute of Arctic Biology. Anchorage, AK. 89 pp. + Appendices	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
17	Caribou and Moose - Wildlife co-management and community participation in monitoring	In the draft WMMP (PR#112), the GNWT indicates that it proposes to establish a voluntary Indigenous harvest monitoring and reporting program for the highway corridor. At the technical sessions, the GNWT indicated (19 Nov transcripts, p. 136, lines 6-12) it "…will provide support to Indigenous governments and organizations to develop their own voluntary harvest monitoring program. So I think the same approach is being proposed here for this project." This suggests the GNWT has not considered an overarching management and monitoring approach. The Review Board wants more information on how Indigenous governments, communities, and/or other organizations will be engaged and participate directly in co-management of boreal caribou and moose, and monitoring of harvest and population health. Since the MVH occurs across the Dehcho and Sahtu regions, which represent unsettled and settled land claim areas respectively, it is important to understand how co-management and monitoring for caribou and moose along the MVH will be implemented. reference: Technical sessions Nov 19 p 136 (PR#283)	Please describe how co-management and community-based monitoring (such as of harvest and population health) of boreal caribou and moose could be implemented and achieved along the MVH corridor. What would the overall co-management system of boreal caribou and moose look like? Please include considerations across a range of strategic organizational and governance aspects (including funding) right down to tactical level issues, such as data management, evaluation, and reporting.	
18	Harvesting - Indicators	In the response to an outstanding technical session question (ORS IR 5), the GNWT indicated that it currently (every 5 years) measures aspects of country food consumption that could be used to determine if country food consumption is changing. This is one way of measuring project impacts on harvest. The Review Board wants to understand if there are other indicators the GNWT will monitor, and how frequently. In other words, the Review Board wants to understand how the GNWT will determine if harvest is becoming unsustainable and if mitigation is effective. This was discussed in passing at the technical sessions [power analyses, rate of decline, harvest thresholds - Heather Sayine-Crawford (21 Nov transcripts, p. 66, lines 9-18; p. 67, lines 10-22), James Hodson (21 Nov transcripts, p. 88, lines 9-25)]. Reference: Technical session Nov 21 (PR#285)	1. Describe a) the key monitoring indicators and decision framework b) and the spatial and temporal monitoring design features and associated thresholds that will be used to assess whether boreal caribou and/or moose harvest levels are increasing towards or exceeding unsustainable levels, in areas that intersect the MVH Project 2. Describe whether additional indicators will be monitored to assess effectiveness of mitigation measures that may be implemented to keep harvest within sustainable levels	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
19	Harvesting - Monitoring	In the first round of IRs MVEIRB 39 asked for GNWT to "describe strategies and options for managing harvesting and hunting for sustainability during road operations, with consideration for a short-term moratorium (5-10 year) on resident (non-Indigenous) hunting after completion of each of the three highway segments to allow time to better understand caribou and moose populations along the road corridor, to ensure mortality is sustainable and that overharvesting does not occur." Table 11.18 lists mitigation recommendations by Indigenous organizations. One recommendation (p11-94) to mitigate impacts on overharvesting is to "Implement a 5–10-year moratorium on hunting to protect and monitor the baseline of caribou and moose and to protect large ungulates (more targeted) (Dehcho First Nations) 2011)." GNWT's overall response indicated that current monitoring "should provide an understanding of the boreal caribou population trend along the MVH alignment before construction begins." And that "this suggests that there is no need to introduce new harvest management measures for NWT Resident moose harvest." In technical sessions, parties mentioned that moose populations are generally trending down, there have been issues with poaching and an overall concern for hunting and harvesting. There is a public concern that more should be done for the managing hunting/harvesting for the sustainability of caribou and moose. Reference: First round IRs MVRB 39/GNWT response and Day 3 transcript pg. 92 and page 174.	1. Please provide information on whether wildlife distribution patterns and numbers suggest that the population can support additional harvest from the road. 2. To expand on your response to MVEIRB IR#39, describe specific strategies and options for managing harvesting and hunting for sustainability during road operations.	
20	Harvesting - Monitoring	In its response to MVRB IR#37, GNWT mentioned the following harvesting monitoring approaches: • Tłı̨chǫ Highway Wildlife Management and Monitoring Plan (GNWT, 2023) and • harvest monitoring by the Kátł'odeeche First Nation as part of the NWT [NWT CIMP] GNWT, 2024a The Review Board understands Indigenous harvesters' sensitivity regarding	Provide examples of other voluntary harvest monitoring in the NWT, Nunavut, Yukon, Alaska and/or northern portions of neighbouring provinces that are relevant for designing and implementing harvest monitoring strategies of boreal caribou and moose in collaboration with Indigenous communities along the MVH corridor.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		harvest monitoring. Voluntary harvest reporting has been considered, and in some cases, implemented in other jurisdictions beyond the NWT. There may be useful models for voluntary harvest reporting in neighbouring jurisdictions of Yukon, northern B.C., northern Alberta or even Alaska. The goal is to search for examples to assist with collaborating with Indigenous governments and organizations to design a voluntary harvest monitoring system, to help wildlife co-management partners maintain sustainable harvest. Reference: GNWT response to MVRB IR #37		
21	Harvesting - Tlicho Government Harvesting Program	The Tlicho Highway Harvesting Program is a specific example of caribou harvesting monitoring and mitigation. GNWT's response to IR#37 (PR#257) indicates that the survey will be interview-based to understand how harvest has changed over time and addresses whether Tlicho Hwy has impacted harvesting activities for community members. Reference: MVRB #37-#39. Response to #37 A.	1. How does the Tlicho Highway Harvesting Program work? 2. Would the GNWT consider a similar model for the MVH? 3. What is GNWT's role in this program? 4. What is WRRB's role in this program? 5. Are the results internal or public? 6. If internal, how will the findings influence the goal of sustainable harvest along the Tlicho Highway? 7. How is the monitoring going?	
