Enclosure 1 – Comments on the Impact Statement for the Crawford Nickel Project (May 30, 2025)

The Impact Assessment Agency of Canada (IAAC) is conducting a technical review of the Impact Statement for the proposed Crawford Nickel Project (the project) to prepare conclusions to inform impact assessment decision-makers. IAAC received 33 submissions from federal and provincial authorities, Indigenous communities, and the public, including over 300 technical comments from government reviewers. All comments received will inform IAAC's analysis of project effects in the Impact Assessment Report and are also available to Canada Nickel Company (the proponent) to inform ongoing project plans. The outstanding requirements identified below are built around the remaining key issues relevant to impact assessment decision-making as outlined in IAAC's letter to the proponent on December 19, 2024, where the proponent is best equipped to address the outstanding information. Consistent with previous comments on draft materials, the outstanding information is largely related to water diversions, changes to flow, feasible offsetting for loss of fish habitat, and the downstream extent of contaminants, needed to characterize residual effects within federal jurisdiction.

Comment ID	Topic and Link to *Impact Assessment Act* (IAA)	Reference to TISG and IS	Comment Description (Context and Rationale)	Required Information to Resolve Comment
Fish and Fish Habitat				
FFH-01	Topic Fish and Fish Habitat IAA 2(a)(i) Fish and Fish Habitat	TISG Section 8.8.2 IS Chapter 14 Chapter 15 Chapter 16 Appendix B.5 Appendix C.4 Appendix C.5	**<u>Fish habitat loss – changes in flows</u>** While the Impact Statement (IS) reported fish habitat loss from direct overprinting, there are outstanding requirements to understand fish habitat loss from changes to groundwater and surface water flows. IAAC requires enough information to characterize residual effects on fish habitat (such as magnitude, geographic extent and duration after mitigation), with consideration of the permitting process as a means to refine details. Downstream river flows were identified as a valued component of interest in the TISG and reiterated through discussions of key issues. The approach taken to assess the effects to fish and fish habitat as a result of changes in flow contains a substantial gap. Changes in the quantity and timing of surface water and groundwater affect whether fish can continue to carry out life history processes in affected areas, and therefore may constitute harmful alteration, disruption, or destruction of fish habitat. Chapter 17 of the IS uses three surface water models to predict changes in the timing and quantity of flow in the North Driftwood River, West Buskegau River, and Jocko Creek watersheds for the purposes of characterizing the pathway of effect titled "Alteration of stream flows". These models were used to predict increases and decreases in flow at the "model outlet" (the most downstream sub-watershed) for each watershed. The IS reported the frequency that a change (increase or decrease) in flow greater than 10% was predicted to occur at the model outlets, as per DFO guidance. However, there remains a large area of unassessed effects to fish habitat between the Project Area (PA) and the model outlets which is necessary to understand to determine the extent of adverse effects to fish and fish habitat. Chapter 7 indicates "it was assumed that predicted flow changes would not result in dewatering of watercourses in the Local Study Area (LSA) downstream of the PA. This assumption was made in the absence of hydraulic modelling in these watercourses." No rationale was given for excluding changes to flow in the LSA between the PA and the model outlets, and no discussion on the potential magnitude, extent, or duration of effects to fish and fish habitat or how they would be addressed was provided. Notably, changes in the timing and quantity of flow are provided on a sub-watershed basis for some watersheds at certain time periods (Appendix C.5), but these appear to have been provided to inform the water quality effects assessment only and do not provide the information necessary for IAAC to understand fish habitat loss. IAAC has the option to assume fish habitat will be lost throughout all downstream rivers, but this may over-estimate the effect and reduce any feasibility of off-setting.	The following steps should be taken after addressing outstanding information requirements in the groundwater and surface water sections of this table. 1) Provide a conservative estimate of fish habitat that is predicted to experience instantaneous changes in flow that exceed 10% at any point during the life of the project. Update the quantity of affected fish habitat reported in 17.4.2.3 and elsewhere. (Note: while not all of this habitat may need to be offset in permitting, a conservative evaluation of effects should be provided in the absence of a detailed assessment informed by field verification). 2) Provide a map showing fish habitat that is conservatively predicted to experience instantaneous changes in flow that exceed 10% at any point during the life of the project. 3) Provide an analysis on how changes in flow may affect fish and fish habitat, ensuring the linkage with life history processes of fish that inhabit the affected areas. Include variability of changes in flow in the analysis of effects (i.e.: increases and decreases in flow in the same habitat during different project phases). Ensure that the

			The IS defined a project-caused low flow threshold that would cause effects on fish and fish habitat as well as a project-caused high flow threshold. Although these thresholds may be useful as discussion points to help readers understand extremes, there are substantive effects that could prevent fish from carrying out life history processes, either directly or through changes in habitat, in between the 10% threshold defined by DFO, and the high and low thresholds defined in the IS. Groundwater contributes to the overall volume of water available for fish to carry out life history processes at all times of year, and it also may contribute specific habitat refuges that are important for fish. For example, groundwater contribution may regulate the temperature and oxygen levels during certain times of year, and may be sought out by fish as a means to remain within their tolerable limits of temperature and oxygen concentration. The IS included a groundwater model, but it is not clear how and where groundwater contributions to surface water and fish habitat may change as a result of the project. Finally, substantial habitat baseline gaps were noted downstream of the PA (such as minimal fish community and habitat sampling to validate the desktop information provided, and no characterization of baseline sediment transport). While these gaps will need to be filled to support permitting, they should also be taken into account in providing conservative estimates for the impact assessment.	analysis is linked to existing baseline data and current understanding of fish distribution in the PA and LSA. 4) Provide a qualitative assessment of whether habitat refuges are likely to be important for local fish species, and if so, to what degree those areas may be affected. 5) For all of the above, ensure that uncertainty in groundwater and surface water models (GW-01(a-e), SW Quan-01(a-d), SW Quan(a-b)) is carried through conservatively in estimates of potential impacts to fish and fish habitat. If adaptive water management measures are plausible to ensure changes to water quantity are controlled within agreeable limits to sustain fish habitat, outline those measures at a conceptual level. If they are also expected to be incorporated into permitting regimes, describe how.
FFH-02	Topic Fish and Fish Habitat IAA 2(a)(i) Fish and Fish Habitat	TISG Section 8.8.3 IS Chapter 14 – Section 14.4.2.3.4 Appendix M Appendix C.4 – Section 6.4	**<u>Fish habitat – diversion channel feasibility</u>** The IS did not provide sufficient information to determine the geotechnical feasibility of the North Driftwood Diversion Channel as an offset for fish habitat and location of effluent discharge. Conceptually, it is possible that the North Driftwood Diversion Channel can be designed to incorporate fish habitat features sufficient to count towards fish habitat offsetting. However, there are substantial uncertainties and risks associated with the construction of a 7.5 kilometer long diversion channel that were not discussed in the IS. Many of these were highlighted in a meeting with DFO on June 10, 2024. Additionally, Appendix C.4 shows that the predicted groundwater discharge rate in the North Driftwood River after decommissioning will be a 66% decrease from baseline while other surface water bodies return to baseline, but it is not clear why this is or whether this is for the natural river or the diversion. Areas of uncertainty regarding the diversion channel include: • the geotechnical feasibility, including effects of changes in groundwater discharge to surface water (throughout the life of the project); • basing a detailed design on modelled (rather than measured) flow and sediment transport (a hydrological model has been generated, but has not been applied to allow an understanding of the challenges in the diversion channel design – for example, it's uncertain whether the channel will contain an appropriate flow throughout each year and throughout the life of the project (see GW-01(a-e), SW Quan-01(a-d), SW Quan(a-b)); • time-lag associated with the construction, stabilization, and functioning of the diversion channel relative to the project and required water management timelines;	1) Provide an estimate of the habitat that is expected to be gained as a result of a North Driftwood Diversion Channel that incorporates natural design features. 2) Clarify whether predicted changes in the groundwater discharge rate are for the natural river or the diversion channel (e.g. throughout Appendix C.4). 3) Provide the analysis for the predicted groundwater discharge rate and how it may affect the feasibility of the diversion channel (throughout the life of the project). Explain why the North Driftwood River does not return to baseline ground water levels after decommissioning, while other surface water bodies do. 4) Provide an assessment of the technical feasibility and challenges of achieving natural channel design principles that incorporates the proposed diversion's topography, potentially exposed

			• water quality in the constructed channel from its planned use as a contact water discharge point source; and, • the degree to which natural channel design can be incorporated successfully. For fish and fish habitat, the two primary risks associated with this proposed diversion include: • unstable bed and banks leading to erosion and associated downstream impacts; and, • failure to establish natural channel design and fish habitat features as a consequence of site and water management constraints (e.g., geotechnical, flow regime, sediment transport, water quality). This information is required to determine the feasibility of the currently proposed project design and mitigation (offset) for the loss of fish habitat.	earthen materials, expected flow regime, identified challenges and other relevant factors, and proposed mitigation and any adaptive management measures.
FFH-03	Topic Fish and Fish Habitat IAA 2(a)(i) Fish and Fish Habitat	TISG Section 8.8.3 IS Appendix M	**Fish habitat offsetting** The IS's conceptual fish habitat offsetting plan does not provide sufficient information to understand its feasibility to offset the predicted loss of fish and fish habitat. This is compounded by the uncertainties in the predicted amount of fish habitat loss (FFH-01). IAAC requires enough information to characterize residual effects on fish and fish habitat (such as magnitude, geographic extent and duration after mitigation), with consideration of the permitting process as a means to refine details. Government reviewers have a general understanding of the species and habitat types that will be directly impacted by the project and therefore require offsetting. DFO advises that there are no biological barriers preventing the development of an offsetting plan, that is, there are no fish and fish habitat resources reported in the footprint of the project that are irreplaceable or that will jeopardize a species at risk. However, uncertainty about the ability to offset remains high, particularly in light of the geographic scale of project effects. Effects to fish and fish habitat have not been adequately predicted, and the proposed measures to offset for those losses are still highly conceptual and carry significant uncertainty. More information is needed to understand the scale of habitat loss and the ability for offsetting options to mitigate it. More certainty in the feasibility of the offsetting plan is needed to determine the extent of significance of adverse effects to fish and fish habitat.	1) Revise the predicted fish habitat loss by resolving deficiency FFH-01, with respect to habitat alteration from flow changes. 2) Revise the conceptual fish habitat offsetting measures listed in Table 5.1 of Appendix M of the IS to include an initial coarse assessment of anticipated quantitative gains for each measure. Compare the potential gains for each measure to the estimated fish habitat loss (including how out-of-kind comparisons were made). Include a discussion on the likelihood that the proposed measures will adequately offset predicted losses. 3) If additional assessment reveals high levels of uncertainty in the ability to achieve habitat gains from the construction of the North Driftwood Diversion Channel, provide alternative offsetting measures. Provide the information from #2 above for any alternative offsetting measures proposed.
Groundwater-Surface Water Interactions, where Changes May Affect Fish Habitat and Indigenous peoples				
GW-01	Topic Groundwater - Surface Water Interactions	TISG Section 8.6	**Groundwater model – general** There is substantial uncertainty in the groundwater model's ability to adequately assess the quantity of groundwater discharge to surface water. This limits the understanding of how much, and where, groundwater currently contributes to surface water flows, and how this may change throughout the life of the project (throughout pit dewatering and then pit filling). This creates uncertainty for related effects on fish and fish habitat and use by Indigenous peoples. Due to project size and pit depth, changes to groundwater and surface water interactions can be substantial, so this is a key issue that needs to be understood with confidence to support planning decisions.	Outstanding information requirements about groundwater-surface water interactions are outlined in the next 5 rows, with respect to: a. Baseflow calibration b. Inputs to surface water model c. Boundary conditions

