Enclosure 1: Provincial Advice Record – Crawford Nickel Project Impact Statement

Please submit the completed form by **January 24, 2025,** via the Registry.[1]

Ministry or Organization Contact Information

Submission Date	January 23, 2025
Ministry/Organization	Ministry of Environment, Conservation and Parks
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Please see questions and guidance in Tables 1, 2 and 3 attached.

Freduah Agyemang/MECP
Name of Ministry / Organization Responder

Hydrogeologist
Title of Responder

2025/01/23
Date

[1] All comments should be submitted via the ***Submit a Comment*** feature available on the Project's Canadian Impact Assessment Registry page (Reference 83857). Letters and forms can be uploaded using this feature. If you have any difficulties submitting this way, please contact IAAC at *Crawford@iaac-aeic.gc.ca* for assistance.

Table 1. Views to Inform the Impact Assessment

Table 1 can be used to provide views for IAAC's consideration in the analysis of the Project's federal effects[2,3,4] and preparation of the Impact Assessment Report, considering your ministry's local knowledge and regulatory expertise. Reviewers should consider project context and are encouraged to provide solution-oriented advice even where potential gaps in information are observed.

Comment ID	Refence to Impact Statement	Views to Inform the Impact Assessment
Please identify comments by ministry and number. *e.g.: MNR-01*	*Identify the specific section of the Impact Statement to which your comment applies.*	*Provide views and information for IAAC's consideration in the analysis of adverse federal effects, such as* • *whether the information is technically appropriate to support the conclusions presented, and the proposed mitigation measures are suitable to manage effects, considering regional context;* • *sources of uncertainty in the proponent's analysis that may substantially weaken conclusions, if any;* • *suggestions for provincial operational guidance or standards, including other mitigation and monitoring measures, that are well understood to be effective in the region;* • *relevant provincial legislative frameworks such as licensing, permitting, policies or programs that may provide another means to address adverse effects (describe the environmental outcomes that are typically achieved by the frameworks, how they are achieved, and whether mitigation and monitoring may be required and enforced); and* • *if your ministry has identified any permit or approval that it may not be able to issue to allow the Project to proceed as currently planned, and next steps for resolution of any issues.*
MECP-GW-01	Section 3.3.7	• The section on waste management is silent on how the proponent plans to manage demolition waste, and other non-recyclable waste during site decommissioning, closure, and post-closure. • The Impact Assessment should identify the options for disposal of the demolition waste and non-recyclable waste during decommissioning, closure, and post-closure. If these wastes are to be disposed off-site, then potential waste disposal sites should be identified and whether they have the capacity to accept the waste. If off-site disposal of the waste is not feasible and there is a need for alternative disposal sites for non-recyclable demolition waste including on-site, then it should be identified in the Impact Statement (EIS). • An Environmental Compliance Approval (ECA) from the MECP in accordance with the Environmental Protection Act is required prior to disposal of waste and may required hydrogeological studies to assess the impact on groundwater and surface water quality. Consultation with Indigenous Nations may also be required.
MECP-GW-02	Section 3.3.7.1	• The specific method and design system for domestic sewage has not been confirmed. However, section 3.8.2.3 states that a "a sewage treatment system is proposed to treat domestic sewage for the project that will discharge to the North Driftwood River…". The proponent should clarify the discrepancy between sections 3.3.7.1, and 3.8.2.3, and confirm how domestic sewage generated during all phases of the project will be managed. • An ECA from the MECP in accordance with the Ontario Water Resources Act (OWRA) for collection, treatment, distribution, and discharge of domestic sewage that exceeds a total volume of 10,000 L/day. An application for ECA for a subsurface sewage disposal is required to be supported by hydrogeological assessment and should demonstrate the satisfies the MECP Guideline B-7 (Reasonable Use Guideline).
MECP-GW-03	Section 3.8.3	• This section notes all solid waste produced on site will be reused, recycled, or disposed off site. No deposition of solid waste has been proposed to occur on site, and no waste management facilities are proposed during the construction and operations. • However, there is no discussion of the quantities of waste that may be generated on-site and potential off-site waste disposal sites that have the capacity to accept such volume of waste generated during construction and operations. This is a serious data gap that have the potential to delay the project if off-site waste disposal sites with adequate capacity to accept the waste cannot be identified. • The EIS has not taken any into consideration an assessment of potential impact of waste disposal site during the various of the proposed project. Therefore, any future design changes to include a solid waste disposal site (landfill) will have to be assessed holistically and may require gathering of additional hydrogeological investigation and groundwater risk assessment and monitoring program in accordance with the requirements of EPA, O. Reg. 232/98, and O. Reg. 347
MECP-GW-04	Section 5.3.8.2	• Two candidate alternative locations were considered for the ore process plant, and it is noted that the selection of the eastern location on an esker was based geotechnical stability. The esker is an important resource for groundwater recharge and a source of potential groundwater resource for domestic water supply. • A discussion of the potential water quality and quantity impact of locating the process plant on the esker should be discussed. • Other suitable location for the process plant outside of the esker should be considered.
MECP-GW-05	Section 5.3.10.1	• Two alternatives (i.e., sewage treatment plant, or a septic system) were assessed as both viable options, with a final determination to be made a later date. • However, it is noted that the sewage treatment plant alternative requires less project footprint and minimal water quality impacts compared to the septic system alternative. A septic system option will require availability of large amount of land for use as Contaminant Attenuation Zone (CAZ) and the surficial geology (i.e., clay) underlying the site may not be suitable for infiltration of sewage effluent and may result in sewage breakouts and other surface nuisance.
MECP-GW-06	Section 10.3	• Table 10.4 details the project interactions with geology and geologic hazards including potential adverse effect on changes to terrain stability due to mine rock stockpiles, overburden, and tailings management facility. It is noted that during closure, the TMF will be monitored and maintain due to potential for instability within the TMF. However, during operations phase, the assessment concludes that the management of waste (non water) will continue to not interact with terrain stability. • It is recommended that proponent clarify which waste types are being referred to, since TMF is also mine waste and will be expected to result in changes to terrain stability which could potentially lead to dam failure and impacts to groundwater quality during operations phase. • Further, section 10.4.2.2 (mitigation and enhancement measures) only proposes measures for the TMF and impoundment facility including slope stability assessment only during the closure. • It is also recommended that monitoring and maintenance of the of the TMF due to instability occurs during the operational phase and should also be discussed.

