August 14, 2024

JoAnne Deneron
Chair
Mackenzie Valley Environmental Impact Review Board
Yellowknife, NT

Via: Online Review System

Government of Canada's Information Requests for the proposed Mackenzie Valley Highway Project (EA1213-02)

Dear Ms. Deneron,

To support the Review Board's environmental assessment process, and in accordance with the Review Board's Rules of Procedure, the Government of Canada is submitting information requests (attached) for the Government of the Northwest Territories (GNWT) Department of Infrastructure's (INF) proposed Mackenzie Valley Highway (MVH) Project.

As provided in the Online Review System's information request (first round) public review, it is understood that this information request process allows for detailed questioning to help parties better understand the MVH Project, its potential impacts on the environment and people, and how to mitigate those impacts. In response, the Northern Projects Management Office (NPMO) is submitting the attached information requests on behalf of Heath Canada (HC), Natural Resources Canada (NRCan), Fisheries and Oceans Canada (DFO), and Environment and Climate Change Canada (ECCC). Transport Canada and Crown-Indigenous Relations and Northern Affairs Canada have reviewed materials available on the Review Board's public registry but do not have any information requests at this time.

It is understood that there will continue to be opportunities to provide comments and recommendations on the proposed MVH Project as the environmental assessment continues. The Government of Canada appreciates the opportunity to submit these information requests.

If you have any questions related to this correspondence, please contact Shannon Allerston at Shannon.allerston@cannor.gc.ca or 867-445-7230.

Sincerely,

Paradis, Adrian
Digitally signed by Paradis, Adrian
Date: 2024.08.14 15:09:51 -06'00'

Adrian Paradis
Projects Director
Northern Projects Management Office
Canadian Northern Economic Development Agency

COMMENT ID	REFERENCE	TOPIC	PREAMBLE	INFORMATION REQUEST
HC-01	DAR Vol. 2, Sec. 9.5.7.2 DAR Vol. 3, Sec. 13.0 DAR Vol. 4, Sec. 23.5.3 Response to DAR Review Comments ADKFN-11, HC-2, HC-3, HC-4, and HC-10	Assessment of noise impacts and noise complaint resolution	The response to ADKFN-11 reports that Long-Term Community Annoyance "only applies to receptors within communities and therefore would not apply to other locations…". HC would like to clarify that percent highly annoyed (%HA) applies to all human receptors exposed to Project-related noise (construction and operation of the completed highway) that is of at least one year in duration at the receptor location. However, provided that R1 and R2 are the most affected receptor locations, evaluating long-term annoyance and sleep disturbance at these locations would be consistent with HC guidance. Project noise from construction that is less than one year in duration at any given receptor should be assessed for potential sleep disturbance and complaints. Noise concerns from short-term exposures can be mitigated through best practices and HC acknowledges the mitigations described in the DAR (Volume 2, Section 9.5.7.2). For the construction of a highway that is this extensive, taking several years to complete, strong community consultation will be key to mitigating project-noise related concerns with individuals adversely impacted by project noise. Although HC does not have expertise in assessing noise impacts on wildlife, the community has expressed concerns in this area. These concerns may lead to heightened sensitivity toward project noise overall. In addition, public communication prior to elevated noise levels has been shown to be successful in reducing complaints.	HC recommends: 1. Public communication prior to any particularly noisy activity. 2. Developing a noise complaint resolution plan that includes the following information : • The method(s) for receiving complaints (e.g. website, telephone, etc.) and response time; • The time of complaint and activities that were being undertaken at the time so that there is an understanding of what noise sources were considered problematic; • Weather conditions as they can influence sound propagation and impact the validity of noise monitoring.
HC-02	DAR Vol. 3, Sec. 12.0, 12.4 Response to DAR Review Comments HC-2, HC-5, HC-6, and HC-10	Methodology for assessing Project effects on air quality	HC does not support the methodology used to assess the Project's effects on air quality, as described in the DAR (Volume 3, Section 12.0) and the Proponent's responses to HC-5 and HC-6. HC does not agree with the statement that the National Pollution Release Inventory (NPRI) reporting thresholds are set at "the level(s) at which the substance begin to pose a risk to the environment or to health" (Volume 3, Section 12.1.1.1*)*. Instead, the NPRI thresholds are for reporting	HC recommends: 1. Using a receptor-based assessment that follows HC's Guidance for Evaluating Human Health Effects in Impact Assessment: Air Quality. 2. Comparing against conservative health-based air quality criteria, including the Canadian Ambient Air Quality Standards (CAAQS), when evaluating the predicted COPC concentrations.

			requirements and they should not be considered as emission thresholds below which no health effects exist. As indicated on the NPRI website (https://www.canada.ca/en/environment-climate-change/services/national-pollutant-release-inventory/using-interpreting-data.html), "*NPRI data is not enough to assess the risks and impacts posed by pollution to the environment and human health*." Additional information, such as inherent toxicity, physical and chemical properties, amount, timing, nature and level of exposure are required to assess potential health risks. As described in HC-6, the rationale for this methodology includes the assumption that emissions of contaminants of potential concern (COPCs) are expected to disperse or settle within the local assessment area (1 km). Dust particles may settle within a 1-km buffer but fine particulate matter ($PM_{2.5}$) and precursor pollutants can travel large distances in the atmosphere and affect receptors within and beyond this 1 km buffer distance. Additionally, the distance traveled by dust depends on various factors (e.g., turbulence, wind, dust properties). Given the transient nature (e.g., mobile sources over temporary periods of time) of this Project and the varying spatial and temporal land use by humans (e.g., intermittent harvesting activities), HC recommends use of dispersion modelling to assess potential health effects with a receptor-based approach at key locations along the route where receptors are the closest. HC relies on the expertise of ECCC in the areas of emissions, dispersion, and atmospheric modelling.	
HC-03	DAR Vol. 3, Sec. 12.0 Response to DAR Review Comment HC-5	Sources of air contaminant emissions	The response to HC-5 states that $PM_{2.5}$ and PM_{10} are only considered in the context of vehicle usage (e.g., diesel particulate matter). The exclusion of fugitive dust may underestimate the potential health impacts associated with Project-related activities and should be included in the determination of Project effects. In order to fully assess the potential health risks from the Project's expected changes to air quality, it is best practice that all sources of emissions be considered.	HC recommends: 1. Considering all sources of emissions, for each COPC, including Project-related processes, on-site vehicle usage, and fugitive emissions, or 2. Providing additional evidence-based rationale to justify excluding any emissions, or specific COPCs, from further assessment.

HC-04	DAR Vol. 3, Sec. 12.0 DAR App. 12A Response to DAR Review Comment HC-6 and HC-7	Air quality monitoring for implementation of mitigation measures	The response to HC-7 states that "*mitigation and monitoring measures associated with air quality have been identified, based on visual monitoring for dust plumes.*" PM_{10} and $PM_{2.5}$, the latter being of particular concern for human health, are invisible and only tools such as atmospheric dispersion modelling and/or monitoring stations can provide the information required to assess potential risks to human health. HC's *Guidance for Evaluating Human Health Effects in Impact Assessment- Air Quality* (p.29) states, "*The need for corrective actions for on-site emission management or implementation of additional control measures can be determined by comparing monitoring results to trigger levels.*" Project-specific trigger levels should be informed by reference guideline values (e.g. CAAQS), pre-project baseline concentrations, atmospheric dispersion modeling results, and the analysis of local air quality in relation to the air zone management levels for each pollutant. As mentioned in the Proponent's response to HC-6, and supported by the Project falling in the yellow CAAQS management level, the Project is located in a relatively pristine environment. Other considerations such as public complaints, wind speed, visual observations can also trigger the implementation of mitigation measures.	HC recommends that air quality monitoring for COPCs, specifically $PM_{2.5}$, and the development of Project-specific trigger levels, be used to inform the implementation of appropriate mitigation measures. Monitoring should be performed where the closest receptors to the Project are located and could be informed by the results of atmospheric dispersion modelling.
NRCan-01	ToR 5.1.3, 7.3.4 DAR Vol. 3, App. 14A, Sec. 4.6.4 App. 15B, Sec. 4.2.3.4	Hazards associated with icing (aufeis)	Accumulations of ice related to aufeis or icing can cause hazards to road travel, block culverts and also lead to accumulation of water on the surface in the spring with impacts to the ground thermal regime. Information on icing occurrence is required to adequately assess potential impacts of the environment on the Project and impacts of the Project on the environment. Icings have been observed to occur in the Mackenzie Valley including those near Norman Wells on the winter road resulting from water flowing from Kee scarp through a talik (e.g. Taylor et al. 1998). The Proponent indicates that there is no spatial data on icing occurrence along the highway route. A study	NRCan requests from the Proponent: 1. Please clarify whether existing mapping of icing occurrence has been incorporated into project design and environmental assessment 2. Please provide information on any plans to map icing occurrence as project design advances.