				d. Hydrostratigraphic concepts e. Regional fault 1) If adaptive water management measures are plausible to ensure changes to groundwater-surface water interactions are controlled within suitable limits, outline those measures at a conceptual level. If they are also expected to be incorporated into permitting regimes, describe how.
GW-01a	Topic Groundwater - Surface Water Interactions IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources	TISG Section 8.6.1 Section 8.6.2 IS Appendix C.4 Appendix C.5	**<u>Groundwater model – baseflow calibration</u>** The project is located within a clay belt, which includes clay, sand and till, which all have different permeability. The local groundwater model has been shown to meet standard metrics of calibration for groundwater elevation (having used local and regional well measurements for calibration). This result provides some confidence in the ability of the model to forecast effects on groundwater <u>elevation</u> within a level of uncertainty that can be understood. To calibrate for baseflow, a regional average baseflow was calculated from surface water gauging stations outside of the clay belt and used to estimate baseflows for each local river. Simulated baseflows were compared to estimated baseflows. The model results were one order of magnitude lower than the regional calibration target, with slight variability between watersheds. As discussed in IAAC's August 2024 comments on the groundwater baseline report, the surficial geology of the watershed will affect the magnitude of groundwater-surface water interactions. The proponent's November 2024 response to these comments confirmed this concept, noting that the regional watersheds with the highest degree of low permeability materials have the lowest baseflow index (indicating that the surface water has a lower quantity of groundwater), and noting that there is baseflow index variation across the PA. While conceptually, local baseflow quantities (from within clay belt) can be expected to be lower than regional baseflow quantities (from outside of clay belt), it is not possible to quantitively assess the uncertainty of the local groundwater model, including how local variation may contribute to that uncertainty, using the regional stations alone. The sensitivity analysis addresses the response of the model to changes in the hydraulic conductivity of the surficial units, and streambed conductance, but the results do not help to quantify the uncertainty within the results without a comparison to local baseflow information. The groundwater model is not expected to precisely match observed baseflow values, given the limitations of the groundwater modelling; however, better data support for local baseflow variability is required to understand the degree of uncertainty within the groundwater model results. IAAC understands from the proponent's November 2024 response to IAAC's comments on the groundwater baseline report that some local flow monitoring results are available that can support a better understanding of local variability and uncertainty in the model predictions.	1) To support accurate interpretation of the existing groundwater model's outputs, evaluate the model's calibration using more representative local baseflow information. Use regional information only when it is justified by local analysis. Where existing observation periods of local stations are not sufficient for analysis, the shorter-term data should be compared to regional data both within and outside of the clay belt to determine the confidence in the model results. 2) Provide a comparison between observed and simulated baseflow quantities, and a discussion of the likely uncertainty in the groundwater model results. Note that this is not a requirement to revise or recalibrate the model using local baseflows for the impact assessment, but such an improvement may be required to support permitting.

			Confidence in how the groundwater model predicts baseflow is necessary to understand groundwater-surface water interactions, changes to surface water (flows, quantity, and quality), and associated effects to fish and fish habitat, and Indigenous peoples.	
GW-01b	Topic Groundwater - Surface Water Interactions IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources	TISG Section 8.6.1 Section 8.6.2 IS Appendix C.4 Appendix C.5	**<u>Groundwater model – input to surface water model</u>** To be confident in advice to decision-makers, IAAC must first be clear on how the IS conclusions were generated. Due to what may be inconsistent reporting, IAAC is not able to explain whether and how groundwater model outputs informed surface water model inputs, and therefore whether predictions are reasonable. These inconsistencies relate to both seepage discharge and total groundwater discharge to surface water. The values of modelled groundwater seepage for passive closure included in the surface water model (HEC-HMS model), outlined in Table B.1.4 of Appendix C.5 (the Surface Water Resource Assessment) of the IS, do not match the groundwater model output values for passive closure in Table 7.4 of Appendix C.4 (the Groundwater Assessment), creating uncertainty in how the groundwater model results were incorporated into surface water modelling. Additionally, it is not clear that the total groundwater discharge to each watershed from the groundwater model is carried forward into the surface water model. The groundwater results are discussed in Table 6.13 of Appendix C.5, but it appears that the baseflow values in the surface water model were set to a constant value based on an analysis of regional stations, which is higher than the groundwater model results, and does not appear to change during the project life. This approach would result in the model inappropriately diluting mine impacted seepage by introducing a larger quantity of groundwater seepage into the surface water model relative to the results of the groundwater model. Given the extent to which groundwater discharge is predicted to change for each surface water body throughout the life of the project (Tables 6.1 to 6.4 in Appendix C.4), it is reasonable that specific predictions be incorporated into the surface water model. For example, the West Buskegau River changes from receiving over 1000 m3/day from groundwater to losing 2000 m3/day to groundwater in Year 30. The approach currently taken introduces a high degree of uncertainty into the assessment of changes to surface water quantity and quality. Confidence in how groundwater model inputs are incorporated into the surface water model is necessary to understand groundwater-surface water interactions, changes to surface water (flows, quantity, and quality), and associated effects to fish and fish habitat and Indigenous peoples.	1) Provide an expanded description and rationale of the sources of seepage rates presented in Table B.1.4 of Appendix C.5, including any discrepancies between the seepage values reported in Appendix C.4 and Appendix C.5. Ensure that the seepage values from the groundwater model are carried forward to the surface water model. 2) Confirm if the predicted groundwater discharge to surface water features (Table 6.13 of Appendix C.5) was included in the surface water model under baseline and during all project phases. 3) If predicted groundwater discharge to surface water features (Table 6.13 of Appendix C.5) was not included, revise the surface water model to include any groundwater discharge to surface water, accounting for both the long-term watershed wide groundwater discharge (such as passive closure) and the short-term reductions in groundwater discharge (such as during pit dewatering) and provide the estimated changes to surface water quantity. Alternatively, quantify the uncertainty in the surface water model and provide information on what measures will be put in place to manage the uncertainty.
GW-01c	Topic Groundwater - Surface Water Interactions	TISG Section 8.6.1 IS Appendix C.4	**<u>Groundwater model – boundary conditions</u>** The IS does not provide sufficient rationale for the selection of boundary conditions in the numerical groundwater model. This creates a high degree of uncertainty in the assessment of changes to groundwater quantity and groundwater to surface water interactions. The lakes and rivers within the numerical groundwater model are assigned using boundary conditions that maintain the elevation of the surface water feature throughout the life of the project, regardless of any changes in rates of	1) Provide a more detailed rationale for fixing the elevation of all surface water features within the numerical model. The rationale must include: • Information on the water balance and catchment area of each water feature, to support the degree to

	IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources		groundwater discharge or recharge. In certain cases, this can result in the boundary condition acting as an infinite source of water and limit the extent of groundwater drawdown associated with pit dewatering. This inhibits IAAC from understanding the geographic extent of changes to surface water flows and levels due to groundwater drawdown, which is necessary to understand how habitats used by fish and species of importance to Indigenous peoples may be affected. For example, in reviewing groundwater discharge reported in Tables 6.2-6.6 of Appendix C.4: • Groundwater elevations around Jack Lake are forecasted to change by <1 m throughout all project phases, despite Jack Lake changing multiple times between a location of groundwater discharge and groundwater recharge. The boundary conditions for Sutherland Lake and Jack Lake appear to be in adjacent numerical cells. As these lakes differ in assigned elevation by 1 m, some of the changes in groundwater discharge may be numerical artifacts. It is not clear how much of this change in discharge may be related to the assignment of boundary conditions. • The unnamed lake west of the west stockpile (a headwater to the North Driftwood River) becomes a constant source of water in the numerical model during operations. This limits the extent of groundwater drawdown around this lake. • West Buskegau River's boundary approximation limits the eastern extent of groundwater drawdown from pit dewatering. • The rationale for the choice of boundary conditions in Appendix C.4 is limited and does not include any local scale data or conceptualization. This information is required to assess changes in surface water flows and levels which is then used to assess effects to fish habitat and Indigenous peoples.	which they are maintained by groundwater flow and to support the determination that that there is sufficient runoff to maintain water levels when the water feature becomes a source of groundwater recharge. • Information on the surficial geology associated with each surface water feature. For example, the degree to which a water feature is incised into the glaciolacustrine unit, or is in contact with glaciofluvial units, would improve certainty in the degree of connection between the groundwater and the surface water flow systems. • An assessment of the sensitivity of the model results, particularly the extent of groundwater drawdown, associated with the type of boundary condition assigned.
GW-01d	Topic Groundwater - Surface Water Interactions IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.6.1 IS Appendix B.5 Appendix C.4	**<u>Groundwater model – hydrostratigraphic concepts</u>** There is a high degree of uncertainty within the hydrostratigraphic conceptual model regarding the vertical gradients between ground surface and the subsurface geological units, across the study area. The following uncertainties have been identified in the conceptual groundwater models: • Section 5.7 of Appendix B.5 states that information from nested wells within the eastern portion of the open pit footprint shows downwards vertical gradients between the overburden and bedrock, indicating groundwater recharge. However, this section also states that many of the wells screened within the confined deep glaciofluvial aquifer have groundwater elevations above the ground surface, but sufficient detail has not been provided to determine where this occurs. This information does not form a sufficient conceptual model of groundwater recharge and discharge within the local study area. • Section 5.7 also states that surface water features within the local study area are sites of groundwater discharge. However, data has not been provided to support this conceptualization. Based on the results of the numerical model (Table 6.2), some surface water features are recharging the groundwater flow system (Zed Lake and Sutherland Lake). • It is unclear where groundwater elevations exceed ground surface within the confined aquifer on Figure A.11 of Appendix B.5, nor is it clear if the contours from the numerical model on Figure A.9 of Appendix C.4 represent the water table, or if vertical gradients were accounted for in this figure. These figures do not provide sufficient information to support the conceptual model.	1) Revise the conceptual model of groundwater flow to include vertical gradients, and information on areas of groundwater recharge and discharge, by providing: • A table with all groundwater elevations used in the numerical model calibration process that includes the screened hydrostratigraphic unit, and the ground surface elevation. • A plan view map highlighting areas of groundwater recharge and discharge. • A map showing any location of observed artesian conditions. • A detailed conceptualization of the extent of the confining glaciolacustrine unit, and the confined and unconfined portions

