

Comment Table on the Draft Environmental Impact Statement for the Nuclear Power Demonstration Closure Project
Federal and Provincial Technical Review with Quebec Comments – Revision 3

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
General					
1	Canadian Nuclear Safety Commission (CNSC)	General	N/A	Comment: The Environmental Impact Statement (EIS) should reference the title of the current version of CNSC’s REGDOC-2.9.1, which is “REGDOC-2.9.1, <i>Environmental Protection: Environmental Principles, Assessments and Protection Measures</i>”. Expectation to Address Comment: Please revise accordingly.	Incorporated: Throughout the EIS document, the NPD Closure Project has been updated to use the current title: “REGDOC-2.9.1, <i>Environmental Protection: Environmental Principles, Assessments and Protection Measures</i>”. Change to EIS: The EIS has been revised (throughout) to reflect the response above.
2	CNSC, Environment and Climate Change Canada (ECCC), Health Canada	General	N/A	Comment: While the EIS makes reference to technical supporting documentation and other detailed studies to support the analysis, and Canadian Nuclear Laboratories (CNL) is encouraged through cross-referencing to make use of existing information, a brief summary or narrative which explains the purpose of referencing each supporting document, as well as any relevant information it contains (e.g., data, methodology, conclusions drawn) should be provided in the EIS. It is not always clear which sections of a referenced document (e.g., Athuada-Arachchige 2015, Seto 2014) are relevant to the discussion in the EIS, especially given that some of these documents are quite lengthy. Expectation to Address Comment: The EIS should explain at a high-level how the information is organized in the document, as well as how it is supported by referenced documentation. Consistent with Section 3.3.3 of CNSC’s <i>Generic EIS Guidelines</i> (p.6), where existing documents are referenced, the EIS should: • Specify which portion of the information or data in the document applies to the Nuclear Power Demonstration (NPD) Closure Project • Explain how it applies, and any assumptions, limitations or differences • Distinguish factual evidence from inference • Note any limitations on inferences or conclusions that can be made	Incorporated: The EIS introduces the applicable reference documents at the beginning of each section. For example, the main reference documents used in characterizing the Existing Environment are presented in Section 8.1. The main supporting documents for the Effects Assessment are presented in Section 9.1. In addition, the EIS has an updated figure (Figure 3.6-1) that shows applicable Technical Support Documents (TSDs) and other supplemental documents and their relationship to the EIS. Appendix A: Summary of Supporting Documents has also been added summarizing the following information for the main reference documents (including TSDs) used in the EIS: • which portion of the information or data in the document applies to the NPD Closure Project; • how it applies, and any assumptions, limitations or differences; • whether the information is factual evidence or based on inference; and • any limitations on inferences or conclusions that can be made. Change to EIS: Figure 3.6-1 and Appendix A: Summary of Supporting Documents, have been added to the EIS.

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3	Government of Quebec	General	N/A	Comment: In general, the information provided in the draft EIS (main body) is insufficient. In the context of radiation protection, the draft EIS does not make it possible to assess the safety of the proposed project and its impact on the health of the Quebec populations potentially affected. This lack of detailed documentation is not consistent with best practices in the management of nuclear waste. In addition, the process to gain access to Technical Supporting Documents (TSDs), which are not available on the Canadian Environmental Assessment Registry, should be clearer. Otherwise, this poses a barrier to information access for the public, Indigenous groups and technical experts who may not know how to obtain this key documentation. TSDs, quoted repeatedly in the draft EIS, contain information essential to the evaluation of the impacts of the various phases of the project, as well as the health risk analysis in situations of chronic exposure and emergency. Only the conclusions are conveyed in the public documentation. Expectation to Address Comment: For transparency and to provide a complete picture of the relevant information regarding the proposed project, please ensure that a mechanism exists that allows all parties invited to comment on the draft EIS to have easy access to the TSDs.	Incorporated: The EIS is a summary of all the supporting technical assessments. Technical Support Documents (TSDs) were offered to federal and provincial reviewers by the CNSC. All TSDs and reference documents are also available to any party who requests documents. Contact information for document requests is provided on the NPD webpage on the CNL website. Change to EIS: The following text has been added at the bottom of the Figure that shows the EIS and supporting documents (introductory pages of the EIS): Technical Support Documents are available upon request by contacting ermstakeholder@cnl.ca.
4	Environment and Climate Change Canada (ECCC)	General	N/A	Comment: The various TSDs that rely upon modeling generally describe the model and assumptions used to evaluate the evolution of the monolith under different scenarios. A separate TSD exists for each model; however, many of the models appear to rely on the data outputs of one or more other models. For example, outputs of the groundwater model, the alkaline plume modeling, cement degradation modeling, and lead solubility modeling are used as inputs for the safety assessment and Ecological Risk Assessment (EcoRA). It is noted that the uncertainty associated with a particular scenario or model run is also relevant to any subsequent use of the model outputs. In the TSDs where “predictive uncertainty” is discussed, the discussion is limited to the uncertainty associated with the model that is the basis of the TSD. It does not describe the uncertainty that is carried forward when outputs of one model are used as input for others (e.g., for safety assessments, or for the conclusions made in the draft EIS). Where multiple models are interrelated and rely upon each other (i.e., the outputs of several	Incorporated: The NPD Closure Project has prepared Attachment 1 which discusses the uncertainties of the main modelling documents and their interrelationships addressing the following key aspects: • discussion of uncertainty, sensitivity, and reliability, for each main modelling document; • discussion on key gaps and how they are addressed, for each main modelling document; • main modelling documents and their interrelationships are shown in a Figure including the direction of “flows” of inputs and outputs between the main modelling documents; and • propagation of uncertainty between the main modelling documents are included and generally capture ‘incoming’ and ‘outgoing’ uncertainty.

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				models are combined either in parallel or in series), the uncertainties will accumulate and/or compound across the models. In order to understand the potential risks to the environment from the proposed project, the uncertainty of the information provided should be better articulated, as per the information requirements related to uncertainty in Section 3.2 (p. 5) of CNSC’s <i>Generic EIS Guidelines</i>. This includes acknowledgement that uncertainties will accumulate and / or compound. Expectation to Address Comment: Please review and update the Draft EIS and TSDs to: • Indicate all of the uncertainty, reliability and sensitivity of each model used to reach conclusions. • Identify all significant gaps in knowledge and understanding related to key conclusions, and the steps to be taken to address these gaps. This includes gaps associated with information and modeling used to arrive at each key conclusion. • Clearly identify the interrelationships between models. • Identify which data outputs from a model are used as inputs for other models / modeling exercises. • Clearly identify, describe and assess the uncertainties that carry forward from model to model, and the resulting effect on the uncertainty of the downstream model outputs. • Update the overall predictive uncertainty to include both the model being run and cumulative uncertainty brought forward when model outputs are used as inputs.	
5	CNSC	General	N/A	Comment: The EIS should present clear figures to support the information presented in the text. All figures should be properly referenced in the text. Expectation to Address Comment: Please make sure that all figures contain sufficient and clear information, and that they are properly referenced in the text. In particular, please revise/correct the following figures or in-text references to figures. • In Section 3.3 (NPD Site and Facility Description, p.3-10), the first sentence refers to Figures 3.1-3 and 3.1-4, instead of Figures 3.1-4 and 3.1-5. Please revise accordingly. • Several figures throughout Section 8 (Description of the Existing Environment) are missing a title, including a figure number and a page number (e.g., p.8-40, 8-44, 8-68, 8-74, 8-76, 8-111). Please make sure that every figure in the EIS has a title, a figure number and an associated page number.	Incorporated: The NPD Closure Project has revised incorrect Figure referencing. Change to EIS: The following changes have been made to the EIS: • Edited the first sentence of Section 3.3 to reference correct figures “Figures 3.1-4 and 3.1-5”. • Updated the figures in Section 8 to ensure they include figure number, title and page number (e.g., 8-24, 8-40, 8-44, 8-50, 8-68, 8-74, and 8-111). • Corrected the figure reference in Section 8.3.4 (Surface Water Quality) to say “Figure 8.3-2”. • Corrected the figure reference in Section 8.5.3 Soil Quality. • Regarding Figure 8.10-1: Due to the nature of the source of the basemap (ESRI), the basemap cannot be made lighter. However, the NPD Closure Project has made other changes (e.g., line thickness, font size and colour) for visual clarity of the geographical features on the map and has replaced Figure 8.10-1 in the EIS with the updated version.

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				- In Section 8.3.4 (Surface Water Quality), the last paragraph on p.8-41 refers to Figure 8.3-1 instead of Figure 8.3-2 (which shows the tile drain layout). Please revise accordingly. - In Section 8.5.3 (Soil Quality), the radiological subsection of page 8-75 refers to Figure 8.5-4 instead of figure 8.5-5. Please revise accordingly. - In Figure 8.10-1 (Section 8.10.3 Land Use, p.8-151), not all of the geographical features (including the captions) are visible. Please make sure that all geographical features and captions are visible in Figure 8.10-1. Consider choosing a lighter basemap that would allow the reader to better visualize the geographical features (including the captions) on the map.	
Main EIS					
1. Glossary					
6	CNSC	N/A	p.1-4	Comment: CNL use the following definition for grout: “Grout – a mixture of Portland Cement and water that produces a pourable, concrete-like, mixture.” This definition seems incorrect and incomplete. The binding material may not necessarily be Portland cement. Also, there are typically other ingredients (e.g., fine aggregate), which should not be precluded by the definition. An example of good industry definition is available from the American Concrete Institute: “Grout – mixture of cementitious materials and water, or other binding medium, with fine aggregate” CNL provide insufficient grout design information in the EIS submission (see comment X) for CNSC staff to be able to judge the correctness of the definition against CNL’s actual grout design. Based on CNL’s current definition, it seems as though the grout will consist precisely and exclusively of Portland Cement and water. Expectation to Address Comment: Please use the definition of the term “grout” commensurate with the industry’s established terminology and your own grout design.	Incorporated: The American Concrete Institute, ACI CT -13 defines grout as <i>a mixture of cementitious materials and water or other binding medium with fine aggregate.</i> For the NPD Project, the grout is a 90/10 mixture of Ground Blast Furnace Slag and Portland Cement with sand, water and admixtures that give the required fresh and cured properties. Other details of where and how the grout will be placed have also been added in Section 4.3.1. Change to EIS: Section 1 – Glossary, definition of grout has been updated to: “A mixture of cementitious materials and water or other binding medium with fine aggregate. For the NPD Project, the grout is a 90/10 mixture of Ground Blast Furnace Slag and Portland Cement with sand, water and admixtures that give the required fresh and cured properties.”
2. Executive Summary					
7	CNSC	Table 2.1-1	p.2-2	Comment: CNL does not clearly indicate the number of years after which they expect to reach clearance from regulatory control (i.e., clearance level from CSA N292.3, <i>Management of Low- and Intermediate Level Radioactive Waste</i>). This determination should account for waste categorization and decay (as presented in Section 4.4.1.1)	Resolved As: The scope of CSA N292.3 <i>Management of Low and Intermediate Level Radioactive Waste</i>, (CSA 2014c), states that the standard applies to radioactive waste throughout its lifecycle up to the point of disposal. CSA N292.3 therefore does not apply to the NPD project’s proposed in-situ disposal approach that will result in an onsite nuclear waste disposal facility that has the ability to dispose of nuclear substances at the NPD site.