			published by Crites et al. (2020) mapped icing occurrence in the Mackenzie Valley and provides a digital database. Reference: Taylor AE, Nixon M, Eley J, Burgess M, Egginton P (1998) Effects of atmospheric inversions on ground surface temperatures and discontinuous permafrost, Norman Wells, Mackenzie valley, Canada. In: Lewkowicz AG, Allard M (eds) Proceedings of the 7th International Conference on Permafrost. Collection Nordicana, Yellowknife, 1043-1047. Crites H, Kokelj SV, Lacelle D (2020) Icings and groundwater conditions in permafrost catchments of northwestern Canada. Scientific Reports 10:3283 https://doi.org/10.1038/s41598-020-60322-w	
NRCan-02	ToR 5.1 (5.1.1), 7.1, 7.3.1, 8 DAR Vol. 3 Sec. 14 (14.2, 14.4, 14.7), App. 14A (Sec 4, 5, App. A,B), Vol. 5 (Sec. 9)	Permafrost conditions in the project area – geotechnical and thermal conditions	The Proponent has utilized the extensive data that are available (including Geological Survey of Canada reports) for the Mackenzie Valley in its description of baseline permafrost conditions and assessment of environmental assessment (Vol 3 sec. 14, App 14A). The Proponent has indicated that it has drilled a limited number of boreholes within the project region that appear to be located near infrastructure already constructed or under construction (e.g. Prohibition Creek Access Road) rather than the infrastructure considered in this assessment. There is also limited thermal information (< 1 year) available from these new boreholes and not yet adequate to describe baseline conditions. NRCan realizes that more site-specific information is normally acquired as design advances. However, any additional information the Proponent has collected since the investigations conducted by Tetra Tech in 2020 would facilitate understanding of the baseline permafrost conditions in the project area.	NRCan requests from the Proponent: 1. Please clarify if any additional geotechnical investigations (including borehole drilling) have been conducted in the project area since the investigations conducted by Tetra Tech in 2020 and provide details of any additional investigations conducted (e.g. geotechnical, thermal data). 2. Provide any additional information regarding ground temperatures collected since 2020 from the boreholes instrumented by Tetra Tech during the 2020 investigations.
NRCan-03	ToR 5.1 (5.1.1, 5.1.2), 7, 8 DAR Vol 3 (Sec. 14) App. 12A, 14A, Vol 4	Assessment of long-term changes in permafrost condition and	Knowledge of how permafrost conditions will change over time due to infrastructure construction and operation, climate change and other environmental disturbances is essential to inform project design and assessment of impacts of the project on the environment and also the	Please provide clarification on whether any thermal modelling has been done to assess the evolution of permafrost conditions and inform project design and assessment of environmental effects. If such analysis has been

	(sec. 24, 26), App. 24A, Response to MVEIRB IR#2 – updated Climate Change Risk Assessment	associated environmental effects.	impacts of the environment on the project. The expected changes in permafrost conditions including changes in thermal conditions has been assessed at a high level in the DAR. Similarly, a climate change risk assessment has been done at a high level with some aspects based on global or national scale assessments (including some inappropriate interpretation of results). Thermal modelling is usually done to quantitatively assess the evolution of the permafrost thermal regime over the project lifetime. However, this type of thermal analysis does not appear to be presented in the DAR. It is unclear if this type of analysis is included in the reports submitted to the Proponent by Tetra Tech in support of design of the Mount Gaudet Access Road and the Prohibition Creek Access Road, as these reports have not been provided. NRCan understands that more detailed site-specific thermal analysis is usually completed as design advances. However, information on any thermal modelling completed by the Proponent would be useful to NRCan's review of the DAR to better understand the anticipated changes in permafrost conditions and associated environmental impacts. Reference for Tetra Tech reports cited in DAR: Tetra Tech. 2020. Mount Gaudet Access Road Thermal Assessment Report. MVWR km 687 to 708, Northwest Territories. Issued for Review. Report prepared for the Government of the Northwest Territories, Department of Infrastructure by Tetra Tech Canada Inc. November 24, 2020. Tetra Tech File: 704-ENG.YARC03354-02. Tetra Tech. 2020. Prohibition Creek Access Road Thermal Assessment Report. MVWR km 995.3 to km 1009.3. Northwest Territories. Issued for Review. Report prepared for the Government of the Northwest Territories, Department of Infrastructure by Tetra Tech Canada Inc. November 24, 2020. Tetra Tech File: 704-ENG.YARC03354-02.	conducted, please provide any information (including reports) on the results of this analysis.
NRCan-04	ToR 5.1, 7.1, 7.3.1, 8	Slope stability in the project area	Slope instability related to ground warming has been discussed in the DAR and landslides have been identified on the terrain maps provided in App. 14A (App. B). Creep	NRCan requests from the Proponent: 1. Please provide clarification regarding how creep on warm permafrost slopes was

	DAR Vol. 3 (sec. 14), App. 14A (inc. App B), Vol. 4 (sec 23, 24), Vol. 5	and project design	(gradual downslope movement) has been observed to occur in warm permafrost on slopes along the Norman Wells pipeline and these movements have been monitored with slope inclinometers by Enbridge. NRCan notes that while there are a few references to creep in the DAR it is unclear whether it has been considered in the design of the approaches to water crossings and assessment of impacts on bridge abutments. It is not clear from the monitoring plans submitted whether instrumentation such as slope inclinometers will be installed to inform the need for mitigation at the water crossing approaches and bridge abutments. Any additional information regarding consideration of creep in the project design and assessment of effects of the environment on the project would help inform NRCan's review of the DAR.	considered in design of water crossing approaches and assessment of the effect of the environment on bridge abutments. 2. Please clarify if instrumentation to monitor creep, such as slope inclinometers, will be installed as part of environmental monitoring and management plans in order to determine the need for mitigation at water crossing approaches.
NRCan-05	DAR Vol. 1, Sec. 6.1, Table 6.1	Responsible Authority / Minister	The Proponent has identified that the Project will require the manufacturing and storage of explosives. NRCan, through its role in the administration of the *Explosives Act*, may exercise a power or perform a duty or function that would enable the project to proceed.	If the Project involves the manufacturing or storage of explosives, please provide details of the type and quantity of explosives to be stored, as well as the specific locations of the explosives facilities.
DFO-01	Response to DAR Review Comment DFO-27	Attachment not provided	The Proponent mentioned in their response that a memo entitled "Mackenzie Valley Highway Alignment, Sahtu Region – Fish Assessments by Tetra Tech" dated December 2021 was attached to their response (Attachment CANNOR-45A). However, no attachment was provided.	Proponent to please provide memo titled "Mackenzie Valley Highway Alignment, Sahtu Region – Fish Assessments by Tetra Tech" dated December 2021.
DFO-02	Response to DAR Review Comments DFO-27 and -28	Photographs of proposed culvert crossings	Photographs are not available for all proposed culvert crossings and photographs available are not compiled in one document. This makes it more difficult for the reviewer to access and evaluate information. Photographs of each crossing will be requested to be compiled - in one document that is clear, concise, and follows either a chronological or spatial logic for ease of review - as part of the *Fisheries Act* Authorization application.	As part of the *Fisheries Act* Authorization application, photographs of each crossing will be requested and shall be compiled in one document and in an orderly fashion. DFO recommends the Proponent gather all photographs available into one document, and plan to collect photographs at the crossings where they are currently unavailable.
DFO-03	Response to DAR Review Comments DFO-18, -29 and -28	Crossing summary tables	To assist with the review, DFO requested the Proponent resubmit Appendix 17A Tables 4.2 and 4.3 with additional information, such as channel width, wetted width, the size/number of culverts needed per crossing, and the year/month the fish assessment was conducted. The Proponent responded that DFO should refer to habitat	To help with the review, DFO requests the Proponent resubmit Appendix 17A Tables 4.2 and 4.3 with the following additional information for each crossing: • Specific ID • Stream type

