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March 8, 2023

Anjala Puvananathan
Director, Ontario Region
Impact Assessment Agency of Canada

Submitted electronically: http://iaac-aeic.gc.ca/050/evaluations/proj/83857

Subject: Natural Resources Canada's Submission of Comments on the Draft Tailored Impact Statement Guidelines for the Crawford Nickel Project

Dear Colleague,

On February 6, 2023, the Impact Assessment Agency of Canada (IAAC) requested that Natural Resources Canada (NRCan) provide specialist or expert information or knowledge to support development of the Tailored Impact Statement Guidelines (TISG) and the Permitting Plan for the Crawford Nickel Project (the Project), as per paragraph 23(a) of the *Impact Assessment Act*.

Based on provided documentation, NRCan does not anticipate a requirement to exercise a power or perform a duty or function to enable the Project to proceed. However, based on areas of our expertise, NRCan has made several comments on the draft TISG, which can be found in Attachment 1.

Should you have any questions, comments, or concerns, please contact me by email at anica.madzarevic@nrcan-rncan.gc.ca or by phone at 343-571-9873.

Sincerely,

Anica Madzarevic
Impact Assessment Officer
Impact Assessment Division
Office of the Chief Scientist

cc: Sara Ryan, Team Lead, Impact Assessment Division, Office of the Chief Scientist
Sonia Roussel, Director, Impact Assessment Division, Office of the Chief Scientist

Attachment 1: NRCan Comments on the Draft Tailored Impact Statement Guidelines

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Comment Form – Draft Permitting Plan and Draft Tailored Impact Statement Guidelines – Federal Review Team

Crawford Nickel Project **Response required by: March 8, 2023**

Department/Agency:	Natural Resources Canada		
IA Contact:	Anica Madzarevic	Telephone:	343-571-9873
		Email:	Anica.Madzarevic@nrcan-rncan.gc.ca

Section 1:

1. Confirm that all applicable legislative and regulatory oversight that may apply to the Project, under the authority of your department, is accurately listed in the draft Permitting Plan.

Insert response here:

In the draft Permitting Plan, the second footnote accurately describes Natural Resources Canada's legislative and regulatory oversight that may apply to the Project, "Based on information available at the time of this Plan's publication, it is not expected that Natural Resources Canada will be required to issue an authorization or licence under subsection 7(1) of the *Explosives Act* because explosives would likely be manufactured under an existing licence and the storage of explosives in magazines on site would be permitted by the Province of Ontario."

2. Indicate whether your department has identified any power that it will be unable to exercise to allow the Project to proceed, in whole or in part. For more information, refer to subsection 17(1) of IAA.

Insert response here:

Natural Resources Canada has not identified any power that it will be unable to exercise to allow the Project to proceed, in whole or in part.

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Section 2:

Department – Comment ID	Draft Guidelines Section	Context and Rationale	Recommendation
NRCan-01	4.4. Alternative means of carrying out the Project	Planning for tailings, waste rock, overburden and pit wall management is crucial at the Impact Assessment stage, as it is difficult and economically challenging to move problematic waste a second time during operation or decommissioning. The current expectation for the management of mine material is as follows: • mine waste management (tailings, waste rock, overburden, low-grade ore): ○ storage, management and re-use of excavated materials (e.g., waste rock, overburden, topsoil), including those that are potentially acid-generating or leachable; ○ location of mine waste facilities in consideration of groundwater flow directions, any local groundwater users, nearby rivers, lakes and wetlands; ○ tailings storage methods (e.g., conventional slurry, thickened, filtered tailings facility, co-deposition, re-use as partial pit backfill); ○ tailings management techniques to improve carbon sequestration; The current version of the guidelines does not consider potential acid generation and metal leaching of pit walls and how it would affect the closure of the exhausted open pit. In addition, there are two waste rock piles proposed, however there is presently no expectation to consider the potential alternative of segregating	NRCan recommends the following changes to guidelines on p.18: • "mine waste management (tailings, waste rock, pit walls, overburden, low-grade ore):" ○ "storage, management and re-use of excavated materials. For instance, segregation of ARD/ML rock into waste pile 1 and less problematic rock in waste pile 2 or vice-versa; pit wall ARD/ML management; overburden and soil re-use. ~~(e.g., waste rock, overburden, topsoil), including those that are potentially acid-generating or leachable~~;" ○ "tailings storage methods. ~~(e.g.,~~ For instance, conventional slurry, thickened, or filtered tailings; tailings co-disposal versus disposal of acid and metal leaching tailings in a separate cell from non acid generating and metal leaching tailings ~~facility, co-deposition, re-use as partial pit backfill)~~;" ○ provide an assessment of alternatives comparing management of ARD/ML tailings and waste rock on surface vs backfill into the open mined out pit at the time of decommissioning;