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				and is necessary for establishing the design life and performance of the barriers that are to confine the waste for that period. Expectation to Address Comment: Please provide the number of years after which you expect to reach the clearance level. The analysis associated with this determination should be included in the submission in order to be reviewed.	It is CNL’s position that application of clearance levels to the NPD inventory is not appropriate for a disposal facility. The Nuclear Substances and Radiation Devices Regulations, SOR/2000-207, only uses clearance levels with respect to the disposal or abandonment of waste without a licence which is laid out in Part 5.1: <i>5.1 (1) A person may, without a licence, abandon or dispose of a radioactive nuclear substance if the activity or the activity concentration of the substance does not exceed</i> <i>(a) its exemption quantity;</i> <i>(b) its conditional clearance level; or</i> <i>(c) its unconditional clearance level</i> Following on from this Part D of Licence Application Guide: Nuclear Substances and Radiation Devices, REGDOC-1.6.1, Section D.13 Management of waste nuclear substances and radiation devices, (CNSC 2017b), states: <i>For all applicants, all nuclear substances and radiation devices that are no longer required must be used and disposed of in a way that prevents unreasonable risk to the public or the environment. The acceptable characteristics and limits for each method of disposal are specified as conditions of the licence.</i> CNL is applying for a decommissioning licence amendment to enable in-situ disposal, therefore the requirement to meet conditional or unconditional clearance levels does not apply. In the licence application, CNL will demonstrate that the wastes do not present an unreasonable risk to the public or the environment. This is achieved by demonstrating that the NPD meets the proposed acceptance criteria within the PostClosure Safety Assessment Technical Support Document (PostSA TSD). As suggested in REGDOC 2.11.1, Volume III, Waste Management: <i>Assessing the Long-Term Safety of Radioactive Waste Management</i>, (CNSC 2021a), the NPD Closure Project’s proposed acceptance criteria includes environmental concentrations aligned with federal and provincial environmental quality guidelines as well as a dose-based constraint. The project’s suggested dose-constraint of 0.25 mSv/yr is lower than the 0.3 mSv/yr in REGDOC 2.11.1 and the International Commission on Radiological Protection (ICRP 2007) recommendations for a dose constraint of 0.3 mSv/yr for the disposal of long-lived radioactive waste. The design life and performance requirements of the barriers used in the NPD Disposal Facility are therefore based on the dose consequences to the public and the environment should the barrier fail and not on the time to reach clearance levels. References: <i>Canadian Nuclear Safety Commission (CNSC) 2017b, REGDOC-1.6.1, Nuclear Substances and Radiation Devices Licence Application Guide: Nuclear Substances and Radiation Devices, Version 2, April.</i> <i>Canadian Nuclear Safety Commission (CNSC) 2021a, REGDOC 2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. Version 2.</i> <i>Canadian Standards Association (CSA) 2014c, CSA N292.3-14 Management of Low- and Intermediate Level Radioactive Waste, May, ISBN 978-1-77139-529-8.</i> <i>International Commission on Radiological Protection (ICRP) 2007. ICRP Publication 103, The 2007 Recommendations of the International Commission on Radiological Protection.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-003894. Prepared by Arcadis and Quintessa for CNL.</i>

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8	Government of Quebec	Section 2.2.1 Purpose	p.2-3	Comment: The draft EIS states that “[t]he purpose of the project is to safely carry out the decommissioning of the NPDWF using the in-situ decommissioning approach to isolate the contaminated systems and components inside the below-grade structure.” The IAEA does not recommend this type of approach, with the exception of unique cases (IAEA 2007, 2014a). Furthermore, in the references section, the following scientific article can be found; however, it is never cited in the main body of the draft EIS: Laraia, M. 2014. <i>Entombment: A Viable Decommissioning Strategy for Research Reactors?</i> International Nuclear Safety Journal. 3(4): 1-10. November. This scientific article is perplexing, because none of the cases it presents is similar to the proposed project, for example: • “To achieve a safer configuration of a shutdown reactor in a country or institution lacking basic infrastructure (e.g. dismantling expertise or funds, waste disposal prospects, etc.). • When adequate surveillance of the entombed facility can be ensured, typically when the facility is situated in a wider site bound to remain operational or under institutional control for a long time. A fundamental component of this approach is proper record-keeping. • The use of entombment is limited to a small number in a given country, particularly to remote sites, in order to prevent the uncontrolled proliferation of waste disposal sites. • Leave it open the option of dismantling entombed structures in a not-too-distant future...” Expectation to Address Comment: Please address the above concerns and revise the References section accordingly. References: <i>IAEA (2007) Decommissioning Strategies For Facilities Using Radioactive Material, IAEA Safety Report Series No. 50</i> <i>IAEA (2014a) Decommissioning of Facilities, IAEA General Safety Requirements Part 6</i>	Resolved As: In the case of the NPD reactor the decommissioning strategy is to incorporate the reactor into a new disposal facility, which is in accordance with the IAEA definition of decommissioning, IAEA Safety Glossary. This strategy also meets the Canadian regulatory requirements, in particular the requirements of Section 5.1 of REGDOC-2.11.2, Decommissioning, (CNSC 2021c). The relevant text is repeated below: <i>“Section 5.1 In situ decommissioning</i> <i>In situ decommissioning shall not be considered a reasonable decommissioning option for planned decommissioning of existing or future nuclear facilities and situations where removal is possible and practicable; nevertheless, in situ decommissioning may be considered a solution only under exceptional circumstances (e.g., following a severe accident) or for legacy sites. In situ decommissioning for legacy sites is only considered viable where the use of in situ will be protective of workers, the public and the environment; decommissioning was not planned as part of the design; the fuel has been removed; and the site will remain under institutional control for the period defined in the safety case.</i> <i>In a case where the end-state for in situ decommissioning results in a waste disposal facility, location or site, the licensee shall satisfy all regulatory requirements for a radioactive waste disposal facility, location or site and demonstrate safety in a safety case and safety assessment of the disposal facility, location or site. Further information on safety case and safety assessment can be found in REGDOC-2.11.1, Waste Management, Volume III: Safety Case for the Disposal of Radioactive Waste”.</i> It is therefore concluded that entombment is not being used as a decommissioning strategy for the decommissioning of the NPD reactor. Guidance given by the IAEA documents has been accounted for but Canadian regulation takes precedence as given in the requirements of Redoc 2.11.2, (CNSC 2021c). As recommended the references section has been reviewed and revised accordingly. References: <i>Canadian Nuclear Safety Commission (CNSC) 2021c, REGDOC 2.11.2, Decommissioning, January.</i> <i>Canadian Nuclear Safety Commission (CNSC) 2021a, REGDOC 2.11.1, Version 2. Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management.</i>
9	Government of Quebec	Section 2.2.1 Purpose	p.2-3	Comment: The draft EIS states: “The footprint above the reactor vessel will be capped with reinforced concrete...” Why is the reinforced concrete placed only there? According to Figure 3.3.1 (p. 3-11), the reactor vault communicates directly with	Resolved As: The purpose of the reinforced concrete cap is as a redundant barrier to inadvertent human intrusion and excavation into areas of the facility which have long-lived radionuclides. This generally includes the reactor and associated systems. This also includes the nuclear systems in the boiler room, dump tank room, spent fuel storage room, spent fuel storage bay, and fuelling machine room. However, IAEA SSR-5 (IAEA 2011) only requires prevention of

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				the storage room, storage bay, dump tank room, header service area, and the boiler room. Will these rooms, potentially contaminated, be under the concrete cap? Expectation to Address Comment: Please address the above questions.	inadvertent human intrusion if doses are likely to be ≥ 1 mSv as a result of the intrusion. The inadvertent human intrusion scenario was analyzed in the Post Closure Safety Assessment Technical Support Document (PostSA TSD) and the dose is below this threshold, thus the footprint of the concrete cap was decreased to cover only the areas noted above. By virtue of its presence, it will present an obstacle to the excavation and/or removal of these components, and although not required for safety, is still provided to give an added level of protection over the existing reinforced concrete construction of the NPD Waste Facility. References: <i>International Atomic Energy Agency (IAEA). 2011. Disposal of Radioactive Waste, IAEA Specific Safety Requirements Series No. SSR-5.</i> PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration. 64-508760-ASD-003894, Revision 0. Prepared by Arcadis and Quintessa for CNL.											
10	Government of Quebec	Section 2.2.3 Wastes and Emissions	p.2-4	Comment: The draft EIS states: “Radionuclides will be present in these materials in two forms: [...] as contamination on surfaces, mainly resulting from the handling of fuel elements which had suffered failure of their protective cladding...” What type of defect is CNL referring to? Expectation to Address Comment: Please address the above question.	Resolved As: The fuel defects being referred to, are failures to the zircaloy fuel cladding which contained the uranium fuel pellets, resulting in release of fission products to the heavy water heat transport system, and subsequent fuel handling equipment such as the fuelling machine and used fuel storage bay.											
11	ECCC	Section 2.2.3 Wastes and Emissions Also applicable to Section 4.4.1 Waste Types, p.4-25	p.2-4	Comment: CNL has identified non-radiological contaminants, such as mercury, lead, asbestos and polychlorinated biphenyls (PCBs), and has provided an inventory of such wastes. However, emissions for these substances generated by the project have not been included in the air quality assessment. Expectation to Address Comment: Please provide mercury, lead, asbestos and PCB emissions resulting from the project in the air quality assessment.	Resolved As: Air releases of lead and asbestos are currently assessed within Section 8.5.2.1 of the Decommissioning Safety Assessment Technical Support Document (DecomSA TSD). The DecomSA TSD makes use of baseline industrial hygiene information, as part of its normal operation scenario by conservatively using the highest available measured concentrations for lead and asbestos. It is a conservative assumption because it overestimates the average lead and asbestos concentrations in air within the facility. The air concentrations of lead and asbestos estimated at worker receptor locations are presented in Table 8-4 (of the DecomSA TSD). Table 8-4 Air Displacement – Airborne Asbestos and Lead Concentration at Worker Receptor Locations <table><tr><th rowspan="2">Receptor Location</th><th colspan="2">Estimated Exposure Concentration (Air) [in g/m³]</th></tr><tr><th>Worker (near field)</th><th>Worker (far field)</th></tr><tr><td>Lead</td><td>2.37E-12</td><td>2.37E-12</td></tr><tr><td>Asbestos</td><td>6.41E-14</td><td>6.41E-14</td></tr></table> The DecomSA, in Section 8.6.1.1, also assesses the potential release of lead into the atmosphere from demolition of structures containing lead-based paint. These non-radiological effects are assessed by comparing calculated air concentrations at receptor locations (derived in Section 8.6.1.1 of the DecomSA) against corresponding benchmark	Receptor Location	Estimated Exposure Concentration (Air) [in g/m³]		Worker (near field)	Worker (far field)	Lead	2.37E-12	2.37E-12	Asbestos	6.41E-14	6.41E-14
Receptor Location	Estimated Exposure Concentration (Air) [in g/m³]															
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Asbestos	6.41E-14	6.41E-14														