			assessment cards in Appendix 17A. Compiling this information in tables will help parties understand the potential impacts at water crossings more efficiently. Searching through multiple pages of appendices for this specific information is not efficient. Additional details, such as stream type and gradient, would also aid DFO in their review.	• Channel width • Wetted width • Gradient • Estimated number, size, and type of culverts • Year/month the fish assessment was conducted • Fish species (confirmed and potential) • Reason why crossings were considered unlikely to be non-fish bearing (i.e., downstream barrier to fish passage.) • Connecting waterbodies • Availability of photographs (and reference to photograph # or page #, if applicable)
DFO-04	Response to DAR Review Comment DFO-3	Lessons learned from Inuvik to Tuktoyaktuk Highway - crossings	DFO previously requested that the Proponent provide information (e.g., literature or lessons-learned from other roads) on the effectiveness of the use of geotextile membranes at culverts to maintain structural integrity, thus preventing fish passage issues, and provide information on whether other types of isolation (e.g., polystyrene) were considered and why they were not chosen. The Proponent did not respond to the specific questions. To elaborate on our request, we would like to add that the Proponent encountered issues related to fish passage and habitat on other projects such as the Inuvik to Tuktoyaktuk Highway, including: • perched culverts due to lack of embedment and shifting of permafrost impeding fish passage • inadequate culvert sizes causing yearly (at freshet) road wash outs and sedimentation into fish bearing waters • inadequate water management and erosion and sediment control measures along the road causing erosion and sedimentation into fish bearing watercourses	Based on the Proponent's experience from the construction of the Inuvik to Tuktoyaktuk Highway, please provide design considerations, modifications to the construction techniques, mitigation measures and responses that will be implemented to avoid similar issues from occurring at the MVH crossings. Information should focus on: • effectiveness of the use of geotextile membranes at culverts to maintain structural integrity, thus preventing fish passage issues • effectiveness of water management and erosion and sediment control measures and responses during sedimentation events • culvert sizing

			• in-water works not conducted according to Plans approved under the Water Licence. (e.g. Gunghi Creek) inadequate responses to erosion and sedimentation events leading to enforcement actions by DFO.	
DFO-05	DAR Vol. 3, Sec. 17 and App. 17A	Baseline Fish Sampling	DFO understands the GNWT has taken a precautionary approach by assuming which stream crossings are fish-bearing and the fish species that may be present in a stream crossed by the Project. However, fish sampling was limited due to freezing conditions, and observations were only carried in the fall. Conducting sampling at different times of the year is essential for capturing the full spectrum of fish presence and habitat use. DFO is of the opinion that the baseline information collected is incomplete and sometimes outdated (2004, 2011). Although culverts will be designed to allow for fish passage, having baseline data provides a reference point for assessing the effectiveness of the culverts and any unforeseen negative effects of the road on fish populations, and making necessary adjustments. Additional baseline data would be valuable scientific information that would inform fisheries management.	The Proponent to work with DFO in identifying higher risks crossings, identifying specific baseline data gaps at these crossings, and developing a Baseline Monitoring Plan to supplement the existing baseline data. DFO will have a better understanding of any potential data gaps after receiving responses to IR DFO-02 and DFO-03.
DFO-06	DAR Vol.3, Sec. 17.9	Fisheries Monitoring at crossings	As per the DAR, monitoring at the crossings will include routine periodic inspection of culverts to determine if they are functioning as per design (e.g., allow fish passage) and for evidence of erosion and sedimentation. However, despite the design intentions, flaws in culvert construction and maintenance may compromise a culvert's structural integrity and impede fish passage. DFO believes that additional field monitoring should be conducted in high-risk streams (e.g., where sensitive migratory species such as Bull Trout and Arctic Grayling may be present, such as Four Mile Creek, Twelve Mile Creek, Prohibition Creek) to demonstrate that the culverts do not impede fish passage.	DFO recommends post-construction field monitoring be conducted at high-risk crossings (e.g., in streams where sensitive migratory species such as Bull Trout and Arctic Grayling may be present, such as Four Mile Creek, Twelve Mile Creek, Prohibition Creek) to demonstrate that the culverts do not impede fish passage. Field monitoring may include: • Velocity monitoring at the culvert to validate model predictions • Fish sampling upstream of the culverts DFO recommends the Proponent develop a Conceptual Post-Construction Fish Monitoring Plan, as part of the Fish and Fish Habitat Protection Plan, to verify whether the culverts allow fish passage throughout the open-water season. The Plan may include:

				• Summary of pre-construction conditions • Sampling schedule • Description of success criteria and associated measures of success • Monitoring methods, including locations, target species, and data to be collected. • Description of data analysis to be performed • Reporting schedule • Thresholds for acceptable performance • Response Plans for addressing any issue identified
DFO-07	DAR Vol. 3: Sec. 17 and App. 17A	Culvert crossings in large watercourses	At the time of assessment, the following crossings had large channel widths, likely due to the presence of bever dams: • Site 919.9 Unnamed Watercourse (37 m wide) • Site 820.7 Unnamed Watercourse (15.5 m wide, but 95 m to 100 m wide downstream) • Site 891.4 Unnamed Watercourse (12.5 m wide) It is unclear how culvert crossings will be constructed in those locations.	The Proponent to provide examples, accompanied by photographs, of culvert crossings that have been constructed by the Proponent in wetlands (streams with large, wetted widths). If the Proponent has no such examples, they can provide best practices that would be applied in these situations.
DFO-08	DAR Vol. 3: Sec. 17	Culvert crosses – Type of culverts	The proponent did not specify which type of culverts would be used at different crossings. DFO encourages the use of open bottom culverts or embedded oversized arched culverts instead of circular culverts as they allow maintaining a more natural stream bed and can accommodate higher flow volumes.	DFO recommends the Proponent install open bottom or embedded oversized arched culverts at fish bearing crossings.
DFO-09	Response to DAR Review Comments DFO-14	Culvert verses bridge crossings rationale	DFO requested the Proponent provide a rationale on why bridges are not proposed to be installed, especially in larger watercourses. The Proponent responded that “bridges impose many more constraints on road geometry than culverts, such as: road width, longitudinal and transverse slopes and corner radius. These constraints negatively affect road safety for bridges more than for culverts. Therefore, culvert crossings are often safer than bridge crossings for the type of highway proposed”.	The Proponent should demonstrate that installing a bridge at crossings where sensitive migratory species may be present (such as Four Mile Creek, Twelve Mile Creek, Prohibition Creek) would negatively affect road safety.

			DFO acknowledges the response and the importance of safety when building new roads. However, bridges can facilitate the natural flow of water and have minimal impact on the streambed and surrounding riparian zone, thereby limiting their impact compared to culverts. Additionally, bridges can reduce the risk of flooding, as observed on the Inuvik to Tuktoyaktuk Highway. DFO encourages the Proponent to consider installing bridges at crossings where sensitive migratory species such as Bull Trout and Arctic Grayling may be present (e.g., Four Mile Creek, Twelve Mile Creek, Prohibition Creek), provided it does not create safety issues.	
DFO-10	Response to DAR Review Comment DFO-17	Riparian Vegetation in Bull Trout habitat	In their response, the Proponent clarified that a 30 m wide area of riparian vegetation will be trimmed at watercourse crossings, that vegetation management within is required to maintain sight lines for driver safety and that in riparian areas vegetation will be cut more than 10 centimeters above the ground surface to retain root structure. DFO would like to note that a proposed recovery strategy exists for Bull Trout in the Saskatchewan-Nelson Rivers that considers riparian habitat to extend to 30 m from a stream high water mark, due to a strong reliance for providing food, instream structure, shade, moderating water temperature and regulating the amount of sediment entering the water (https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/bull-trout-proposed-2020.html). Although the Mackenzie River Bull Trout population is not considered in this recovery strategy, DFO is of the opinion that vegetation clearing within 30 m from each water course should be avoided or minimized. In addition, as mentioned in DAR Review comment DFO 19, Bull Trout (Western and Arctic populations) are currently under reassessment by COSEWIC and may be listed as Threatened after the assessment (potentially as early as	DFO recommends that vegetation clearing within 30 m from each water course that has the potential to be Bull Trout habitat should be avoided or minimized as proposed in the Bull Trout, Saskatchewan-Nelson Rivers recovery strategy.