			• The baseline characterization and conceptual model contain little information on the thickness and extent of the glaciolacustrine unit within the Local Study Area, or the location and extent of the hydrostratigraphic units within the numerical model. Regional surficial geology mapping in Figure A.6 is not based on local data and is the only surficial mapping provided. The cross-sections, in Figure A.8, and A.9 are reported to be sourced from the geological model for the project (proponent's November 2024 response to Federal and Provincial comments on draft baseline conditions), but those are limited in spatial extent. The distribution of the modelled hydrostratigraphic units is not shown in either Appendix B.5, or Appendix C.4. This gap in the conceptual model results in a lack of certainty in the groundwater numerical model, which is then carried forward to create uncertainty in groundwater-surface water interactions. Understanding groundwater-surface water interactions is necessary to inform predicted changes to surface water (flows, quantity, and quality), and associated effects to fish and fish habitat and Indigenous peoples.	of the glaciofluvial unit, including maps and cross-sections. • Maps and cross-sections showing the distribution of the modelled hydrostratigraphic units. • Any additional groundwater information available (e.g. standpipe piezometer data) that identifies which surface water features interact with the groundwater flow system, and which ones may be more isolated from groundwater by the glaciolacustrine unit.
GW-01e	Topic Groundwater - Surface Water Interactions IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.6.1 Section 8.6.2 IS Appendix B.5 – Section 5.5 & Section 5.6 Appendix C.4 – Section 6.5 & Section 8	**<u>Groundwater model – regional fault</u>** Despite further testing planned (Section 8.1) there remains uncertainty in the characterization of the regional fault and its effect on groundwater flow. This compounds with the others to cause a high degree of uncertainty with groundwater-surface water interactions. The hydraulic testing straddled a short fault interval (6 metres) with a longer packer interval (60 metres), so that the test does not provide the properties of the fault. It is acknowledged that borehole logging indicates that the fault may contain gouge and some chlorite mineralization, supporting the assumption that the fault does not act purely as a conduit. A sensitivity analysis of the fault representation within the groundwater numerical model may help to increase certainty in the numerical model results. However, the current numerical software package does not permit this approach (Section 6.5). Should the regional fault act as a conduit, a barrier, or a combined barrier conduit, it likely influences groundwater flow (direction and quantity) and groundwater-surface water interactions. Understanding how the fault may influence groundwater-surface water interactions is necessary to understand changes to surface water (flows, quantity, and quality), and associated effects to fish and fish habitat and Indigenous peoples.	1) Provide further characterization of the influence of the regional fault on groundwater flow, including whether it acts as a barrier or a conduit. Within the characterization: • Introduce horizontal anisotropy to the representation of bedrock hydraulic conductivity to represent barrier conduit properties (if appropriate software remains unavailable). • Provide information on the sensitivity of model predictions (groundwater inflow to the open pit, seepage from project facilities to surface water, changes in groundwater discharge to surface water, and groundwater drawdown) to changes in hydraulic conductivity of the regional fault.
Surface Water Quantity, where Changes May Affect Fish Habitat and Indigenous peoples				
SW Quan-01	Topic Surface Water Quantity	TISG Section 8.6	**<u>Surface water hydrological model - general</u>** The surface water hydrological model does not seem to have been designed to inform changes to fish habitat throughout the rivers, and questions about certain inputs and approaches compound with the groundwater model uncertainty, leaving the audience very uncertain about the effects on fish and fish habitat and use by Indigenous peoples. Due to project size and pit depth, changes to river flows and surrounding water levels can be substantial, so this is a key issue that needs to be understood with confidence to support planning decisions. See also comment GW-01b <u>Groundwater model – input to surface water model.</u>	Outstanding information requirements about the surface water hydrological model are outlined in the next 4 rows, with respect to: a. Model calibration and validation b. Climate change adjustments c. Reach lengths d. Flow changes along river reaches

				1) If adaptive water management measures are plausible to ensure changes to surface water quantity are controlled within suitable limits, outline those measures at a conceptual level. If they are also expected to be incorporated into permitting regimes, describe how.
SW Quan-01a	Topic Surface Water Quantity IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources	TISG Section 8.6.1 Section 8.6.2 IS Appendix B.6 – Section 4.1.4 & Section 5.2.4 Appendix C.5 – Appendix C	**<u>Surface water hydrological models – model calibration and validation</u>** There is a high degree of uncertainty in the three HEC-HMS hydrological models developed (one for each affected watershed) due to the use of pro-rated regional flow data in the calibration and validation of each model. These models are used to predict long-term surface water flows which are necessary to quantify predicted changes to surface water flows and effects to fish habitat. The models were calibrated against daily discharge flows which were estimated based on measured flows at the Water Survey of Canada (WSC) station ID 04MD004 (Porcupine River at Hoyle) and pro-rated based on watershed areas. The models were calibrated for the period 2008 to 2014. The calibration was measured based on similarity between hydrographs and through statistical performance metrics. The TISG requires that the IS "*provide flow hydrographs and corresponding water levels for nearby streams and rivers including any site-specific rating curves (and manually collected flow/level data), if available, showing the full range of seasonal and inter-annual variations; as well as seasonal low-flow for baseflow quantification;*" and that "*hydrographs may be based on data from nearby gauging stations or from gauging stations on site if appropriate rationale is provided to explain its applicability; the approach used should take into account the need to provide information for use in fish habitat characterization and effects assessment as guided by the Canadian Science Advisory Secretariat's <u>Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada</u>*" The Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada recommends a minimum of 20 years of river flow data to establish a statistically robust natural flow regime. This can be done using modelled streamflow data and these models must be both calibrated and validated. Modelled flows were not compared against local measured flows at monitoring stations SW-1 to SW-9, and therefore their applicability to the site cannot be validated. Additionally, IAAC has previously advised the proponent that the use of this WSC station is not suitable for model calibration and that the use of the WSC Station 04MD004 for pro-rating flows likely does not provide an accurate estimation of natural streamflow characteristics in the affected watersheds. Any modelling (e.g., water balance model, water quality modelling, assimilative capacity assessment) that includes data from WSC station ID 04MD004 (Porcupine River at Hoyle) may not be an accurate estimation of characteristics in the affected watersheds. The low flow statistics (7Q20) in Table 3.1 of Appendix C.5 appear to have been estimated based on watershed area and the corresponding regional regression relationship for the five selected WSC stations used to evaluate regional hydrology. There is no information about how the low flow statistics compare to flows measured on site, which creates	1) Provide results of model validation at stations SW-1, SW-2b, SW-3, SW-4, SW-5, SW-6b, SW-7, SW-8, and SW-9. The results should include graphical comparison of measured and modelled flows, and a table summarizing the statistical performance metrics over the entire monitoring period. 2) Clarify the units of the root mean square error included in Tables B1.4 to B1.6. 3) Based on the results of the model validation against local hydrometric data, quantify the level of uncertainty in the estimated flows and flow changes at different locations within the LSA, as well as in any modelling that included streamflow data such as the assimilative capacity assessment and site-wide water balance model. 4) Quantify the uncertainty of the low flow (7Q20) predictions based on a comparison of monitoring data collected on-site as part of the baseline program to regional flow data.

			a high degree of uncertainty in the estimated low flow which alters IAAC's ability to evaluate the extent of the mixing zone. In addition, the units of the root mean square error used to quantify the average difference between model predicted and measured values are not reported. Based on the above, the level of uncertainty in the predicted local flows and estimated flow changes is high. This information is needed for IAAC to reduce uncertainty in predicted effects to fish habitat as a result of changes in surface water flows within the PA and LSA, as well as understand changes to available habitat types for species of importance to Indigenous peoples.	
SW Quan-01b	Topic Surface Water Quantity IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources	TISG Section 8.6.1 Section 14 IS Appendix C.5 – Section 6.3.6	**Surface water hydrological model – climate change adjustments** As required in the TISG, the IS considers the effects of climate change in the regional hydrologic model; however, it does not include a sensitivity analysis to quantify the potential effects under both baseline and climate-adjusted baseline conditions to demonstrate how climate change may alter the effects assessment on surface water. Additionally, there is uncertainty in the model results due to inconsistencies in hydrology peak timing. The regional station mean monthly flow (Figure 5.6 in Appendix B.6) has a discharge peak in May due to spring freshet and a second peak in November due to fall rainfall. Flow hydrographs for local monitoring stations (Appendix B.2 of Appendix B.6) appear to support the regional monthly flow distribution. However, the HEC-HMS predictions using existing climate baseline data (Appendix C.5 Figures A.88 – A.121) show a sharp discharge peak in early April but not an increase in discharge in November, meaning that the modelled timing of peak flows and monthly distribution of flows do not match those estimated by the regional station assessment or local monitoring stations. Modelled climate-adjusted baseline flows (Appendix C.5 Figures A.18 – A.87) appear to show the receiving environment running at its lowest flow during May, with peaks in February and March. This differs greatly from the characterization of current conditions. It is uncertain based on the information provided whether climate change adjustments are responsible for the substantial alteration of hydrology peak timing. This creates an unknown level of uncertainty in the modelled hydrographs under climate-adjusted baseline data and their suitability and usefulness to support the assessment of changes to surface water. In particular, inaccurate timing of peak and low flows in the model will hinder the ability to understand how changes in flow affect fish life history processes. This uncertainty limits IAAC's ability to understand the magnitude of effects to fish and fish habitat and Indigenous peoples through changes to surface water flows and levels, and surface water quality within the PA and LSA.	1) Provide an explanation of any differences in hydrological watershed parameters (for example, discharge peak timing and quantity) between observed on-site water flows and flows modelled in HEC-HMS under baseline and climate-adjusted baseline conditions. 2) Provide any HEC-HMS model results that can explain this difference, such as the modelled depth of snowpack time-series in the climate-adjusted baseline, compared with the baseline. 3) Provide a sensitivity analysis to quantify the changes to water quantity under existing climate baseline and describe whether the estimated changes to flows are more conservative than under climate-adjusted baseline conditions.
SW Quan-01c	Topic Surface Water Quantity IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources	TISG Section 8.6.1 IS Appendix B.6 – Section 4.1.4	**Surface water hydrological models – reach lengths** There are questions about the reach lengths used to calculate the lag times (Table 4.5) used in the hydrological models to predict flows in the receiving environment. The reach lengths for some of the subwatersheds, shown in Table 4.6, appear to be overly large compared to the area of the subwatersheds themselves. For instance, the total area of subwatershed ND3 is approximately 50 km2 with estimated dimensions of 10 km x 5 km, however the length for the associated reach appears to be more than 45 km. This calls into question the accuracy of the reach lengths used to calculate lag times. This creates a high degree of uncertainty about the modelled flows, leading to compounded levels of uncertainty around the predicted changes to surface water quantity and flows and effects to Indigenous peoples.	Provide additional information to demonstrate the accuracy of the reach lengths reported in Table 4.6 and, if incorrect, quantify any uncertainty that this model input may have added to the hydrological model predictions.