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					values (presented in Section 4.1.6.1 of the DecomSA TSD). The result of the comparison is a screening index, which is a ratio of an estimated air concentration to its corresponding benchmark value. These are given in Table 8-22 (of the DecomSA TSD). Table 8-22 Demolition – Inhalation Screening Index (Public Receptors) <table><tr><th>Receptor Location</th><th>Inhalation Screening Index <i>[unit less; comparison of estimated concentration to benchmark value]</i></th></tr><tr><td><i>Res. 1</i></td><td>1.86E-03</td></tr><tr><td><i>Res. 2</i></td><td>2.05E-03</td></tr><tr><td><i>Res. 3</i></td><td>1.90E-03</td></tr><tr><td><i>Rec. (Res. 4)</i></td><td>2.44E-03</td></tr><tr><td><i>Guardhouse</i></td><td>1.71E-01</td></tr><tr><td><i>Rapides Des Joachims</i></td><td>1.43E-03</td></tr><tr><td><i>Pt. Stewart Residential</i></td><td>1.12E-03</td></tr><tr><td><i>Cottage</i></td><td>1.63E-03</td></tr><tr><td><i>Rolphton Residential</i></td><td>6.20E-04</td></tr><tr><td><i>Mackey Beef Farm</i></td><td>3.53E-05</td></tr><tr><td><i>Bass Lake Beef Farm</i></td><td>3.80E-05</td></tr></table> With respect to polychlorinated biphenyls (PCBs), all light ballasts will be removed before decommissioning begins. Therefore, the light ballast PCB inventory will not be available as a source for emission. Further, CNL sampled the paint and caulking in the NPD facility for PCBs, and all samples contained less than the regulated level of 50 mg/kg of PCBs in solids (McVeigh 2018a). As such, PCB-containing paint and caulking do not warrant further assessment (DecomSA TSD Section 5.2.4). Due to the nature and waste form of PCBs, as well as anticipated project activities, PCB emissions (releases to air) are not expected during the normal operations of Decommissioning Execution or under bounding scenarios (Table 9-10 of the DecomSA TSD summarizes the Material-at-Risk (MAR) for each bounding scenario and highlights no PCBs). Similarly, due to the waste form of mercury (residual contamination) and its location within the facility (Section 5.2.2 of the DecomSA TSD), mercury emissions (releases to air) are not expected (Table 9-10 of the DecomSA TSD summarizes the Material-at-Risk (MAR) for each bounding scenario and highlights no mercury). Change to EIS: Section 9.2.3.3 has been revised to include the following text: With respect to PCBs, all safely accessible light ballasts will be removed before decommissioning begins. CNL sampled the paint and caulking in the NPD facility for PCBs, and all samples contained less than the regulated level of 50 mg/kg of PCBs in solids (McVeigh 2018a). As such, PCB-containing paint and caulking do not warrant further assessment. Due to the nature and waste form of PCBs, as well as anticipated project activities, PCB releases to air are not expected (DecomSA TSD). Similarly, due to the waste form of mercury (residual contamination), mercury releases to air are not expected (DecomSA TSD).	Receptor Location	Inhalation Screening Index <i>[unit less; comparison of estimated concentration to benchmark value]</i>	<i>Res. 1</i>	1.86E-03	<i>Res. 2</i>	2.05E-03	<i>Res. 3</i>	1.90E-03	<i>Rec. (Res. 4)</i>	2.44E-03	<i>Guardhouse</i>	1.71E-01	<i>Rapides Des Joachims</i>	1.43E-03	<i>Pt. Stewart Residential</i>	1.12E-03	<i>Cottage</i>	1.63E-03	<i>Rolphton Residential</i>	6.20E-04	<i>Mackey Beef Farm</i>	3.53E-05	<i>Bass Lake Beef Farm</i>	3.80E-05
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					There is no expected release of PCBs or mercury as part of the planned decommissioning activities (DecomSA TSD). References: <i>DecomSA TSD: Garisto, N., Kovacs, and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i> <i>McVeigh, A. 2018a. NPD Building Characterization Report. NPD Decommissioning. 64-509410-REPT-011. Revision 0.</i>
12	ECCC	Section 2.2.3 Wastes and Emissions Also applicable to Section 2.2.5 Government Communications (p.2-5), Section 4.4.1 Waste Types (Table 4.4-2), and Section 8.3.3 Surface Water Releases (Table 8.3-3)	p.2-4	Comment: The draft EIS outlines CNL’s proposal and discussions with ECCC to entomb a small number of PCB-containing light ballasts in the NPD Waste Facility (NPDWF) due to inaccessibility. Table 4.4-2 also states that there is an estimated 2.97 kg of PCBs located in light ballasts. Table 8.3-3 reports that the concentration of total PCBs in the Wells Area Sump was 4.9 to 6.0 ug/L based on a sampling campaign conducted in 2015. This indicates that PCBs are capable of being released to the environment. PCBs are very persistent and do not readily degrade over time. Therefore, their risks will remain even over the timeframes considered for permanent decommissioning. Under the proposed project, if PCB sources are grouted in place within the monolith, they will eventually be released to the environment. The project will need to be in compliance with the PCB Regulations, which are administered by ECCC. Discussions are still ongoing between ECCC and CNL in order for CNL to identify appropriate management options for radiologically-contaminated PCB waste. Based on a site visit performed by ECCC staff in November 2017, ECCC believes it is possible to access and remove the ballasts. During this visit, ECCC advised CNL that, for PCBs in concentrations equal to or greater than 50 ppm: Grouting the PCBs within the monolith would not be in compliance with the regulations If the PCBs are radiologically contaminated, an extended storage period may be recognized until such a time that the PCBs can be destroyed, as required by the federal PCB Regulations. Expectation to Address Comment: Please propose PCB management options that are in compliance with the PCB Regulations. This would apply to the PCB ballasts and any effluent (e.g., Wells Area Sump water) or other wastes contaminated by PCBs. In addition, please describe how the proposed project and waste acceptance criteria complies with the	Incorporated: Following discussions with ECCC in November 2017, CNL has revised its strategy for PCB-containing light ballasts. All PCB-containing light ballasts will be removed from the NPD facility prior to grouting in order to be compliant with the PCB Regulations. Table 8.3-3 of the EIS shows that the highest concentration of residual PCB contamination measured in the Wells Area Sump is 6.0 ug/L, or 0.006 mg/kg. This concentration is compliant with the PCB Regulations excerpted below: Release into the environment: 5 (1) No person shall release PCBs into the environment [...] in a concentration of a) 2 mg/kg or more for a liquid containing PCBs. In 2018 November, CNL changed its strategy for managing liquid effluent from the Wells Area Sump (Phillips 2018). Instead of discharging liquid effluent from facility sumps to the Ottawa River it is now transferred to the Waste Treatment Centre on the Chalk River site. The last discharge of liquid effluent from NPD facility sumps to the Ottawa River was 2017 December. McVeigh 2018a summarizes sampling results of building materials in both the Nuclear and Non-Nuclear areas of the facility. For PCBs, results show very minor concentrations of in the facility structure, ≈0.1 ppm. Specific high risk materials (paint and caulking) were tested and contain between 5 and 31 ppm Total PCBs, which is compliant with the PCB Regulations excerpted below: Release into the environment: 5 (1) No person shall release PCBs into the environment [...] in a concentration of b) 50 mg/kg or more for a solid containing PCBs. The electrical transformers at the facility are confirmed as not containing PCBs. With respect to the potential for an extended storage period for radiologically contaminated PCBs, CNL notes that PCB-containing light ballasts removed to date from the NPD facility have either not been contaminated or have had only surface contamination which is easily removed. The project does not anticipate radiologically contaminated PCBs that would require extended storage period. Change to EIS: Section 2.2.3: Bullet describing PCBs states that only negligible amounts of PCBs remain in the NPD Waste Facility (NPDWF) from residual contamination, and all PCB-containing light ballasts will be removed from the facility.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				PCB Regulations, and how the November 2017 advice provided by ECCC on the management of PCB waste has been incorporated.	Section 4.4.1.2 and Table 4.4-2: states that the negligible amounts of PCBs remain in the NPDWF from residual contamination and all PCB-containing light ballasts will be removed from the facility. This section summarizes the results of PCB characterization in the facility from McVeigh 2018a. Section 8.3.3: The text before Table 8.3-3 includes an explanation that in 2018 November, CNL changed its strategy for managing liquid effluent from the Wells Area Sump. Instead of discharging liquid effluent from facility sumps to the Ottawa River it is now transferred to the Waste Treatment Centre on the Chalk River. References: <i>McVeigh, A. 2018a. NPD Building Characterisation Report. NPD Decommissioning. 64-509410-REPT-011. Revision 0.</i> <i>Phillips, B. Letter to K. Ross (CNSC) Notification of Alternate Strategy for Management of Liquid Effluent from Nuclear Power Demonstration Waste Facility (NPDWF). File No. 64-CNNO-18-0011-L. 2018 November 27.</i>
13	Government of Quebec	Section 2.3 Scope of EA	p.2-6	Comment: Section 2.3 states: “The Site Study Area extends 50 m into the Ottawa River and includes [...] areas that will not necessarily be affected during decommissioning activities but will require work during the site restoration (e.g., due to prior contamination).” More information should be provided on this “prior contamination” (duration, type, scope, etc.). Expectation to Address Comment: Please provide more details on this contamination.	Incorporated: CNL conducted a systematic characterization of the NPD site in 2016 and 2017, for the purposes of documenting environmental liabilities, consisting of Phase I and Phase II Environmental Site Assessments (ESAs). The Phase I ESA (ORAU 2017) was conducted based on CSA Standard Z678-01 (CSA 2012b) and nuclear industry site characterization guidance (Multi-Agency Radiation Survey and Site Investigation Manual, referred to as “MARSSIM”). The Phase II ESA (Golder 2017b; McVeigh 2018b) was conducted in accordance with O. Reg 153/04 (MOE 2011b), CSA Standard Z769 (CSA 2013) for Phase II ESA, as well as CSA Standard N292.5-11 (CSA 2011), which provides guidelines for the exemption or clearance from regulatory control of materials that contain, or potentially contain, nuclear substances. The Phase II ESA work was conducted based on the requirements of the Characterization Plan (ORAU 2016) that was developed from the Phase I ESA identified gaps. The ESAs for the NPD site have been documented in the following reports: a) <i>Historical Site Assessment (HSA) for the Nuclear Power Demonstration Waste Management Facility, Rolphton, Ontario</i> (ORAU 2017). • Phase I ESA. b) <i>Phase Two Environmental Assessment Nuclear Power Demonstration Site, Canadian Nuclear Laboratories</i> (Golder 2017b). • Summarizes the Phase II ESA results for Conventional Contaminants of Concern. c) <i>NPDWF Balance of Site Characterisation Report</i> (McVeigh 2018b). • Summarizes the Phase II ESA results for Radiological Contaminants of Concern. Based on the results of the Phase II ESA, no radiological contamination was located in areas that will not be affected by decommissioning activities, but a few discrete areas of non-radiological contamination were identified: • Along the shoreline of the Ottawa River a pile of debris was found during the Phase II ESA work. The majority of debris was cleared in Spring 2018 to the extent practical. The soil around the debris was found to have a phenanthrene concentration of 0.091 ug/g which was noted as an exceedance in Golder 2017b. However, the exceedance was identified based on a CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (polycyclic aromatic hydrocarbons) 0.046 ug/g. (CCME 2010b). This same guidance states that “if impact to surface water is not a concern, it is recommended to revert to the 1997 provisional SQG_E for naphthalene and the 1991 Interim Soil Quality Criteria for phenanthrene”.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					These Interim Soil Quality Guidelines show a benchmark value for phenanthrene of 43 µg/g for Soil and food ingestion (for Agricultural and Residential/Parkland use). Similarly, guidance from the Ontario Ministry of the Environment (MOE 2011) show standard values for phenanthrene in soil as 0.19 µg/g (Agricultural or other property use) and 0.69 µg/g (Residential/Parkland/Institutional/Industrial/ Commercial/Community Property Use). Since the area in question has phenanthrene values less than CCME Interim Soil Quality Criteria and Provincial soil standards, it does not require soil remediation. At two sites used historically for unauthorized dumping and vehicle maintenance, exceedances of metals (arsenic, copper, vanadium and zinc) and hydrocarbons were found. These two sites are located in close proximity to each other, in a forested area approximately 300 m south of the Main Building. The sites were likely used during the construction of NPD. The impacted soil was relocated next to the main building in 2018 spring (i.e. an area which will become part of proposed waste disposal facility and covered with an engineered barrier). Change to EIS: Section 8.5.3 has been revised to reflect the response above. Section 5.2.1.1 has been revised to refer to Section 8.5.3 for details about areas of prior contamination. Section 2.3 contains the following statement: “CNL conducted a systematic characterization of the NPD site, consisting of Phase I and Phase II Environmental Site Assessments, for the purposes of documenting areas of prior contamination. CNL has undertaken localized remediation of these contaminated areas, including appropriate management of waste.” References: <i>Canadian Council of Ministers of the Environmental (CCME). 2010b. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health - Polycyclic Aromatic Hydrocarbons. http://ceqg-rcqe.ccme.ca/download/en/320</i> <i>Canadian Standards Association (CSA). 2011. Guideline for the exemption or clearance from regulatory control of materials that contain, or potentially contain, nuclear substances. N292.5-11</i> <i>Canadian Standards Association (CSA). 2012b. CSA Standard Z678-01. Phase I Environmental Site Assessment. [Reaffirmed: 2012].</i> <i>Canadian Standards Association (CSA). 2013. CSA Standard Z679-00. Phase II Environmental Site Assessment. [Reaffirmed: 2013].</i> <i>Golder Associates Limited. 2017b. Environmental Site Assessment Report – NPD Closure Project. 64-509410-REPT-006. Revision 0.</i> <i>McVeigh, A. 2018b. NPD Balance of Site Characterisation Report, 64-509410-REPT-009, Revision 0.</i> <i>Oak Ridge Associated universities (ORAU). 2016. Characterization Plan for Nuclear And Conventional Hazards Of The Nuclear Power Demonstration Waste Facility (NPD). 64-509410-PLA-001. Revision 0.</i> <i>Oak Ridge Associated universities (ORAU). 2017. Historical Site Assessment Report for The Nuclear Demonstration Waste Management Facility (NPD). 64-509410-ASD-001. Revision 1.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Ontario Ministry of the Environment (MOE). 2011. Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act. 2011 July 01. https://www.ontario.ca/page/soil-ground-water-and-sediment-standards-use-under-part-xv1-environmental-protection-act</i> <i>Ontario Ministry of the Environment (MOE). 2011b. Ontario Regulation 153/04, as amended, Records of Site Condition - Part XV.1 of the Environmental Protection Act. Amended 2011 October 31.</i>
14	CNSC	Section 2.5 Aboriginal Engagement	p.2-11	Comment: The Executive Summary does not indicate whether Métis communities were also provided with opportunities to participate in the archaeological assessment field studies (as were First Nation communities). Expectation to Address Comment: Please revise accordingly or explain why Métis communities were not provided the same opportunities as First Nation communities.	Resolved As: Throughout the project, CNL has been responsive to the specific requests of each Indigenous Nation, community and organization. The Algonquins of Ontario (AOO) were provided the opportunity to participate in archeological assessment field studies, after the AOO approached CNL with a request for these field studies to occur and a request for participation in said field studies. The fieldwork, while not initially required by the environmental assessment (EA), was carried out as a response to the AOO’s interest in the work being done. Upon request, CNL has provided archeological reports to any Indigenous Nation, community or organization that requested such information, including the Métis Nation of Ontario (MNO). As of 2018 February, CNL has provided the same archeological information (the Phase I Archaeological Assessment) to the Algonquins of Ontario (AOO); Curve Lake First Nation, the Algonquin Anishinabeg Nation Tribal Council (AANTC) through their consultant; and the MNO. The MNO provided technical feedback on the archaeological assessment in January of 2019. Details on project engagement activities are captured in the Indigenous Engagement Report Technical Support Document (IER TSD). References: <i>IER TSD: Chennette, R. 2024. Nuclear Power Demonstration (NPD) Indigenous Engagement Report. 64-513130-REPT-001. Revision 5.</i>
15	CNSC	Section 2.5 Aboriginal Engagement	p.2-10 to 2-11	Comment: While CNL has provided a summary of consultation with First Nation and Métis groups, CNL has not included a complete summary of the concerns and issues raised by the identified groups and the responses provided to address these concerns and issues (which is an information requirement of the Executive Summary as per CNSC’s <i>Generic EIS Guidelines</i>, p.8). Expectation to Address Comment: Please provide a complete summary of the concerns and issues raised by the identified Indigenous groups, as well as CNL’s responses to each of concern or issue.	Incorporated: Section 6 of the EIS details all concerns and issues raised by Indigenous Nations, communities, and organizations, up to the agreed cut-off date of 2024 March (2024 May and 2024 June for Kitigan Zibi Anishinabeg and Kebaowek First Nation, respectively). This section also addresses CNL’s response to these concerns and issues in the sub-section titled Summary Discussion of Interests and Concerns - 6.2.4.X.3 (where X represents the community specific subsection). Appendix C of the EIS contains summary tables of <i>Interests and Concerns</i>, one for each Nation, community or organization that has raised interests with CNL. The tables of <i>Interests and Concerns</i> have five columns: • Column 1 identifies the key topic area of interest or concern. • Column 2 describes in detail the topics of interest or concern each Indigenous Nation, community and organization has identified formally in writing and / or verbally to CNL. • Column 3 summarizes CNL’s efforts to address these interests and concerns. • Column 4 identifies where in the EIS the interest / concern is addressed, changes made to the EIS as a result of the interest / concern and any changes to the EIS outcomes (if applicable); and, • Column 5 is the “Status”. This column describes the status of each interest or concern and whether the Indigenous Nation, community, or organization has verified that CNL has addressed the interest or concern.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					A revised Indigenous Engagement Report Technical Support Document (IER TSD), containing the most up to date record on engagement activities, will be submitted to the CNSC ahead of the Commission Hearing. Change to EIS: Section 2.5 and 6.2.4 have been updated to outline concerns and issues raised by Indigenous Nations, communities, and organizations, up to the agreed cut-off date of 2024 July 31, as well as CNL’s response to these concerns and issues. CNL has also added a new appendix to the EIS that contains the summary tables of <i>Interests and Concerns</i> as described above. Note: The order of EIS sections has been changed in the 2024 EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples.
16	Government of Quebec	Section 2.6.1 Atmospheric Environment (Baseline Environment)	p. 2-11	Comment: Section 2.6.2 states: “Current releases to air at the NPD site are via operation of the ventilation system... These releases are below applicable guidelines.” What is the source of these releases? The draft EIS states that if the ventilation system is started, concentrations in the air are reduced, but then they increase again. This indicates that there is an active source. Expectation to Address Comment: Please provide more details on current releases to air from the ventilation system.	Incorporated: After more than 30 years of decay, the main radioactive source term for the air effluent released from the ventilation stack is airborne re-suspension of residual radioactive contamination on facility systems (e.g. heat transport and moderator, both of which are drained): Co-60, Fe-55, C-14, Ni-63, Cs-137, and tritium. Tritium is the predominant contaminant present in the source term, representing >97% of total radioactive airborne emissions with a dose impact to public of ~1E-05 mSv/a, which is well below the public dose limit of 1 mSv/y. The air emissions from the ventilation stack (the only source of airborne radioactivity at NPD) were evaluated as part of the development of the NPD Effluent Monitoring Plan (CNL, 2022b) in accordance with CSA Standard N288.5. The effluent monitoring plan determined that the parameters that required monitoring for the ventilation stack are fan run time, tritium, as well as Gross Beta particulates (which would monitor the beta emitters Co-60, Fe-55, Ni-63 and Cs-137). It was determined that C-14 did not require monitoring because it is not a significant source term; it is also a localized source term and thus, an insignificant contributor to dose under normal conditions. Monitoring of the required parameters commenced in 2016 April, when CSA Standard N288.5, Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills was officially implemented. Change to EIS: The information provided above has been added to Section 8.2.3 (Air Releases) to provide more details on current releases to air from the ventilation system. References: <i>Canadian Nuclear Laboratories (CNL). 2022b. Nuclear Power Demonstration Effluent Monitoring Plan. 64-509200-PLA-001. Revision 1.</i>
17	CNSC	Section 2.6.4 Geological and Hydrogeological Environment Also applicable to the Updated	p.2-12	Comment: The EIS makes reference to lithology as “quartz and granite gneiss”. Quartz is a mineral, while granite is a rock type that by definition contains quartz. Do you mean that there are quartz ribbons within a granitic gneiss? In the Updated Groundwater Modeling Report, the bedrock is briefly described as “granitic Precambrian biotite and hornblende gneisses” and “hornblende-biotite-gneiss with quartz-feldspar injection”. This is inconsistent with limited rock type descriptions	Resolved As: The initial descriptors of granitic Precambrian biotite and hornblende gneisses hornblende-biotite-gneiss with quartz-feldspar injections were based on bedrock data from various monitoring well installation or environmental investigation campaigns, which were not designed to provide conclusive data on bedrock composition. Subsequent fieldwork in late 2018 and early 2019 undertook geoscientific characterization work to obtain a more extensive understanding of the bedrock conditions and allowed the revised conclusions regarding bedrock composition. The Geosynthesis Technical Support Document (TSD), in support of closure of the Nuclear Power Demonstration Facility has been prepared. The Geosynthesis TSD includes the results of the detailed geoscientific characterization work of the NPD site (Geofirma 2019). The Geosynthesis TSD reviews and presents available site-specific, local and