[2] "Federal effects" for this purpose means adverse effects within federal jurisdiction and adverse effects that are direct or incidental to the exercise of a federal power, duty or function (as defined in section 2 of the *Impact Assessment Act*).
[3] IAAC also invites views on effects related to public interest factors (defined in section 63 of the *Impact Assessment Act*) that may inform decision-making, such as positive effects on local economic conditions that contribute to sustainability.
[4] IAAC also invites views on potential effects to species at risk, and how they are typically managed in the region, to inform IAAC's obligations under section 79 of the *Species at Risk Act.*

MECP-GW-07	Sections 14.1.1.1.2; 14.1.1.2.5; and 14.1.1.2.2	• These sections indicate that the assessment of water quality impacts due to anticipated groundwater discharge to surface water features is based on CWQG-FAL used with a ten times dilution factor and Aquatic Protection Values (APVs), consistent with development of GW-3 values under O. Reg. 153/04. • However, the MECP water management policies (B-1-5) do not endorse or support the use of O. Reg. 153/04 (i.e., Brownfields standards/guidelines) as the basis for deriving groundwater quality criteria for assessment of groundwater discharges to surface water at Ministry approved discharge sites. • It should be noted that the use of the brownfield's regulations and guidelines at undeveloped sites cannot be defended as affording the highest degree of environmental protection. Further, brownfields standards/guidelines are intended for sites at which waste materials have been removed to the maximum extent feasible and there is no continuous source of contamination, which is the opposite of the active discharge scenarios at the proposed mine site. • The existing provincial water management policies (PWQOs) clearly instruct the use of PWQs and CWQGs as the quality targets for groundwater at the point of discharge to surface water. • It is recommended that PWQOs and CWQG-FAL are used as the water quality criteria for assessment of groundwater discharge to surface water for the Crawford Nickel mining project.
MECP-GW-08	Section 14.4.1	• The model grid spacing of the 3-D GW model consisted of general spacing of 800 X 800 m, with refinement to 100 X 100 m in the vicinity of project components. The grid spacing and refinement appears to be relatively coarse. It is known that the spatial resolution or spatial accuracy of the model is limited by the size of the discrete volumes and in some cases the ability to represent a flow or transport process is also limited by cell size. It is noted that the selecting the size of the cells in a model is an important step in model design and can cause bias in the simulation results. Finer discretization of the model domain allows for finer definition of hydraulic properties and more accurate solution of stresses. • It is recommended that a very fine grid spacing such as 10 X 10 m is used in the vicinity of the project components (i.e., open pit, TMF, impoundment facility, stockpiles), with 100 X 100 m and progressively larger general grip spacing across the rest of the model domain.
MECP-GW-09	Section 14.4.2.3.1	• Groundwater flow and quantity due to lowering of groundwater levels are predicted to be adversely affected by dewatering and changes to infiltration rates during construction. These changes are primarily due to the open dewatering, construction of process plants, and other infrastructure such as stockpiles, impoundment facility, and TMF. Groundwater levels (drawdown) are predicted to change by a minimum of 1 m extending between 2 km and 7.5 km around the open pit due to dewatering of the East Zone of the open pit. As outlined in Table 14.5, the changes to groundwater levels at the end of construction are predicted to affect groundwater discharges to surface water, wetlands, etc., with the highest reduction in predicted discharge rate predicted to occur in the West Buskegau River, Jack Lake, Martin Lake, Gerry Lake, and Sutherland Lake. The residual environmental effects related to the dewatering of the East Zone will extend to the operations phase and are characterized as adverse, medium-term, continuous, and irreversible. AEM has recommended potential mitigation measures (i.e., section 14.4.2.2) to mitigate against potential impacts should they exceed the model predictions. • It is recommended that AEM develop a detailed groundwater monitoring program to monitor for the effects on the groundwater levels and flows during construction and operations. • It is also recommended that the mitigation measures outlined in section 14.4.2.2 are incorporated into the project commitments. The mitigation measures must be tied into the groundwater flow model predicted changes on groundwater levels.
MECP-GW-10	Section 14.4.2.3.2	• The predicted groundwater inflow into the Open Pit when the Main Zone is fully developed, and East Zone development is still ongoing is 10,500 m3/day. The corresponding predicted 1 m drawdown contour extends between 3.2 km and 7.3 km around the open pit. This drawdown extent appears to be similar to the dewatering of only the East Zone alone during the construction phase when the groundwater inflow rate is 2,700 m3/day. This has been attributed to increased infiltration in the TMF, and diversion of the North Driftwood River. • As outlined in Table 14.6, the changes to groundwater levels at the end of Operations Year 17 are predicted to affect groundwater discharges, with the highest reduction in predicted discharge rate predicted to occur in the North Driftwood River, and Unnamed Lake (West Stockpile). The residual environmental effects related to the dewatering of the Open Pit are characterized as adverse, long-term, continuous, and irreversible. • It is recommended that the proponent develop a detailed groundwater monitoring program to monitor for the effects on the groundwater levels and flows during construction and operations phases of the project. • It is further recommended that mitigation measures are developed and included in the project commitments should the monitoring results deviate from the predicted effects.
MECP-GW-11	Section 14.4.2.3.3	• The predicted groundwater inflow into the Open Pit at the end of Operations Phase Year 30, when the Main Zone and East Zone are fully developed is 9,400 m3/day. The corresponding predicted minimum 1 m drawdown contour extends between 3.1 km and 9 km around the open pit. • As outlined in Table 14.7, the changes to groundwater levels at the end of Operations Year 30 are predicted to affect groundwater discharges, with the highest reduction in predicted discharge rate predicted to occur in the North Driftwood River, West Buskegau River, Jack Lake and Unnamed Lake (West Stockpile). The residual environmental effects related to the dewatering of the Open Pit at Year 30 are characterized as adverse, long-term, continuous, and irreversible. • It is recommended that the proponent develop a detailed groundwater monitoring program to monitor for the effects on the groundwater levels and flows during operations phases of the project. • It is further recommended that mitigation measures are developed and included in the project commitments should the monitoring results deviate from the predicted effects.
MECP-GW-12	Section 14.4.2.3.4	• At closure, groundwater level recovery in the open pit is expected to occur until elevation in the pit reaches 272.5 masl (spillway elevation) with a predicted steady-state flows of 1,400 m3/day from the flooded pit lake discharged to the environment. • As outlined in Table 14.9, the changes to groundwater levels at passive closure with pit lakes are generally predicted to positively affect groundwater discharges to surface water. However, predicted adverse effect on groundwater discharges with the highest reduction in predicted discharge rate predicted to occur in the North Driftwood River. • It is recommended that the impact of the groundwater discharge reduction in the North Driftwood River flows and ecology as well as monitoring of the effects and mitigation measures should be discussed.
MECP-GW-13	Section 14.4.3.2	• The proponent has proposed to incorporate these mitigation measures during all phases of the project. Without these measures, it is likely that groundwater quality and surface water quality could be adversely impaired. • It is recommended that the proposed mitigation measures including preparation of the following plans should be included in the project commitments and are required to be submitted for review prior start of construction including: • Emergency Preparedness and Response Plan and a Spill Prevention and Contingency Plan. • Metal Leaching and Acid Rock Drainage Management Plan. It is noted that a conceptual plan (Appendix L) has been prepared for the EIS.