SW Quan-01d	Topic Surface Water Quantity IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources	TISG Section 8.6.2 IS Appendix C.5 – Section 6.3.6	**<u>Surface water hydrological models – flow changes along river reaches</u>** The approach taken to predict changes to surface waters flows in the IS does not present an accurate and comprehensive assessment of effects to inform fish habitat loss and other things. The IS focuses on the changes to surface water predicted at the most downstream watershed discharge points (WB1 for the West Buskegau and ND1 for the North Driftwood, the model outlets) which are located at quite a distance (tens of kilometers) from the PA. project-related flow changes at these locations are reduced due to the contribution of water from additional tributaries and watersheds. The discussion in the IS generally excludes changes that occur within the reaches between the model outlets and the PA where predicted changes are the largest and frequently exceed the 10% change in flow threshold during operations. The IS does include the estimated potential changes to flows, based on the number of days in a year when changes to flows are predicted to be beyond the 10% threshold, for a subset of selected subwatersheds in Figures A.18 to A.121 and Tables 6.8 to 6.12. However, there is no distinction or quantification of changes to flows during critical periods that may be relevant to fish and fish habitat. As a result, the predicted changes to flows are not presented at adequate temporal and spatial scales, nor do they provide quantification of changes to flows and water levels to support assessment of effects to fish and fish habitat or Indigenous peoples.	1) Based on predicted daily changes to flows, provide summary tables for key nodes in the watersheds, extending from the PA to the model outlets, and including the key junctions (confluences) within the reach (refer to Figures A.2 and A.3 for HEC-HMS model schematic with all watershed and confluences). The summary tables should be presented on a monthly basis for both baseline and climate-adjusted conditions, representative of years for all project phases, and include: • Monthly average flows (baseline, operations, decommissioning and abandonment); • Changes to monthly average flows as a result of the project (expressed as a %); • Quantification of the number of days when the 10% change in flow threshold is exceeded. 2) Describe the potential changes to water levels estimated as a result of the modelled changes to flows in the receiving environment.
SW Quan - 02a	Topic Surface Water Quantity IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources	TISG Section 8.6.1 IS Appendix I – Section 5.0 Appendix C.5 – Section 6.3.6	**<u>Site-wide water balance model – runoff coefficients</u>** There are questions about the runoff coefficients used in the site-wide water balance model and regional hydrological model, which directly translates into compounding uncertainty in flow predictions within the PA and the LSA. The assumed runoff coefficient for baseline is not included in the list of assumed runoff coefficients for various mine site areas (Table 3-4) or specified in Appendix I. It could be speculated that it is assumed as 0.5 given that this is the value assumed for natural ground for all project phases (Table 3-4). Section 6.1 of Appendix B.6 concludes that the climate normal streamflow estimate represents a runoff coefficient of 41%, based on an environmental water balance for the PA using the USGS Thornthwaite method. Runoff coefficients for stations considered in the regional analysis (Table 5.11), range from 0.38 to 0.51. It is unclear why the selected runoff coefficient for natural ground is 0.5 when the environmental water balance estimates a runoff coefficient of 41% and 0.5 is the higher end of the range at regional hydrometric stations.	1) Confirm IAAC's assumption that the runoff coefficient for baseline is synonymous with natural ground. 2) Provide clarification for the selected runoff coefficient used for baseline in Appendix I (i.e. confirmation of what value was used and why). 3) Demonstrate that the selected baseline runoff coefficient is adequate for application to the PA by comparing flow estimates from the baseline site-wide water balance model with flow measured at the local hydrometric stations. 4) Provide a sensitivity analysis to the baseline runoff coefficient to decrease

			Further, Section 6.3.6 of Appendix C.5 indicates that during closure, flows in the receiving environment are predicted to increase over baseline. These changes are predicted despite the increased loss of water to evaporation from the pit lake and the increased capture of groundwater volumes by the pit (relevant during pit filling). These predictions raise additional uncertainty around the assumptions for natural ground (0.5). An overestimation of the runoff coefficient for baseline conditions (i.e. natural ground) may substantially underestimate the potential effects to surface water flows associated with the project. This uncertainty has the potential to affect the evaluation of habitat loss for fish and species of importance to Indigenous peoples within the PA and LSA.	the level of uncertainty in the predicted changes to flows presented in Appendix C.5 of the Impact Statement (Section 6.3.6).
SW Quan-02b	Topic Surface Water Quantity IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.6.2 IS Appendix I – Appendix B	**<u>Site-wide water balance model – inconsistent facility footprints</u>** There is uncertainty in the site-wide water balance model, and associated water quality model, due to inconsistencies in the facility footprints during the transition from operations to reclamation. The site-wide water balance model (and associated water quality model) use the footprint of each mine facility and its change over time to predict changes to water quantity (and associated water quality). Each mine facility at each project phase is assigned a distinct water quality. The mass load associated with each mine facility is dependent on the predicted water quantity and the assigned water quality. Appendix B (of Appendix I) includes a table with an overview of mine facility footprints through the mine life. During the period when facilities transition from operations to reclamation, the total area of some of the rock impoundment, stockpiles, and Tailings Management Facility (TMF) does not appear to be maintained. For example, Appendix B (of Appendix I) suggests a deficit in the total rock impoundment (operational or reclaimed) in year 33, relative to year 29 and 34, which both have a higher total). It is unclear how the areas unaccounted for are considered in the site-wide water balance model and how this may influence changes to water quantity during this period. Considering the flows from these facilities have the potential to convey large mass load of contaminants, this has the potential to substantially influence water quality predictions. This contributes to compounding uncertainty in predicted changes to water quality and quantity and associated effects to fish and fish habitat and Indigenous peoples.	1) Provide the rationale for not accounting for the footprint areas for some mine facilities where the total area does not appear to be maintained through time. Describe the potential influence of the excluded areas on the site-wide water balance and water quality models. 2) Explain the assumptions with respect to the transition (timeframe) from operational to reclaimed conditions and the impact on predicted changes to water quantity.
Species of Importance to Indigenous peoples where habitat is lost due to changes in groundwater and surface water				
IP-01	Topic Surface Water Quantity 2(e)(ii) the current use of lands and resources for traditional purposes	TISG Section 8.7.2 Section 8.9.2 Section 8.10.2 IS Chapter 16 Chapter 18 Chapter 19	**<u>Habitat loss – changes to groundwater and surface water levels</u>** IAAC's assessment will characterize the approximate changes to habitat for species of importance to Indigenous peoples (e.g. moose, waterfowl, otter, beaver), including magnitude, durations, irreversibility, etc. Given the abundance of terrestrial and wetland habitat types in the PA and the LSA that are used by species of importance to Indigenous peoples, these habitats may be affected by changes in groundwater and surface water levels, including drawdowns, mounding and flooding. The IS acknowledges that during the operations phase, as the pit is excavated, shifts in the water balance of nearby lakes, rivers, wetlands, vegetation, and riparian environments (as discussed in Chapter 16 and 19) could directly affect these habitats. While the IS emphasizes that changes to habitats may extend further into the LSA, the result of changes from surface water and groundwater have not been fully incorporated into the assessment and the extent of changes to the habitat of species of importance to Indigenous peoples. For example, Figure 16.7 in Chapter 16 identifies wetlands with the potential to be affected by groundwater drawdown, based on where 1 m of groundwater drawdown may occur in Year	1) After addressing uncertainties in the surface water and groundwater models (GW-01(a-e), SW Quan-01(a-d), SW Quan(a-b)), verify and, if appropriate, update the reported extent of habitat loss for species of importance to Indigenous peoples (including all relevant birds, terrestrial species, etc). 2) Provide updated maps that indicate: • geographic extent of groundwater changes (drawdown and mounding) • habitat that is used by species of importance to Indigenous peoples that is likely to be impacted by