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		Groundwater Modeling Report		in other documents (i.e., EIS, Postclosure Safety Assessment TSD). Expectation to Address Comment: Please document rock type consistently, and include petrographic observations and modal mineral assemblages.	regional geoscientific data and information as part of defining the geological, hydrogeological and geomechanical frameworks for the NPDWF site. The Geosynthesis TSD summarizes the bedrock at the NPD site as Precambrian Canadian Shield. Historical regional mapping of the Precambrian bedrock places the NPD site within the lithostructural Opeongo Domain of the Algonquin (Lac Dumoine) Terrane of the Central Gneiss Belt, of the Grenville Province of the Canadian Shield. Mapping of bedrock outcrops as part of 2019 geoscientific characterization of the NPD site identify NPD bedrock geology as interlayered granitic to monzonitic gneiss and biotite hornblende gneiss with minor gabbroic gneiss. Core logging of shallow bedrock boreholes completed as part of the same 2019 investigations show the subsurface bedrock is principally an interlayered sequence of meter-scale bands of granitic gneiss and hornblende gneiss, with minor bands of dioritic gneiss and hornblende K-feldspar gneiss. Meter-scale to sub-meter-scale pegmatite dykes and occasional diabase dykes intrude the gneissic rock sequence. Although these bedrock descriptions appear different, they are all consistent with the best overall description of the bedrock rock type at the NPD site as migmatitic biotite gneiss. The inferred mineralogy based on available rock descriptions and 2019 petrographic work completed on both NPD outcrop and borehole core samples is plagioclase>quartz>K-feldspar>amphibolite~biotite. Based on Streckeisen ternary plot, the dominant lithologies at the NPD site vary from granite/granodiorite to quartz monzodiorite to quartz diorite to diorite / gabbro. The EIS has been updated to be consistent with the wording in the Geosynthesis TSD. Changes to the EIS: Sections 2.6.4, 8.5.2.1 and 8.5.2.2 have been updated to reflect the lithological information presented in the updated Geosynthesis TSD. References: <i>Geofirma Engineering Ltd. 2019. Geoscientific Characterization of the NPD Site. 64-509410-REPT-012. Revision 0.</i> Geosynthesis TSD: <i>Raven, K., Sterling, S. and Calder, N. 2022. 2021 Update to Geosynthesis Nuclear Power Demonstration Closure Project Rolphton, Ontario. 64-509410-REPT-010. Revision 2. Prepared by Arcadis and Geofirma for CNL.</i>
18	Government of Quebec	Section 2.8.2 Why are there No Adverse Residual Effects? Also applicable to Section 4.1.1 Robustness of the System, p. 4-2	p.2-22	Comment: Section 2.8.2 states: “In-situ decommissioning provides containment and isolation of the NPDWF inventory for a sufficiently long time to ensure that the long-term environmental concentrations do not cause adverse effects to human health or the environment.” What is this statement based on? Expectation to Address Comment: Please clarify the above statement.	Resolved As: This statement is based on the in-design mitigation measures discussed in Section 4.1.1 of the EIS which describes how the waste will be contained and isolated for a sufficient period to ensure there is no adverse effect. This statement is further supported based on the results discussed for each of the Valued Components (VCs) in Section 9 of the EIS. The two main Technical Support Documents submitted in support of the EIS are the Post Closure Safety Assessment Technical Supporting Document (PostSA TSD) and the Ecological Risk Assessment Technical Supporting Document (EcoRA TSD), which demonstrate that the proposed project does not have an adverse effect on human health or the environment. Section 9.1.1.1 of the EIS provides details on the PostSA TSD and the EcoRA TSD and identifies how their results were utilized in support of the EIS. References: EcoRA TSD: <i>Garisto, N., Manolopoulos, H., Arbaban-Esfahani, E., and Tong, X. 2020. Ecological Risk Assessment. 64-509200-ASD-004. Revision 2. Prepared by Arcadis for CNL.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																										
19	Government of Quebec	Section 2.8.3 Natural Analogues	p.2-23 to 2-24	Comment: Section 2.8.3 presents no details about the grout, except the comparison with Roman or Mycenaean cements. All the characteristics of the grout should be presented. Expectation to Address Comment: Please provide the precise characteristics of the grout that CNL plans on using for this proposed project.	Incorporated: The EIS has been updated to provide details on the grout formula and performance. Change to EIS: Table 4.3-1 with the grout formula to be used at NPD has been updated in Section 4.3.1.2. <table><tr><th>Materials</th><th>Standard Reference</th><th>Quantity (kg/m³) water to binder ratio of 0.90</th></tr><tr><td>Type 90/10 Cement (90% BFS/10% OPC) note 1</td><td>ASTM C595</td><td>386</td></tr><tr><td>Sand (quartz)</td><td>ASTM C33</td><td>1375.0</td></tr><tr><td>Water</td><td>ASTM C94/CSA A23.1-14</td><td>346.2</td></tr><tr><td>SIKA Visco Crete 2100</td><td>ASTM C494 B&F</td><td>4.681</td></tr><tr><td>Diutan Gum based VMA</td><td>ASTM C94</td><td>0.299</td></tr></table> Note 1: BFS – Blast Furnace Slag, OPC – Type I/II Portland Cement (Johnson 2022c) The following paragraph is also added in Section 4.3.1.2 to describe the validation of the grout formula: “The NPD Closure Project has worked with Golder and Associates to validate the formula using locally sourced materials. The grout is intended to prevent future subsidence and fill voids in the facility to as reasonable extent as possible. It is required then to have good flow characteristics, zero bleed and reach a compressive strength of greater than 3.4 MPa at 28 days. The testing has confirmed these performance requirements. Results are summarized in a grout report (English, 2022)”. Resolved as: The specification meets Ontario Provincial Standards for specifying grout / concrete properties and quality control for mix suppliers to the Province. The specification details all the fresh and cured properties the grout mixture must meet which includes the following from Tables 2 and 3 of the specification: Table 2: Fresh Properties <table><tr><th>Property</th><th>Requirement</th><th>Test Method</th><th>Comments</th></tr><tr><td>Slump Flow (mm)</td><td>660+/- 50</td><td>CSA A23.2-19C</td><td>Material flow in the deposition area is important during execution to fill areas in and around congested areas.</td></tr></table>	Materials	Standard Reference	Quantity (kg/m³) water to binder ratio of 0.90	Type 90/10 Cement (90% BFS/10% OPC) note 1	ASTM C595	386	Sand (quartz)	ASTM C33	1375.0	Water	ASTM C94/CSA A23.1-14	346.2	SIKA Visco Crete 2100	ASTM C494 B&F	4.681	Diutan Gum based VMA	ASTM C94	0.299	Property	Requirement	Test Method	Comments	Slump Flow (mm)	660+/- 50	CSA A23.2-19C	Material flow in the deposition area is important during execution to fill areas in and around congested areas.
Materials	Standard Reference	Quantity (kg/m³) water to binder ratio of 0.90																													
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Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response			
								The Slump Flow test to be performed with slump cone in the upward position.
					Visual Stability Index	1.0 or less	CSA A23.2-19C	A VSI of 0 is rated as “highly stable” while a 1 is “stable.
					Flow Rate T ₅₀	Less than 3 sec.	CSA A23.2-19C	Visual measurement of viscosity of grout and assesses the filling ability of the grout.
					Static Working Time (min)	≥ 30	ASTM D6103/D61036M modified to collect measurements at 15 minute intervals	Grout should remain pumpable and flowable for at least 30 minutes to recover from equipment failures e.g. pump breakdown.
					Dynamic Working Time (min)	> 60	CSA A23.2-19C	Grout should remain pumpable and flowable for at least 60 minutes while being stirred or recirculated to recover from equipment failures or to allow for delays in deposition area readiness.
					Air Content (vol.%)	≤ 8	CSA A23.2-4C	Frothing / air entrainment can hinder pumping. The grout pump will be sized to have extra volume and pressure capacity so air content will not impact the operation. No minimum air content is specified. Minimum air content is required for grout being exposed to below freezing temperatures. The bulk of the grout in the facility is well below the frost depth as will not undergo freeze-thaw cycles. In addition, there will be an engineered cover placed over the grouted facility, therefore no minimum air content value is required.
					Set Time (hr.)	2-12	CSA A23.1-14	Grout should set in a timeframe that readily enables flexible placement but short enough to mitigate settling. To avoid lengthy delays between subsequent lifts. The 2 hour set time is the minimum