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		potential ARD/ML rock in one pile and less problematic rock in a second pile. In addition, the current project description identifies one tailings management area. Perhaps it could be wise to manage potentially acid and metal leaching tailings in a separate cell. Finally, as there is only one pit at the end of this operation, the TISG is not asking the proponent to assess the potential of backfilling the pit with ARD/ML rock or tailings.	
NRCan-02	7.3.2 Temporal Boundaries	Temporal boundaries can at times be limited to several decades following closure. As groundwater effects may not yet be monitorable within this period, a request is made that temporal boundaries, and monitoring plans acknowledge these longer time scales for certain effects.	NRCan recommends adding the following bullet on p.32 after "define temporal boundaries by taking into account: relevant physical, technical, ecological, social, health, economic and cultural considerations;": ○ The foreseeable period over which temporary impacts are expected
NRCan-03	8.2 Geology and Geological Hazards 8.2.1 Baseline conditions	While satellite imagery can be useful for delineating bedrock outcrops and faults/lineaments, they are not required on geological maps.	NRCan recommends rewording this bullet on p.42 for clarity as follows: ○ "describe the geology of the bedrock and unconsolidated sediments at an appropriate scale for the Project, including a table of geological descriptions, geological maps, geophysical information, ~~using~~ satellite imagery~~,~~ and cross-sections at the appropriate scale;"
NRCan-04	8.2 Geology and Geological Hazards 8.2.1 Baseline conditions	All bedrock outcrop locations are used in the assessment of groundwater-surface water interactions. Maps should show all outcrops, not just those being excavated.	NRCan recommends rewording this bullet on p.42 for clarity as follows: • "identify on geological maps the location of areas of bedrock outcrops, highlighting locations that will require blasting;"

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NRCan-05	8.3 Geochemistry of mined or excavated materials 8.3.1 Baseline Conditions	The detailed project description indicates that the proponent may use a sand and gravel deposit located within the property boundary, or other sources of aggregate may be sourced as needed from existing or new pits and quarries operated by third parties or new operations developed and operated by the proponent. The Impact Statement must also include geochemical characterization of any geological materials to be used on site that are sourced off the property. In addition, currently, the TISG indicates that the Impact Statement must "describe the quantity of chrysotile (asbestos) in rock". NRCan recommends that this bullet be replaced by a new one as provided in the recommendation. In addition, some of the text currently located under section 8.6.2 Effects to Groundwater and Surface Water refers to characterization and analysis work of the mined or excavated materials which would be better suited in section 8.3.1.	NRCan recommends rewording this bullet on p.43 following "The Impact Statement must:": • "provide a geochemical and mineralogical characterization of expected mined or excavated materials (and historical waste, if applicable), such as waste rock, ore, low grade ore, pit wall materials, tailings, overburden and potential construction material (i.e., mine rock, on-site sand and gravel deposits, quarries, unconsolidated material), either sourced on-site or transported to the site from external sources." NRCan recommends the second and third bullet below be moved from section 8.6.2 to section 8.3.1 on p.43 following "In particular:", the last bullet be removed from the TISG and replaced with the first bullet: • quantify the abundance of asbestos, distinguishing the chrysotile and amphibole types, of expected mined or excavated materials and geological waste products using an appropriate mineralogical technique; • provide longer term kinetic testing to evaluate rates of acid generation and metal(loid) leaching, if applicable; • provide potentially acid-generating rock volumes and tonnage, and disposal methods; • ~~"describe the quantity of chrysotile (asbestos) in rock."~~