			31. However, equivalent figures for terrestrial or riparian habitats are absent. Further, while the Section 19.4.2 acknowledges the potential for indirect effects to wildlife habitats, there is no specific assessment of groundwater drawdown or mounding on wetlands that are moose aquatic feeding areas or on coniferous forests required by moose as a late overwinter habitat, despite moose being a dietary staple of Indigenous peoples. Though the IS uses conservative assumptions to predict the extent of the water table drawdown, IAAC has identified fixes for substantial uncertainties in the groundwater and surface water modeling through previous outstanding requirements (GW-01(a-e), SW Quan-01(a-d), SW Quan(a-b)) needed to understand impacts to habitat types used by species of importance to Indigenous peoples. Predictions about impacts to habitat for species of importance to Indigenous peoples should be verified and, if appropriate, updated based on the improved model outputs. This information is necessary to characterize residual changes to resources available for traditional purposes, which will inform the extent of significance of impacts to the current use of lands and resources for traditional purposes by Indigenous peoples.	changes to groundwater and surface water levels
Surface Water Quality, where Changes May Affect Fish or Indigenous peoples				
SW Qual-01	Topic Surface Water Quality IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.6.2 IS Chapter 3 – Section 3.3.5.2 Appendix C.5 – Appendix B: Table B.1.4, Table B.1.1.1, & Table B.1.2.1, Appendix C.5 – Appendix C: Appendix B Appendix B.5 – Section 2.3.2 Appendix C.4 –	**<u>Surface water quality – seepage</u>** The IS is predicting that a substantial daily volume of seepage (Table B.1.1.1 in Appendix B of Appendix C.5) will bypass the collection ditch system in the operations phase and be deposited directly to the surface waters of the West Buskegau River, North Driftwood River, Jocko Creek, and eight lakes. The eight lakes are currently used by Indigenous communities. In the Impact Assessment Report, IAAC will characterize residual adverse effects to fish and fish habitat and Indigenous peoples, including from potential changes to surface water quality. Greater confidence in the predicted quantity and quality of seepage to be released is necessary to understand changes to surface water quality and associated effects to fish and fish habitat and Indigenous peoples. The locations selected for predicting surface water quality in the surface water quality model do not assess the potential effects of seepage at the seepage face, but instead assess effects of seepage downstream at the point of full mixing (in some cases the assessment nodes are kilometers away from the TMF, Impoundment Facility, ore stockpiles, and open pit). This is especially important given the close proximity of project facilities and the predicted volumes of seepage. For example, untreated seepage from the TMF is predicted to account for flow increases greater than 10% in the Jocko Creek watershed during low flow (7Q20) conditions in phase 2 operations. IAAC notes that the IS uses Brownfield O.Reg. 153/04 Aquatic Protection Values (APVs) as the established water quality criteria for the assessment of water quality effects due to seepage. Brownfield's APVs are not appropriate for the assessment of groundwater discharges to surface water for this project (a greenfield site). Comparison of seepage quality to appropriate guidelines is needed to understand potential effects to fish health, growth and survival, and to identify appropriate mitigation to manage effects to fish. A Hazard Quotient (HQ) risk analysis completed by ECCC identified that, for the following elements and substances, the concentration at the seepage face (taken from seepage predictions in Table B.1.2.1 in Appendix B of Appendix C.5) would be higher than the water quality guidelines and that toxicity effects on aquatic life are likely: • Arsenic (As) • Chloride (Cl)	1) After addressing the outstanding information requirements related to groundwater-surface water interactions, surface water flows, and geochemistry (GW-01(a-e), SW Quan-01(a-d), SW Quan(a-b), GCH-01(a-e), GCH-02(a-d)), revise the assessment of changes to surface water quality from seepage from the TMF, Impoundment Facility, ore stockpiles, and open pit after its been filled with tailings at the seepage face (i.e., not when it is fully mixed with surface water) in the West Buskegau River, North Driftwood River, Jocko Creek, and eight lakes. To complete this assessment, directly compare seepage quality at the seepage face to Provincial Water Quality Objectives and Canadian Water Quality Guidelines for the Protection of Aquatic Life. 2) Provide updated maps showing the geographic extent of predicted seepage from the TMF, Impoundment Facility, ore stockpiles, and open pit after it has been filled with tailings over the life of the project. 3) Provide an assessment of potential effects to fish health, growth and

		Sections 3.2.2, 3.3.2, 3.3.5 & 7.1	• Chromium VI (Cr VI) • Cobalt (Co) • Copper (Cu) • Nitrate-N (NO4) • Nitrite-N (NO3) • Selenium (Se) • Uranium (U) • Vanadium (V) • Zinc (Zn) The IS states that seepage (and runoff) interception ditching will be in place, but no other mitigation measures are being proposed to limit seepage. IAAC and Federal Authorities are of the view that interception ditching alone will not be sufficient to manage seepage, and that opportunities to apply adaptive management in response to future monitoring results will be limited after construction. IAAC understands that the Ontario Ministry of Environment, Conservation and Parks will provide oversight to seepage monitoring through applicable provincial frameworks. The *Fisheries Act* prohibits the deposit of all deleterious substances into waters frequented by fish unless authorized pursuant to, and in a manner consistent with, a *Fisheries Act* regulation or by a regulation under other federal legislation. The *Fisheries Act* makes no allowance for a mixing zone.	survival as a result of the revised assessment. 4) Provide additional mitigation measures to prevent or reduce the effects of seepage from project components to the eight lakes listed in Table B.1.1.1 (Seepage Quantity at the Subwatershed Scale), Jocko Creek, the West Buskegau River, and the North Driftwood River. If adaptive water management measures are plausible to ensure changes to surface water quality from seepage are controlled within suitable limits, outline those measures at a conceptual level. If they are also expected to be incorporated into permitting regimes, describe how.
SW Qual-02	Topic Surface Water Quality IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.6.2 IS Appendix C.5 – Appendix C	<u>**Surface water quality – effluent mixing**</u> In the IA Report, IAAC will characterize the geographic extent of effects on fish and fish habitat and Indigenous peoples, and the extent of significance of effects, including from changes to surface water quality in the rivers downstream of planned effluent discharge points. In the analysis, IAAC will rely on oversight by the Province of Ontario to manage effluent mixing and will report on predicted residual federal effects using available information. Ideally, advice to the federal impact assessment decision-makers will be based on coarse project designs that are conceptually feasible and unlikely to change drastically through the permitting process. The IS presents potential effluent mixing zones of up to 87 km in the North Driftwood River and 40 km in the West Buskegau River (under the regulatory scenario). It also presents conceptual plans for effluent treatment and reasons the larger Mattagami River was not selected for effluent discharge. Based on the information in the IS and comments received, IAAC is not clear that the project effluent, as designed and presented, is consistent with provincial policies that would enable the issuance of a provincial Environmental Compliance Approval for Industrial Sewage. However, IAAC anticipates that with improvements to the effluent modelling (without additional data collection), and potential adaptations in effluent treatment plans, predictions can be refined to support a more likely effects scenario and build confidence with current conceptual project design. The following observations were made about the approach to determining the influence of planned effluent discharge on surface water quality in rivers (Appendix C of Appendix C.5), which IAAC understands may influence predictions of the downstream extent of water quality changes (either by over-estimating or under-estimating): • When mixing zones extended past the 200 m limit of the selected effluent mixing model, mass balance assessment was implemented. The use of the mass balance/pourpoints to estimate the length of the mixing zone does not necessarily represent the actual distance downstream of the final discharge points (FDPs)	1) Re-evaluate, in consultation with MECP, the geographic extent of the conceptual effluent mixing under the regulatory scenario. 2) Discuss the level of confidence that the current project design will result in an effluent mixing scenario that can feasibly align with provincial policies that support issuance of an Environmental Compliance Approval for Industrial Sewage. The assessment should consider, where appropriate, updated modelling, additional effluent treatments, updated discharge parameters, or any other means necessary to improve predictions. 3) Provide a map of the updated conceptual predicted geographic extent of surface water quality changes caused by effluent mixing under the worse-case regulatory scenario. 4) If adaptive water management measures are plausible to ensure changes to surface water quality from

			required for most Parameters of Potential Concern (PoPC) to meet the applicable regulatory criteria or background concentrations. • Each final discharge point (FDP) effluent discharge flow is compared to the corresponding receiver flow at that specific pourpoint; whereas, at the downstream FDP in each river, the total effluent flow from both FDPs should be compared to the receiver flow at that specific pourpoint. In addition, the receiver flow calculations include seepage flows. The downstream changes due to parameter of potential concern (POPC) loading are not discussed. • Effluent flow is greater than receiver flow for the following models: West Buskegau River 7Q20 downstream, North Driftwood 7Q20 upstream, North Driftwood 7Q20 downstream, and North Driftwood Normal upstream. IAAC understands that for provincial permitting a minimum receiver flow requirement would need to be established which would influence predicted changes to surface water quality in rivers, but may also influence mine operations in a way that needs to be considered in planning and conceptual design. • CORMIX mixing zone model inputs were not clearly identified, including background water quality in the West Buskegau and North Driftwood Rivers and the proposed effluent criteria at all discharge points (including if they differ). • The IS indicates that Mine Water Effluent Treated Daily Maximum Concentration in Table 5.3 (Appendix C in Appendix C.5) were used to determine the extent of the mixing zone under the regulatory scenario. However, the proposed extent of the mixing zone (for certain PoPCs) does not seem to reflect the proposed maximum concentrations used in the Assimilative Capacity Study. • Climate change adjusted climate normal discharge from the FDPs were used to determine potential effects of normal conditions on mixing zone extent, but not for the worst-case regulatory scenario. MECP has advised IAAC that, based on the information provided in the IS, the potential geographic extent of the effluent mixing zones is unclear. At the provincial permitting stage, receiver-based effluent limits that are protective of the environment will need to be developed in accordance with provincial policies, before approvals are issued. Mine effluent mixing zones usually range from near instantaneous mixing to several hundred meters downstream of the FDP. Based on the estimated mixing zone lengths provided in the IS, the treatment and proposed effluent discharge limits may need to be re-evaluated.	planned effluent are controlled within suitable limits, outline those measures at a conceptual level. If they are also expected to be incorporated into permitting regimes, describe how.
SW Qual-03	Topic Surface Water Quality IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic	TISG Section 8.6.2 IS Appendix C.5 – Table 6.16, Table 5.4, Table 7.2 & Table 7.3 Chapter 15 – Section 15.4.3.3.1 & Table	**Methylmercury production** During a technical working group meeting an Indigenous community raised concerns about the potential for effluent-induced methylmercury production in downstream rivers. Canada Nickel advised it would be addressed in the IS. The IS discusses methylmercury production that can arise from flooding organic soil, but not from effluent, and proposed a follow-up program to monitor methylmercury in fish tissue. Under anoxic conditions, sulphate from effluent can be used by sulphate-reducing bacteria to enhance methyl mercury production. Methylmercury can bioaccumulate in country foods consumed by Indigenous peoples. In the IA Report, IAAC will characterize potential effects on the health of Indigenous peoples and their traditional practices. In the analysis, IAAC will take into account oversight by the Province of Ontario to manage effluent. IAAC is aware that mine proponents typically work with the Province of Ontario to establish effluent limits where appropriate, during the permitting phase. MECP made several comments regarding effluent-induced methylmercury production in downstream rivers in its submissions to IAAC. The following observations were made in the IS:	1) Provide an assessment of the potential for methylmercury production in the North Driftwood River and West Buskegau River. The assessment should include the potential for anoxic conditions from the discharge of phosphorus and total inorganic nitrogen and increased concentrations of sulphates from both seepage and treated effluent under normal and regulatory conditions. 2) Confirm intentions to discuss appropriate effluent targets with MECP during permitting, as necessary, to manage the potential for