MECP-GW-14	Section 14.4.3.3.2	• Seepage from the TMF, Impoundment Facility, stockpiles and tailings impounded in the open are predicted to have potential to affect groundwater quality. Table 14.10 provides a summary statistic for the mean, 75th percentile, and maximum concentrations for the operations and passive closure phases of the project. Potentially, concentrations of nitrate (N), arsenic, chloride, chromium, copper, and uranium are predicted to exceed PWQOs, CWCG-FAL. Manganese was elevated in both background groundwater and seepage from the TMF and Impoundment Facility in comparison to the ODWQS. • During operations Year 17, predicted groundwater flow pathway of seepage from the Impoundment Facility is generally towards the west and east towards the North Driftwood and West Buskegau Rivers respectively with lowest travel time of 150 years to the North Driftwood River. • The predicted groundwater flow pathway of seepage from the TMF extends into the west to the esker lakes (Zed, Mel, Sutherland, Jack, Gerry Lakes, and unnamed lake south of Zed Lake), south towards Jocko Creek, and northeast to the West Buskegau River, with the lowest travel time of 60 years to Gerry Lake. • It is concluded that the seepage is not predicted to reach a receiver during the period of mine life during the Year 17 model. • The predicted travel time from the TMF to the drilled water well located to the south is approximately 275 years which is expected to occur several years into Passive Closure when groundwater flow is expected to have reversed and away from the drilled water supply well. • It is recommended that a monitoring well is installed south of the TMF between the drilled water well and the TMF.
MECP-GW-15	Section 14.6.1	• The representation of the main regional fault was not possible in the model analysis and as such determining the sensitive of the model predictions to increased hydraulic conductivity along the fault or the influence of the main fault on the model results was not undertaken. It is understood discussion with the code developers are ongoing to rectify the issue. This issue should be addressed prior to the permitting. • It is recommended that addressing the shortcoming of the modelling code pertaining to the sensitivity of the model predictions to the main regional fault is included in the project commitments.
MECP-GW-16	Section 14.6.3	• Additional field studies are proposed with the results to be incorporated into an updated groundwater flow model to refine the model prediction prior to and to support permit applications. • It is recommended that the proposed studies are included in the project commitments.
MECP-GW-17	Appendix B.5, Section 2.3.2	• According to Section 2.3.2, paragraph 3, Aquatic Protection Values (APVs) are the established water quality criteria in surface water developed O. Reg. 153/04 and are used to determine the acceptable concentration in groundwater (GW-3 values). For this project, it is proposed the modelling process used to established APV by applying ten times dilution in the receiving environment compared to groundwater is used when comparing the groundwater quality data to surface water criteria. • However, the MECP water management policies (B-1-5) do not endorse or support the use of O. Reg. 153/04 (i.e., Brownfields standards/guidelines) as the basis for deriving groundwater quality criteria for assessment of groundwater discharges to surface water at Ministry approved discharge sites. • It should be noted that the use of the brownfield’s regulations and guidelines at undeveloped sites cannot be defended as affording the highest degree of environmental protection. Further, brownfields standards/guidelines are intended for sites at which waste materials have been removed to the maximum extent feasible and there is no continuous source of contamination, which is the opposite of the active discharge scenarios at the proposed mine site. • It is recommended that PWQOs and CWQG-FAL are used as the water quality criteria for assessment of groundwater discharge to surface water for the Crawford Nickel mining project.
MECP-GW-18	Appendix B.5, Section 2.3.5	• This section states that “For the Project, the PWQO (or interim PWQO) are used with a ten times dilution factor, in a manor consistent with the development of GW-3 values under O. Reg. 153/04, as a comparison where groundwater is anticipated to discharge to surface water features”. • However, the MECP water management policies (B-1-5) do not endorse or support the use of O. Reg. 153/04 (i.e., Brownfields standards/guidelines) as the basis for deriving groundwater quality criteria for assessment of groundwater discharges to surface water at Ministry approved discharge sites. • It should be noted that the use of the brownfield’s regulations and guidelines at undeveloped sites cannot be defended as affording the highest degree of environmental protection. Further, brownfields standards/guidelines are intended for sites at which waste materials have been removed to the maximum extent feasible and there is no continuous source of contamination, which is the opposite of the active discharge scenarios at the proposed mine site. • It is recommended that PWQOs and CWQG-FAL are directly compared to groundwater quality to ensure that there is protection of maximum number of aquatic receptors during the implementation of the project. Without this there is high likelihood that adjacent surface water quality and aquatic organisms that depend on the water could be adversely impacted.
MECP-GW-19	Appendix B.5, Section 5.4	• Five private dwellings were identified near the project area (PA), with only one of which confirmed to depend on groundwater for water supply. • It is recommended that the proponent conduct door-to-door survey to confirm the source of drinking water for other four dwellings.
MECP-GW-20	Appendix B.5, Section 5.6	• There is no hydraulic conductivity testing done within the esker although two boreholes were drilled in the esker. The report proposes to install monitoring wells within the esker and in-situ hydraulic conductivity testing completed. I agree with this recommendation and should be completed as soon as possible, and the results included in the model calibration update exercise. • There was only one hydraulic response test completed for the surficial clay unit with K estimated to be 2 x 10-8 m/s. It is noted that only one hydraulic testing of the surficial clay is insufficient to appropriately characterize the hydraulic conductivity of the clay. It also recommended that additional hydraulic testing of the glaciolacustrine clay at several other locations within the PA and LSA/RSA. • Further, only two hydraulic response testing was reported to have been completed within the weathered bedrock (i.e., between 0 and 10 m below top of bedrock). The rest of the bedrock hydraulic response testing were completed in the un-weathered bedrock. It is noted that majority of the groundwater flow within the bedrock occurs within the shallow weathered bedrock rather than the un-weathered bedrock. • It is recommended that additional hydraulic testing is completed within the weathered bedrock across the PA, LSA and RSA. • Furthermore, the proponent completed only one hydraulic response testing across the regional faults located within the PA, LSA and RSA at borehole CR21-GT-01C and concluded that the hydraulic conductivity for the testing interval which contains the fault is not significantly different than the average hydraulic conductivity estimated at CR21-GT-01C. The proponent is requested to clarify this statement since the fault is indicated to have been tested at CR21-GT-01C. It is recommended that additional hydraulic testing is competed across the regional fault in the PA as well as LSA and RSA to provide additional hydraulic conductivity data to support the EA conclusions that the main fault is not a preferential pathway for groundwater flow. It is a common knowledge that K values may vary by several orders of magnitude for the same formation and likely along different the different portions of the fault. • It is reported that MODFLOW6 code use for the groundwater flow modelling is not capable to simulate the regional faults within the model domain. The potential effects of the regional faults on the groundwater flow and impact on the modelling results is unknown.