22	Harvesting - LKFN Harvesting Checkpoint	During Technical sessions, LKFN stated it "partnered with then ENR, and we had a very successful campaign where our LKFN Guardians worked with ENR officers to do a checkpoint program and just engage with people harvesting." LKFN has been trying to implement that program again but has been difficult and there is a continuing problem with transient hunters. Reference: Technical session Nov 21 (PR#285)	1. Can more information be provided regarding the harvesting checkpoint program with then ENR/ECCC and LKFN? 2. What were the lessons learned from the program? 3. What supports were provided to LKFN from GNWT-ECC after the program completion?	
23	Harvesting - Monitoring	In technical sessions PKFN asked the developer why the hunting restrictions along Highway no. 7 (the Liard Highway) weren't considered for MVH. The developer stated, "that wasn't necessary… at this point in time. So the focus of this project is on the current project, Mackenzie Valley Highway, as proposed, not the Liard Highway."	1. What were the hunting restrictions along Highway No. 7, when it was first constructed in the 1980s? 2. What were the lessons learned from the hunting restrictions along Highway 7? 3. What supports were provided to AKDFN from GNWT after the hunting restrictions?	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		The Review Board would like to know more about these restrictions. Reference: Technical session Nov 21 p.174 (PR#285)		
24	Socio-economics - Mitigations for bootlegging	The Review Board has repeatedly heard from community members that certain social issues are already bad in communities and getting worse. The developer has predicted that the road will make them worse. The developer needs to describe mitigation options that could be used to reduce or prevent impacts of the road that would contribute to increased use of drugs and/or alcohol. This IR is a follow up to round 1 MVEIRB IR 81, which was not answered in sufficient detail. In responding to this IR, the Review Board requires identification and analysis of mitigation by the RCMP and other relevant expert departments or agencies. Please engage with the federal government in responding to this question.	1. Please provide specific details on the measures to be taken to control trafficking of illegal and prohibited drugs and alcohol in relation to the highway construction and operation. Include information for measures such as: a. Control and monitoring in camps and rotational workforce b. Control and monitoring during construction c. Control and monitoring after road is operational d. Targeted community-based education programs and drug and alcohol awareness campaigns e. Culturally relevant, community-based support services for mental health and addictions Provide sufficient baseline information in your response to allow for an evaluation of trends and effectiveness of proposed controls. Distinguish if actions are passive (such as provision of educational material) versus active (such as inspections and road-blocks). 2. What techniques, approaches, and tools have been used to successfully manage illegal or prohibited alcohol and drugs in small (Indigenous or non-Indigenous) communities across Canada? How have those informed the plan to address similar challenges from this project? (for example, more control at the entry points of communities with increased police presence or drug dogs) 3. Please provide any reports or studies that include internal analysis of drug or alcohol inflow to communities that have recently transitioned from winter road to all-season road. 4. Identify and describe GNWT programs or strategies aimed at mitigating substance misuse or controlling alcohol and drug	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
			transport, describing their scope and adequacy of funding. 5. Provide examples of partnerships between GNWT, RCMP, and local Indigenous and municipal governments to address alcohol and drug challenges related to new roads. (For example, elsewhere in Canada municipal bylaws allow law enforcement officers to conduct inspections based on reasonable suspicion of drug use or bootlegging. Other examples include Community Watch programs and anonymous tip lines. Would these work?) 6. Identify any relevant band council resolutions, community bylaws, formal agreements, or community-led enforcement (such as checkpoint protocols). For any relevant parts (1-6), please indicate who will be responsible for implementation of measures.	
25	Socio-economics - building resilience	GNWT identified significant adverse social impacts in the DAR. More information is required on preventative mitigation that the GNWT will put into place before the increased impacts occur. The Review Board needs to have confidence in the ability of the GNWT to make all reasonable efforts to prevent significant adverse impacts, not relying primarily on adaptive management once the impacts occur.	Will GNWT take actions to build resilience in communities along the MVH in advance, and if so, how? What programs and services will mitigate the predicted significant adverse impacts? Please evaluate the value of implementing the following mitigations before road construction: - offering more youth activities (sports, arts, culture, community activities, etc.) - increasing funding for Indigenous healing programming and services - offering educational activities on wellbeing (prevention)	
26	Socio-economics - Mitigations: Increasing	MVEIRB understands that the GNWT intends to have the working groups participate in the development of the project-specific mitigation measures as part of the Community Readiness Strategy. It is also understood that the GWNT intends to rely on existing programs, policies, procedures and legislation to develop and implement the Readiness Strategy.	1. Based on experience with the Tłı̨chǫ All-Season Road and any other relevant information, please provide the following: - time required to prepare a Community Readiness Strategy through the working groups and sub-working groups - listing of all programs, policies, procedures and	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	resilience to face health issues	During community sessions, members emphasized the need for education, proactive planning and prevention (see Tulita and Deline Reports). The Review Board needs to hear what MVH-specific mitigations the developer will implement as part of the plans and how those are anticipated to build resilience in communities before construction and operations. Reference: DAR section 9.5.3.2 and Follow-up to IR round 1, MVEIRB IR-27.	legislation used by the GNWT and TG to inform and develop the Community Readiness Strategy for the Tłı̨chǫ All-season Road - an analysis of whether existing GNWT programs, policies, procedures and legislation will have had to be modified to support project-related changes to communities, including predicted budget adjustments - information on the tracking of effects and outcomes of the Tłı̨chǫ All-Season Road, emphasizing which health issues dominated and were a change from pre-project baseline conditions - provide a copy of the Tłı̨chǫ All-Season Road Community Readiness Plan - any actions the GNWT intends to take in advance of construction to help communities prepare. 2. Indicate who has been responsible for the implementation of measures.	