			2025). If the listing for Bull Trout is changed, the 30 m wide riparian zone may be considered critical habitat at the time of project review and a reassessment of fish and fish habitat would be required for the project.	
DFO-11	Response to DAR Review Comment DFO-20 DAR Vol. 3, Sub-s. 17.2.2 and App. 17A, Subss. 4.2.1.5	Bull Trout Habitat Suitability	The Proponent provided the following rationale on why habitat at the proposed stream crossings is considered unsuitable for Bull Trout: 1. Most of the watercourses that may be crossed by the Project are small second or third order streams of low gradient that drain directly into the Mackenzie River, a river with relatively turbid water. In contrast, bull trout prefer higher gradient watercourses connected to larger relatively clear downstream rivers such as the Keele and South Nahanni Rivers (Mochnacz et al. 2013). 2. Most of the watercourses that may be crossed by the Project have substrates dominated by fines and organics. In contrast, adult bull trout (the life stage most likely to access watercourses on the eastern side of the Mackenzie River), prefer habitat with cobble to boulder substrates (Mochnacz et al. 2004). Juveniles are less likely to make the long migration from western headwater streams of the Mackenzie River to eastern tributaries of the Mackenzie River due to the increased risk in predation and energy cost. 3. Most of the watercourses that may be crossed by the Project are shallow and lack deep pools suitable for bull trout overwintering; most watercourses that may be crossed by the Project freeze to the bottom in winter. DFO mostly agrees with the rationales but would like to point out that in Mochnacz et al (2021) attached, Bull Trout were sampled in the Prairie Creek watershed in streams with gradients ranging from 0.7 to 13.8 %. The article also states that in the Prairie Creek watershed, adult bull trout move into first to third-order habitat patches in the late summer	DFO recommends the proponent not assume a stream does not support Bull Trout bases on stream morphology alone.

			to spawn and then migrate downstream into larger tributaries in the fall. Additionally, juvenile bull trout rear for 3-5 years in second and third-order streams. Finally, in Alberta, juvenile and adult bull trout overwinter in small, shallow (max depth 0.4 to 1.5 m) pools that are isolated from one another, have little cover, and receive flow from groundwater springs (Stewart et al., 2007). References: Mochnacz, N. J., et al. (2021). "Fringe effects: detecting bull trout (Salvelinus confluentus) at distributional boundaries in a montane watershed." Canadian Journal of Fisheries and Aquatic Sciences 78: 1030-1044. Stewart, D. B., et al. (2007). Fish life history and habitat use in the Northwest Territories: bull trout (Salvelinus confluentus) Winnipeg, Mb, Fisheries and Oceans Canada. 2801: i-46.	
DFO-12	DAR Vol. 3: Sec. 17 and App. 17A	Offsetting	A Fisheries Act authorization will likely be necessary for the construction of the MVH, along with offsetting measures to compensate for any lost or altered fish habitat. The DAR does not present conceptual offsetting options. Given the challenges of finding suitable offsetting options in the North and the need to consult impacted Indigenous Groups, it is crucial to start planning for offsetting early in the project's life cycle.	DFO Recommend the Proponent develop a preliminary conceptual Offsetting Plan.
ECCC-01	DAR Vol. 2: Sec. 10, Sec. 10.1.4.1, Sec. 10.5, Sec. 10.5.1, Sec. 10.5.2.3.1.1 DAR Vol. 2: Sec. 10, Sec. 10.1.4.1, App. 10A	Selection of Appropriate Spatial Assessment Boundaries for Boreal Caribou and Cumulative Effects	The Proponent outlines their analysis of the cumulative effects boundaries applicable to boreal caribou for this Project in Section 10.1.4.1 – Spatial Boundaries. The Proponent uses a Local Assessment Area (LAA) to assess cumulative effects to boreal caribou. The LAA is defined as the area within a 15 km radius of the Project Development Area (PDA - the area of direct project disturbance/footprint). The Proponent notes there is no Regional Assessment Area (RAA) defined for caribou in the Developer's Assessment	ECCC requests the Proponent: 1. Provide further rationale and clarity for the selection of the LAA (15 km buffer) as the relevant scale for the cumulative effects assessment area for boreal caribou. 2. Clarify whether areas other than the proposed LAA were considered, and if not, then explain why. If other areas were

			Report (DAR). Part of the Proponent's justification for this boundary is that 15 km is "the estimated maximum distance caribou moved in 24 hours" (Section 10.1.4.1, pg. 10-11). The Proponent stated they avoided an area as large as the Northwest Territories Range (NT1) habitat planning unit range for assessing effects, as the Mackenzie Valley Environmental Impact Review Board (MVEIRB) found the scale of NT1 to be "inappropriately large and diluted the effects on caribou" for the similarly assessed project, the Tlicho All-Season Road (Section 10.1.4.1, pg. 10-11). The area of the NT1 range is over 44 million hectares. The Proponent-selected caribou LAA is only slightly over 1 million hectares (Table 10.18). It is not clear how the Proponent chose the current LAA size. The Proponent did not rationalize that this selection is of a sufficient size to accurately capture other projects that may be relevant to the survival of boreal caribou in the area or reflect biologically relevant regional habitat conditions.	considered, then provide the rationale to disregard them in favour of the 15 km buffer along the PDA. Outline what ecological factors and/or Indigenous groups' perspectives were considered when evaluating which potential area(s) would be better at "*identifying and assessing current projects/activities as well as any foreseeable future projects/activities*" that may affect boreal caribou that interact with the Project.
ECCC-02	DAR Vol. 2: Sec. 10, App. 10A:	Clarification of Study/Assessment Areas for Boreal Caribou: LSA/LAA and RSA/RAA	The Proponent uses the terms Local and Regional Study Area (LSA/RSA) and Local and Regional Assessment Area (LAA/RAA) seemingly interchangeably in the Developer's Assessment Report (DAR). The main section of the DAR discussing the assessment of potential effects on caribou and moose (Section 10) uses the term RAA while the technical data report (Appendix 10A) uses the more common terms LSA and RSA. Section 10 of the DAR excludes the use of an RAA/RSA for boreal caribou, stating the LSA will appropriately substitute for the RSA.	ECCC requests the Proponent: 1. Clarify and define which terms are to be used when discussing impacts to caribou in the DAR (i.e. LSA/RSA or LAA/RAA), and use these terms consistently. 2. Provide the rationale, including advantages and disadvantages, to exclude an RAA/RSA from the assessment for boreal caribou, and to have the LSA serve as the RAA/RSA (Section 10 of the DAR).
ECCC-03	DAR Vol 2: Sec. 10.5, Sec. 10.6 Environment Canada(2012), Recovery Strategy for the Woodland	Cumulative Effects Analysis to Boreal Caribou: Past, Present and Reasonably Foreseeable Projects	The Mackenzie Valley Environmental Impact Review Board (MVEIRB)'s *Environmental Impact Statement Guidelines (2004)* state that proponents will "assess the impacts of the development in combination with the impacts of all other past, present and reasonably foreseeable future developments and human activities".	ECCC requests the Proponent revise the cumulative effects assessment for boreal caribou to include Imperial Oil activities in the Norman Wells area (past, present and reasonably foreseeable future activities). This should include a thorough pathways of effects analysis (e.g. changes to habitat, movement,

	Caribou (*Rangifer tarandus caribou*), Boreal population, in Canada, *Species at Risk Act* Recovery Strategy Series. https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_caribou_boreal_caribou_0912_e1.pdf Mackenzie Valley Environmental Impact Review Board (2004), Environmental Impact Assessment Guidelines. https://reviewboard.ca/file/614/download?token=3dz7s5gt		Current Imperial Oil operations are well within the Local Assessment Area (LAA) as designated by the Proponent, yet oil operations are absent from the cumulative effects assessment (Section 10.5.1, Table 10.17). Imperial Oil has been operating in the Norman Wells area of the Northwest Territories since 1920. This ongoing oil and gas activity likely had (and will continue to have) impacts on boreal caribou. Imperial Oil recently rescinded an environmental assessment of a waste management facility expansion (MVEIRB EA 2223-01). While this application has been withdrawn, a more detailed application is anticipated to be put forward at a later date. A waste management facility expansion would be an activity within the LAA defined by the Proponent in the Developer's Assessment Report (DAR). Remediation of the entire Imperial site may also be a "reasonably foreseeable" human activity. Past, present or reasonably foreseeable potential future project activity in the area could have cumulative impacts on boreal caribou.	mortality risk and health, significance determinations, etc.), as well as a list of assumptions. If the Proponent does not revise the cumulative effects assessment for boreal caribou, then provide a clear, scientifically defensible rationale as to why they are not.
ECCC-04	DAR Vol. 2: Sec. 10.4, 10.4.2.3.1.3 Sec. 10.5.3 Environmental Dynamics Inc. for K'alo-Stantec Limited (2024), Mackenzie Valley Highway Project: Inferring the Potential Barriers to Boreal Caribou Movement.	Probable Caribou Movement Corridors PDA Overlap with Existing Disturbed Areas Effects to Caribou Habitat Connectivity and Movement	The Developer's Assessment Report (DAR) discusses potential movement corridors (Section 10.4), as does a report entitled "Mackenzie Valley Highway Project: Inferring the Potential Barriers to Boreal Caribou Movement" (the report) that was provided for review on February 27, 2024, as part of the environmental assessment process (EA1213-02) to the Mackenzie Valley Environmental Impact Review Board (MVEIRB). The report notes there are locations where caribou have crossed and are more likely to cross the Mackenzie Valley Winter Road. The report (pg. iii) also states that the authors "… do not anticipate the highway to pose a barrier to caribou movement". However, probable movement corridors have not been expressly identified in either document.	ECCC requests the Proponent: 1. Clarify whether further analysis of boreal caribou movement is planned as part of the Project assessment. If so, then elaborate on whether the analysis will include identification and mapping of probable movement corridors for boreal caribou within the PDA and Local Assessment Area (LAA). If the Proponent is not planning to conduct further analysis on boreal caribou movement, then provide a clear, scientifically defensible rationale as to why this analysis is not needed. 2. Provide a map that illustrates the extent to which the PDA overlaps with existing