		• The lack appropriate number of hydraulic conductivity testing and the inability to simulate the regional faults as outlined in the preceding paragraphs is a serious data gap that has the potential to significantly influence the modelling predictions. • It is strongly recommended that the additional hydraulic conductivity testing of the bedrock, esker and regional faults are undertaken. • It is further recommended that the regional faults are simulated individually in the groundwater flow model.
MECP-GW-21	Appendix B.5, Section 5.7	• Groundwater within the deep overburden glaciofluvial sand (Figure A.11) is interpreted to generally flow from south to north across the PA. • It is recommended that additional figures showing groundwater contours and flow directions are prepared for the bedrock, till and glaciolacustrine clay.
MECP-GW-22	Appendix B.5, Section 5.8.1.2	• As indicated, the temperatures of several groundwater samples arriving at the laboratory had not achieved the <10 ᵒ C as recommended by the MECP Analytical Protocol (O. Reg 153/04, O. Reg 406/19). It is noted that samples arriving at the laboratory on the day of sampling may not have had time to achieve a temperature of <10 ᵒ C. However, this is only acceptable if the cooling process has begun. • In most of the samples where the temperatures were exceeded, the arrival temperatures were higher than the sampling temperatures which does not indicate the cooling has started when the samples were received at the laboratory. • It is strongly recommended that sufficient ice or other coolants are added to the groundwater samples to achieve temperatures of less than 10 ᵒ C.
MECP-GW-23	Appendix B.5, Figures A.8 and A.9	• Figures A.8 Cross-Section A-A' (1 borehole), and A.9 Cross-Section B-B' (6 boreholes) shows very few monitoring wells or boreholes. In the case of Figure A.9, the 6 boreholes are clustered around the area of the Open Pit. • It is recommended that all boreholes and monitoring wells used to construct the cross-sections are identified on the cross-section for completeness and review.
MECP-GW-24	Appendix C.4, Section 3.2.2	• It is stated "For this Project, the Canadian Water Quality Guidelines for Protection of Freshwater Aquatic Life (CWQG-FALs) are used with a ten times dilution factor, in a manor consistent with the development of GW-3 values under Ontario Regulation 153/04, as a comparison where groundwater is anticipated to discharge to surface water features. • The MECP water management policies (B-1-5) do not endorse or support the use of O. Reg. 153/04 (i.e., Brownfields standards/guidelines) as the basis for deriving groundwater quality criteria for assessment of groundwater discharges to surface water at Ministry approved discharge sites. • It should be noted that the use of the brownfield's regulations and guidelines at undeveloped sites cannot be defended as affording the highest degree of environmental protection. Further, brownfields standards/guidelines are intended for sites at which waste materials have been removed to the maximum extent feasible and there is no continuous source of contamination, which is the opposite of the active discharge scenarios at the proposed mine site. • It is recommended that PWQOs and CWQG-FAL are directly compared to groundwater quality to ensure that there is protection of maximum number of aquatic receptors during the implementation of the project. Without this there is high likelihood that adjacent surface water quality and aquatic organisms that depend on the water could be adversely impacted.
MECP-GW-25	Appendix C.4, Section 3.3.2	• Section 3.3.2 refers to impact of surface water resources that may be affected by brownfield properties as a result of the impact of the discharge of impacted groundwater to surface water receivers. Further, it is stated that for this project, modelling process that considers a ten times dilution in the receiving environment compared to groundwater is used when comparing the groundwater quality data to surface water criteria. This is similar to the modelling approach used to develop Aquatic Protection Values (APVs) under O. Reg. 153/04. • The MECP water management policies (B-1-5) do not endorse or support the use of O. Reg. 153/04 (i.e., Brownfields standards/guidelines) as the basis for deriving groundwater quality criteria for assessment of groundwater discharges to surface water at Ministry approved discharge sites. • It should be noted that the use of the brownfield's regulations and guidelines at undeveloped sites cannot be defended as affording the highest degree of environmental protection. Further, brownfields standards/guidelines are intended for sites at which waste materials have been removed to the maximum extent feasible and there is no continuous source of contamination, which is the opposite of the active discharge scenarios at the proposed mine site. • It is recommended that PWQOs and CWQG-FAL are directly compared to groundwater quality to ensure that there is protection of maximum number of aquatic receptors during the implementation of the project. Without this there is high likelihood that adjacent surface water quality and aquatic organisms that depend on the water could be adversely impacted.
MECP-GW-26	Appendix C.4, Section 3.3.5	• This section states that "For the Project, the PWQO (or interim PWQO if applicable) are used with a ten times dilution factor, in a manor consistent with the development of GW-3 values under O. Reg. 153/04, as a comparison where groundwater is anticipated to discharge to surface water features. • The MECP water management policies (B-1-5) do not endorse or support the use of O. Reg. 153/04 (i.e., Brownfields standards/guidelines) as the basis for deriving groundwater quality criteria for assessment of groundwater discharges to surface water at Ministry approved discharge sites. • It should be noted that the use of the brownfield's regulations and guidelines at undeveloped sites cannot be defended as affording the highest degree of environmental protection. Further, brownfields standards/guidelines are intended for sites at which waste materials have been removed to the maximum extent feasible and there is no continuous source of contamination, which is the opposite of the active discharge scenarios at the proposed mine site. • It is recommended that PWQOs and CWQG-FAL are directly compared to groundwater quality to ensure that there is protection of maximum number of aquatic receptors during the implementation of the project. Without this there is high likelihood that adjacent surface water quality and aquatic organisms that depend on the water could be adversely impacted.
MECP-GW-27	Appendix C.4, Section 5.2.2	• The model grid spacing of the 3-D GW model consisted of general spacing of 800 X 800 m, with refinement to 100 X 100 m in the vicinity of project components. The grid spacing and refinement appears to be relatively coarse. It is known that the spatial resolution or spatial accuracy of the model is limited by the size of the discrete volumes and in some cases the ability to represent a flow or transport process is also limited by cell size. It is noted that the selecting the size of the cells in a model is an important step in model design and can cause bias in the simulation results. Finer discretization of the model domain allows for finer definition of hydraulic properties and more accurate solution of stresses. • It is recommended that a very fine grid spacing such as 10 X 10 m is used in the vicinity of the project components (i.e., open pit, TMF, impoundment facility, stockpiles), with 100 X 100 m and progressively larger general grip spacing across the rest of the model domain. It also recommended that the site pan/figure showing the model domain with the grid spacing be appended to the report.
MECP-GW-28	Appendix C.4, Section 5.2.5.4	• The calibrated hydraulic conductivity for the and glaciolacustrine clay deposits (1.2x10-5 to 1.2x10-6 m/s) were between 2 and 3 orders of magnitude higher than the measured/estimated hydraulic conductivity range obtained from the aquifer response tests (1x10-11 to 1x10-8 m/s). The rationale provided is to balance the need for adequate recharge volumes to reach the underlying aquifer in