27	Socio-economics - Emergency response for road accidents	MVEIRB understands that the GNWT will rely on the actions of the sub-working groups, supported by programs and policies, procedures and legislation that are already in place to develop and implement the Road Safety Plan, the Safety and Security Plan for Vulnerable Community Members, and the Traffic Management Plans. MVEIRB notes that substantial advance planning will be required to develop these plans. Reference: Follow-up to IR Round 1, MVEIRB IR-78.	Please provide the following: - the time that will be required to prepare these plans through the working groups and sub-working groups. - Summary of current highway safety measures in use or planned in the NWT, including public education and awareness strategies, community emergency preparedness and response plans (based on available services), and infrastructure controls established along the highways to mitigate road accidents. - Information on current management practices, budget setting and emergency response statistics. - Examples of potential technically and financially feasible mitigation measures to enhance emergency response services, especially outside of community boundaries. In responding to the questions above, please consider how the GNWT will manage increase demand on volunteer emergency responders that would require them to leave the community and therefore potentially not be available to a community emergency.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
			Indicate who will be responsible for implementing these mitigations.	
28	Socio-economics - Food costs	The Review Board understands that once the highway is constructed, Tulita and Norman Wells will no longer qualify for the Nutrition North Food Subsidy based on current funding criteria. In response to MVEIRB comment 10, GNWT mentions the effect on the cost of living is expected to be positive although most likely unnoticeable. In response to PKFN round 2 IR#1, GNWT provided case studies of road socioeconomic impacts on communities of similar size as Wrigley; one case study conducted in Tuktoyaktuk highlighted that food costs increased as the community lost the Nutrition North subsidy.	Please provide the necessary evidence to determine how food prices will change as a result of the Project, weighing the positive effects of lower transportation and warehousing costs against the negative effects of lost subsidization of food from Nutrition North Canada on food prices at a regional level.	
29	Socio-economics - Cost of Living	The developer predicted in the DAR that the project is unlikely to have much of an effect on cost of living. The DAR fails to provide sufficient information to confirm this assumption. For example, an all-season road may be predicted to lower certain costs, especially those related to transportation and warehousing. However, the road will not be in place for several years, suggesting that another, more expedient intervention is warranted. This may well reduce the marginal effect on prices because of the road. We are interested to learn the developer's expectation of prices over time, in enough specificity for Sahtu residents to understand what can be expected in terms of their own cost of living, and subsequently their standard of living (especially given the stresses of the failed barging seasons and additional reliance on the winter road).	Please provide an analysis of cost-of-living changes that are expected from the project at a household level and from the perspective of the region as a whole. In completing that study, consider the effects of subsidies and whether subsidies will change as a result of the project including subsidies for food and recent subsidies on fuel introduced by the GNWT. Prepare the evaluation according to the five baskets of goods and services within the Sahtu Market Basket Measure (food, clothing, shelter, transportation, other).	
30	Socio-economics - Food security	The developer predicted that the road will improve food security by increasing access to harvesting. In the DAR and response to a question from the technical sessions (ORS round 2 IR #5), the GNWT does not offer any indication of the percentage of country food currently in diets and its contribution to food security. Nor does it provide an indication of which species are most dominant in the diet. The GNWT did indicate that it gathers data every five years on certain measurable parameters that could be used to understand if country food consumption changes.	Based on experience elsewhere, provide evidence to support this prediction (for example, evidence that similar roads have increased food security because of new access points).	
31	Fish -	The developer predicts a risk of overfishing (DAR, IRs, technical sessions). It	1. Please describe how fisheries management	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	Overfishing	proposes to address this impact by limiting the number of pullouts and availability of parking near watercourses (DAR 17.6.3.2). During the technical sessions, the developer mentioned there would be no boat launch access either. In the DAR (DAR 17.6.3.2), additional mitigation measures suggested by the GNWT (but not planned) include implementing fisheries management measures, like restricting fishing during the spawning season for non-Indigenous people or placing catch limits. However, concerns remained. During technical sessions, PKFN suggested implementing a registration system to limit non-traditional fishing. It also suggested implementing mitigation measures at the mouth of the Dehcho. To understand the possibility and effectiveness of limiting non-traditional fishing, the Review Board would like more information on how such limits could be implemented and monitored. The Review Board has noted that the GNWT mentioned that "These measures would need to be developed and approved by regulators responsible for fisheries management, the SRRB, and other resource managers" (DAR p.17-38). Reference: DAR 17.6.3.2	mitigations, like a non-traditional fishing registration system or restrictions on non-traditional fishing during the spawning season, could be implemented for fishing areas made more accessible by the highway. 2. Please describe how such mitigation could be enforced. 3. Please describe the geographical extent of these mitigations (entire Mackenzie Valley River, PDA, LAA, or RAA, or other). 4. Please describe whether the developer thinks this mitigation could be effective. 5. Please describe the potential effects on other values (e.g., economic development via tourism).	
32	Vegetation - Wildlife habitat and the WMMP Update	GNWT's response to a previous information request from LKFN (PR#217 #15 from the Review of the DAR) includes a list of methods to facilitate natural revegetation based on the GNWT, 2013. Erosion and Sediment Control Manual. The Review Board is interested in any other methods of promoting revegetation for abandoned winter road segments that the GNWT would consider. Reference: Response to IR1 LKFN #15 PR#217 and WMMP DAR Volume 5	1. Are there other revegetation methods (beyond promoting natural revegetation) that will be considered? 2. Would the GNWT consider tree-planting on abandoned sections of the winter road? 3. How will the GNWT consider: • revegetation of plant species useful to a range of wildlife and wildlife habitat • revegetation of plant species less susceptible to wildfire • revegetation of plants with a long-term climate change view Responses to this information request should be used to inform the preparation of an updated WMMP.	