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NRCan-06	8.3 Geochemistry of mined or excavated materials 8.3.2 Effects to chemical release rates	The detailed project description indicates that the proponent may use a sand and gravel deposit located within the property boundary, or other sources of aggregate may be sourced as needed from existing or new pits and quarries operated by third parties or new operations developed and operated by the proponent. The Impact Statement must also consider chemical release from any geological materials brought onto the site.	NRCan recommends rewording the following text and sub-bullet on p.44 as follows: "The Impact Statement must describe the effects of the Project on the rate at which chemicals may be released from ~~mined or excavated~~ materials mined or excavated on site, and geological materials transported onto the site, to inform assessment of effects on groundwater and surface water quality (*section 8.6.2*), which are then used to inform on necessary mitigation measures, including:" ○ "mine waste disposal, management and mitigation methods and their ~~affects~~ effects on acid rock drainage and/or metal(loid) leaching potential;
NRCan-07	8.3 Geochemistry of mined or excavated materials 8.3.3 Mitigation and enhancement measures	Mitigation measures do not vary for amphibole and chrysotile forms of asbestos, therefore specifying chrysotile is not necessary.	NRCan recommends editing this bullet on p.44 of the draft TISG: • describe methods for the prevention, monitoring, management and control of ~~chrysotile (~~asbestos~~)~~ in airborne dust.
NRCan-08	8.4 Topography, soil and sediment 8.4.2 Effects to topography, soil and sediment	Consider re-landscaping and movement of overburden impacts in addition to vegetation clearing and watercourse diversions.	NRCan recommends editing this bullet on p.45 as follows: • "potential and likelihood of problematic erosion from movement or re-distribution of soil and overburden, vegetation clearing and watercourse diversions; and"
NRCan-09	8.4 Topography, soil and sediment	Describe effects related to potential changes to soil quality and fertility, loss and compaction.	NRCan recommends adding this bullet on p.45 as follows:

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	8.4.2. Effects to topography, soil and sediment		• potential and likelihood of changes to soil quality and fertility, loss and compaction
NRCan-10	8.4 Topography, soil and sediment 8.4.2. Effects to topography, soil and sediment	The creation of contaminated soil can be considered here.	NRCan recommends editing this bullet on p.45 as follows: • "potential and likelihood of contaminating soil or re-suspending, releasing or otherwise disturbing known or suspected soil or sediment contamination."
NRCan-11	8.5 Atmospheric, acoustic, and visual environment 8.5.1 Baseline conditions	Dust has been flagged as a particular source of concern in the Summary of Issues due to the enhanced possibility of chrysotile asbestos being present in dust emissions. Dust monitoring data quality varies by method. It is therefore recommended that the Impact Statement includes information on the dust data collection methods.	NRCan recommends editing this bullet on p.46 as follows: • "describe the data collection methods and data source(s), including data validation and quality control methods;"
NRCan-12	8.5 Atmospheric, acoustic, and visual environment 8.5.1 Baseline conditions	To add precision recognizing that amphibole asbestos is more harmful than chrysotile asbestos, the proponent should assess both amphibole and chrysotile forms of asbestos.	NRCan recommends editing this sub-bullet following "provide baseline ambient air concentrations for contaminants for all phases of the Project, in particular near key receptors (e.g., communities, traditional land users, wildlife) and quantify emission sources for the following:" on p.46 of the draft TISG: ○ "asbestos (chrysotile and amphibole) ~~(asbestos)~~; and"
NRCan-13	8.5 Atmospheric, acoustic, and visual environment 8.5.2 Effects to the atmospheric, acoustic, and visual environment	To add precision recognizing that amphibole asbestos is more harmful than chrysotile asbestos, the proponent should undertake analyses to predict the likelihood and quantity of both amphibole and chrysotile forms of asbestos.	NRCan recommends editing this bullet on p.48 of the draft TISG: • "describe additional analyses that were undertaken, if any, to predict the likelihood and quantity of asbestos (chrysotile and amphibole) ~~(asbestos)~~ contamination in dust;"

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NRCan-14	8.5 Atmospheric, acoustic, and visual environment 8.5.3 Mitigation and enhancement measures	Mitigation measures do not vary for amphibole and chrysotile forms of asbestos, therefore specifying chrysotile is not necessary.	NRCan recommends editing this bullet on p.50 of the draft TISG: • "provide a description of additional measures to be implemented specifically to manage ~~chrysotile (~~asbestos~~)~~ in airborne dust, if necessary;"
NRCan-15	8.6 Groundwater and surface water 8.6.1 Baseline conditions	Remove template preamble.	Remove the following text on p.51: "~~Requirements for the characterization of baseline groundwater and surface water conditions in an Impact Statement will vary depending on the type of project. They will be commensurate in emphasis and detail with potential effects on groundwater and on surface water. Requirements listed here are in a sequence corresponding to the steps of a generic, coupled, groundwater–surface water characterization study.~~"
NRCan-16	8.6 Groundwater and surface water 8.6.1 Baseline conditions	The use of the term baseflow can have different interpretations between hydrologists and hydrogeologists. It is recommended that when referring to hydrograph data, low flow not baseflow is derived from the data.	NRCan recommends rewording this bullet on p.51 for clarity as follows: • "provide flow hydrographs and corresponding water levels for nearby streams and rivers showing the full range of seasonal and inter-annual variations; as well as seasonal ~~baseflow~~ low-flow for baseflow quantification"
NRCan-17	8.6 Groundwater and surface water 8.6.1 Baseline conditions	Model Calibration guidelines seem out of place, and may be missed when placed in the field data collection section. The sub-bullet (p.52) : ○ use this information to calibrate and verify numerical flow modelling;	NRCan recommends removing this sub-bullet from the field data section on p.52: ○ ~~use this information to calibrate and verify numerical flow modelling;~~ NRCan recommends rewording this sub-bullet on p.53 as follows:

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		should be moved to the baseline model calibration section (p.53).	○ "calibrate the numerical model to baseline hydrogeological conditions using groundwater level and stream flow monitoring data, along with the delineation and characterization of groundwater–surface water interactions from the field investigation, and provide metrics and graphs describing the quality of the calibration that was achieved and discuss how spatial variability is considered in model calibration"
NRCan-18	8.6 Groundwater and surface water 8.6.1 Baseline conditions	As interpretation of heads regarding groundwater relative to the conceptualization can differ between hydrogeologists, additional text is recommended to ensure that the required information is provided.	NRCan recommends rewording this bullet on p.53 for clarity as follows: • "describe the hydrostratigraphic units (aquifers, aquitards, aquicludes) of the hydrogeological environment in both bedrock and overburden and provide a piezometric map showing ~~heads~~ groundwater elevations and the direction of groundwater flow for the various hydrostratigraphic units"
NRCan-19	8.6 Groundwater and surface water 8.6.1 Baseline conditions	Faults can change both the direction and quantity of groundwater flow. To understand the hydrogeological conceptualization of the fault system, both direction and magnitude should be provided.	NRCan recommends rewording this bullet on p.53 for clarity as follows: ○ "describe the structural geology of the hydrogeological environment, including major faults, fracture density, orientation with respect to groundwater flow directions and magnitudes"
NRCan-20	8.6 Groundwater and surface water 8.6.1 Baseline conditions	Cross-sections illustrate the conceptual modelling of groundwater flow. To fully illustrate the conceptual model, hydrostratigraphic units should also be included on the cross-section.	NRCan recommends rewording this bullet on p.53 for clarity as follows: • "provide hydrogeological maps and cross-sections of the study area showing hydrostratigraphic units, water table elevations, potentiometric contours, interpreted groundwater flow

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			directions, groundwater divides and areas of recharge and discharge"
NRCan-21	8.6 Groundwater and surface water 8.6.1 Baseline conditions	See note regarding the term baseflow in NRCan-16. The more general term groundwater should be used in the context of numerical groundwater flow model results. It is noted that wetlands, streams, rivers, and lakes were used inconsistently when referring to groundwater-surface water interaction. To ensure that all waterbodies are evaluated, the terms watercourses and waterbodies should be used to reduce the chance of excluding a more specific term.	NRCan recommends rewording this sub-bullet on p.53 for clarity as follows: ○ "using the calibrated numerical model, provide a baseline groundwater budget including ~~baseflow~~ groundwater discharge to/recharge from waterbodies and watercourses, particularly those identified in the delineation of groundwater-surface water interactions, ~~wetlands, streams and rivers, recharge from lakes or streams,~~ and any anthropogenic withdrawals"
NRCan-22	8.6 Groundwater and surface water 8.6.2 Effects to groundwater and surface water	This section seems to be missing a guideline about assessing potential vegetation and terrestrial changes on water quantity. There is mention of water quality response, but not water quantity.	NRCan recommends adding this bullet in section 8.6.2 as follows: • Provide an assessment of potential changes to surface water quantity due to removal of vegetation and changes to riparian, wetland, and terrestrial environments.
NRCan-23	8.6 Groundwater and surface water 8.6.2 Effects to groundwater and surface water	The requirements to describe the potential for acid rock drainage and metal(loid) leaching in the TISG are repeated in sections 8.3 Geochemistry of mined or excavated materials and 8.6 Groundwater and surface water. As a result, there is repetition in the TISG requirements. Specifically, section 8.3.1, pp.43-44 includes the following bullets: • "describe the approach and methods for the prediction of acid rock drainage and metal(loid) leaching, including identification of potential parameters of concern. Provide	NRCan recommends that all requests for characterization of mine waste material and their potential for acid rock drainage and metal(loid) leaching be made in Section 8.3, and that Section 8.6 only request how the source terms described in Section 8.3 are predicted to change the surface water, groundwater, and sediment quality in both the expected and worst-case scenarios. In section 8.6.2, NRCan recommends reference to acid rock drainage and metal(loid) leaching be moved to a sub-bullet under the bullet "describe the potential changes to surface water, groundwater or sediment