		the local area. However, this phenomenon also has the tendency to introduce excess recharge into the groundwater system and thereby artificially minimizing the potential effect of the water taking on local groundwater levels and baseflow reduction. Was sensitivity analysis done on the recharge to assess influence on the modelling outcome? Further discussion is recommended.
MECP-GW-29	Appendix C.4, Section 6.2	• No explanation of why Jocko Creek, West Buskegau River, Unnamed Lake (south of Zed Lake) and majority of the surface water bodies are net gaining rivers at operations year 17 even though it was a losing river at the end of operations year -1. It would be expected that the impact of the dewatering on surface water bodies would be greater as the open pit expands and more groundwater is removed. Provide clarification. • At operations year 30, the Buskegau River is again a losing river compared to operations year 17 and year 1- when it was a gaining river. • It is recommended that the proponent provide clarification why the Buskegau River status changed from a losing river to gaining river and then to a losing river during the operations not only a losing river when the reversal of the hydraulic would have been established from year -1.
MECP-GW-30	Appendix C.4, Section 6.4	• The North Driftwood River is predicted to be a losing river at closure as indicated on Table 6.6. • Please clarify why all the surface water bodies are expected to have groundwater discharge returned to near baseline conditions but not the North Driftwood River.
MECP-GW-31	Appendix C.4, Section 6.5	• There is no hydraulic conductivity testing done within the esker although two boreholes were drilled in the esker. In the baseline groundwater report, it is proposed to install monitoring wells within the esker and in-situ hydraulic conductivity testing completed. I agree with this recommendation and should be completed as soon as possible, to support the model conclusions or where results of the hydraulic conductivity testing differ significantly from the calibrated values, they are used to update groundwater flow model. • There was only one hydraulic response test completed for the surficial clay unit with K estimated to be 2 x 10-8 m/s. It is noted that only one hydraulic testing of the surficial clay is insufficient to appropriately characterize the hydraulic conductivity of the clay. It is recommended that additional hydraulic testing of the glaciolacustrine clay at several other locations within the PA and LSA/RSA is implemented. • Further, only two hydraulic response testing was reported to have been completed within the weathered bedrock (i.e., between 0 and 10 m below top of bedrock). The rest of the bedrock hydraulic response testing were completed in the un-weathered bedrock. It is noted that majority of the groundwater flow within the bedrock occurs within the shallow weathered bedrock rather than the un-weathered bedrock. The sensitivity analysis discuss in section 6.6 shows that the model predictions are mostly sensitive to increased hydraulic conductivity. It is recommended that additional hydraulic testing is completed within the weathered bedrock across the PA, LSA and RSA. • Furthermore, the proponent completed only one hydraulic response testing across the regional faults located within the PA, LSA and RSA at borehole CR21-GT-01C and concluded that the hydraulic conductivity for the testing interval which contains the fault is not significantly different than the average hydraulic conductivity estimated at CR21-GT-01C. The proponent is requested to clarify this statement since the fault is indicated to have been tested at CR21-GT-01C. It is a common knowledge that K values may vary by several orders of magnitude for the same formation and along different the different portions of the fault. It is also recommended that additional hydraulic testing is competed across the regional fault in the PA as well as LSA and RSA to provide additional hydraulic conductivity data to support the EA conclusions that the main fault is not a preferential pathway for groundwater flow. • It is reported that MODFLOW6 code use for the groundwater flow modelling is not capable to simulate the regional faults within the model domain. The potential effects of the regional faults on the groundwater flow and impact on the modelling results is unknown. It is recommended that the regional faults are simulated individually in the groundwater flow model. • The lack appropriate number of hydraulic conductivity testing and the inability to simulate the regional faults as outlined in the preceding paragraphs is a serious data gap that has the potential to significantly influence the modelling predictions. It is recommended that the additional hydraulic conductivity testing of the bedrock, esker and regional faults is implemented.
MECP-GW-32	Appendix C.4, Section 7.1	• Section 7.1 and Table 7.1 presents the predicted seepage quality and background groundwater quality in bedrock and overburden. The criteria used for comparison purposes includes PWQO (x10) and CWQG-FAL (x10). The MECP do not support the use of ten times the PWQO or the CWQG-FAL to assess impact of groundwater discharges to surface water features. • It is recommended that PWQOs and CWQG-FAL are directly compared to groundwater quality to ensure that there is protection of maximum number of aquatic receptors during the implementation of the project. Without this there is high likelihood that adjacent surface water quality and aquatic organisms that depend on the water could be adversely impacted.