33	Project	During the analysis phase to date, the Review Board has heard numerous	1. Please clarify what the develop means by avoiding	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	Description - Route selection	concerns about the routing of the project, ranging from concerns about proximity to the river or important cultural locations, to concerns about low-lying wetlands or moose pastures or certain types of soils crossed by the project. In December, the Review Board asked Indigenous governments (Round 2 IRs6-10) to clearly describe any reroutes that they believe are necessary to avoid significant adverse impacts from the MVH. The Review Board expects this information by January 30th. In the meantime, the Review Board also has questions for the developer about the preferred route selection.	areas of wetlands to the extent possible (PR#98 p18-38) and its note that the alignment deviates from the winter road in wetland areas (PR#98 pg 18-6). Construction through a wetland is typically expensive and requires more maintenance in the long-run. Under what circumstances will the developer build in wetland areas? 2. In identifying and evaluating criteria to determine the GNWT's preferred route, how did the GNWT consider the short-term cost benefits of using the existing winter road corridor compared to the long-term performance and maintenance costs of an all-season road constructed over low-lying, wet terrain? 3. The GNWT did a high-level assessment of an inland route alternative, and concluded that following the winter road corridor (primarily) is the preferred route, in part because it reduces disturbance by using existing bridges and following a cleared right-of-way . a. Are there pre-cleared linear disturbances along the 'inland route' discussed by Indigenous Governments that could potential be used for the all-season road alignment? For example, along the routes of the Mackenzie Valley Pipeline, Canadian National Telegraph lines, or seismic cut lines? b. If a new ROW was cleared and the existing winter road right-of-way was revegetated, which of the negative impacts of clearing a new right of way would this revegetation offset?	
34	Road design - Minimum embankment	In the DAR, the GNWT did not provide a minimum embankment height (above original ground level) (for example PR#93 pg 5-9)	Provide more information on the minimum embankment height for MVH based on literature and similar projects in the Northwest Territories.	Please see the attached response
35	Road design - Geotextile Use	In the DAR (PR#93 pg. 5-33), the GNWT includes placement of geotextile on original ground in winter as step 2 of embankment construction.	Will the entire highway embankment between Wrigley and Norman Wells be underlain by a geotextile? If not, what are the soil, permafrost or terrain conditions that will initiate geotextile placement?	Please see the attached repsonse
36	Project Descriptio	The DAR states that mobilization and demobilization of project equipment are not expected to interact with terrain, soils, and permafrost as	1. Does barging on the Mackenzie River cause waves that contribute to bank erosion?	Please see the

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	n - Barge transportation	equipment will be transported by barge on the Mackenzie River during the open water season (PR#98 p14-18).The big slumps along the banks of the Mackenzie may be precipitated by bank erosion.	2. If the mobilization and demobilization require more barges than usual, could the increased barge traffic induce more wave action on the river and, thus, potentially more bank erosion that could lead to more riverbank instability?	attached response
37	Permafrost - Icing along the route	The developer has said that no spatial data is currently available on the occurrence and distribution of icings along the MVWR route, LSA, or RSA (PR#100 pg 45).	Has the GNWT considered the following reference? van Everdingen, R.O. 1980. Frost blisters of the Bear Rock spring area near Fort Norman, N.W.T. Arctic, 35(2): 243 - 265. https://pubs.aina.ucalgary.ca/arctic/Arctic35-2-243.pdf	Please see the attached response
38	Permafrost - Climate Change	Appendix 14A section 14.2.2 (PR#100) seems to propose that climate warming will be a significant contributor to permafrost degradation along the highway route. Previous studies in the area (for example: Conceptual and Preliminary Engineering for Mackenzie Gas Project , 2006), showed through geothermal modelling that the clearing of the right-of-way and associated changes to the surface geothermal regime was the primary driver for permafrost degradation and that climate warming was a secondary effect.	How were the findings of this or other similar studies considered in the assessment?	Please see the attached response
39	Permafrost - Ice-rich permafrost	According to the DAR, permafrost degradation is expected to result in a loss of soil strength over time (e.g., as the heat is absorbed by the road surface and ground temperature rises) (PR100 pg 14-24). In rich-ice permafrost, the loss of strength due to thawing is associated with an increase in soil pore water pressures during the thawing (Nixon and Morgenstern, 1973).	1. Could this degradation lead to surface deformation, progressive deformation, or landslides on sloping ground? 2. Is this only true for ice-rich permafrost, or also for ice-poor permafrost?	Please see the attached response
40	Permafrost - Mapping along the route	Regarding the use of the Geological Survey of Canada borehole database, the DAR states that "[f]or these reasons, the borehole data was mainly used to support the terrain mapping through the description of surface/subsurface material types and textures, without attempts to summarize permafrost distribution and ground ice conditions." (PR#100 pg 27)	Could the data from this or other databases be used to identify the likely presence of permafrost or ice-rich soils along the route (for example, using the ground ice descriptions and water content data by geographic positioning)? If so, please provide permafrost/ice-rich soil maps for the preferred and alternate route areas.	Please see the attached response
41	Caribou and Moose - Wildlife	During technical sessions, John Nishi (Review Board) asked Indigenous Governments about being involved in monitoring and management decisions (19 Nov transcripts, p. 132, lines 2-7).	Please provide the Board with recommendations and suggestions for how you wish to participate in wildlife co-management decisions and monitoring activities.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	co-management and community participation in monitoring			
42	Caribou and Moose - Wildlife co-management and community participation in monitoring	During technical sessions, John Nishi (Review Board) asked Indigenous Governments about being involved in monitoring and management decisions (19 Nov transcripts, p. 132, lines 2-7).	Please provide the Board with recommendations and suggestions for how you wish to participate in wildlife co-management decisions and monitoring activities.	