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		initial leaching potential results based on short term leach tests and an analysis of the representativeness of laboratory and field kinetic tests based on static tests results; • "provide estimates of the potential for all materials to be sources of acid drainage, neutral mine drainage, and/or metal(loid) leaching, timing to its onset, and short- and long-term loading rates calculated from kinetic testing for both neutral and acidic conditions, with consideration for the use of a proxy (i.e., historical mine waste, analytical tests replicating acidic conditions) if kinetic tests have not produced acidic leachate, if applicable; and", while section 8.6.2, p.57 includes the following bullets: • "describe the changes to surface water, groundwater and sediment quality resulting from acid rock drainage and/or metal leaching: ○ "describe the methods used to predict acid rock drainage and/or metal leaching for mined materials, tailings, and process waste;" ○ "provide longer term kinetic testing to evaluate rates of acid generation and metal(loid) leaching, if applicable;" ○ "provide estimates of the potential for mined materials, tailings and process waste to be sources of acid drainage or metal leaching, and estimates of the potential time to	quality related to the Project including;" on p.55 as follows: ○ potential changes to surface water, groundwater and sediment quality resulting from acid rock drainage and/or metal(loid) leaching from mined or excavated material, tailings, stockpiles, and pit walls. NRCan recommends moving the following guidelines from section 8.6.2, p.56 to section 8.3.2 and making the following changes: • "describe tailings management strategies, including:" ○ characterization of tailings to be backfilled and tailings to be stored on surface ○ "the solid and liquid composition and volume of specific waste streams (including mineralogy and total organic carbon content for solid streams), and dissolved inorganic carbon, organic carbon, isotopic composition of water, and potential tracers of groundwater contamination for liquid streams;" ○ "disposal sites and dimensions, including their location on the post-closure landscape;" ○ "feasibility and effectiveness of different reclamation strategies (i.e., various wetland landscapes and dry landscapes), the use of covers and consideration of their long-term, post-closure performance;" ○ "measures and strategies for recycling, preventing pollution and minimizing waste

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		the onset of acidic drainage or metal leaching, if applicable;" ○ "provide estimates of surface and seepage water quality from the areas of potentially acid generating and metal leaching rock and other infrastructure for the life cycle of the Project; and" ○ "provide potentially acid-generating rock volumes and tonnage, and disposal methods;"	throughout the life-cycle of the Project, including information on the technologies that will be employed;" ○ "identify the limits of proposed tailings treatment technologies at closure; and" ○ "a plain language summary of options for, and approach adopted for tailings management." NRCan recommends removing the following guidelines from section 8.6.2, p.57 as it is covered by guidelines in section 8.3: ○ "~~describe the methods used to predict acid rock drainage and/or metal leaching for mined materials, tailings, and process waste;~~" ○ "~~provide longer term kinetic testing to evaluate rates of acid generation and metal(loid) leaching, if applicable~~;" ○ "~~provide estimates of the potential for mined materials, tailings and process waste to be sources of acid drainage or metal leaching, and estimates of the potential time to the onset of acidic drainage or metal leaching, if applicable~~;" ○ "~~provide potentially acid-generating rock volumes and tonnage, and disposal methods;~~"
NRCan-24	8.6 Groundwater and surface water 8.6.2 Effects to groundwater and surface water	It is noted within the detailed project description that mineral carbonization is being considered for both the waste rock and tailings for the Project. As mineral carbonization approaches may employ non-standard waste placement approaches (to enhance water and air ingress), and may produce	NRCan recommends adding the following bullet on p.54 below the header bullet "The Impact Statement must:": • Where mineral carbonization is planned, discuss mine waste management practices and by-products as they relate to the conceptualization of groundwater flow and seepage, and ensure that