MECP-GW-33	Appendix C.4, Section 8	• Canada Nickel has proposed additional field studies to refine the groundwater flow model and to refine modelling predictions of effect of the project. The following additional field studies have been proposed:
		  o Additional hydraulic testing to refine the understanding of the hydrogeological properties of the Main Regional Fault.
		  o Drilling of boreholes and installation of monitoring wells within the footprint of the Impoundment Facility, TMF, and Stockpiles; along the proposed realignment channel of the North Driftwood River; and within the regionally mapped boundaries of the esker.
		  o Completion of geophysics to characterize hydrostratigraphy between discrete drilling locations in select areas.
		  o A pumping test in the footprint of the Open Pit to refine estimates of hydraulic conductivity.
		  o In addition to the proposed studies, the reviewer notes in MECP-GW-31, that further hydraulic testing of the esker, weather bedrock, surficial clay, and simulation of the Main Regional Fault within the PA is necessary to understand the full impact of the proposed project on groundwater flow and quality and predictions of the project impacts on the environment.
		• Therefore, it is concluded that the effect of the project on groundwater quantity and quality is not fully understood at this stage.
		• It is recommended that these additional studies are implemented and incorporated into the groundwater assessment and prediction of impacts on environment.
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MECP-GW-34	Appendix H – Executive Summary	• Using CO3-NP, 22% of waste rock is assessed as potentially acid generating (PAG), 7% as uncertain, 5% of ore classified as PAG and 6% as uncertain, no tailings samples were classified as PAG, 75% of tailings classified as uncertain, all samples of overburden were classified as not potentially acid generating (NPAG). • Using the modified Sobek NP, 1% of waste rock is assessed as PAG and 1% uncertain, all samples of ore are classified as NPAG, all samples of tailings are classified as NPAG, 4% of overburden is classified as PAG, and 4% is classified as uncertain. • Perhaps it is surprising that the modified Sobek NP classified 4% of overburden as PAG and 4% as uncertain compared to the CO3-NP which classified all the overburden as NPAG. Modified Sobek method uses both carbonate and silicates as neutralization and so it is unclear how that method will result in less neutralization potential for the overburden than the CO3-NP alone. • The proponent is required to clarify this discrepancy.