43	Caribou and Moose - Wildlife co-management and community participation in monitoring	During technical sessions, John Nishi (Review Board) asked Indigenous Governments about being involved in monitoring and management decisions (19 Nov transcripts, p. 132, lines 2-7).	Please provide the Board with recommendations and suggestions for how you wish to participate in wildlife co-management decisions and monitoring activities.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
44	Caribou and Moose - Wildlife co-management and community participation in monitoring	During the Technical Session, (PR#283, p. 145, lines 10-13), Jane Henderson, PKFN, indicated that PKFN would consider and respond with recommendations or suggestions to a question from John Nishi (Review Board) about participating in monitoring and management decisions (19 Nov transcripts, p. 132, lines 2-7).	Please provide the Board with recommendations and suggestions for how you wish to participate in wildlife co-management decisions and monitoring activities.	
45	Harvesting - Monitoring	Parties have shown interest in starting monitoring, but GNWT is only committing to starting those discussions. LKFN indicated that moose populations are "generally trending down." Additionally, the NWRRC mentioned there have been illegal hunting occurrences. Reference: Technical session Nov 21 (PR#285)	1. What projects has the GNWT provided funding for monitoring? 2. What supports are required for enhancing the effectiveness of monitoring in the region for the MVH?	
46	Harvesting - Monitoring	Parties have shown interest in starting monitoring, but GNWT is only committing to starting those discussions. LKFN indicated that moose populations are "generally trending down." Additionally, the NWRRC mentioned there have been illegal hunting occurrences. Reference: Technical session Nov 21 (PR#285)	1. What projects has the GNWT provided funding for monitoring? 2. What supports are required for enhancing the effectiveness of monitoring in the region for the MVH?	
47	Harvesting - Monitoring	During Technical sessions LKFN stated it "partnered with then ENR, and we had a very successful campaign where our LKFN guardians worked with ENR officers to do a checkpoint program and just engage with people harvesting." LKFN has been trying to implement that program again but has been difficult and there is a problem with transient hunters. .	1. What requirements would LKFN need to make the checkpoint harvest program successful again?	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		Reference: Technical session Nov 21 (PR#285)		
48	Harvesting - Monitoring	Parties have shown interest in starting monitoring, but GNWT is only committing to starting those discussions. LKFN indicated that moose populations are “generally trending down.” Additionally, the NWRRC mentioned there have been illegal hunting occurrences. Reference: Technical session Nov 21 (PR#285)	1. What projects has the GNWT provided funding for monitoring? 2. What supports are required for enhancing the effectiveness of monitoring in the region for the MVH?	
49	Harvesting - Monitoring	Parties have shown interest in starting monitoring, but GNWT is only committing to starting those discussions. LKFN indicated that moose populations are “generally trending down.” Additionally, the NWRRC mentioned there have been illegal hunting occurrences. Reference: Technical session Nov 21 (PR#285)	1. What projects has the GNWT provided funding for monitoring? 2. What supports are required for enhancing the effectiveness of monitoring in the region for the MVH?	
50	Project description - Impacts of different routing	Follow-up to MVRB IR#66 and discussion on the upland route during the technical session During the technical session (Day 3, p. 677) GNWT stated that engagement is currently underway with PKFN and that there is currently work that has been undertaken by PKFN, and funded by the GNWT, to help inform the investigation on a proposed alternative alignment. GNWT advised that it is currently working with PKFN to have that information shared but has not yet received it from PKFN. Once GNWT has that information and has had an opportunity to have further dialogue with PKFN, that information will most likely be shared with the Review Board to the extent possible (considering that there may be confidential information or information in there that is sensitive that PKFN will not want to be made public). PKFN described an inland route alignment north of Wrigley multiple times during the technical session. PKFN's rationale for an inland route included	IR 50: Please describe if and how the GNWT's impact predictions for the project change if the highway follows the upland routing described by PKFN.[1] In the response, · Describe any potentially significant impacts that the GNWT predicts would be different for this route, considering impacts to cultural and traditional land use; harvesting; caribou and moose; soil, terrain, and ice-rich permafrost; water and fish; wildlife and wildlife habitat; birds; vegetation; socio-economic values; non-traditional land and resource use; road maintenance; road safety; and, accidents and malfunctions (such as spills). · Please include any difference in the impacts of constructing the winter access trail to build the road, considering the additional length of access trails for an Inland Route Alternative, as described in the GNWT response to PKFN IR	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		avoiding the moose ponds, avoiding Mt. Gaudet as a cultural site, protecting harvesting values, and keeping the road away from the Mackenzie River, especially at the mouth of incoming watercourses (such as Ochre River, and Whitesand Creek). During the technical sessions, PKFN asked how the GNWT can conclude the proposed route is the preferred route without a rationale or quantitative evaluation (PR#283 p36). The Review Board understands GNWT's point that more studies have been completed along the winter road has because it is easier to access. However, to duly consider the alternate upland route as proposed by PKFN, a certain degree of analysis and understanding of this route is required as part of the EA. While the Review Board understands the GNWT's desire to avoid demolishing and rebuilding bridges, it is clear from the application permits that those bridges were built to extend the life of the winter road. Indigenous groups in the area and other interested parties were not consulted or engaged on those bridges as long-term components of the all-season road. The Review Board needs to understand the general location of an inland route, including evidence on how far inland it is from the existing winter road, to be able to make an informed environmental impact assessment decision. Reference: DAR 7.2 PR285 Transcription - Technical sessions Day 3, pp 67, 70-76, 94, 160 PR289 PKFN questions on routing PR321 Response from PKFN to MVEIRB-7 PR297 GNWT Responses to PKFN Questions from Technical Sessions	13[2]. · Please structure the response similarly to the GWNT supplemental filing on the accelerated timeline alternative (PR#251). That is, please consider how an upland route such as that identified by PKFN would change the project, and also identify in what ways it would be the same as the alternative assessed in