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		cementitious material that can alter the groundwater flow properties of the waste materials, a guideline has been added such that these factors are, at a minimum, discussed within the conceptual modelling of groundwater flow.	numerical modelling approaches represent this conceptualization
NRCan-25	8.6 Groundwater and surface water 8.6.2 Effects to groundwater and surface water	Seepage can occur from tailings, waste rock piles, and any waste backfilled into the mined open pit. The numerical model should be used to quantify seepage from all these sources.	NRCan recommends rewording this sub-bullet on p.55 for clarity as follows: ○ "estimate key project fluxes, including open pit or mine inflow rates, pit or mine dewatering rates, pit or mine flooding rates, and tailings and waste storage (including in pit storage) seepage rates during operations and the post-closure period; and"
NRCan-26	8.6 Groundwater and surface water 8.6.2 Effects to groundwater and surface water	The term basal aquifer refers specifically to a water bearing unit present below oil sands deposits and is specific to the mining of those deposits. Reference should be more general to refer to aquifer depressurization.	NRCan recommends rewording this sub-bullet on p.55 for clarity as follows: ○ "estimate seasonal changes to surface water and groundwater regimes during operations and the post-closure period, including effects of groundwater depressurization ~~of the basal aquifer~~ and dewatering of ~~surficial deposits~~ water bearing units, effects on ~~baseflow in rivers and streams~~ groundwater-surface water interactions in waterbodies and watercourses, effects on wetlands, effects on potable supplies, and effects on natural flow divides"
NRCan-27	8.6 Groundwater and surface water 8.6.2 Effects to groundwater and surface water	The timing, quantity and receptors for seepage from mine facilities generated by the numerical groundwater model is critical to understanding the effects to other valued components including fish and fish habitat.	NRCan recommends adding the following sub-bullet regarding receptors on p.55 below the "using the 3-dimensional numerical groundwater flow model" bullet to be more specific regarding guidelines: ○ describe the direction, quantity, timing, and receptors for any groundwater seepage

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			associated with project facilities including the waste rock stockpiles, the low grade ore stockpiles, the tailings management facility, and the flooded/backfilled open pit in post-closure, using particle tracking, piezometric contours, and water balance quantification.
NRCan-28	8.6 Groundwater and surface water 8.6.2 Effects to groundwater and surface water	Various data types are required to validate the results of the groundwater numerical model. This data includes both groundwater elevation (piezometric contours), and groundwater drawdown to facilitate review.	NRCan recommends rewording this sub-bullet on p.55 for clarity as follows: ○ "describe the downgradient flow of groundwater affected by the Project, with the use of figures showing groundwater piezometric contours, drawdown contours and particle tracking results, and"
NRCan-29	8.6 Groundwater and surface water 8.6.2 Effects to groundwater and surface water	To support the assessment of surface water and fish and fish habitat, the changes in the quantity of groundwater flow that interacts with surface water must be reported.	NRCan recommends adding the following sub-bullet on p.55 below the "using the 3-dimensional numerical groundwater flow model" bullet to ensure information supports the assessment of other valued components: ○ quantify any changes in groundwater discharge to surface water, or surface water recharge to groundwater relative to the calibrated baseline conditions for both operations and post-closure.
NRCan-30	8.6 Groundwater and surface water 8.6.2 Effects to groundwater and surface water	As the results of the groundwater model are applied in the assessment of other valued components including surface water and fish and fish habitat, and potentially used as input to site wide water balance and water quality modelling, the results should be reported such that the	NRCan recommends adding the following bullet on p.54 below the header bullet "The Impact Statement must:" to ensure information supports the assessment of other valued components: ○ Clearly indicate and describe any output from the groundwater flow model used within the integrated site wide water balance and/or

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		transfer of this data between the assessment of different valued components is clear.	water quality model, or in the assessment of other valued components.
NRCan-31	8.6 Groundwater and surface water 8.6.2 Effects to groundwater and surface water	There are several sub-bullets listed under the bullet "using the 3- dimensional numerical groundwater flow model" that are conceptual in nature. It is noted that the groundwater flow model is meant to quantify the conceptual understanding of the system, and cannot be used to describe attenuation parameters, contaminant locations and (in the absence of a contaminant transport model) fate and transport. Many impact assessments choose to represent contaminant transport using conservative assumptions such as conservative tracers and instantaneous arrival, especially in the case of ultramafic deposits likely to produce neutral mine drainage. The text has been altered to allow this approach.	NRCan recommends removing the following sub-bullets that follow the bullet "using the 3-dimensional numerical groundwater flow model" on p.55, and placing them below the header bullet "The Impact Statement must:" on p.54, and reword as follows: • "describe the contaminants associated with the Project, their spatial and temporal locations. ~~and their potential flow paths (e.g. groundwater seepage pathways and how they relate to potential receptors).~~ Characterize how they could affect surface and groundwater quality, including information on the source(s) of any contaminants, and their transport and fate in the hydraulic environment;" • "describe the contaminant attenuation capacity within the hydrogeological units in the project area. With this input, assess the potential for off-site groundwater and surface water contamination. Alternatively, the proponent may conservatively assume no attenuation capacity, but must still describe, in detail, potential degradation products (i.e., daughter materials) that may result from attenuation and other processes during groundwater flow."
NRCan-32	8.6 Groundwater and surface water 8.6.3 Mitigation and enhancement measures	As reported for the Upper Beaver TISG, and as part of the template review exercise, it has been noted that hydrostatic testing refers specifically to the pressure testing of pipelines that are operated under pressure. This is an engineering test and not a hydrogeological test.	NRCan recommends removing the following bullet from p.58: • "~~if the final details of the hydrostatic tests have not been confirmed yet, the proponent nonetheless must specify the expected~~