	Conditions of Indigenous peoples	15.7	• The IS states that mercury is not anticipated to increase as a result of mining operations. Although there will be an increase in mercury concentrations in the receivers after full mixing, the concentration of total mercury in the North Driftwood River and the West Buskegau River would be below Canadian Water Quality Guidelines for the Protection of Aquatic Life. • Chapter 15 states that the maximum average FDP total phosphorus discharge concentration and maximum average total phosphorus concentration at the point of complete mixing in the receiver in both the West Buskegau River and North Driftwood River are predicted to be below the Provincial Water Quality Objectives (PWQO) value. However, this is not true for the predicted results under regulatory conditions shown in Appendix C.5 Table 7.2 and Table 7.3, where phosphorus levels exceeding the PWQO extend downstream of the confluence with the Frederick House River and Abitibi River. It is unclear if phosphorus concentrations under regulatory conditions were considered in predictions of eutrophication. Eutrophication can lead to anoxic conditions that support methylation. • The IS acknowledges that the average total inorganic nitrogen discharge via FDPs into the North Driftwood River would be expected to increase the potential for eutrophication in the watercourse segment from FDP-TMF-SP to up to 3.6km downstream of FDP-SP-02. It is unclear what mitigation measures will be considered to manage this. • The proposed mine effluent limits in Table 6.16 of Appendix C.5 do not include sulphate. The high predicted sulphate concentrations in the treated mine effluent reveal that even after full mixing, the concentration of sulphate in receivers will be 4 to 15 times higher than baseline.	methylmercury production, taking into account input from Indigenous communities.
SW Qual-04	Topic Surface Water Quality IAA 2(a)(i) Fish and Fish Habitat 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.3.2 IS Appendix K – Section 3 & Section 4	**<u>Sediment contamination</u>** Information remains outstanding about sediment-bound contaminants of potential concern (COPCs), which could act as ongoing sources of contamination for fish. Understanding what partition coefficients were used in the water quality modelling, and why, will support refined predictions about how COPCs will behave (how they will separate, settle, and move) in the on-site collection ponds and in the receiving environment's water and sediment downstream of effluent. Some of these COPCs such as Cr(VI) also have the potential to bioaccumulate in fish consumed as country foods. This will help refine predictions of any effects to fish and impacts to Indigenous health. Section 3.3 of Appendix K (Water Quality Assessment) includes data on metal sorption to total suspended solids (TSS), but the text and table legends in the Impact Statement lack clarity on how this information is incorporated into the water quality model. According to the IS, "The difference in total and dissolved concentration generated by this range of assumed TSS values (10 mg/L, 15 mg/L, and 30 mg/L) are shown in Table 3-6. These values are added to dissolved concentrations predicted for collection pond discharge to produce the total metal concentrations." However, in Section 4, the predicted concentrations presented in Tables 4-1 to 4-8 (water quality results in collection ponds and pit, compared against criteria) and associated figures appear to reflect dissolved concentrations, raising uncertainty about whether these predictions account for total concentrations. While Section 4 of Appendix K notes that water quality model predictions are "presented as" dissolved concentrations it also says that the influence of TSS is incorporated into water quality model results. Additionally, the text does not specify the partition coefficients used to calculate the particulate fraction for metals, nor does it provide information on suspended solids and settling rates for particles used to predict sediment accumulation of COPCs. Without this information, it is difficult to evaluate whether the model conservatively predicts metal partitioning, sediment accumulation, and settling dynamics in mine site water ponds. The exclusion of Cr(VI)	1) Provide the partition coefficients used for each element presented in Table 3.6 (the Suspended Solid Composition and Contributions to Total Concentrations) and justify their conservativeness. Explain why Cr(VI) is not included in Table 3.6 or provide the information for Cr(VI). 2) Clarify water quality predictions by confirming whether the predictions presented in the tables and figures of Section 4 represent total concentrations or dissolved concentrations. If the predictions are dissolved concentrations, explain how the consideration of particulate metal settling ensures a conservative approach. If they are not conservative estimates, update the water quality predictions using total concentration and the comparison against the criteria. 3) Provide the following details on sediment accumulation predictions: • information on suspended solids;

			from Table 3-6 is also unexplained, leaving a gap in the understanding of how significant contaminants are accounted for in the surface water model. Predictions of sediment contamination in the receiving environment and downstream areas during construction, operation, closure, and post-closure are absent.	• the partitioning coefficients of COPCs; and • settling rates for particles used to predict sediment accumulation of COPCs. 4) Provide an assessment of predicted sediment contamination in the receiving environment of the project and downstream during construction, operation, closure, and post-closure. Based on the predictions, verify the selection of mitigation measures for: • effluent (e.g., stand-by modular treatment); • tailings; and • potentially acid-generating waste rock.
SW Qual-05	Topic Surface Water Quality IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.6.1 IS Appendix C.5 – Appendix C: Table 3.2, Table 7.2, Table 7.3, Table 7.4, & Table 7.5	**<u>Surface water quality – baseline values for parameters of potential concern (PoPC)</u>** It is unclear why the baseline data for the West Buskegau River, North Driftwood River, and Jocko Creek (Table 3.2) shows no values for chromium III, chromium VI, and un-ionized ammonia. The IS states that "when more than 50% of results were below the reportable detection limit (RDL), summary statistics were not calculated, except for the maximum parameter values" however, maximum values for chromium III, chromium VI, and un-ionized ammonia do not appear to have been included. Additionally, the information presented in Tables 7.2, 7.3, 7.4, and 7.5 appears to contradict the information provided in Table 3.2. Table 7.2 and Table 7.3 in Appendix C provide receiver 75th percentile concentration as 1.5 ug/L for chromium III, 0 ug/L for chromium VI and 0.48 ug/L for un-ionized ammonia. Table 7.4 and Table 7.5 provide receiver mean concentration as 1.3 ug/L for chromium III, 0 ug/L for chromium VI and 0.60 ug/L for un-ionized ammonia. Ensuring accurate baseline values for PoPC, including PoPC that may bioaccumulate in country foods, are available and reflected in models is necessary to validate predicted changes to water quality and associated effects to fish and fish habitat and Indigenous peoples.	1) Review and explain any inconsistencies between Tables 3.2, 7.2, 7.3, 7.4, and 7.5 in Appendix C.5 or revise the values reported for chromium III, chromium VI, and un-ionized ammonia in water quality baseline data. 2) Ensure that model predictions reflect the appropriate baseline values.
SW Qual-06	Topic Surface Water Quality IAA 2(a)(i) Fish and Fish Habitat	TISG Section 13.1 IS Chapter 3 – Section 3.4.1 Chapter 31 –	**<u>Accidents & malfunctions – nickel concentrate spill</u>** The IS includes an effects and risk assessment for various scenarios arising from plausible accidents and malfunctions related to the project. Generally, these were well documented with clear pathways and risk. The scenario of a rail accident resulting in the release of nickel concentrate still needs to be addressed. The project includes the construction and operation of a rail spur that will cross several waterways, including Jocko Creek and Kidd Creek, both tributaries to the Mattagami River, and rail transport along an existing rail line to the Kidd Concentrator. The rail spur will accommodate up to four roundtrip trains per 24 hours for the life of the mine,	1) Based on the quantity of concentrate to be transported by rail: • report, with appropriate rationale, the risk of spill within the waterways noted; • report, with appropriate rationale, in the event of a spill from train derailment, potential consequences

	2(a)(iii) Migratory Birds 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	Section 31.2.4	transporting various commodities, including nickel concentrate. Nickel concentrate is known to be toxic to the environment, particularly to aquatic organisms, and may cause long-term adverse effects in aquatic ecosystems. IAAC has considered that rail transportation of dangerous goods is highly regulated with a suite of government standards to be followed. Although the likelihood and frequency of accidental nickel concentrate releases could very well be low over the 40 year life of the project, the consequence of effect may be large (considering the potential magnitude, geographic extent, duration, and reversibility of effect). Low-probability effects with severe consequences, and related uncertainty, will be taken into account in the overall extent of significance of effects reported for fish and fish habitat, migratory birds, and Indigenous peoples. In the absence of project-specific information, IAAC would have to report grossly estimated predictions across a broad range of scenarios including precautious scenarios. project specific information is needed to refine these conclusions. IAAC acknowledges that existing Transport Canada framework will provide oversight to emergency response requirements for a transportation-related spill of dangerous goods, and that details will be determined later based on the classification of the concentrate. For awareness, IAAC also typically requires proponents to develop an Indigenous communication plan for accidents and malfunctions, in consultation with potentially affected communities.	(including the adverse effects to fish and fish habitat, migratory birds, and Indigenous peoples); • in doing so, describe the plausible worst-case scenarios and the more-likely, but lower-consequence scenarios, including magnitude, geographic extent, duration and reversibility of effects, taking into account the influence of local geography and relative locations of sensitive receptors, and informed by known behaviors of nickel concentrate in the environment.
Geochemistry, where Conditions Influence Water Quality and Effects to Fish and Fish Habitat and Indigenous peoples				
GCH-01	Topic: Geochemistry	TISG Section 8.3	**Geochemical characterization program – methods and data** The geochemical characterization program is used to characterize the geochemical properties of mine materials. This is necessary to validate source term predictions used in the model to predict changes to water quality as a result of seepage and effluent discharge. Due to a number of missing or incomplete components, there is a lack of confidence that the geochemical characterization program was well designed and representative of site conditions. Understanding representativeness of the samples will support appropriate interpretation of the results of the geochemical characterization program and associated uncertainty with changes to surface water quality and effects to fish and fish habitat and Indigenous peoples. Understanding any constraints in the geochemistry program is also important considering the predicted high influence of seepage and planned effluent discharge on surrounding waters.	Outstanding information requirements about the methods and data used for the geochemical characterization program are outlined in the next 5 rows, with respect to: a. Missing cross-sections b. Missing datasets c. Methods d. Humidity cell testing e. Representative sampling
GCH-01a	Topic Geochemistry IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.3.1 IS Appendix H	**Geochemical characterization – missing cross-sections** The IS does not include cross-sections or maps illustrating the locations, lithology, proximity to the ore zone, and other relevant details for samples included in the geochemical characterization program. While the geochemical characterization program in Appendix H of the IS includes 50 overburden samples (26 organic and 24 mineral soils) and over 400 samples of waste rock and ore, no maps or cross-sections identifying the locations of these samples are included. This omission significantly limits the ability to assess the spatial representativeness of the geochemical sampling program, and whether the results of the program accurately represent the characteristics of the site. With high volumes of seepage and planned effluent, the uncertainty compounds in the water quality model.	1) Provide cross-sections or block model images that clearly identify the locations and depths of all overburden, waste rock, and ore samples included in the geochemical characterization program. Present cross sections or block model images at an appropriate scale that include mine rock samples, geology, mineralized zones, the approximate location of all open pit and underground mine development, borehole traces and identification numbers, and a scale and legend. 2) Develop and implement a plan to address spatial data gaps, ensuring full coverage of all lithologies and overburden areas. Alternatively, discuss how data gaps will be addressed during