the DAR. (For example, for the upland route proposed by PKFN, describe how the number of bridges and culverts would change; how many bridges along this reroute could be moved; how many would need to be demolished and built from scratch in new locations; and, how this would change the number of culverts) · For any new impact predictions, provide GNWT's evaluation of significance, and any changes to proposed mitigations for the valued components previously assessed. The response to this information request should be provided to the Review Board at the same time as the DAR Addendum. This response can be submitted either as part of the addendum or separately. If part of the Addendum, please make clear where the response to this information request is provided. [1] In its January 30, 2025 response to Review Board IR 7, PKFN requested a route alignment scenario that is generally parallel the Enbridge Pipeline, from “the beginning of the winter road to the boundary of the Sahtu Dene and Metis Settlement Agreement, approximately 100km”, considering that “the route should bend to the east and travel into higher ground near the base of Cap Mountain” to generally follow the Enbridge Pipeline route. It can be found on the Online Review System as PR321 Response from PKFN to MVEIRB-7. [2] PR297 - GNWT Responses to PKFN Questions from Technical Sessions. The Inland Route Alternative referred to in this	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
			answer, and in Section 7 of the DAR, may have similar characteristics but is not necessarily identical to the upland route described by PKFN in PR321.	
51	Project description - Impacts to PKFN	The Review Board would like to understand GNWT's views on each of PKFN's specific concerns, which are described in PKFN's response to the Review Board's information request MVEIRB-7 (PR321).	IR 51: Please provide a response to each specific concern raised in PKFN's response to MVEIRB Round 2 IR7 (PR321). Those include: · Impacts on hunting, fishing, trapping, and spiritual practices, which PKFN has identified as impacts on their Aboriginal and Treaty Rights · protecting places of "particular significance and sensitivity for harvesting, cultural, archeological, and spiritual uses" · impacts on moose habitat, increased access to moose habitat, and increased pressure on the moose population · permanent impacts on the Land, traditional uses of the Land, and opportunity costs for PKFN's ability to steward its traditional territory in the future · impacts on ground stability, such as ground slumping, erosion, slide problems, drainage system problems, and permafrost degradation · borrow source impacts on sacred places · increased access leading to recreational or illegal harvesting, overharvesting, overfishing, and potentially disrespectful behaviours of visitors in sensitive areas · ensuring the road benefits tourism The answer to this information request should be provided to the Review Board at the same time as the DAR Addendum. This response can be submitted either as part of the Addendum or separately. If part of the Addendum, please make clear where the answer to this information request is provided.	
52	Project Description –	This IR is about understanding the cumulative effects of the potential large-scale realignment of the highway away from the Mackenzie Valley Winter Road (MVWR): if the all-season alignment is moved away from the	If the all-season alignment is moved away from the current Mackenzie Valley Winter Road (MVWR) alignment, how much of the MVWR alignment would be allowed to naturally	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	Cumulative effects of alternative route	current winter road route, the Review Board would like to know if the winter route will be completely revegetated or if a clear right-of-way (ROW) would have to be maintained on the current winter road alignment. The Review Board notes that the Mackenzie Valley fibre optics line follows the existing winter road alignment. The response to this information request is due on April 11, 2025.	revegetate and return to "natural" conditions, considering the presence of the Mackenzie Valley fibre optics line? Would a 10 m or 15 m cleared ROW still have to be maintained centred on the Mackenzie Valley fibre optics line?	
53	Project Description – Route Alignment	Follow-up to PR297 GNWT Responses to PKFN Questions from Technical Sessions. It may be expected that permafrost degradation has occurred below the current winter road surface and is thus more thermally stable than adjacent areas near the edge of the currently cleared ROW, and within the treed area that will eventually be cleared to expand the ROW for the all-season highway. The response to this information request is due on April 11, 2025.	Is the intent to centre the all-season highway embankment on the existing winter road centreline or place the all-season highway embankment somewhere in the newly cleared 60 m ROW that may or may not be centred on the current winter road alignment?	
54	Project Description – Route Alignment	Follow-up to PR297 GNWT Responses to PKFN Questions from Technical Sessions. According to the GNWT, To support construction access and resupply, a winter road or access trail is necessary to allow vehicles to turn around after placing embankment material, as construction progresses from both ends (construction headings). The embankment itself does not provide sufficient width for this purpose. Without a winter road or trail, whether using the existing winter road or a temporary trail within the highway right of way (ROW), vehicles would have to drive over bare ground, causing greater damage to the soil and vegetation. Constructing a winter road provides a compacted snow and ice surface for construction vehicles, thereby protecting the native ground and helping to mitigate erosion, rutting, and soil damage within the ROW. In areas where the highway alignment will follow the existing Mackenzie Valley Winter Road (MVWR), the MVWR will be used to support	Please explain why a parallel trail beside the winter road would not be needed for construction if the alignment of the all-season road follows the existing winter road. Is it because the all-season road embankment will not be centred over the winter road alignment? Why is this parallel trail only needed for a new highway alignment?	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		construction vehicles in the winter during embankment placement. Both will share the 60 m wide ROW. In areas where the highway alignment deviates from the MVWR, the GNWT anticipates that a separate winter access trail will be constructed parallel to the embankment being constructed, also within the 60 m wide ROW. (PR297 GNWT Responses to PKFN Questions from Technical Sessions) The same constraint could be said for the use of the existing winter road. Dump trucks with embankment fill will approach the end of the embankment and need to turn around to end-dump the embankment fill at the leading edge of the road embankment. This will require the trucks to either perform the "u-turn" on the existing embankment or use an off-embankment ice/snow trail. The same problem likely exists for either the existing winter road or a new cleared ROW. The response to this information request is due on April 11, 2025.		