			The report highlights the impacts habitat disturbance has on caribou movements, including habitat avoidance and fragmentation. The Proponent states on page 10-51 of the DAR that "An indirect alteration of boreal caribou or moose habitat is expected through sensory disturbance caused by noise and dust deposition, edge effects on habitat, and fragmentation that can result in habitat avoidance and reduced habitat effectiveness in areas adjacent to the PDA… Edge effects and fragmentation may result from vegetation clearing activities, particularly where the PDA intersects forested habitats." The Proponent goes on to say that 47.8% of the Project Development Area (PDA) overlaps with previously disturbed areas, which have already created edge effects and fragmentation. The DAR does not provide a map indicating this overlap.	disturbed areas (as defined in the Federal Recovery Strategy). 3. Identify specific mitigation measures to address impacts to crossing accessibility and to reduce vehicle collisions. 4. Clarify what evidence is available to support the statement that the all-season road will not have a greater impact on movement and connectivity than the winter road.
ECCC-05	DAR Vol. 2: Sec.10.4.2.3.1.1: Environment Canada(2012), Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal population, in Canada, *Species at Risk Act* Recovery Strategy Series. https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_caribou_boreal_caribou_0912_e1.pdf	Loss of Biophysical Attributes – Caribou Habitat	The Proponent states that the Project Development Area (PDA) will result in direct general habitat loss of 2,315.2 ha, and of that, 94.3 ha are considered selected boreal caribou habitat, and indirect selected habitat disturbance of 1,466 ha. The Proponent has estimated the total combined caribou habitat loss as 1,560.0 ha (94.3 ha direct and 1,466 ha indirect loss). The Federal Recovery Strategy (pg. 38) describes biophysical attributes as "… the habitat characteristics required by Boreal Caribou to carry out life processes necessary for survival and recovery." Biophysical attributes are also described as a major component of critical habitat in the NT1 range, therefore it is important to understand the types and amounts of biophysical attributes lost as a result of the proposed Project. The Proponent uses the term 'general' and 'selected' habitat but does not provide a definition of these terms.	ECCC requests the Proponent: 1. Define 'general' and 'selected' habitat. Discuss how the definition aligns with the Federal Recovery Strategy (Section 3.3, Glossary, and Table H-1). 2. Clarify what type of biophysical attributes are present within the 2,315.2 ha that will be lost. 3. Discuss the unique nature of biophysical attributes present in the 94.3 ha that is anticipated to be lost. 4. Clarify what type of biophysical attributes are present within the 1,466 ha that is anticipated to be disturbed. 5. Provide a map in order to illustrate where biophysical attributes are anticipated to be lost along the proposed Project.

ECCC-06	DAR Vol. 2: Sec. 10.5, Sec. 10.5.2.3.1.1: ECCC (2024), Report on the Progress of the Recovery Strategy Implementation (Period 2017 - 2022) and the Action Plan Implementation (Period 2018 - 2023) for Caribou (Rangifer tarandus), Boreal Population, in Canada. *Species at Risk Act* Recovery Strategy Report Series. https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/report-progress-recovery-document/caribou-rangifer-tarandus-boreal-report-progress-recovery-strategy-2017-2022-action-plan-2018-2023.html#toc13	Ground-Truthing of Disturbed and Undisturbed Caribou Habitat in NT1 Range	The proposed project overlaps the Northwest Territories Range (NT1) as described in Environment and Climate Change Canada's "Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada" posted on the Species at Risk Public Registry. The Federal Recovery Strategy identifies the amount of habitat disturbance within a boreal caribou range as a key factor determining whether a local population is likely to be self-sustaining over time. The recovery strategy specifies that each responsible jurisdiction manage the habitat disturbance within a range to achieve or maintain a self-sustaining local population through a range plan. The recovery strategy also indicates that maintaining connectivity of boreal caribou habitat between and within ranges is essential for boreal caribou persistence on the landscape. Several of the potential impacts of the proposed Project have been identified as threats to boreal caribou, as described in the amended (2020) Federal Recovery Strategy. On page 37 of the recovery strategy, it states that, "In ranges with undisturbed habitat equal to or above the threshold, critical habitat is at least 65% undisturbed habitat in a range". At this time, and until the publication of all five finalized regional range plans identifying where that minimum 65% undisturbed habitat is protected, the guiding principle from the recovery strategy is that all undisturbed habitat should be considered critical habitat (habitat necessary for the survival and recovery of the species). In the Developer's Assessment Report (DAR), Table 10.18 shows existing disturbance and Project contribution in NT1 Boreal Caribou Range, affected range planning regions (Sahtu and southern NWT) and the Caribou and Moose LAA.	ECCC requests the Proponent: 1. Calculate and provide the (1) affected area (in ha) of undisturbed habitat, and (2) affected area of existing habitat, using the following standardized equations as derived from the Federal Recovery Strategy: i. (1) Effects on undisturbed habitat = (proposed Project footprint + 500 m buffer) - overlapping area(s) already considered disturbed habitat (see Recovery Strategy Glossary for definition) ii. (2) Effects on existing habitat = (proposed Project footprint + 500 m buffer) - overlapping (permanent alterations(s) + 500 m buffer). 2. Provide maps in order to outline the features calculated in above request in a). 3. Describe the level of confidence in the data used to develop conclusions on the effects to boreal caribou individuals and critical habitat. 4. Clarify whether changes to landcover as a result of the 2023 forest fires are reflected in Table 10.18. If the values do not account for this change to the landcover, then explain and provide a rationale for why this information is not relevant when assessing impacts to caribou critical habitat.

			Table 10.18 presents the amount of disturbed habitat in the entire NT1 range assessed as 27.95% (or ~72% undisturbed total). This is inconsistent with the amended Federal Recovery Strategy (2020) and the Report on the Progress of the Recovery Strategy Implementation (2024), which indicates that NT1 is 35% disturbed (25% being fire and 9% being anthropogenic) with 65% of the range undisturbed habitat. These values were updated in the 2024 Federal Recovery Strategy Progress Report to 30% disturbed (22% fire, 10% anthropogenic). The Proponent states that the disturbance-based approach used to calculate boreal caribou habitat disturbance is based on data from fires </= 40 years old (1982-2021) and anthropogenic disturbances (circa 2015, Table 10.18) plus a 500 m buffer. While the calculation is consistent with the recovery strategy, ECCC notes that the human disturbance layer is dated 2015 and likely does not represent the current on the ground human disturbance. Additional information is required in order to validate the Proponent's effects assessment.	5. Clarify the date of "Human disturbance" Geographic Information System (GIS) data-layer used. If data used is circa 2015 (or earlier), then provide rationale to the use of this data, including how it reflects current land use. 6. Clarify whether the data used to conduct the Proponent's effects assessment (including human disturbance, fire, and landcover data) have been, or will be, ground-truthed and provide rationale for this decision. 7. Provide a revised estimate of human disturbance based on current best available data. 8. Revise Table 10.18, as appropriate, taking into consideration the revised estimate of human disturbance based on current best available data from request g). 9. Provide the same calculations outlined in point a) for the NWT range planning regions of the Sahtu and Southern NWT.
ECCC-07	DAR Vol. 2: Sec. 10, 10.2, 10.7 Fig. 10.1, Fig.10.2:	Project-Specific Baseline Information Studies Caribou Current Use of Habitat/Biophysical Attributes	The Developer's Assessment Report (DAR) indicates that the assessment of effects on caribou is based on existing habitat information which has been collected over a variety of years, areas and scales, and no additional Project-specific baseline information studies were conducted to validate that the available data is representative of current conditions on-the-ground. Collar data provided in the DAR spans a wide range of years and, along with land cover type, has been used to develop Technical Data Report – Caribou and Moose Figure 3.2,	ECCC requests the Proponent provide: 1. further justification as to how the existing habitat information is adequate without the need for additional Project-specific baseline data for caribou; 2. the seasonal and all-year habitat RSF study (ENR, 2020a; unpublished) for review; and 3. mapping of land cover type that illustrates and identifies biophysical attributes of boreal caribou habitat