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		This bullet is present in the guidelines in relation to oil sands projects. It should be removed from the groundwater and surface water section of the guidelines for all projects and placed elsewhere for oil sands projects.	~~requirements, the options available and the criteria it intends to apply to assure protection of water resources.~~"
NRCan-33	8.6 Groundwater and surface water 8.6.3 Mitigation and enhancement measures	Groundwater monitoring should consider both groundwater quality and quantity as quantity can be used to validate the groundwater model. Groundwater pressure changes can be the first indication of potential impacts to surface water (as contaminate arrival significantly lags pressure change).	NRCan recommends rewording this sub-bullet on p.58 for clarity as follows: ○ "the proposed monitoring points to assess changes to groundwater quality and quantity, which should include well locations and depths; and"
NRCan-34	8.7 Vegetation, riparian and wetland environments 8.7.1 Baseline conditions	Add additional sub-bullet under the bullet: • "use the Ontario Land Cover Compilation v.2.0 to quantify, describe and map wetlands (e.g., fens, marshes bogs) within the local and regional study area and potentially affected by the Project, in the context of" that relates to peat depth as an indicator of carbon storage capacity of the wetland.	NRCan recommends adding this sub-bullet on p.60 as follows: ○ wetland/peatland depth
NRCan-35	8.7 Vegetation, riparian and wetland environments 8.7.1 Baseline conditions	In the bullet, "identify and describe wetland capacities to perform hydrological and water quality functions, provide for wildlife and wildlife habitat or other ecological functions;" the focus is heavy on wetlands, with less on riparian vegetation and function. Suggest extending some of the wording around wetlands to also include riparian vegetation. In addition, specify carbon sequestration function under "other ecological functions".	NRCan recommends editing this bullet on p.60 as follows: • "identify and describe wetland and riparian capacities to perform hydrological and water quality functions, provide for wildlife and wildlife habitat or other ecological functions, such as carbon sequestration;"

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Department – Comment ID	Draft Guidelines Section	Context and Rationale	Recommendation
NRCan-36	8.7 Vegetation, riparian and wetland environments 8.7.2 Effects to vegetation, riparian and wetland environments	Specify impact on peat properties that could affect carbon sequestration.	NRCan recommends editing this bullet on p.61 as follows: • "quantify the area of vegetation communities, riparian, wetland, and terrestrial environments, that may be cleared or otherwise disturbed and volume of peat disturbed within the study area during all phases of the Project, including a description of the disturbance;"
NRCan-37	8.7 Vegetation, riparian and wetland environments 8.7.2 Effects to vegetation, riparian and wetland environments	Specify carbon sequestration function under ecological functions.	NRCan recommends editing this bullet on p.61 as follows: • "describe any changes to or loss of wetland function, including consideration of ecological (e.g., hydrological, biogeochemical cycling, habitat, carbon sequestration, climate functions) and socio-economic functions of wetlands."
NRCan-38	8.11 Species at Risk and their habitat 8.11.1 Baseline conditions	Minor clarification	NRCan recommends editing this bullet on p.77 as follows: • "include a map showing where project components overprint the Kesagami caribou range at an appropriate scale to clearly identify the entire southern border of the range, the Hicks Oke Bog, Lake Abitibi, Timmins, Cochrane, Smooth Rock Falls, Highway 655, Highway 11, and any other features of potential relevance to connectivity and use of caribou habitat;"
NRCan-39	8.11 Species at Risk and their habitat 8.11.1 Baseline conditions	Minor clarification	NRCan recommends editing this bullet on p.78 as follows: • "evaluate whether caribou have potential to interact with the project or be impacted by the project activities during sensitive periods associated with caribou life stages, such as