55	Project Description – Culverts	There are many smaller culverts presently installed along the current MVWR. If the all-season road embankment is constructed over the MVWR alignment/centreline, then it is likely that some of the existing culverts could be suitable for the all-season road. But, if the all-season road is located away from the MVWR alignment within the 60 m cleared ROW, then it is likely that few of the existing MVWR culverts will be suitable for the new all-season road and that new culverts will need to be installed. Reference: PR297 GNWT Responses to PKFN Questions from Technical Sessions (IR15) The response to this information request is due on April 11, 2025.	Have the smaller culverts presently installed along the current MVWR been designed considering the placement of up to 1.5 m to 2 m of embankment fill over them? If not, then will they not need to be removed and replaced with more structurally competent culverts that can accommodate the all-season road embankment fill loads? Can the developer quantify what percentage of existing culverts are expected to be suitable (in terms of size, age, integrity and location) for use as part of the all-season road?	
56	Project Description – Route Alignment	From PR283 Transcription - Technical sessions Day 1 (p.64). During technical sessions the developer said: "And the GNWT is very much willing to look at options where they're reasonable, and that involves a dialogue, that involves engagement, that involves, you know, understanding the concerns and, you know, sitting down at the table or	Please define what the GNWT means by "reasonable", in terms of delineating which options identified in engagement for road routing, design and management the GNWT is willing to consider . What specific criteria does the GNWT consider when looking at options?	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		going out in the field and looking at what the reasonable options are to that." The response to this information request is due on April 11, 2025.		
57	Project Description – Route Alignment	From PR283 Transcription - Technical sessions Day 1 (p.82). During technical sessions, the developer said: "Geotechnical work, as we've said a lot of different times, is not likely to constrain a routing. It will be factored into the final design. It's not something we need to pick a route. We can absolutely adequately do that with desktop information that's available to us." This suggests that GNWT is of the view that geotechnical issues can not be key issues in routing. The response to this information request is due on April 11, 2025.	Please explain why the route would not be realigned if the detailed design geotechnical work (including non-intrusive investigations, such as GPR or EM31 surveys) detects the presence of a massive buried ice body or very ice-rich lacustrine soils.	
58	Project Description – Route maintenance cost and long-term sustainability	Follow-up to IR round 2, MVEIRB IR-2 about project cost (itself a follow-up to technical sessions) During the technical session, we discussed maintenance costs. For instance, the GNWT mentioned that "Any road will require maintenance. That's an ongoing balance between how much you put into the design upfront and therefore increase the costs. Or how much you defer to the long-term maintenance." (GNWT, p.51 of Transcript 1, PR283). The Review Board would benefit from more details on long-term maintenance costs and road resilience to better inform its decision. The response to this information request is due on April 11, 2025.	A. Please predict the long-term sustainability and resilience of the roadbed on the proposed route, and contrast it against that of an upland route (such as described in the DAR as the Inland Alternative Route, or in the PR321 Response from PKFN to MVEIRB-7). Consider the long-term structural integrity, increased risks to human safety from accidents related to physical failures and problems, and total maintenance costs of the road over its predicted lifespan. B. Is the maintenance cost of an upland route likely to be lower than the maintenance cost of the proposed route in the long term (e.g. over 100+ years)? Please provide best estimates for both routes (proposed route and upland route).	
59	Project Description – Route construction cost	Follow-up to PR297 GNWT Responses to PKFN Questions from Technical Sessions. GNWT did not adequately respond to question 13 from PKFN, requesting a quantitative estimate comparing winter road construction costs between the MVWR Project Route and the Inland Route Alternative.	Based on the information currently available, please provide your best quantitative estimate comparing winter road construction costs between the MVWR Project Route and the Inland Route Alternative.	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
		The response to this information request is due on April 11, 2025.		
60	Project Description – Route vulnerability to fires	The Review Board recognizes that wildfires can affect infrastructure and that the GNWT has noted that the project could help with fire-related evacuations if necessary. With the predicted increase in wildfire frequency and severity with climate change (DAR, App. 14A, section 4.7.1), the Review Board would like to assess how the different road alignments might withstand wildfires, and how this could affect any future evacuations during a wildfire emergency. The response to this information request is due on April 11, 2025.	A. Compare the settings of the proposed route and the Alternative Inland Route in terms of likely wildfire frequency and intensity (considering factors such as wildland fuel loads, topography and landscape, and fire history). B. Describe the direct and indirect physical effects of wildfires on the highway and identify any general differences in the resilience of the highway to wildfires, for the proposed route and the Alternative Inland Route (considering factors such as substrates/subgrades and topography). C. Considering the above, describe highway failure modes for wildfires. Describe any differences between the two routes, comparing their predicted effectiveness as evacuation routes in the event of wildfires like those of 2023.	