			"Predicted All-Year Habitat Selection by Boreal Caribou" model and map. The Predicted All-Year Habitat Selection Map captures data from 2003-2023. The Proponent has not conducted baseline studies to validate whether the habitat and movement data used to create this map represent current conditions. Clarity on the current use of habitat/biophysical attributes is needed to understand how caribou are currently using the Local Assessment Area (LAA). Maps which show the land cover type could help reviewers better visualize current land use. Further, the Resource Selection Function (RSF) model referenced in the DAR is used as the basis for habitat loss calculations; the RSF study (ENR, 2020a), is unavailable for review, and if provided could shed some light on how the Proponent has made the reported calculations.	
ECCC-08	Email sent to Proponent March 13, 2022 by ECCC-CWS; RE: MVH proposed 2022 bird study scope – (Methodology behind developer's proposed 2022 field survey with ARUs) DAR Vol. 3: Sec. 20.0 DAR Vol. 3: App. 20C DAR Vol. 3: App. 20A	Methodology Behind Proponent's 2022 Avian Survey Work	ECCC-Canadian Wildlife Service (CWS) was engaged by the Proponent to provide feedback on their draft 2022 Bird Study Scope and Approach document, which was meant to better assess the potential effects of the proposed Project on migratory birds and avian Species at Risk, and propose methods to fill gaps in existing data. This document led to the creation of Appendix 20C in the Developer's Assessment Report (DAR) – the 2022 Avian Survey Report, which subsequently informed Appendix 20A – the Bird and Bird Habitat Technical Data Report. The above two reports inform the Proponent's overall assessment of potential effects on birds (Section 20 of the DAR). ECCC provided a response letter via email on March 13, 2022 (attached .pdf) stating that ECCC-CWS could not fully support the Proponent's proposed 2022 scope of work. ECCC-CWS had differing views on the adequacy of the approach proposed in the Proponent's draft document. The topics touched on were a) Predictive modelling and the use of Boreal Avian Monitoring Project models; b) Guidance on the number of sample sites per land cover class; c) Standardized point count data to account for imperfect	ECCC requests the Proponent: 1. Provide detail on how the ECCC advice provided on the bird study design was incorporated into the 2022 Bird Study (Appendix 20C), including any deviations from the advice. The following topics should be covered: • Predictive modelling and the use of Boreal Avian Monitoring Project models; • Guidance on the number of sample sites per land cover class; • Standardized point count data to account for imperfect detection; • Use of bird song recognizers; and • Data sharing. 2. Provide a summary that outlines how baseline data was used to inform mitigation measures and adaptive management. Comment on the overall adequacy of the data used to develop a baseline for the Project and inform subsequent predictions on the potential effects to migratory birds

			detection; d) Use of bird song recognizers; and e) Data sharing. No further correspondence on this topic was received from the Proponent after ECCC-CWS advice was offered. ECCC-CWS notes that the Proponent has completed surveys in 2022 using Autonomous Recording Units (ARUs). It is unclear how ECCC-CWS advice was used.	in the DAR. Include the level of confidence in this data, and how representative it is of baseline conditions in the Project Development Area, Local Study Area, and Regional Study Area. Note whether there are still gaps in knowledge. 3. Comment on whether existing data was used to conduct a power analysis in order to inform sample size requirements per strata (land-cover class), and whether that analysis was then acted upon to determine sampling size and draw more accurate conclusions on the significance of impacts to migratory birds. If the power analysis was not conducted, then provide rationale for why the analysis was not completed
ECCC-09	DAR Vol. 3: Sec. 20.0, App. 20A:	Data on Migratory Birds and the Reliance on Modelling and ARUs for the Majority of Data	Autonomous Recording Units (ARUs) are useful tools for making inferences about densities of territorial singing birds (i.e. most landbirds), but are less effective to identify abundance of semi-colonial birds (e.g. waterfowl) and quieter birds (e.g. shorebirds, which use sound differently than landbirds). The Proponent draws conclusions on the potential effects of this Project on all migratory birds based mainly on the following data sources: - BAM (Boreal Avian Modelling project; largely derived from data collected in southern Canada), - eBird model predictions (largely derived from data collected in southern Canada), - 2004 and 2006 ECCC- Canadian Wildlife Service (CWS) point-count surveys (Wrigley, Norman Wells and north of Tulita collection sites), - 2017 ECCC-CWS ARU data (collection sites along winter road between Wrigley and north of Tulita), and	ECCC requests the Proponent: 1. Provide the rationale for reliance on ARU data and desktop modelling (BAM, eBird) for the Developers Assessment Report's (DAR) conclusions on migratory birds, particularly on how the use of southern population data can or cannot be used to derive conclusions for northern populations. 2. Provide a discussion on how impacts to non-landbird species (such as waterfowl and shorebirds) are considered, given the known limitations of ARU data. 3. Comment on the limitations of the data used and the conclusions drawn from it. Explain the implications to non-landbird species groups that do not have recent human observer surveys of bird abundance (point counts, aerial survey, area-based or transect ground searches, etc.). Provide specific information on waterfowl and

			- 2022 Proponent ARU data collected specifically for this Project (collection sites along winter road between Wrigley and north of Tulita). The proposed Project's study area has limited, or no data presented for waterfowl and shorebirds.	shorebirds, including populations and seasonal densities, and describe potential Project effects to these migratory birds and how these effects will be mitigated.
ECCC-10	DAR Vol 3: Sec. 20. Table 20.1 Wolfe JD, Alexander JD, Stephens JL, Ralph CJ. A novel approach to understanding bird communities using informed diversity estimates at local and regional scales in northern California and southern Oregon. Ecol Evol. 2019; 9: 4431–4442.	Disturbance to Migratory Birds During Other Key Life Periods – Arctic Breeding Migrants; Climate Change Considerations	In most of Canada, migratory bird diversity and abundance are highest during the local breeding season, and the disturbance or destruction of this breeding habitat can significantly affect populations. However, disturbing migratory birds while they are molting, migrating, or overwintering can also affect populations (Wolfe et al. 2019), and project impact assessments need to identify any relevant risks and potential population implications for those species. Project proponents must consider their proposed projects' potential impacts on distribution and abundance of migratory birds beyond the local nesting period, particularly for arctic-breeding migrants. The Mackenzie Valley is a significant migration corridor for arctic-nesting migratory birds. Both northbound (spring) and southbound (fall) migrants use a similar corridor to the proposed Project's routing. The habitats they use within the Regional Study Area (RSA) may be very important to their survival and reproduction. Other groups, including the Norman Wells Renewable Resources Council (NWRRC) have noted concern with changing bird migration patterns/directions and less frequent appearance of some species (Table 20.1) which may suggest change and uncertainty in migration movements and patterns. These changes could be due to any number of factors including the effects of climate change, the effects of which most scientists acknowledge are amplified in northern Canada. The Proponent has not provided adequate spring and fall migrant bird surveys, especially survey methods that capture species not easily detected by Autonomous	ECCC requests the Proponent: 1. Describe how the assessment will account for and assess effects to avian species present in and/or potentially using habitats within the RSA during spring and fall migration. 2. Include a specific section focused on arctic-breeding species (including waterfowl and shorebirds). This section should explain when and how spring and fall migrant studies will be conducted and/or a description of how this information will be incorporated into the assessment of effects, and the identification of mitigation measures. If ARU data or desktop modelling are being considered to supplement data, explain how the effects to species not easily detected by ARUs will be assessed. 3. Describe how the effects of climate change were/will be incorporated into the analysis of effects to migratory bird species.