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response			
								to avoid grout setting in the line / equipment during the grouting operation. The set time solely effects the timing of placement for successive lifts of grout which will affect the sequencing of successive pours but has no effect on the performance of the grout as demonstrated in the compressive strength results.
					Bleed Water after 24 hr. (vol. %)	0	CSA A23.2-1B	Zero bleed eliminates the need for water removal and reduces the risk of shrinkage.
					Segregation / Stability	No visible segregation	CSA A23.1-14 Clause 8.6.1.2	Grout should be a stable matrix with no bleed water and have homogeneous appearance which means strength and permeability performance will be consistent within the mix.
					Maximum Temperature from Curing (°C)	< 25 °C above ambient	Thermocouple and data logging over time	Keep temperature low to avoid thermal cracking.
					pH – initial	11-13	ASTM D4972	Portland cement-based grout is compatible with materials in the facility. pH 12+ reduces corrosion rate of steel.
Table 3: Cured Properties								
					Property	Requirement	Test Method	Comments
					Unconfined Compressive Strength @ 7 Days	> 0.34 MPa	ASTM D2166 ASTM C39/CSA 23.2-9C	Grout should be stable enough to support subsequent lifts. For cylinders under 10 KN load, ASTM D2166 is used and for cylinders above 10 KN load ASTM C39/CSA 23.2-9C is used.
					Unconfined Compressive Strength Design Target @ 28 Days	> 3.4 MPa	ASTM D2166 ASTM C39/CSA 23.2-9C	Cohesive solid material. For cylinders under 10 KN load, ASTM D2166 is used and for cylinders above 10

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response					
									KN load ASTM C39/CSA 23.2-9C is used.	
						Compressive Strength Design Target @ 90 Days	> 6.9 MPa	ASTM D2166 ASTM C39/CSA 23.2-9C	Rigid solid material. For cylinders under 10 KN load, ASTM D2166 is used and for cylinders above 10 KN load ASTM C39/CSA 23.2-9C is used.	
						Total Void Volume (vol. %)	≤ 40%	CSA A23.2-11C	To limit water migration throughout the grout mass. The test age shall be at least 28 days unless otherwise specified.	
						Dry Bulk Density (kg/m³)	1,800 to 2,100	CSA A23.2-11C	To insure proper structural support and is an indicator of low porosity and grout consolidation. The test age shall be at least 28 days unless otherwise specified.	
						Hydraulic Conductivity (m/yr)	< 0.03	ASTM D5084 Method A	To limit water migration throughout the grout mass. No specified cure time however testing shall be at 28 days of curing to be consistent among all the tests.	
						Shrinkage (length change of hardened concrete)	NA	CSA A23.2-21C	To measure fluctuations, if any, in grout casted prism moulds to determine shrinkage. The drying time for the moulds shall commence after 7 days of curing and shrinkage determined after 28 days of drying (35 days total). Interim shrinkage measurements can also be taken at the 7 day and 14 day of drying.	

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					References: <i>Johnson D. 2022c. CNL Specification, Grout Formula and Properties. 64-508300-SP-001. Revision 1.</i> <i>English, M. 2022, NPD Phase 2 Bulkfill Testing Summary Memo, 64-508120-REPT-003 Revision 2.</i>
20	CNSC	N/A	N/A	Comment: The Executive Summary does not provide sufficient detail for the reader to learn and understand the project’s proposed follow-up and monitoring program (which is an information requirement of the Executive Summary as per CNSC’s <i>Generic EIS Guidelines</i> , p.8). Expectation to Address Comment: Please provide a description, in the Executive Summary, of the project’s proposed follow-up and monitoring program.	Incorporated: The NPD Closure Project has added a new sub-section which discusses follow-up monitoring to the EIS Executive Summary. This new subsection describes the broad objectives of the Follow-Up Monitoring Program and references the individual environmental components for details. Change to EIS: Section 2 of the EIS has been updated to include a new sub-section (Section 2.8) on Follow-up Monitoring.
3. Introduction					
21	CNSC	Section 3.1 Location of the Project	p.3-1 to 3-4	Comment: From the description of the location, the map and the photograph, it is clear that the project is located near the Ottawa River. However, no distance between the NPD facility and the Ottawa River is provided in this section or in Section 8.3.2.1 (Surface Water Environment). CNSC’s <i>Generic EIS Guidelines</i> specify (on p.8) that the project location description “should include those aspects of the project and its setting that are key to understanding the project’s potential adverse environmental effects”, such as proximity to a water body. Expectation to Address Comment: Please provide in the EIS the distance between the NPD facility and the Ottawa River.	Incorporated: The NPD facility is located (on average) 94 m from the south shore of the Ottawa River. This has been confirmed using GIS information taken from the County of Renfrew, ON. Change to EIS: This information has been added to Section 3.1 of the EIS.
22	CNSC	Section 3.1 Location of the Project	p.3-3	Comment: CNSC’s <i>Generic EIS Guidelines</i> require (on p.8) that geographical maps of the project location show any important environmental features. Figure 3.1-2 does not <u>clearly</u> show the important environmental features and environmentally sensitive areas surrounding the project (e.g., forests, lakes, river systems, wetlands). Because the basemap chosen consists of a dark background, some geographical features (including captions) are difficult to see on the map. In addition, the legend for Figure 3.1-3 does not explain what the blue perimeter represents or what “NPD” represents (i.e., is it the area of the NPD facility?). Lastly, the in-text references to these figures are incorrect (e.g., on page 3-4,	Incorporated: Due to the nature of the source of the basemap, the project cannot easily lighten the basemap in Figure 3.1-2. However, the NPD Closure Project has made other changes (e.g., line thickness, font size and colour) for improved visual clarity of the features and captions on the figure. Additionally, the NPD Closure Project has revised the figure references in the text of the first sentence in Section 3.3 from “Figures 3.1-3 and 3.1-4” to “Figures 3.1-4 and 3.1-5”. The NPD Closure Project has replaced Figure 3.1-3 with a version that has been revised as follows: the “NPD” label has been changed to “NPDWF” to clarify that the arrow is marking the location of the NPD facility. A legend entry “fenceline” has been made for the blue perimeter.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Figure 3.1-3 is referenced instead of Figure 3.1-4, which shows the two landfills; no reference to Figure 3.1-5 is made in the text). Expectation to Address Comment: Please revise the above-mentioned figures (and related text) to provide a clearer visual representation of the project location. When applicable, consider choosing a lighter basemap that would allow the reader to better visualize the geographical features (including all captions) on the map.	Change to EIS: Figure 3.1-2, Figure 3.1-3 and the reference to figures in Section 3.3 of the EIS have been revised to reflect the response above.
23	Government of Quebec	Section 3.3 NPD Site and Facility Description	p.3-10 to 3-13	Comment: The following information on the NPD site and facility is missing and should be included in the draft EIS: • The power capacity of the facility (20 or 25 MW according to the IAEA), its theoretical and actual annual electricity production for each year of useful life, its utilization factor, and the reasons for output gaps over its 25 years of operation • All incident reports filed by year • The level of radioactivity at the NPD site and the equipment concerned • The reactor core, the pressure tubes and the heat transfer ducts that would still be present at the NPD site, including their level of contamination in detail • The total quantity of waste at the NPD site (in cubic meters) and their level of contamination in percentage (low, medium and high) • An explanation for: ○ The reasons leading to the reactor shutdown in 1987 ○ The reasons for not extending the life of the reactor over a period of 25 to 30 years and the origin of any specific cause (e.g., site contamination, radioactive incident or weakening of the equipment through operation) ○ The possible partial melting of the reactor core, and whether or not the corium was deposited at the bottom of the reactor or in its drain tank • The radioactive state of the contaminants present at the base of the reactor and its drain tank • The planned decommissioning schedule for the facilities and an explanation of the decisions regarding the dates of these decommissioning activities • The size and location of the concrete cap and engineered barrier system Expectation to Address Comment: Please provide the information requested above.	Resolved As: Responses have been provided in the bullets below. Please note that this level of operational detail is discussed in the Detailed Decommissioning Plan (DDP) (Johnson 2022a). Relevant details are presented in the EIS if it could have an impact on the waste inventory or safety of the worker or the public. The DDP identifies all the potential radiological hazards associated with the facility and estimated dose expected to be received by workers during the decommissioning process. Operational aspects relevant to the EIS are associated with the waste inventory and are presented in Section 4.4 of the EIS. Bullet 1 – The NPD facility has been cited in different areas as having a capacity of between 20 MWe and 25 MWe. The unit was designed to produce a maximum continuous output from the turbine-generator of 22 MWe, which led to a net output of 19.5 MWe after station loads were considered. The nominal output of the plant was intended to be 20 MWe gross. The initial design called for a capacity factor of 80% (ratio of actual output to theoretical output) and an availability factor of 90% (amount of time the unit was available to produce energy), over a period of 10 years, which was the initial design life. Over the 25 year operating life of the station, the capacity factor approached 70%. The project does not have access to availability factor data. The unit was used as a proof-of-concept for larger production units and was also used as a test bed for fuels, components, heat transport conditions, and for training. Given the varied roles, it had many reasons for output gaps, including breakdowns, refitting, experiments, inspections, component lifetime assessments, as well as scheduled maintenance. The relevant details for operating history were utilized for calculation of the activation products. The calculation of activation inventory depends on the total neutron flux in the tubes and the power history of the fuel. While this information is interesting, much of it is not pertinent to the decommissioning work, except for the capacity factor as that can be utilized to determine the source term present in the reactor components, which has been done and verified by measurements (see EIS Section 4.4.1.1). Bullet 2 – In general, the incidents that have occurred are not unexpected for a first of a kind demonstration facility. Broken fuel bundles and some split fuel elements resulted in some contamination throughout the primary coolant system. The east and west reactor vault areas had broken fuel bundles and contamination from failed equipment. The majority of contamination events resulted from heavy water leakage in various systems, mostly contaminating the boiler room and sump collection areas. Appendix B of the DDP identifies all of the operational incidents that occurred that could impact the decommissioning strategy for the facility. These incidents have been used in the development of the decommissioning planning as well as the waste characterization planning. Bullet 3 – Section 4.4.1 provides a summary of the radioactivity present in the structure and equipment and the detailed inventory can be found in the Post Closure Safety Assessment Technical Support Document (PostSA TSD). The NPD Balance of Site Characterization Report provides an overview of a comprehensive suite of field characterization measurements and concludes that the portions of the NPD site outside of the proposed disposal

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					facility have not been impacted by site operations. Thus, these portions of the site are suitable for Unconditional Clearance. Bullet 4 – The reactor core, pressure tubes and heat transfer ducts will all remain and be grouted in place. Section 4.4.1 provides a summary of the radioactivity present in the structure and equipment and the detailed inventory can be found in the PostSA TSD. Bullet 5 – Once the facility is grouted the total estimated quantity of waste is 27,590 m³. This includes all the existing concrete foundation, tanks, equipment and the emplaced grout, but it does not include the reinforced concrete cap to be poured and the engineered cover. As indicated in 4.4.1.1 the only material that would be considered Intermediate Level Waste (ILW) based on CSA N292.0 is the reactor core, which has an estimated volume of 125 m³, or an ILW proportion of 0.75% of the total. All other material is classified as low-level waste. Bullet 6 - NPD was shut down in 1987 following 25 years of operation. This 25 year time period had seen the nuclear fleet in Ontario (then run by Ontario Hydro) grow from the initial NPD and Douglas Point stations, to having eight units in operation at Pickering (total 4,100 MWe), eight units in operation at Bruce (total 6,300 MWe), and four units under construction at Darlington (which would eventually provide another 3,550 MWe). The decision to shut down NPD was based on degraded margins to failure; the prime factor was the brittleness of the pressure tubes from hydrogen ingress, a phenomenon that was common to the material used for early pressure tubes. Continued operation would have required replacement of the 132 pressure tubes with a different type of zirconium alloy, but it did not make economic sense for Ontario Hydro and AECL to invest that money for 20 MWe when they had over 10,000 MWe in operation. The decision was made to place the facility in a safe storage state, and the Ontario Hydro personnel were transferred to other generating stations. There were no incidences of fuel melting at the unit over its operation, and thus no corium was ever present. Bullet 7 - Section 4.4.1, specifically Table 4.4-1, provides a summary of the radioactivity present in the reactor vessel and the detailed inventory can be found in the PostSA TSD. Bullet 8 – Decommissioning works can only proceed with approval of a licence amendment by Canadian Nuclear Safety Commission allowing physical decommissioning activities. The physical works are expected to last approximately 2 years (see EIS Table 3.2-1). This project officially began when CNL submitted the Project Description on March 2016 which launched the Environmental Assessment (EA) process. The decision to decommission the NPD reactor was made by the Government of Canada. As part of the restructuring of Atomic Energy of Canada Limited (AECL) (the owner of the NPD reactor), the government implemented a Government-owned, Contractor-operated (GoCo) model for the management and operation of AECL’s sites. The requirement to decommission the NPD reactor was specifically part of the GoCo contractual agreements that are being managed by AECL. Further details regarding the decommissioning schedule can be found in Table 4.3-2 of the EIS and in the DDP. Bullet 9 – The reinforced concrete cap covers the Boiler Room, Reactor Vault, and Spent Fuel Rooms, to provide an additional obstacle to inadvertent human intrusion. The concrete cap will be placed on the Reactor Hall Floor at elevation 129.5 masl (425’ 0”), following completion of grouting. The cap has a thickness of 0.40 meters (1’-4”) at the edge and rises to a thickness of 0.71 meters (2’-4”) at the centre. The area of the cap is approximately 570 m² (6,135 ft²), and it is dowelled to the foundation walls of the existing structure for anchorage. The final cover, covers the entire grouted facility including the reinforced concrete cap and has a maximum height of 11’-8” (3.56 m) over the existing Reactor Hall Floor level. The engineered cover has a surface area of approximately 6,500 m² (69,965 ft²).