				provincial permitting relative to project timelines.
GCH-01b	Topic Geochemistry IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.3.1 IS Appendix H – Sections 2.3.4, 3.1.1.4, 3.1.2.4, Appendix D, & Appendix E	**Geochemical characterization – missing datasets** The IS does not include specific data generated by the geochemical characterization required to evaluate data completeness. The following datasets are absent: • Section 2.3.4 of Appendix H describes the Whole Rock Analysis methodology to involve Lithium meta-borate fusion followed by ICP-MS analysis to be applied to 22 samples (15 waste rock, 3 ore, and 4 tailings samples). Whole Rock Analysis data is indicated as being presented in Appendix D of Appendix H. Appendix D has the Whole Rock Analysis data for the 4 tailings samples, but data for the 15 waste rock and 3 ore samples is absent. The IS provides quantitative mineralogy (QEMSCAN) results to support the interpretation of the ML/ARD potential testing in the geochemical characterization program. Section 3.1.1.4 of Appendix H summarizes the QEMSCAN results for 14 waste rock samples in Figures 9-13 and Section 3.1.2.4 of Appendix H summarizes the QEMSCAN results for 3 ore samples in Figures 19 - 20. The full data set for both material types is indicated to be provided in Appendix E. Appendix E includes QEMSCAN data for the tailing's samples only. The full QEMSCAN dataset for the ore and waste rock samples is absent from the IS. This dataset is additionally needed to determine the quantity of chrysotile (asbestos) in the different rock units.	1) Provide the complete datasets and associated certificates of analysis for all data generated in the geochemical characterization program, including: • The full dataset for Whole Rock Analysis, specifically for the 15 waste rock and 3 ore samples referenced in Section 2.3.4 of Appendix H, which are currently missing from Appendix D. • The complete QEMSCAN dataset for waste rock and ore samples is described in Sections 3.1.1.4 and 3.1.2.4 of Appendix H, which are currently missing from Appendix E. This data must be used to support the interpretation of ML/ARD potential testing and the quantification of chrysotile (asbestos) in different rock units. 2) Outline a plan for how these complete datasets will be used to refine predictions of ML/ARD potential and update the ML/ARD management plan as required.
GCH-01c	Topic Geochemistry IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of	TISG Section 8.3.2 IS Appendix H – Section 2.3	**Geochemical characterization - methods** Section 2.3 of Appendix H of the IS does not contain complete descriptions of the methods used in the analysis of tailings supernatant liquid, and leachates from Shake Flask Extraction (SFE) and Humidity Cell Tests (HCT). This information is necessary to validate the acid rock drainage and metal leaching potential of mine materials.	Provide complete descriptions of all methods used in the geochemical characterization program, including the analytical procedures for the chemical analysis of the supernatant liquids, SFE leachates, and HCT leachates. Descriptions should include the analytical techniques employed, detection limits, quality assurance and control measures, and any deviations from standard practices.

	Indigenous peoples			
GCH-01d	Topic Geochemistry IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.3.1 IS Appendix H – Sections 2.2.5, 3.1.1.5, 3.2.1, 3.2.2 & 3.1.2.5	**<u>Geochemical characterization – humidity cell testing</u>** The IS is missing information necessary to assess whether the samples selected for humidity cell testing (HCT) in the geochemical characterization program are appropriate for capturing the metal-leaching (ML) potential of the waste rock lithologies they represent. This creates compounding uncertainty in the results of the geochemical characterization program and the water quality model. In the geochemical characterization program, samples selected for HCT were based on their potential for ML as reflected by the shake flask extraction (SFE) test results and the percentile of element mobility produced in the test. Table 16 (Appendix H) summarizes the percentiles of constituents with potential for ML in waste rock samples selected for HCT, used as criteria and justification for their selection. Only 7 of the 11 waste rock samples selected for HCT are included. Table 23 (Appendix H) summarizes the percentiles of constituents with a potential for ML in ore samples selected for HCT, used as criteria and justification for their selection. Only 3 of the 4 ore samples selected for HCT are included. It should also be noted that the title of Table 23 refers to tailings samples, which is presumed to be a typographical error since this table occurs in the section for ore samples. This information is required to determine whether the data generated by the kinetic test and applied in the development of source terms for the water quality model are sufficiently representative of the base-case and worst-case scenarios. This information is necessary to understand project-related changes to surface water quality, and associated effects and mitigation measures for fish and fish habitat, and Indigenous peoples.	1) Provide updated versions of Table 16 and Table 23 to include all waste rock and ore samples selected for HCT, along with clear justification for their selection based on static test results. 2) Review and correct, if needed, the title of Table 23, which refers to "tailings samples" instead of ore samples. 3) Provide a rationale for how the selected HCT samples represent the base-case and worst-case scenarios for metal leaching and acid generation, with a clear link to the criteria derived from static testing. 4) Discuss how ongoing testing and follow-up programs will be enforced through provincial permitting relative to project timelines. The discussion should present, where appropriate, commitments to verify geochemical predictions, develop an ML/ARD management plan, and adhere to MEND guidelines and other applicable standards for water quality modeling and management.
GCH-01e	Topic Geochemistry IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.3.1 IS Appendix H – Appendix B, Section 4.0 & Section 6.0 Appendix L – Section 2.3 & Section 4.1	**<u>Geochemical characterization – representative sampling</u>** Appendix B of Appendix H of the IS reveals key gaps in the representativeness of the sampling program for the geochemical characterization studies. This information is used to assess the validity of the predicted acid rock generation and metal leaching potential of mine materials, which informs the source terms applied in the water quality model for the site, the design of tailing and waste rock management facilities, the ML/ARD management plan, and the assessment of changes to water quality, and associated effects to fish and fish habitat and Indigenous peoples. As project design evolves, predicted tonnages and lithologies may change. It is critical to verify that sampling and geochemical characterization remain representative of the revised mine plan. Any data gaps from under-sampling particular materials or lithologies must be addressed to ensure accurate source term predictions and a robust ML/ARD management plan. Inclusion of Lithologies: • The ML/ARD management plan (Appendix L, section 2.3, Table 2.1) identifies six lithologies, including talc (2.7% of waste rock, 5.0% of ore), while the baseline geochemical characterization program for waste rock (Appendix H, Appendix B, Table 4) includes only five. The talc lithology was excluded from the geochemical	Present plans for: • Expansion of the geochemical sampling program to include all lithologies, ensuring representative sampling and reconciliation of tonnage discrepancies. • Conducting site-specific testing during planning, construction, and early operations. • Updating water quality models and the ML/ARD management plan to reflect these improvements and ensure the predictions align with site-specific conditions. Alternatively, discuss how gaps in the

			characterization program, meaning that it does not inform the water quality model or ML/ARD management plan. Quantification of Tonnages: • The baseline geochemical characterization for ore (Appendix H, Appendix B, section 4.0) reports 1,672 Mt of ore to be extracted but lists tonnages totaling only 1,610 Mt (e.g., 1,372 Mt dunite, 230 Mt peridotite, 4 Mt pyroxenite, 1 Mt gabbro, 3 Mt basalt), leaving 62 Mt unaccounted for. • Tonnage discrepancies exist between the ML/ARD management plan and the geochemical characterization program. For instance, the ML/ARD plan (Appendix L, section 2.3, Table 2.1) identifies gabbro as 59% of waste rock, whereas Appendix H reports it as 29%. Representative sampling that reflects evolving mine plans is essential to ensuring that data are available to inform an up-to-date water quality model. These inconsistencies create compounding uncertainty in the geochemical characterization of mine materials and in predictions of seepage composition. A comprehensive and up-to-date geochemical characterization program is required to understand changes to surface water quality due to the release of seepage and assess effects to fish and fish habitat and Indigenous peoples.	geochemical sampling program will be addressed during provincial permitting relative to project timelines.
GCH-02	Topic Geochemistry	TISG Section 8.3	**<u>Geochemical Characterization Program – Results</u>** There are a number of inconsistencies identified in the results of the geochemical characterization program that, along with the lack of confidence in the representativeness of the program, create compounding uncertainty in the inputs to the water quality model and associated effects to fish and fish habitat and Indigenous peoples. Due to the scale of the project and the anticipated quantity of mine materials that will be produced over the life of the project, it is necessary to understand the geochemical characteristics of those materials and building confidence that contaminants will be managed properly. Understanding any constraints in the geochemistry program is also important considering the predicted high influence of seepage and planned effluent discharge on surrounding waters.	Outstanding information requirements about the results of the geochemical characterization program and how they were incorporated into the water quality model are outlined in the next 4 rows, with respect to: a. ARD/ML potential in construction materials b. Geochemical characterization – tailings c. Geochemical characterization – ARD/ML Assessment d. Water quality model – geochemical characterization inputs
GCH-02a	Topic Geochemistry IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic	TISG Section 8.3.3 IS Appendix K – Section 4 Appendix H – Section 3.1.5.1	**<u>ARD/ML potential in construction materials</u>** Based on the results of the geochemical characterization program, IAAC is not confident in the suitability of clay and waste rock to be used in construction as proposed, due to the potential for metal leaching (ML). The IS indicates that clay and waste rock from the East Zone will be used as construction material for haul roads, the tailings dam, and other infrastructure. The geochemical characterization in Appendix H indicates that a primary concern for the waste rock generated by the project is ML, with 53% of waste rock material being a source of contaminants of concern, including Cr(VI), Al, As, U, Cu, and V. Section 5.2.1.1 of the IS indicates that confirmatory waste rock samples will be screened to evaluate the potential for the development of acid rock drainage (ARD), and only used if the criteria indicate it is non-potentially acid-generating (NPAG). However, the potential for ML, even in NPAG materials, is a remaining concern due to its potential to degrade water quality and affect fish and fish habitat, including through bioaccumulation of certain contaminants in species consumed by Indigenous peoples as country foods.	1) Provide a description of how detailed criteria and supporting data will be used to evaluate the suitability of clay and waste rock for construction purposes, including how confirmatory testing will ensure these materials meet non-potentially acid-generating (NPAG) requirements. 2) Outline intentions to have a monitoring plan for metal leaching from construction materials, particularly for aluminum (Al), arsenic (As), chromium (Cr(VI)), vanadium (V), and other elements exceeding CCME or PWQO