		• In accordance with the MEND 2009, materials (i.e., waste rock, ore, tailings, and overburden) classified as uncertain with neutralization potential ration (NPR) of between 1 and 2 are to be considered as capable of generating acid rock drainage. • Aluminium, arsenic, boron, cadmium, chromium VI, copper, and vanadium were identified as having potential for metal leaching exceeding PWQOs in waste rock materials. There is also potential for alkalinity to exceed CCME and PWQO in all materials. • Aluminium, antimony, arsenic, boron, cadmium, chromium VI, copper, thallium, and vanadium have potential for leaching exceeding PWQOs in ore. • Overburden material indicate potentially elevated arsenic, aluminium, cadmium, cobalt, fluoride, chromium VI, boron, copper, iron, lead, vanadium, selenium, and zinc, with exceedances of relevant PWQOs. • Boron, cadmium, and chromium VI, copper, cobalt, nickel, and iron shows potential for metal leaching in the tailings.
MECP-GW-35	Appendix L, Section 4.2	• The use of carbonate neutralization potential (CO3-NP) to predict acid generation potential resulted in approximately 29% of the waste rock been classified as PAG or uncertain. It is also noted that CO3-NP provides a more conservative prediction of acid generation potential as it only account for neutralization of the acidity by carbonates alone. It also provides a means to assess the effectiveness of acid neutralization at the early onset of acid generation. • Therefore, the use of modified Sobek NPR values for the ARD assessment and classification of materials as NPAG is not conservative assessment of acid drainage potential and as such the conclusion that the excavated materials at the Crawford Nickel Project Area do not likely generate acid drainage based on the modified Sobek NPR results is inaccurate. In accordance with the precautionary principle and considering the impact of acid drainage on the environment, it is imperative that a conservative approach to management of metal leaching and acid rock drainage is adopted. • A subset of 20 samples of waste rock with CO3-NPR indicative of PAG were subjected to Net Acid Generation (NAG) test with all results of final pH exceeding 4.5 criteria for NPAG material. However, it is noted that analysis of only 20 samples for NAG may not be adequate samples size to fully classified the waste rock as NPAG.
MECP-GW-36	Appendix L, Section 5.1.4	• This section should include CO3-NPR as a screening criterion on its own to ensure conservative estimate of potential acid drainage generation and should not be tied to NAG pH. According to the MEND 2009 manual, 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.
MECP-GW-37	Appendix L, Section 5.2.1	• It is stated that "Based on preliminary characterization data, waste rock is anticipated to be NPAG, and acid rock drainage is not anticipated to occur during the LOM" No waste segregation will be conducted. This conclusion is based on the use of modified Sobek NPR values and NAG pH. However, as noted in MEND 2009 manual, this is one method for measuring NP and the sample size use for the NAG testing is very 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 2009 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. Therefore, it is the reviewer's opinion, and based on the precautionary principle that the most conservative estimate of NP should be used to manage the waste rock generated at the site. As noted, the CO3-NP is the most conservative approach to determining the potential for acid rock drainage. • It is recommended that the management of the waste rock 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.
MECP-GW-38	Appendix L, Section 5.2.1.2	• It is stated that the "Based on preliminary characterization data, waste rock is anticipated to be NPAG. Thus, waste rock segregation is not necessary and will not be conducted. • However, based on the CO3-NP results approximately 29% of the waste rock could be PAG. • It is recommended that the disposal of waste rock piles is appropriately segregated or blended to prevent and manage potential acid rock drainage. • It is also recommended that the proponent prepare a contingency measures and operational testing plan in relation to acid rock drainage for the site.
MECP-GW-39	Appendix L, Section 5.2.4	• Based on the CO3-NP analysis of 4 tailings it is classified 75% of the tailings as uncertain and could be potentially acid generating (PAG). • It is recommended that additional ABA testing of the tailings are undertaken during the operation and that the long-term management of the tailings ensures that there is no possibility of acid generation including subaqueous deposition.