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound. References: <i>Canadian Standards Association (CSA). 2014b. General principles for the management of radioactive waste and irradiated fuel. N292.0-14.</i> <i>Johnson, D 2022a. Detailed Decommissioning Plan for Nuclear Power Demonstration Waste Facility. 64-508310-DDP-001. Revision 3.</i> <i>McVeigh, A 2018. NPD Balance of Site Characterisation Report, 64-509410-REPT-009. Revision 0.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
24	ECCC	Section 3.3.1 Structures at the NPD site	p.3-10	Comment: The draft EIS does not indicate the size of any diesel storage tanks or if any tanks are subject to the Fuel Storage Tank Regulations under the <i>Canadian Environmental Protection Act, 1999</i> (CEPA 1999). The text states that the remaining permanent structures at the NPD site include diesel-generator equipment, which provides emergency power to mitigate power interruptions at the facility. The batch mixing plant is expected to run on electrical power. However, a generator will provide backup power to the batch mixing plant if needed. The backup generator, as well as the heavy machines on-site, will run on diesel. Thus, it would be expected that diesel storage tanks will be needed on site. Please note that, under these regulations which are administered by ECCC, a petroleum storage tank registration may be required depending on the size of the diesel tanks installed to support the project. Expectation to Address Comment: Please provide the number, size and location of any fuel storage tanks required for each phase of the proposed project, and identify which tanks will be subject to the Fuel Storage Tank Regulations.	Resolved As: <u>Current condition – Storage With Surveillance</u> The NPD site currently has one emergency diesel generator located within the fenced area in the south-east corner. This emergency diesel generator has a total volume of 166 US Gal (628 L). As per s.s. 2(2)(c) of the Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197), emergency generators with an aggregate capacity of 2,500 L or less are exempt from the regulations. <u>Decommissioning Execution Phase</u> During the Decommissioning Execution Phase of the project, it is anticipated the project will require a maximum of two fuel storage tanks which will be set up to support the heavy equipment required for grouting, demolition, and construction of the concrete cap and engineered cover. As stated in CNL Environment Policy (CNL 2022d), CNL complies with environmental laws and regulations applicable to our activities. To do so, CNL Environmental Protection Program has a process in place (CNL 2022e) to ensure that any petroleum storage tank required for use on any of CNL managed sites are in compliance with all pertinent CNL processes and procedures and all Federal regulations. <u>Post Closure Phase</u> No fuel storage tanks will reside on the property. References: <i>Canadian Nuclear Laboratories (CNL). 2022d. Environment Policy. 900-509200-POL-001.</i> <i>Canadian Nuclear Laboratories (CNL). 2022e. Management of Petroleum Storage Tanks. 900-509200-STD-002.</i>
25	Government of Quebec	Section 3.3.2 NPDWF Description,	p.3-11 to 3-12	Comment: The terms used in the draft EIS do not correspond to those used in Figures 3.3-1 and 3.3-2.	Incorporated:

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																												
		Figures 3.3-1 and 3.3-2		Expectation to Address Comment: Please revise accordingly.	The NPD Closure project has updated affected sections of the EIS to clarify the use of synonymous terms. For example, the term “Condenser Room” and “Condenser Pit” are used interchangeably, as well as the terms ‘Used Fuel Room’ and ‘Spent Fuel Room’ and the term “used fuel” and “spent fuel”. Change to EIS: Section 3.3.2 has been updated with the following wording: “As outlined in the decommissioning plan (Johnson 2022a), the above-ground structures will be demolished, and the debris will be placed into the lower level space of the Condenser Room/Pit as backfill and grouted in place before the concrete cap and engineered cover is placed over the grouted facility.” “The reactor was de-fuelled and the used/spent fuel bundles from the Used/Spent Fuel Room were transferred to the CRL site. Demineralizer system equipment was removed from the various nuclear process systems and transferred to CRL (Johnson 2022a).” References: <i>Johnson, D. 2022a. Detailed Decommissioning Plan Nuclear Power Demonstration Waste Facility, 64-508310--DDP-001, Revision 3.</i>																												
26	ECCC	Section 3.5.3 Additional Regulatory Authorities & Legislation (Environment Canada) Also applicable to Appendix A, p.A-1	p.3-17	Comment: On November 17, 2017 an order amending Schedule 1 of the <i>Species at Risk Act</i> (SARA) was registered in Canada’s Gazette Part II. As a result, additional species at risk have been listed on Schedule 1 of SARA, which may occur at the NPD site. This order came into force on the day at which it was registered. The text of the order, including a list of relevant species, is available online at: http://www.sararegistry.gc.ca/default.asp?lang=En&n=EC2CD677-1. Expectation to Address Comment: Please update “the species list” referred to in Section 3.5.3.1 based on the November 17, 2017 amendments to Schedule 1 of SARA, where needed. If baseline information about a newly listed species has not been provided, please identify the missing information and propose a plan to collect it during the environmental assessment (EA) review phase. If a species has been listed and could potentially be impacted by the project, provide an additional analysis, including: • A Description of potential impacts • A list of proposed mitigation measure, where appropriate • Anticipated residual effects	Incorporated: The species list found in Section 8.6.4 and Appendix B has been updated based on the most recent (as of June 2024) amendments to Schedule 1 of SARA, along with any other changes that were made from the COSEWIC and SARO since the 2017 EIS submission. These changes have been noted in the table below (NAR: Not At Risk, SC: Special Concern, THR: Threatened, END: Endangered): <table><tr><th>Species</th><th>Changes since 2017</th></tr><tr><td colspan="2">Amphibians</td></tr><tr><td>Northern leopard frog (<i>Lithobates pipiens</i>)</td><td>COSEWIC: Not listed to NAR</td></tr><tr><td colspan="2">Reptiles</td></tr><tr><td>Blanding Turtle – GLStL population (<i>Emydoidea blandingli</i>)</td><td>SARA: THR to END</td></tr><tr><td>Eastern musk turtle – stinkpot (<i>Sternotherus odoratus</i>)</td><td>SARA: THR to SC</td></tr><tr><td>Eastern spiny softshell (<i>Apalone spinifera</i>)</td><td>SARA: THR to END SARO: THR to END</td></tr><tr><td>Midland painted turtle (<i>Chrysemys picta marginata</i>)</td><td>SARA & COSEWIC: Not listed to SC</td></tr><tr><td>Northern map turtle (<i>Graptemys geographica</i>)</td><td>SARO: SC to not listed</td></tr><tr><td>Northern water snake (<i>Nerodia sipedon</i>)</td><td>COSEWIC: Not listed to NAR</td></tr><tr><td colspan="2">Birds</td></tr><tr><td>Bank swallow (<i>Riparia riparia</i>)</td><td>SARA: No status yet to THR</td></tr><tr><td>Barn swallow (<i>Hirundo rustica</i>)</td><td>SARA: No status yet to THR</td></tr><tr><td>Bobolink (<i>Dolichonyx oryzivorus</i>)</td><td>SARA: No status yet to THR COSEWIC: THR to SC</td></tr></table>	Species	Changes since 2017	Amphibians		Northern leopard frog (<i>Lithobates pipiens</i>)	COSEWIC: Not listed to NAR	Reptiles		Blanding Turtle – GLStL population (<i>Emydoidea blandingli</i>)	SARA: THR to END	Eastern musk turtle – stinkpot (<i>Sternotherus odoratus</i>)	SARA: THR to SC	Eastern spiny softshell (<i>Apalone spinifera</i>)	SARA: THR to END SARO: THR to END	Midland painted turtle (<i>Chrysemys picta marginata</i>)	SARA & COSEWIC: Not listed to SC	Northern map turtle (<i>Graptemys geographica</i>)	SARO: SC to not listed	Northern water snake (<i>Nerodia sipedon</i>)	COSEWIC: Not listed to NAR	Birds		Bank swallow (<i>Riparia riparia</i>)	SARA: No status yet to THR	Barn swallow (<i>Hirundo rustica</i>)	SARA: No status yet to THR	Bobolink (<i>Dolichonyx oryzivorus</i>)	SARA: No status yet to THR COSEWIC: THR to SC
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SC</td><td></td></tr><tr><td>Evening grosbeak (<i>Coccothraustes vespertinus</i>)</td><td>SARA: Not listed to SC SARO: Not listed to SC</td><td></td></tr><tr><td>Grasshopper sparrow (<i>Ammodramus savannarum pratensis</i>)</td><td>SARA: No status yet to SC</td><td></td></tr><tr><td>Great gray owl (<i>Strix nebulosa</i>)</td><td>COSEWIC: Not listed to NAR</td><td></td></tr><tr><td>Loggerhead shrike – eastern subspecies (<i>Lanius ludovicianus migrans</i>)</td><td>SARA: No status yet to END</td><td></td></tr><tr><td>Merlin (<i>Falco columbarius</i>)</td><td>COSEWIC: Not listed to NAR</td><td></td></tr><tr><td>Northern goshawk (<i>Accipiter gentilis</i>)</td><td>COSEWIC: Not listed to NAR</td><td></td></tr><tr><td>Northern harrier (<i>Circus cyaneus</i>)</td><td>COSEWIC: Not listed to NAR</td><td></td></tr><tr><td>Olive-sided flycatcher (<i>Contopus cooperi</i>)</td><td>SARA & COSEWIC: THR to SC</td><td></td></tr><tr><td>Peregrine falcon (<i>Falco peregrinus anatum/tundrius</i>)</td><td>SARA: SC to not listed COSEWIC: SC to NAR</td><td></td></tr><tr><td>Red-headed woodpecker (<i>Melanerpes erythrocephalus</i>)</td><td>SARA & COSEWIC: THR to END SARO: SC to END</td><td></td></tr><tr><td>Red-shouldered hawk (<i>Buteo lineatus</i>)</td><td>SARA: SC to not listed</td><td></td></tr><tr><td>Red-tailed hawk (<i>Buteo jamaicensis</i>)</td><td>COSEWIC: Not listed to NAR</td><td></td></tr><tr><td>Rusty blackbird (<i>Euphagus carolinus</i>)</td><td>SARO: Not listed to SC</td><td></td></tr><tr><td>Sedge wren (<i>Cistothorus platensis</i>)</td><td>COSEWIC: Not listed to NAR</td><td></td></tr><tr><td>Short-eared owl (<i>Asio flammeus</i>)</td><td>COSEWIC: SC to THR SARO: SC to THR</td><td></td></tr><tr><td>Wood thrush (<i>Hylocichla mustelina</i>)</td><td>SARA: No status yet to THR</td><td></td></tr><tr><td colspan="3">Mammals</td></tr><tr><td>Hoary Bat (<i>Lasiurus cinereus</i>)</td><td>COSEWIC: Not listed to END</td><td></td></tr></table>	Canada warbler (<i>Cardellina canadensis</i>)	COSEWIC: THR to SC		Cerulean warbler (<i>Setophaga cerulea</i>)	SARA: END to SC		Common loon (<i>Gavia immer</i>)	COSEWIC: Not listed to NAR		Common nighthawk (<i>Chordeiles minor</i>)	COSEWIC: THR to SC		Common tern (<i>Sterna hirundo</i>)	COSEWIC: Not listed to NAR		Cooper’s hawk (<i>Accipter cooperii</i>)	COSEWIC: Not listed to NAR		Eastern bluebird (<i>Sialia sialis</i>)	COSEWIC: Not listed to NAR		Eastern meadowlark (<i>Sturnella magna</i>)	SARA: No status yet to THR		Eastern whip-poor-will (<i>Antrastomus vociferus</i>)	COSWEIC: THR to SC		Eastern wood pewee (<i>Contopus virens</i>)	SARA: No status yet to SC		Evening grosbeak (<i>Coccothraustes vespertinus</i>)	SARA: Not listed to SC SARO: Not listed to SC		Grasshopper sparrow (<i>Ammodramus savannarum pratensis</i>)	SARA: No status yet to SC		Great gray owl (<i>Strix nebulosa</i>)	COSEWIC: Not listed to NAR		Loggerhead shrike – eastern subspecies (<i>Lanius ludovicianus migrans</i>)	SARA: 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END		All species on this list have been surveyed for, and the listed SAR are assessed as a proposed valued component under Appendix B. The NPD Closure Project will not engage in any activities representing a known threat for species at risk. Change to EIS: The SARA, COSEWIC and SARO status’ for species at risk changes have been updated in Tables 8.6-2, 8.6-3 and 8.6-4, as well as in Appendix B.
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Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
27	ECCC	Section 3.5.3 Additional Regulatory Authorities & Legislation (Fisheries and Oceans Canada)	p.3-18	Comment: In the main EIS and other documents provided, the role of ECCC in relation to the pollution prevention provisions of the <i>Fisheries Act</i>, specifically subsection 36(3), was not identified. Expectation to Address Comment: Please revise the EIS to note that ECCC administers the pollution prevention provisions of the <i>Fisheries Act</i> (including subsection 36(3)). Furthermore, discuss and assess the potential adverse effects on the aquatic environment from all possible liquid effluent releases from the project. Identify measures that will be taken to mitigate impacts to water quality. If treatment of 64. is being considered as a mitigation measure, discuss the treatment technology to be used.	Incorporated: (a) The NPD Closure Project has updated the discussion of the Fisheries Act in Section 3.5.3.2 as follows: "The purpose of the <i>Fisheries Act</i>, under Fisheries and Oceans Canada (DFO), is to protect the productivity of recreational, commercial, and Aboriginal fisheries. The project must comply with specific subsections of the <i>Fisheries Act</i> including, but not limited to: subsection 35(1) which prohibits serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery, and subsection 36(3) which prohibits the deposit of deleterious substances in water frequented by fish. The <i>Fisheries Act</i> focusses on managing threats to the sustainability and ongoing productivity of these fisheries, providing compliance and protection tools, clarifying regulatory requirements, and, enabling partnerships to allow appropriate agencies and organizations to provide fisheries protection services." (b) With respect to assessing the potential adverse effects on the aquatic environment from all possible liquid effluent releases from the project: The main liquids identified for normal decommissioning operations are: • wash water (produced from washing cement vehicles and sluices); and, • any water potentially accumulated inside the facility during grouting (from groundwater ingress or precipitation) or at the base of the ventilation stack (produced by precipitation) or by activities such as misting. During the Postclosure phase, groundwater will saturate the grouted facility and eventually discharge to the Ottawa River. EIS Sections 9.3, 9.4 and 9.8 assess the potential effects of the above effluent streams and discharges on human receptors and receptors in the aquatic environment, in both the Decommissioning Execution and Postclosure phases. No adverse residual effects are identified from any of the above effluents. (c) With respect to mitigation measures: The DecomSA and EIS (Section 9.3.3.2) present mitigation measures to protect the surface water and aquatic environments. These include installation of silt fences / barriers, proper stockpile management (covering of stockpiles), washout pit design and placement and stormwater conveyance to direct precipitation runoff from the cover system towards ditches that enable infiltration. In the Postclosure phase, in-design mitigation measures (i.e., containment and isolation of contaminants) reduce the potential for the release of soluble contaminants to groundwater and eventually to the aquatic environment. (d) With respect to effluent treatment: Any liquid effluent generated by the NPD Closure Project will be handled as a non-routine discharge following approved CNL Environmental Protection processes (Matasich 2021). Any non-routine discharge will be reviewed against the acceptability criteria in (Matasich 2021), which outlines appropriate disposition routes depending on the analysis results. The key aspect is that no un-assessed liquid effluent releases will occur as part of the decommissioning work. Change to EIS: The following text has been added to Section 2.2.3 Wastes and Emissions: The main liquids that could be associated with normal decommissioning operations are: • wash water (produced from washing cement vehicles and sluices); and, • any water potentially accumulated inside the facility during grouting (from groundwater ingress or precipitation) or at the base of the ventilation stack (produced by precipitation) or by activities such as misting.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Any liquids generated by the NPD Closure Project will be handled as a non-routine discharge following approved CNL Environmental Protection processes. Any non-routine discharge will be reviewed against acceptability criteria to determine the appropriate disposition routes based on the analysis results. The following text has been added to Section 4.5 Potential Project-Related Releases to the Environment The main liquids identified for normal decommissioning operations are: • wash water (produced from washing cement vehicles and sluices); and, • any water potentially accumulated inside the facility during grouting (from groundwater ingress or precipitation) or at the base of the ventilation stack (produced by precipitation) or by activities such as misting. Any liquids generated by the NPD Closure Project will be handled as a non-routine discharge following approved CNL Environmental Protection processes (Matasich 2021). Any non-routine discharge will be reviewed against the acceptability criteria in (Matasich 2021), which outlines appropriate disposition routes depending on the analysis results. The following text has been added to Section 9.3.3.2 (Proposed Mitigation Measures): Any liquids generated by the NPD Closure Project will be handled as a non-routine discharge following approved CNL Environmental Protection processes (Matasich 2021), which outlines appropriate disposition routes depending on the analysis results. The key aspect is that no un-assessed liquid effluent releases will occur as part of the decommissioning work. The following reference has been added to Section 13 (References): Matasich, C. 2021. Acceptability Criteria for Routine and Non-Routine Discharge of Liquids at Canadian Nuclear Laboratories Sites, 900-509200-MCP-005. Revision 1. References: <i>DecomSA TSD: Garisto, N., Kovacs, and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i> <i>Matasich, C. 2021. Acceptability Criteria for Routine and Non-Routine Discharge of Liquids at Canadian Nuclear Laboratories Sites, 900-509200-MCP-005. Revision 1.</i>
28	CNSC	Section 3.5.3 Additional Regulatory Authorities & Legislation (Canadian Standards Association)	p.3-18 to 3-19	Comment: In Section 3.5.3, the Canadian Standards Association (CSA) standards seem to be considered only as external or guidance documents. However, some of the referenced documents are part of the Compliance Verification Criteria (CVC) in the current NPD Licence Condition Handbook (LCH) (e.g., CSA N292.3, <i>Management of Low- and Intermediate Level Radioactive Waste</i>). Expectation to Address Comment: Please differentiate between the documents that are part of the CVC in the current NPD LCH (and therefore that need to be complied with), and those that are external or guidance documents.	Resolved As: The planned project activities identified in the EIS are activities that are currently not licensed, also the existing license and associated Licence Conditions Handbook apply only to the approved activities listed in that license, which do not include the proposed project. Under the integrated environmental assessment (EA) and licensing process, the project has applied for a license amendment to authorize the disposal of nuclear substances at the Nuclear Power Demonstration Waste Facility (NPDWF), this will result in both a revised license and associated Licence Conditions Handbook and will clearly specify Compliance Verification Criteria applicable to the project and revised license. No change proposed to the EIS.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
4. Project Description					
29	Government of Quebec	Section 4.1 Purpose of Project	p.4-1	Comment: The Government of Quebec would like to understand what the urgency for decommissioning quickly is, when the site has been dormant for 30 years. Expectation to Address Comment: Please respond to the above question related to the need and purpose of the proposed project.	Resolved As: The NPD facility has been in storage with surveillance or deferred decommissioning for the last 30 years. The NPD decommissioning strategy had been to delay closure of the site until a disposal facility became available. The Government of Canada has requested CNL reduce Canada's nuclear liabilities. This has led to a change in strategy for the future of NPD by bringing forward closure of the facility. The lack of a disposal site is not a significant reason to delay the decommissioning of NPD. Continuing with storage with surveillance will make little difference to the total radioactive inventory because most of the short-lived isotopes have already decayed. However, continuing with storage with surveillance for an indeterminate period will increase the risk that deterioration of the facility causes an unacceptable release to the environment, result in continued federal capital investment and in the end the decommissioning costs are not reduced. Moving forward with the project now ensures the Government of Canada focuses their environmental efforts on limiting the nuclear legacy for future generations.
30	CNSC, ECCC	4.1.2 Natural Analogues	p.4-2 to 4-3	Comment: New (specific to the project) and existing research could not be identified to support the argument for barrier performance, including, but not limited to the following topics: durability, deterioration, degradation, defects, permeability and corrosion. Roman and other ancient cements are cited (in Section 4.1.2) as analogues for the long-term performance of the monolith grout. However, there is no technical discussion that establishes the similarities between the project and the examples provided (e.g., materials, technology, environmental conditions), which are key to making analogies. For example, it is not clear whether these ancient cements use a similar formulation to the one proposed for the NPD Closure Project or whether analogues have been exposed to conditions that are similar to those anticipated for the NPD Closure Project. The comparison is only valid if both of the above conditions are met. The technical justification for barrier performance is therefore lacking. This technical justification should include the following building blocks: ☐ A literature review for, and analysis of, available information that is used in justifying the performance of the barriers ☐ The identification of any gaps, where there may not be sufficient technical basis, to support the performance of a barrier ☐ The plan for bridging those gaps, as needed. Expectation to Address Comment:	Resolved As: The NPD project has used a graded approach to identify systems (barriers) important to safety, determine their design rules and quality selection. The engineering design rules are defined as the relevant national or international codes, standards and proven engineering practices that should be applied, as appropriate, to the design of Structures, Systems and Components (SSCs) to meet the applicable design requirements. The long-term radiological acceptability of a waste disposal facility is evaluated through two broad categories of exposure situations: natural processes and human intrusion. Natural processes include the range of conditions anticipated over the lifetime of the facility and events that could occur with a lesser likelihood. Human intrusion is disruptive scenarios to the NPD Disposal Facility (NPDDF) that can lead to radiological risk to members of the public. The assessed doses from these exposure situations are then compared with dose constraint acceptance criteria. Barriers that contribute to long-term safety requirements of NPDDF by satisfying dose constraint acceptance criteria are identified as important to safety in the Postclosure phase of the NPDDF. Classification of barriers important to safety focused primarily on the demonstration of safety and compliance to safety requirements. Barriers (i.e., SSCs) should be designed to the appropriate standards that commensurate with their safety importance, REGDOC-2.5.2, Design of Reactor Facilities: Nuclear Power Plants’. The barriers restricting radionuclide / contaminant release from the NPDDF include: - Waste form: the majority of the radioactivity is embedded within iron-based matrices (carbon steel, stainless steel) and zirconium alloy that will corrode very slowly in the chemical environment of the NPDDF; the main non-radioactive contaminant, lead, is “embedded within its own matrix” which corrodes gradually and its release in the Postclosure Safety Assessment (PostSA) is limited by lead solubility in the NPDDF environment; - The thick concrete walls of the Reactor Vault and structure: inhibit movements of radionuclides and other contaminants from the NPDDF into the surrounding environment; - The grout backfill: inhibits movement of radionuclides and other contaminants and creates an alkaline environment that limits the solubility of key contaminants; and - The isolation of radionuclides and / or contaminants is achieved by: - The location of the Facility in bedrock. - Containing them in grout. - Placing a multilayer cover over the NPDDF.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Please provide the technical information and research, from academia and existing projects (nuclear or non-nuclear) with similar challenges, to justify the performance of the barrier. Where references are made to natural analogues, a discussion that supports the analogy is needed. In particular, please provide a description of the conditions that the ancient cement analogues have been exposed to and the comparability of these conditions to those that exist at the NPD site. Also, please review the EIS to include only the analogues that fulfill these conditions.	Iron Based Materials The PostSA assumes that radionuclides embedded in iron-based matrices are gradually released into the surrounding cement pore water as the iron corrodes. It is generally accepted that iron and in particular steels can corrode quickly and this is a familiar scenario to many people who have experienced rapid rusting. Thus, for the purpose of this discussion it is biased towards the fact that this is not always the case and that there are many examples of iron artifacts surviving in good condition for long periods of time under a wide range of conditions. Johnson and Francis (1980) studied the corrosion of iron-based archeological artifacts, native metals and meteorites under a wide range of environmental conditions. The environmental conditions ranged from buried in mud in the sea to dry tombs in arid environments, with ages spanning up to 3,500 years old for manmade iron objects and up to 130,000 years old for iron meteorites. The NPDDF is a below ground structure in a water saturated environment, therefore we only considered those artifacts that were located in either fresh water or buried in the ground in non-arid environments. The reported iron corrosion rates in Johnson and Francis (1980) ranged from 0.1-10 microns per year for manmade objects, consistent with the assumed range in the PostSA for the corrosion of carbon and stainless steels. Ferrous materials have shown long term durability in several environments, examples of which are iron articles in the Tutankhamen tomb (1300 BC), the iron pillar of Delhi (400 AD), and cast iron water pipes (Versailles, France, 1665 AD). The carbon steel and stainless steel waste forms at the NPDDF contain impurities such as nickel and chromium. Natural analogue studies of meteorites have shown that the presence of nickel and chromium in iron meteorites offers resistance to corrosion. Johnson and Francis (1980). These metal analogues do not have exactly the same chemical composition as the iron-based matrices, however, they provide insight and support the possible survival of these metals over long periods of time. The corrosion of meteorites also gives confidence that metals containing large amounts of nickel and chromium similar to modern stainless steels used in the NPD reactor are able to survive many thousands of years under wet conditions and when exposed to freeze thaw cycles. A significant example studied in Johnson and Francis (1980) are meteorites in the climate at the Canyon Diablo crater in Arizona. The area is currently dry, but there is evidence that a lake once formed in the crater, during the last Pleistocene ice age (around 10,000 to 15,000 years ago), exposing the meteorite masses to extremely moist conditions for several thousand years. Metal masses on the surface of the soil apparently survived the moisture quite well but degradation of buried metal masses may have been accelerated by the increased ground water. There are estimated to be more than 20,000 metal masses found ranging in size from 0.05 kg to 635 kg in size with an age of around 20,000 years. The PostSA conservatively estimates that the steels in the reactor will take around 30,000 years to corrode and this is supported by the analysis of meteorites. It is noted that many meteorites have dark surface oxides which appear to be compact and coherent formed as a fusion layer from heat as they entered the Earth’s atmosphere and provide protection from corrosion. Similarly, there are well preserved archeological iron pillars in India, (Balasubramaniam 2000), (Johnson and Francis 1980). They are believed to have been erected around 400 AD although their exact age is not known. Their durability is attributed to dry conditions and metal purity. This is similar to the oxide layers intentionally formed using processes such as chemical pickling on ferrous alloy components to provide protection from corrosion. This is a feature of reactor components where corrosion resistant materials are required. Some analogues represent very large amounts of iron, where the large amount is used to buffer redox conditions, preventing oxidizing conditions and thus, exhibiting essentially no corrosion for thousands of years Helmuth (1991) and Pitts and St. Joseph (1985). Helmuth, (1991), examined the corrosion of native iron with a low nickel content in basalt which unsurprisingly corrodes easily when exposed to weathering. Fissures in the rock providing pathways for oxygen are observed to be filled with corrosion products, which was not widespread except where hydrothermal influences were active. Of the samples examined it was also seen that disintegration of the rock matrix from volume expansion of the corrosion products did not occur. There are no hydrothermal effects predicted to be associated with the NPDDF therefore it can be inferred that should cracking of the facility occur only localised corrosion of the