			Recording Units (ARU).	
ECCC-11	DAR Vol. 3: Sec. 20.0, Table 20.5	Waterfowl and Data Limitations, Collar Data, Increased Human Access	The Proponent notes that migrating waterbirds/waterfowl are "highly mobile and adjust their daily distribution relative to sensory disturbance" (Section 20.4.2.3.2.1). The Developer's Assessment Report (DAR) also notes that Indigenous groups have heightened concern about effects to many specific species of waterfowl (Section 20.2.2.1; Table 20.5). Given the limited ability of Autonomous Recording Units (ARUs) to estimate the density and abundance of species like waterfowl, limited data in the area and changing climate, ECCC notes that further fieldwork and data collection on waterfowl abundance may be warranted to more reliably identify and manage effects from the Project and determine appropriate mitigation methods. The proposed highway routing is near riparian habitat and many wetlands. ECCC also notes there are two key Important Bird Areas (IBAs) along the Mackenzie River used for foraging and migratory stopover: Bracket Lake IBA and the Middle Mackenzie River IBA. ECCC has collared waterfowl and existing data on migratory bird use in these particular areas. Disturbance from construction and operation of the highway may affect the suitable migratory stopover sites in the area for waterfowl. It may also make these species more accessible to human harvesters and predatory wildlife species. During a February 14th, 2024, meeting with the Proponent, ECCC-Canadian Wildlife Service (CWS) offered to increase the frequency of data collection on Global Positioning System (GPS) collared snow geese (or similar) in the Mackenzie Valley area. This could potentially provide higher	ECCC requests the Proponent: 1. Provide justification for why the Proponent may or may not be considering a follow up meeting with ECCC-CWS to discuss to waterfowl GPS collar data collection and further migratory bird surveys. If action is being considered, then detail potential plans (which seasons, number of individuals, etc.) and elaborate on how this will help address data gaps. 2. Further describe how human access to nesting or staging areas will be incorporated into analysis of effects to migratory bird species, including changes in harvest pressure on migrant bird species, specifically waterfowl.

			resolution data on migratory species in these areas, to better increase the confidence of prediction of effects on such species. However, there is a limited time-window in which to do these adjustments every spring. ECCC welcomes follow up to the February 14th meeting should the Proponent consider: - approaching ECCC-CWS staff to request collaboration and sharing of collar data of waterfowl in the area, and consider the increase in frequency of GPS collar data collection; and - further surveys of additional migratory birds that frequent the proposed Regional Assessment Area (RAA) to better understand waterfowl diversity and abundance. This data could be used by the Proponent for adaptive management to better mitigate Project effects on waterfowl.	
ECCC-12	DAR Vol. 3: Sec. 20.0: Sec. 20.2.1:	Accounting for Interannual Variation in Migratory Bird Surveys	The GNWT supplemental avian survey work completed in 2022 compiled one year of breeding-season data. The collection of one year of baseline data is not sufficient to reflect natural variation in species abundance/use of habitat. ECCC recommends bird surveys over a period of at least two consecutive breeding seasons to account for interannual variation.	ECCC requests the Proponent: 1. Discuss whether they are planning to conduct additional survey work for migratory birds to supplement the 2022 bird surveys. 2. Provide the survey methods/plans to conduct this survey work in order to account for interannual variation. 3. Provide a comprehensive justification if further migratory bird data will not be gathered, and how the current data will account for annual variation. Please include any assumptions or extrapolations that could be considered by reviewers if the collection of two additional years of survey data is not feasible
ECCC-13	DAR Vol. 3: Sec. 20.0, Sec.20.2.2.1	Consideration of Impacts to Important Bird Areas (IBAs)	ECCC notes that within the Regional Assessment Area for the Project there are two key migratory bird areas identified as important for foraging and migratory stopover: Bracket Lake IBA and the Middle Mackenzie River Islands IBA.	ECCC requests the Proponent provide further details on how impacts to the IBAs were considered, including effects from the Project on migratory birds and their use of these areas, and list specific mitigations relevant to them.

ECCC-14	DAR Vol. 3: Sec. 20.0, 20.4.1.1, Table 20.10	Derivation of Land Cover Classes in the Developer's Assessment Report (DAR): Accuracy and Age of data	It appears that land cover classes were derived via a desktop review of geospatial data from 2013 & 2017. Details on the origins of the data used to create these classes were not clearly described in the DAR. Landsat satellite imagery used to derive the geospatial data appears to have been derived from 2007-2013 data, as noted in Section 20.4.1.1 of the DAR: "Land cover classes were quantified using EOSD NWT geospatial data (NRCan and GNWT, 2017). This dataset is part of the Multi-source Vegetation Inventory Project (NRCan, 2020) and uses an unsupervised classification and cluster analysis to classify land cover. The dataset includes cover type and density classes and forest structure height and volume information based on Landsat imagery collected from 2007 to 2013. Mapping was done at a scale of 1:250,000 and was refined through field evaluation by the GNWT (NRCan and GNWT, 2017). Detailed land cover classification methods for this Project are in the Vegetation and Wetlands TDR (K'alo-Stantec, 2022b; Appendix 18A)." There is an absence of information on recent field verification/validation of land cover classification. Ground-truthing allows for the verification and incorporation of actual conditions on the ground, which may differ significantly from what is observed via Geographic Information System (GIS) data collected one-and-a-half decades earlier. A 2013/2017 dataset (derived from this ~15-year-old data) appears to have been used to inform the spatial modelling for migratory bird species and their potential habitat. For migratory birds, the time of year when imagery is collected to create habitat classifications (typically August/September) often doesn't match the critical breeding time of year the migratory birds when they make decisions based on water or vegetation availability (typically April-June). Furthermore, habitat classifications in the North	ECCC requests the Proponent: 1. Clarify the age of the data-sources used to derive land cover classes. Confirm whether or not the data originates in whole or in part from the 2007-2013 dataset. • Describe the confidence in the accuracy of the landcover classifications, taking into account its age. • Provide an analysis on how the time gap (from year dataset was collected to anticipated year of construction) accurately considered potential change in species demographics, accelerated effects of climate change, and recent (e.g. 2014, 2023) forest fires. 2. Given the data is not current and likely does not represent the current state of land cover classes, collect current field data and/or verify the accuracy of the data-sources used in the field. If current data will not be collected, then discuss the uncertainty around the effects predictions, mitigation measures and follow-up monitoring/adaptive management. 3. Provide justification on the appropriateness of, applicability to and

			are often skewed towards large mammals, or forestry (tree) type, and may not have the class breakdowns appropriate for assessing value to migratory birds. The Northwest Territories fire-season in 2023 caused significant changes to the landscape and may have had effects on available land cover types in the Project area. If geospatial data/land cover classifications are inaccurate, there may be over/underestimation of effects to migratory bird species.	validity of the land cover classes for migratory birds. • Explain how the land cover classes used are biologically appropriate for migratory birds. • Clarify the date(s) when the imagery was taken to derive the land cover classes. 4. Use updated/current satellite/GIS data to classify habitat in order to reflect the above noted concerns. If up to date information will not be used, then explain how the above concerns are addressed with the information presented in the DAR. 5. Update the land cover classes to reflect the changes to the landscape due to the 2023 wildfires. If the land cover classification will not be updated, then provide a discussion on the strength of the assessment in the absence of this information, and how accurately it can identify effects and mitigation measures.
ECCC-15	DAR Vol. 3: App. 20A, Sec. 3.2.2, App. 20C	Clarity and Error Correction for Bird Groupings	The developer uses a variety of terms to group bird species in the Developer's Assessment Report (DAR). These terms and how species are grouped into them are used inconsistently and often incorrectly. For example (not an exhaustive list): • Section 3.2.2. of Appendix 20A (Birds and Bird Habitat Technical Data Report) incorrectly lists terns as a type of shorebird	ECCC requests the Proponent clearly define terms used to describe bird groupings for clarity and consistency, using biologically understood and standardized nomenclature (e.g. landbirds, waterfowl, waterbirds, shorebirds). Avoid double-grouping species or using terms twice that could have different meanings (e.g. using waterbirds as a large group, then true waterbirds as the order).