	Conditions of Indigenous peoples		It is unclear from the ML/ARD management plan how it was assessed that clay and waste rock from the site is suitable for road construction and how any metal leaching from materials used for construction will be monitored, mitigated, or managed. IAAC is of the opinion that this gap should be addressed prior to construction, considering this would be difficult to reverse after these materials have been used for construction and contaminants have been released. The lack of cohesion between the ML/ARD management plan and the geochemical characterization program prevents a sufficient understanding of potential changes to surface water quality and effects to fish and fish habitat and Indigenous peoples.	guidelines, as identified in the Geochemistry Characterization Report. 3) Outline adaptive management strategies to address exceedances detected during operations, including mitigation measures to prevent contamination of water quality and effects to fish health, growth and survival. Ensure alignment with applicable guides, standards, and legislative frameworks, such as MEND 1.20.1, to reduce uncertainty and strengthen the ML/ARD management plan.
GCH-02b	Topic Geochemistry IAA 2(a)(i) Fish and Fish Habitat 2(a)(iii) Migratory Birds 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.3 Section 8.6 IS Appendix H – Appendix B, Sections 4.0 & 5.0, and Appendix K – Section 2.3 Appendix C.4 – Section 1.3 Appendix L – Section 5.2.4	<u>**Geochemical characterization – tailings**</u> The geochemical characterization program in Appendix H of the IS includes the characterization of four tailings samples and associated process water. The IS does not include information about where the four tailings' samples were sourced from to demonstrate representativeness. Considering the quantity of tailings that are anticipated to be generated over the life of the project (1,586 million tonnes), and the high potential for contamination from tailings due to their fine grained nature, IAAC does not have confidence that the geochemical characterization of the tailings provides an accurate assessment of contamination potential. Based on the CO3-NP analysis of the four tailings samples, 75% of the tailings are classified as uncertain and could be potentially acid generating (PAG). It is recognized that the availability of tailings samples can be limited during the planning stages of a project, due to mineral processing not having begun, and available samples being generated by processing test samples which can differ in composition from the feed used during operations. The representativeness of the tailings generated during testing is therefore inherently limited and directly influenced by the representativeness of the ore samples used for their generation. Additional information on the geochemical characterization of the tailings is needed to understand how runoff and seepage from exposed tailings may influence the composition of seepage and associated water treatment requirements. Confidence in predictions of seepage quality are necessary to understand changes to surface water quality and associated effects to fish and fish habitat and Indigenous peoples. Understanding the tailings geochemistry also helps inform the need for mitigation for migratory birds and species of importance to indigenous peoples that may come into contact with tailings.	1) Provide detailed descriptions of the methods used to generate tailings samples for geochemical characterization, including the representativeness of the ore samples used and any treatments applied (including IPT carbonation). 2) Clarify whether additional tailings samples are available to expand the geochemical characterization program. If samples are available, expand the geochemical characterization program to include these samples. Provide a revised water quality model using worst case scenario source terms. Demonstrate how this revised model will inform protective monitoring and water treatment plans. 3) Provide updated assessments of changes to water quality, and effects to fish and fish habitat based on the worst-case scenario model predictions, as appropriate, recognizing the uncertainty associated with limited tailings samples available. 4) Provide a comprehensive plan that outlines: • ongoing sampling and testing of tailings generated during

				operations, including tailings that have undergone IPT carbonation, that will ensure that predictions of runoff and seepage can be validated, and adaptive management strategies can be implemented. • how source terms and predictive models will be refined to better match observed conditions relative to project timelines • Alternatively, discuss how gaps in the geochemical sampling program will be addressed during provincial permitting relative to project timelines.
GCH-02c	Topic Geochemistry IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.3.1 IS Appendix H Appendix L – Section 4.2, Section 5.2.1 & Section 5.2.1.2	**<u>Geochemical characterization – ARD/ML Assessment</u>** There is a lack of confidence in the IS's characterization of mine materials as being non-potentially acid generating (NPAG), based on the results of the geochemical characterization program. An accurate understanding of the potential for acid rock drainage (ARD) is necessary to validate the water quality model. Confidence in the water quality model, including for contaminants that bioaccumulate, is necessary to inform the assessment of effects and associated mitigation measures and management for fish and fish habitat and Indigenous peoples. The IS (Appendix L, section 5.2) states that waste rock will not be segregated because preliminary geochemical characterization data shows waste rock is anticipated to be NPAG. This conclusion is based on the use of modified Sobek neutralization potential ratio (NPR) values and net acid generation (NAG) pH. However, as noted in the MEND 1.20.1 manual, this is only one method for measuring neutralization potential (NP) and the sample size used for the NAG testing is too limited to be relied upon to predict the acid drainage generation of the entire volume of the waste rock generated at the site. According to the MEND 1.20.1 manual, the CO3-NP is a potentially useful measure for determining NP because carbonate minerals are often the only rapidly available NP source capable of matching the fastest rates of acid generation. Based on the CO_3-NP results, approximately 22% of the waste rock could be PAG. Using CO_3-NP, all samples of overburden were classified as NPAG while modified Sobek NP classified 4% of overburden as potentially acid generating (PAG) and 4% as uncertain. The IS does acknowledge that this discrepancy is thought to be driven by the relatively low abundance of both sulphides and carbonates in the materials, and an abundance of silicate minerals; however, it is unclear why the modified Sobek method results in less neutralization potential for overburden than the CO_3-NP considering the modified Sobek method uses both carbonate and silicates as neutralization. In the acid rock drainage and metal(loid) leaching (ARD/ML) assessment, using CO_3-NP, 7% of waste rock, 6% of ore, and 75% of tailings were assessed as uncertain; using modified Sobek NP, 1% of waste rock and 4% of overburden were assessed as uncertain. In accordance with MEND 1.20.1, materials (i.e., waste rock, ore, tailings, and overburden) classified as uncertain with NPR of between 1 and 2 are to be considered capable of generating ARD.	1) Discuss the discrepancy between the modified Sobek NP and CO_3-NP results for overburden and provide a rationale for why these results represent an accurate assessment of the potential for acid rock drainage from overburden. 2) Revise the water quality models (see also GCH-02d) and the ML/ARD management plan to reflect: • The most conservative estimate of NP (CO_3-NP) to manage the waste rock generated at the site. Management of waste rock may include segregation and/or blending of the PAG and NPAG materials to enhance buffering of potential acid drainage that may be produced from the PAG materials. • Contingency measures in relation to the results of ongoing geochemical testing at the site. 3) Develop a comprehensive plan to continue geochemical testing of mine materials for a more accurate assessment of ARD/ML potential and discuss how gaps in the geochemical sampling program will be addressed

			Additional observations regarding the ARD/ML assessment include: • Aluminum, arsenic, boron, cadmium, chromium VI, copper, and vanadium were identified as having potential for metal leaching exceeding Provincial Water Quality Objectives (PWQO) in waste rock materials. There is also potential for alkalinity to exceed Canadian Council of Ministers of the Environment and PWQO in all materials. • Aluminum, antimony, arsenic, boron, cadmium, chromium VI, copper, thallium, and vanadium have potential for leaching exceeding PWQOs in ore. • Overburden material indicates potentially elevated arsenic, aluminum, cadmium, cobalt, fluoride, chromium VI, boron, copper, iron, lead, vanadium, selenium, and zinc, with exceedances of relevant PWQOs.	and results will be incorporated into the ongoing refinements to the water quality model and ML/ARD management plan during provincial permitting relative to project timelines.
GCH-02d	Topic Geochemistry IAA 2(a)(i) Fish and Fish Habitat 2(e)(ii) Current Use of Lands and Resources 2(f) Health, Social or Economic Conditions of Indigenous peoples	TISG Section 8.3.2 IS Appendix K – Section 3.2.4 Appendix H – Section 3.1.4.3 & Section 3.2.1 Appendix H – Section 6.0 & Appendix B	**Water quality model – geochemical characterization inputs** The IS's water quality model does not sufficiently incorporate data from the geochemical characterization program. As a result, IAAC is unable to validate predicted changes to surface water quality due to the release of seepage, and associated effects to fish and fish habitat and Indigenous peoples. Appropriate incorporation of geochemical data in the water quality model is necessary to inform the ML/ARD site management plan and/or determine potential mitigation measures to manage effects to fish and fish habitat and Indigenous peoples due to changes in water quality in the receiving environment. Gaps are noted in the following categories: Representation of Impoundment Facility Composition The Water Quality Model assumes the Impoundment Facility's source terms are entirely represented by waste rock, despite the facility also containing 16% overburden material. Overburden samples were subjected only to static testing, not kinetic testing, and were excluded from the model based on the assertion that selenium enrichment was due to high detection limits. However: • Static tests revealed overburden samples had significant crustal enrichment in selenium. • Shake Flask Extraction tests indicated exceedances of Canadian Council of Ministers of the Environment (CCME) and Provincial Water Quality Standards (PWQO) limits for multiple elements (e.g., Al, Cr(VI), Cu, Zn) exceeding those observed in waste rock. The assumption that overburden has source terms comparable to waste rock is unsupported, necessitating its inclusion in the model with robust testing. Chromium (Cr(VI)) Concentrations The model sets Cr(VI) concentrations to detection limit values for materials in the Impoundment Facility based on unsupported assertions: • The claim that waste rock is predominantly mafic, while ultramafic rocks are the primary source of Cr(VI), ignores that 13% of waste rock is ultramafic peridotite, which showed Cr(VI) exceedances in humidity cell test (HCT) results. • The claim that HCT results showed Cr(VI) below detection limits for waste rock is contradicted by data (e.g., Figure 37, Appendix H), where Cr(VI) approached PWQO limits in mafic gabbro samples. • Overburden was not tested via HCT, yet 48 of 50 overburden samples in shake flask tests exceeded CCME and PWQO for Cr(VI). The exclusion of Cr(VI) contributions from these materials is unjustified and undermines the reliability of the model's predictions for Ponds 1 and 2. Source Term Data The water quality model's source term data lacks sufficient detail to understand the range of potential changes to surface water quality and effects to fish habitat and Indigenous peoples from contact water: • The TISG requires base, worst-case (e.g., 75th to 90th percentile), and sensitivity scenarios, but only median loading rates were used without justification for the omission of a worst-case scenario and sensitivity analysis.	1) Revise the water quality model to ensure that all source term inputs are fully supported by the results of the geochemical characterization program. This revision should: • Address the identified discrepancies in the representation of overburden and waste rock, particularly in relation to metal leaching potential and Cr(VI) exceedances. • Align the updated model with TISG requirements by presenting base, worst-case, and sensitivity scenarios, alongside a detailed description of all input parameters and assumptions used. 2) Provide a plan to: • Update the Water Quality Model to include kinetic testing data for overburden materials and incorporate realistic Cr(VI) concentrations based on observed exceedances in waste rock and overburden, to inform ongoing refinements to optimize the ARD/ML management plan and inform provincial permitting. • Conduct and include a sensitivity analysis to account for imperfect segregation of mine rock types (namely waste rock, overburden, clay), considering the variability in metal leaching potential across different material types. These

			• The TISG requires clear descriptions of input parameters and assumptions, yet the model does not detail how release rates were calculated from HCT results (e.g., test weeks, assumptions applied), or how data from ongoing tests will be used. This is critical as unstable release rates are observed for some tests, particularly those indicating increased levels of ML potential.	updates will improve the reliability of the Water Quality Model and ensure it adequately supports the ML/ARD management plan, reducing uncertainties in mine site effluent water quality predictions and enabling more effective mitigation of potential risks to water quality, and fish and fish habitat