Table 2. Missing Information in Relation to the Tailored Impact Statement Guidelines

Table 2 should be used to identify missing or unclear information from the Impact Statement that is **both** 1) required by the Tailored Impact Statement Guidelines **and** 2) required to formulate ministry views to inform the impact assessment.

Deficiency ID	Reference to Impact Statement	Reference to Tailored Impact Statement Guidelines	Description of Deficiency (Context and Rationale)	Advice for Resolving Deficiency
Please identify deficiencies by ministry and number. *e.g.: MNR-02*	*Identify the specific section of the Impact Statement where information is deficient.*	*Identify the specific section of the Tailored Impact Statement Guidelines where a requirement has not been satisfied.*	*Provide a brief description of the deficiency, including a rationale for why the information does not meet the requirements of the Tailored Impact Statement Guidelines and how the missing could inform the impact assessment.*	*Provide a clear and precise description of the missing information that would resolve the issue. Optionally provide other commitments the proponent can make to respond, such as:* • *offsetting or mitigation to compensate for uncertainty in baseline;* • *follow-up to verify the accuracy of predictions and effectiveness of mitigation;* • *applicable guides, standards and thresholds the proponent intends to meet; and* • *measures the proponent intends to take to comply with other legislative frameworks that provide a means to address effects.*
MECP-GW-40	Section 34.2.5	Section 17	• Groundwater quality and quantity and flow effects have been predicted through all phases of the project. However, Canada Nickel is proposing to develop a follow up and groundwater monitoring program to verify	• It is recommended that additional monitoring wells are identified and/or proposed for those areas of the site where they are lacking and likely to experience water level effects during the project especially at locations such as open pit, impoundment facility, TMF, stockpiles, etc.

			and confirm the predicted effects and to meet specific permit and approval conditions as outlined in section 34.2.5. • The absence of an appropriate groundwater monitoring program to monitor the predicted effects of the project on the groundwater and the environment is a serious data gap that must be addressed at the EIS stage. Indeed, as stated in the Tailored Impact Statement Guidelines (Section 17), "monitoring is a key component of follow-up programs and can identify the potential for environmental health…, degradation", and "monitoring can also assist in developing clearly defined action plans and emergency response procedures to account for environmental, health…., protection". • Furthermore, Sections 17.2 and 17.3, requires that the Impact Statement must present a preliminary environmental, health…., monitoring program for the VCs. At the EA stage, an overarching groundwater monitoring program must be developed to monitor the effect of the approved project. The monitoring program should be based on the existing groundwater monitoring network used to prepare the baseline groundwater report. Like Section 34.2.6 (surface water monitoring), the groundwater section must identify proposed monitoring locations and rationale, sampling parameters and frequency.	• It is recommended that the monitoring wells are installed as nested wells within the overburden and the bedrock at each location. • It is recommended that the groundwater section of the IS identify the proposed monitoring locations and rationale, sampling parameters and frequency.
MECP-GW-41	Appendix C.4, Section 8	Section 17	• Canada Nickel further proposes to develop a monitoring program to monitor effect on groundwater levels and groundwater quality through permitting and approvals during construction and operations. The absence of a groundwater monitoring program is a deficiency in the Impact Statement that must be resolve as part of the EIS.	• It is recommended that the groundwater monitoring program is developed at the EIS stage and could be refined as the project progresses. As outlined in section 8.2, the following should be included in the groundwater monitoring program: ○ The type of monitoring equipment, selection of monitoring stations, frequency of sample collection, and duration of the program will be based on federal and provincial guidelines and consultation with government agencies. However, it is anticipated that the monitoring program will generally comprise the following key elements: ▪ Water quantity (flow rate and total daily volume) of dewatering water. ▪ Monitoring groundwater levels in monitoring wells to document changes in level and flow in response to Open Pit dewatering, filling of the pit in early closure, and changes in recharge due to Project components (e.g., TMF). Groundwater levels will be monitored using a combination of manual and automated monitoring methods. ▪ Monitoring groundwater and surface water levels at drive-point piezometers in the vicinity of key surface water features to document changes in groundwater and surface water interactions in response to Open Pit dewatering and changes in recharge due to Project components (e.g., TMF). ▪ Monitoring groundwater quality at monitoring wells located upgradient, cross-gradient, and downgradient of the Impoundment Facility, East and West Stockpiles, TMF, and Open Pit to document potential changes in groundwater quality. ▪ Groundwater quality samples from monitoring wells will be collected three times (3X) a year in spring, summer, and fall during construction, operations, and decommissioning/closure. Groundwater quality samples will be analyzed for general chemistry parameters, dissolved metals, and petroleum hydrocarbons based on the location of the monitoring wells. ▪ Groundwater quality monitoring results will be compared with applicable regulatory standards set out in GCDWQ, ODWQS, PWQOs and CWQG-FAL. ▪ Monitoring groundwater levels and quality in background monitoring wells.

				▪ A water well survey (door-to-door) will be completed within and adjacent to the LSA to confirm known, and unknown groundwater users and residences in the vicinity of the PA.