			• Appendix 20C (2022 Avian Survey Report), Appendix B, Table B.4 incorrectly lists gulls and jaegers as shorebirds (page B.8-B.9) • Appendix 20C (2022 Avian Survey Report), Appendix B, Table B.4 duplicates the use of certain names for grouping birds: waterbirds is used as a Group for many species on Table B.4, and also referred to waterbirds as an Order on the same table. • Appendix 20C (2022 Avian Survey Report), Appendix B, Table B.5 also lists waterbirds such as bitterns, coots and cranes as shorebirds. The inconsistent and incorrect classifications may cause confusion amongst parties reviewing the Project for its potential effects during the environmental assessment..	Update all applicable sections of the DAR (including appendices) to ensure that these terms are used consistently.
ECCC-16	DAR Vol. 2, Sec. 3.2.2.6 Vol. 3: App. Vol. 3: App. 20B Guidelines to avoid harm to migratory birds - Canada.ca https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/reduce-risk-migratory-birds.html#toc5	Inconsistencies in Appropriate Setbacks for Lesser Yellowlegs, Other Species	ECCC acknowledges the use of Lesser Yellowlegs as a species of focus for the Proponent, given that they are generally known as an umbrella species with behaviour and habitat use that encompasses many other boreal shorebirds. In Appendix 20A: Birds and Bird Habitat Technical Data Report, the nest setback distance for development activities proposed is stated to be 100 m for general development, and 50 m from pedestrian or All-Terrain Vehicle (ATV) activities. In Appendix 20B: Recommended Activity Restriction Guidelines for Sensitive Bird Species, the Proponent lists the nest setback distance of 300 m for Lesser Yellowlegs. Setback distances should be adjusted to the activities causing the greater amounts of disturbance, and reflect the degree of tolerance of the species.	ECCC requests the Proponent: 1. Provide a biologically relevant justification for the use of the setback distance(s) proposed in Appendix 20A/B. Include a scientifically defensible rationale that incorporates application of the setback distance(s) based on activity disturbance levels. 2. Ensure any inconsistencies regarding setbacks in the DAR (namely in the above noted appendices 20A and 20B) are resolved/corrected and transferred/applied to any management plans (such as the Draft Wildlife Management and Monitoring Plan [WMMP]) appropriately.
ECCC-17	DAR Vol. 5, Sec. 7, P.17, Sec.1.6	Emergency Response Plan Training Regimen's Periodicity	The Proponent mentions staff training on various aspects of the Management Plans, as outlined in the Draft Emergency Response Plan Framework and Draft Spill Contingency Plan. However, the Proponent does not address the frequency of these training sessions. Establishing an appropriate training schedule is crucial to ensure that staff are consistently	ECCC requests the Proponent establish a training regimen with defined periodicity.

			updated on any revisions to these plans and remain well-informed about the appropriate response measures in the event of an accident or malfunction. Considering the construction timeline that extends far into the future, considerations for frequency of the training regimen in-place will help reduce the probability and environmental impact of spills.	
ECCC-18	Response to DAR Review Comment ECCC-4	Land Use Change	ECCC has determined that the Proponent has used a Tier 1 approach to estimate the emissions from land-use changes. Though the Proponent stated they are using a Tier 2 approach, the biomass default values from Intergovernmental Panel on Climate Change (IPCC) documentation used is considered Tier 1. Based on the size of the land being impacted and the carbon sensitivity of the land, a minimum Tier 2 approach should be used and specific regional values for the biomass and land characteristics should be incorporated. In addition, the wetland soil organic carbon (SOC) values used in Table 22.3 appear low for the land type.	ECCC requests the Proponent: 1. Use a minimum a Tier 2 approach to estimate emissions from land-use changes as per the Federal Strategic Assessment of Climate Change (SACC) and the Technical Guide, and incorporate specific regional values for the biomass and land characteristics. 2. Review the wetland SOC value used in Table 22.3, and provide either an updated value or justification for the value used.
ECCC-19	Response to DAR Review Comment ECCC-5	Carbon Sinks	The methodology used for the calculation of the carbon sinks is missing information and details, and there are some inconsistencies with the carbon sink emission factor used. It is not clear how the carbon sinks emission factor was determined from the source listed (Kurz et al. 2013). The carbon accumulation rate for only forested areas was provided (non-forested ecosystems have not been included in the calculations), however the carbon accumulation for the wetland areas should also be considered. As per the Strategic Assessment of Climate Change (SACC), the carbon sinks evaluation should not be included in the calculation of net GHG emissions (only land-use change should be included in net GHG emissions, carbon sinks are considered separately). Due to the size of the Project area, site-specific or region-specific values should be used for the carbon sinks calculations.	ECCC requests that the Proponent update the carbon sink assessment and provide: • reference to the draft Technical Guide Related to the SACC: Guidance on quantification of net GHG emissions, impact on carbon sinks, mitigation measures, net-zero plan and upstream GHG assessment, section 4 for calculation methods for carbon sinks. • forest age and class when calculating the carbon sink potential of the forest that overlaps with the Project footprint. • more site-specific land and vegetation data as per the SACC and the Technical Guide, by incorporating specific site or regional values (through a literature review or field measurements).

				regional values (through a literature review or field measurements). • an outline of how the carbon sink emission factor was determined from the source provided. The carbon sink emission factor should be phrased in terms of carbon (C), not units of gas or CO2e, and on a per-year basis. • application of carbon sink rates for other land-use change classes (such as wetlands) for non-forested areas. • the method(s) used in the Technical Guide, where the carbon sink rate should be multiplied by the default of 100 years. • calculation of the natural carbon sink capacity of the Project footprint, and the sum of this lost carbon sink capacity (measured as carbon emissions or removals) for each type of land, not only forested areas. Include the method(s) used, land and vegetation data, and all assumptions made for both construction and operations.
ECCC-20	DAR Vol. 3, Sec. 16, Sec. 16.5.2.3, App. 16A: Sec.3.2.3 Response to DAR Review Comment ECCC-16	Collecting Baseline Data for Water and Sediment Quality	There is a shortage of data necessary to establish existing conditions of water and sediment quality. The Proponent argues that it is not necessary to collect additional baseline data because: they could not model effects on the aquatic environment from a non-point source such as the highway, they are proposing the use of mitigation measures that are well known to be effective, and water quality monitoring for turbidity would occur during construction activities. The Developer's Assessment Report (DAR) states "Project-related effect pathways relevant to surface water and sediment quality are directly associated with the development of the Project and will not persist into operation."	ECCC requests the Proponent: 1. Describe how they will collect baseline water and sediment quality data at water crossings in sensitive areas and areas of cultural importance. 2. Consider including Canadian Aquatic Biomonitoring Network water quality data available for sites in the area in their baseline data.

			ECCC does not agree with this conclusion because effects to the aquatic environment next to the road might occur beyond the construction period, including: • from dust lifted by highway traffic, • increased runoff from the road, and; • dust suppressants like calcium chloride. While it is unfeasible to sample and make measurements of every creek along the highway alignment, it would be relevant to characterize baseline water and sediment quality at water crossings in sensitive areas (such as near wetlands) and those that are of cultural importance. This data will be necessary to confirm if mitigation measures are effectively preventing impacts to the aquatic environment. Water quality data available for sites in the region from the Canadian Aquatic Biomonitoring Network were not included in the list of water quality data sources discussed in Technical Data Report Surface Water and Sediment Quality. Given the paucity of data on water quality presented as baseline data, this data source should be considered unless there are factors which render it unusable.	
ECCC-21	DAR, Appendix 16A Sec. 3.2.3.1, Vol. 3, Sec. 16, Sub-s. 16.5.4	Surface Water Contamination at Material Sources	The Surface Water and Sediment Quality Technical Data Report includes the statement “the potential for existing and future material sources to influence surface water quality in the [Regional Study Area] RSA is not well understood.” Despite this poor comprehension, the Developer’s Assessment Report (DAR) concludes “Cumulative effects on surface water and sediment quality are characterized as ‘neutral’ in direction and low magnitude.” It is not clear how this conclusion was reached. There is potential for material sources to impact the aquatic environment, including through increased sedimentation and leaching of nitrogen compounds from blast residue. It is necessary to understand influences of material sources to surface water quality to evaluate effectiveness of proposed	ECCC requests the Proponent: 1. Describe which aspects the potential for material sources to impact surface water are not well understood, and what is proposed to reduce the uncertainty in this area. 2. Justify how the conclusion of neutral and low magnitude cumulative effects was reached, given the uncertainty.

			mitigation measures. This must be done before it is possible to assess residual and cumulative effects.	
ECCC-22	DAR Vol. 3 Section 16 Sub-s. 16.4.2.2.4 Response to DAR Review Comment ECCC-14	Mitigation of Nitrogen Loading Due to Use of Explosives	Both the Developer's Assessment Report (DAR) and Proponent responses propose a list of mitigation measures at quarries to reduce nitrogen compound loading from explosives residue in freshwater that includes: "To the extent possible, blasting activities will be completed during winter months to avoid freshet runoff." It is not clear how this mitigation measure would be effective, since residue would remain on the rock and snow during the winter until it was washed out with freshet. Spring runoff would then potentially have higher concentrations of nitrogen compounds which would have to be monitored and managed appropriately.	ECCC requests the Proponent explain how blasting in the winter months would reduce the extent to which residue rich in nitrogen compounds enters surface water during freshet.