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			calving, overwintering, and any seasonal movements over project timelines;"
NRCan-40	8.11 Species at Risk and their habitat 8.11.1 Baseline conditions	Minor clarification	NRCan recommends editing this bullet on p.78 as follows: • "describe the current state of connectivity of caribou habitat within the range including the corridors between important habitat features such as the Hicks Oke Bog and Lake Abitibi, as determined appropriate through technical discussions with the Agency and its federal expert advisors prior to submitting the Impact Statement, and the projection of caribou habitat connectivity in the absence of the Project over project timelines; and"
NRCan-41	8.11 Species at Risk and their habitat 8.11.2 Effects to species at risk and their habitat	Minor clarification	NRCan recommends editing this bullet on p.79 as follows: • "provide an assessment of potential adverse effects on boreal caribou habitat from the project activities;"
NRCan-42	8.11 Species at Risk and their habitat 8.11.2 Effects to species at risk and their habitat	Minor clarification	NRCan recommends editing this bullet on p.79 as follows: • "evaluate effects to habitat quality and habitat connectivity at the local, regional and range scales using quantitative methods (e.g. habitat quality analysis);"
NRCan-43	8.11 Species at Risk and their habitat 8.11.2 Effects to species at risk and their habitat	Minor clarification	NRCan recommends editing this bullet on p.80 as follows: • "evaluate the effects on the ~~population~~ status of caribou populations at the range scale by providing"

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NRCan-44	8.11 Species at Risk and their habitat 8.11.3 Mitigation and enhancement measures	Minor clarification	NRCan recommends editing this sub-bullet on p.81 as follows: ○ "use techniques to prevent predators from using the corridors and disturbed areas;"
NRCan-45	11.2 Effects to economic conditions 11.2.1 Employment	Suggest revising the following sub-bullet on p.97: "an estimate of the target workforce for each phase of the Project based on demographic profiles such as biological (sex), socio-cultural (gender), and identity factors (race, ethnicity, religion, age, and mental or physical disability);" Workforce targets by demographic profiles will be arbitrary and unlikely to succeed unless there is a support plan to create an inclusive work environment.	NRCan recommends rewording this sub-bullet on p.97 for clarity as follows: ○ "~~an estimate of the target workforce for each phase of the Project based on~~ a description of the plans to support hiring of underrepresented demographic profiles such as by biological (sex), socio-cultural (gender), and identity factors (race, ethnicity, religion, age, and mental or physical disability);"
NRCan-46	11.2 Effects to economic conditions 11.2.2 Business environment and local economy	Suggest revising the following bullet on p.99: "situate the Project within the international nickel supply chain context…" With nickel being a key component of electric vehicle and clean energy value chains, it is expected that raw and manufactured materials will flow across borders, particularly between the US and Canada, and may still provide a benefit to Canada through manufactured goods (i.e. electric vehicles). The North American value chain is well established for vehicles with internal combustion engines and is expected to remain the same for electric vehicles.	NRCan recommends rewording this bullet on p.99 for clarity as follows: • "situate the Project within the international and North American nickel supply chain context…"

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NRCan-47	13 Effects of potential accidents or malfunctions 13.1 Risk Assessment	Specific to a mine site is the potential malfunction or failure of liners and covers used to prevent or mitigate the formation or release of environmental contaminants. NRCan recommends that this be explicitly stated in section 13.1.	NRCan recommends modifying this bullet on p.114 as follows: • "take into account the lifespan of different project components, including any waste management and remediation strategies, such as liners and covers, if applicable, design of different project components, complicating factors such as weather or external events, and the potential for vandalism or sabotage;"
NRCan-48	17 Follow-up programs 17.1 Follow-up program framework	A mine waste characterisation program during construction and operation of the Project is critical to validating and adjusting the mine waste handling program developed during the planning phase. As such, this program needs to be explicitly described in the Impact Statement.	NRCan recommends these bullets on p.122 be edited as follows: • "preliminary description of follow-up studies planned (e.g., mine-waste characterisation program during construction and operations), as well as their main characteristics (list of parameters to be measured, planned implementation timetable, etc.);" • "triggers and intervention mechanism used in the event that the effects to the environment or impacts on rights of Indigenous peoples and cultures attributed to the Project are not as predicted;"
NRCan-49	17 Follow-up programs 17.2 Follow-up program monitoring	Text could be more explicit.	NRCan recommends this bullet on p.123 be edited as follows: • "identification of regulatory instruments (i.e., MDMER, Provincial requirements, etc.) that include a monitoring requirement for the VCs;"

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NRCan-50	17 Follow-up programs 17.3 Compliance monitoring	Text could be more explicit.	NRCan recommends the following text and bullet on p.123 be edited as follows: "Proponents are responsible for verifying whether the required mitigation measures were implemented and performed as predicted. The Impact Statement must present a framework by which it will undertake compliance monitoring for follow-up programs. This should include, but not be limited to:" • "description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements (e.g., not meeting Impact Statement predictions) or with the obligations imposed on contractors by the provisions of their contracts; and"