61	Terrain, Soil, and Permafrost – Permafrost under RCP8.5 scenario	Based on several studies, clearing the trees and organic matter disturbance is responsible for the majority of long-term active layer thickness deepening and permafrost degradation. Climate warming is a secondary effect. Please clarify whether the deepening of the active layer under a Representative Concentration Pathways (RCP) 8.5 scenario, mentioned in the permafrost section of the Climate Profile for the Mackenzie Valley Highway Project – 2024 CCRA Addendum, was due only to climate warming or if the right-of-way clearing and organic matter disturbance were also considered. Reference: PR233 Developer responses to Review Board overarching IRs, Climate Profile for the Mackenzie Valley Highway Project – 2024 CCRA Addendum, Section 9 – Permafrost (PDF p.104) The response to this information request is due on April 11, 2025.	Have the projections of active layer thickness considered the impact of ROW clearing and organic matter disturbance (up 60 m) or just air temperature rise? If not, what is the expected impact of ROW clearing on the active layer thickness?	
62	Terrain, Soil, and Permafrost –	From PR283 Transcription - Technical sessions Day 1 (p.51): During technical sessions the developer said: "The GNWT fully expects that permafrost will continue to degrade over time, become more sporadic,	Please define "sensitive soils".	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	Sensitive soils	and therefore the highway is not designed to mitigate for or to protect permafrost. It's to avoid areas of sensitive soils, and that's very different." The response to this information request is due on April 11, 2025.		
63	Terrain, Soil, and Permafrost – Geotechnical data	Appendix 14A "Terrain, soils and permafrost technical data report", Section 3.2.1.3 makes reference to a borehole database, and specifically, "The information contained within these databases was downloaded and then imported into Esri's ArcGIS program to inform mappers about site-specific conditions while conducting detailed terrain mapping for the LSA." However, the report does not provide any substantive details that suggest how the borehole database was used in the assessment. The Board assumes that the "borehole database" referred to is the following: Smith, S.L., Burgess, M.M., Chartrand, J., Lawrence, D.E. 2005: Digital borehole geotechnical database for the Mackenzie Valley/Delta region, Geological Survey of Canada, Open File 4924, 25 p. This borehole database contains thousands of georeferenced borehole locations with data such as soil type (texture) and ice content, amongst other information. It is also understood that water content data and soil texture can be used to identify soils that are susceptible to thaw settlement; for example, fine-grained soils with a gravimetric water content greater than about 22% will experience thaw settlement. The response to this information request is due on April 11, 2025.	Given this source of existing and available information: 1. To what extent do the legacy boreholes contained within the borehole database coincide with the existing Mackenzie Valley winter road alignment or other linear infrastructure (such as the 1970s-era Canadian Arctic Gas Study Limited (CAGSL) pipeline route, the Enbridge Norman Wells route)? 2. Has the developer used this database to extract locations of boreholes with sufficient ice contents that could be interpreted as being ice-rich and thus susceptible to thaw settlement and loss of strength if those soils were to experience thawing through permafrost degradation? 3. Has the developer extracted borehole data from the borehole database to identify locations of unfrozen sites (non-permafrost) between Wrigley and Norman Wells? If not, please produce such a map using the available borehole database information. 4. If the developer has not extracted information on water content and soil texture data from the borehole database, please produce maps that show colour-coded locations of various ice/water contents (for example, 20% to 30%, 31% to 45%, 46% to 60%, greater than 61%) to indicate locations where thaw settlement may occur if the terrain at that borehole location were to experience permafrost thaw.	
64	Socio-economics – Bootlegging	In the second round of IRs, Review Board IR-26 asked about innovative ways that bootlegging and trafficking can be controlled. Specifically, it was asked, “What techniques, approaches, and tools have been used to successfully manage illegal or prohibited alcohol and drugs in small (Indigenous or non-Indigenous) communities across Canada?”	Please evaluate the suitability of programs such as the Safer Communities and Neighborhoods program and the Community Safety Officer program to mitigate social impacts from increased bootlegging and trafficking that may result from the Mackenzie Valley Highway. Please consider both highway	

No.	Topic	Reviewer Preamble	Reviewer Request	Response
	mitigation	The Review Board notes the model of the Safer Communities and Neighbourhoods program in Kwanlin Dün First Nation communities in the Yukon. A similar pilot Community Safety Officer program was implemented in Fort Liard in 2021. In addition to any other approaches or examples the GNWT will identify in response to IR-26, the Review Board is particularly interested in the developer's evaluation of how well these two programs could be applied to mitigate social impacts from bootlegging and trafficking in communities along the highway. The response to this information request is due on April 11, 2025.	construction and operations.	
65	Socio-economics – Accidents	The Tłı̨chǫ Highway Socio-Economic Working Group recently noted an increase in accidents from the road following construction. Reference: Tłı̨chǫ Highway Socio-Economic Working Group 2025 posters. This first progress report is a measure from the Whatì All-Season Road environmental assessment. The response to this information request is due on April 11, 2025.	Does the GNWT wish to revisit its accident predictions for the Mackenzie Valley Highway in light of the observed trends regarding accidents on the Tłı̨chǫ Highway?	
No.	**Topic**	**Reviewer Preamble**	**Reviewer Request**	**Response**
Deline Got'ine Government - Todd Slack				
1	Socio-economics: Wellbeing and Adaptive Management Plan	Follow-up to the technical sessions.	Provide information about funding amounts for staffing, resourcing, and programing in the Sahtu for any programs that will be relied on by the Wellbeing and Adaptive Management Plan. The intent is to develop a snapshot/baseline of current funding/resourcing levels to allow for meaningful comparisons after mitigations are applied.	Please see the attached response.
2	Socio-economics: financial impacts on fly-in communit	Follow-up to the technical sessions.	GNWT will undertake research to evaluate the impacts on fly-in communities for passenger and freight costs from the construction of this road. As the regional centre and Tulita move to the road net, there is a real concern that 'dis'economies of scale will result, increasing the cost of passenger travel and freight costs for communities that rely on	Please see the attached response.

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	ies and mitigations		the air-net. Please include what programs are available to mitigate this impact if it is observed.	