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					reactor steels can be expected and it is unlikely that volume expansion due to corrosion products would cause further damage to the concrete and grout. A large number of nails and iron tyres were found in Scotland at an abandoned Roman fortress dating from 87 AD, Angus et Al (1962) and Pitts and St. Joseph (1985). Over a million nails were buried in an underground pit and it is estimated that the total mass of iron recovered from the site was around 10,000 kg. Only the nails on the outside have corroded and the iron oxides that formed self-sealed the remaining nails from intruding groundwater and oxygen. As a result, the vast majority of the nails experienced minimal to no corrosion over close to 2, 000 years. The corrosion experienced by these anthropological artifacts reflects the corrosion of native iron in basalt discussed by Helmuth, (1991). This again provides further evidence that iron alloys under moist low oxygen conditions can survive for thousands of years with minimal corrosion, similar to the conditions that are expected to be seen by the steels in the NPDDF. Many archaeological iron weapons have been discovered in good condition even after burial for many centuries in soil even in corrosive environments due to the protective properties of formed layers of corrosion products, Jegdić et al (2011). Iron buried in soil normally experiences corrosion due to chemical and electrochemical effects. Figure 1 shows a Pourbaix diagram for iron and water showing how iron is affected by corrosion depending on pH and electrical potential. The hatched areas show the regions where iron corrodes, the lower part of the diagram is where iron is thermodynamically stable and the remaining area is where insoluble corrosion products form and provide a protective layer to the iron preventing further corrosion. For the NPDDF the steel components in the facility experience high pH from the grout used to backfill the facility. Under these alkaline conditions it is expected that the steels will be in the passive region and will be protected from corrosion due to the passivation layer formed on the metal surface. Jegdić et al (2011), discuss the corrosion of iron archaeological artefacts in soil, and how contact with oxygen is required to accelerate the rate of corrosion. They also identify that the iron artifacts can have different layers of corrosion produces with the lower oxidation state, next to the metal surface, and the layers of iron compounds with a higher oxidation state in the outer layer. These layers are identified as significantly reducing the corrosion rate of iron in relation to the initial corrosion rate seen at the time of burial of the artefact. This suggests that the iron based metals in the NPDDF can be expected to resist corrosion for long periods of time due to the exclusion of oxygen and the highly alkaline conditions within the facility.

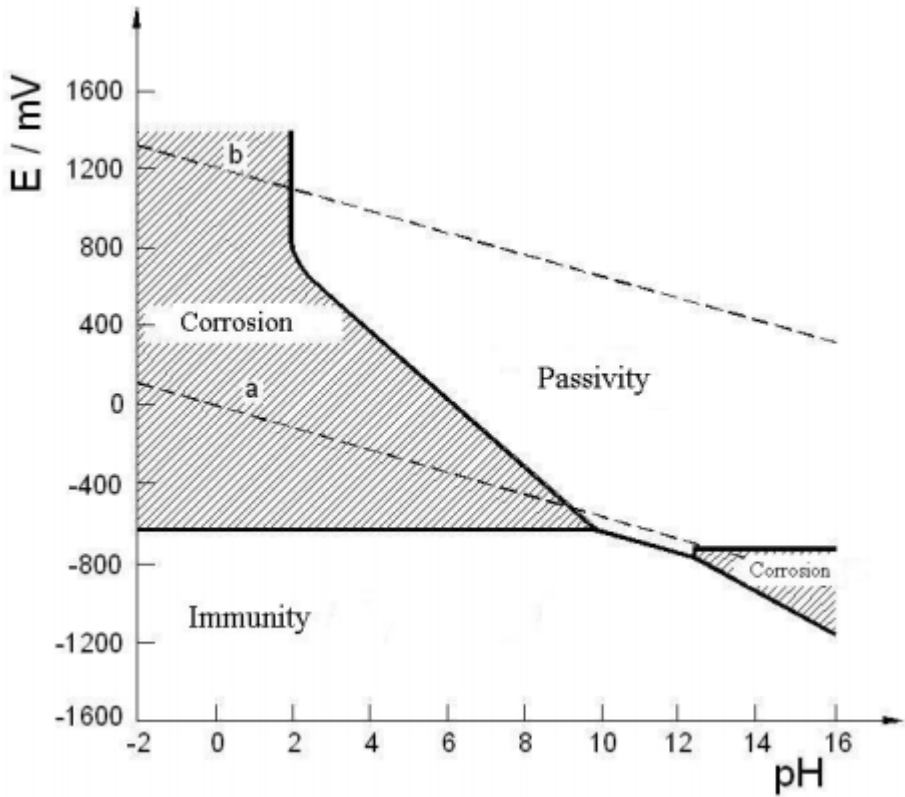


Figure 1: Pourbaix Diagram for Iron and Water, Jegdić et al (2011)

It should be noted that the PostSA accounts for the corrosion of iron-based waste forms also includes a case with increased corrosion rates to address any residual uncertainty. Based on the above analogues the steel wastes in the NPDDF can therefore be expected to take thousands of years to corrode as they experience similar conditions to the examples discussed above. This correlates well with the predicted time of 30 000 years for the stainless steel components of the waste form to corrode, and provides confidence that the NPDDF will perform as expected.

Lead

There is a significant quantity of lead associated with shielding at NPDWF. There are also minor amounts associated with lead paint. Much of the shielding lead is part of the NPDWF structure itself, e.g., lead has been used as shot infill into voids and lead lining of doors and walls to provide shielding during the operational phase of the NPD reactor. The gradual dissolution of lead is modeled in the PostSA conservatively, assuming solubility control of its release. No credit has been taken for the corrosion rate of lead.

Lead has been used in antiquity for weights, pipes, cladding, etc. and many such artifacts have survived over the years. Recent dating of lead artifacts has shown that such artifacts undergo very slow corrosion when buried in soils with $pH > 6.5$, (Reich et al. 2003). The annual corrosion rate of lead artifacts inferred from the work of Reich et al. is about 0.1 micron. These corrosion rates are similar to that seen for iron and thus it will take many thousands of years for the lead to fully corrode. Reich et al, (2003), also identify that the lead corrosion products are mostly lead oxide, lead carbonate and lead hydroxides all of which are sparingly soluble in water at room temperature. While no credit has been taken in the model for the lead corrosion rates the low rates seen in historical lead artifacts under alkaline conditions such as that seen in the NPDDF show that the model is very conservative, and that lead can be expected to remain in the NPDDF for thousands of years. Further to this the low solubility of lead corrosion products associated with the archaeological artifacts gives confidence that the lead in the NPDDF will only be released sparingly into the environment over thousands of years.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					This analogue provides credibility to the conservative nature of the lead dissolution model. Concrete / Grout / Cement The NPDWF structure includes concrete walls. The proposed ISD activities include removing the above ground structure and placing redundant materials and demolition waste into the below grade structure. The below grade structure will be sealed by grouting. The PostSA assumes that the grout will gradually degrade as the cement constituents are slowly leached out upon contact with groundwater. A site that has been extensively studied and discussed as an analogue for cement evolution, cement-rock interaction (and radionuclide behaviour) in radioactive waste repositories, is Maqarin, Jordan, Linklater (1998), Smellie (1998), and Baker et al (2002). An overview of the site and its main features is presented by Savage (2011). The Maqarin site is located on the south side of the Yarmouk valley in northwest Jordan and lies on the border with Syria, ~16 km north of the city of Irbid and 25 km east of the River Jordan. The hyperalkaline groundwaters in the area are the product of leaching of highly bituminous siliceous limestones. The interaction of the high-pH waters and the surrounding rock at Maqarin provides an analogue for the ‘alkaline disturbed zone’ expected in the bedrock downstream from the NPDDF. The alkaline groundwaters emanating from the ‘Cement Zone’ rocks flow through fractures in the adjacent sedimentary strata, to discharge through loose, unconsolidated sediments and gravels in a series of springs along the floor of the Yarmouk valley. Extensive deposits of travertine (mineral spring deposits) are formed at the spring discharge points as the Ca(OH)₂-saturated groundwaters interact with atmospheric CO₂. Maqarin is relatively well fractured and subject to high hydraulic gradients. Moreover, the host rock is a clayey limestone, rather than a true mudstone, such as those considered for deep geological disposal systems. The principal alteration products at Maqarin includes: ettringite and thaumasite (and ettringite-thaumasite solid solutions); C-S-H gels; Poorly-crystalline or amorphous ‘zeolitic composition’ or calcium aluminosilicate hydrate (C-A-S-H) gels. For the NPDDF the blast furnace slag cements used in the grout to backfill the interior of the facility share a number of similarities with the Maqarin analogue. The NPDDF is situated in a hydraulic gradient, in an area of disturbed and fractured bedrock and in a hyperalkaline environment as a consequence of the grout and cement. The use of blast furnace slag also mimics the chemistry of the alteration products seen at the Maqarin site, e.g. C-S-H and C-A-S-H gels, and ettringite and thaumasite are observed to form in slag blended cement concretes. Therefore, the chemical performance, some of the concrete degradation phases and robustness of the NPDDF grout can be compared to the Maqarin site. Studies at Maqarin have demonstrated significant reduction in the matrix porosity of the rock, gravel and sediments through cementation with gels and zeolites. These observations suggest that reactions occurring in a repository in aluminosilicate-rich rocks will therefore tend to produce sealing and reduction in porosity. Observations at Maqarin also show that interaction with alkaline groundwater can produce narrow (1-5 mm wide) zones, adjacent to fracture walls, in which the microporosity is enhanced by the dissolution of calcite and dolomite. These alteration zones are complex and include areas where the porosity is reduced by secondary calcite cementation. There is evidence for both repeated fracture sealing operating on timescales of tens to hundreds of years and for the long-term stability of newly-formed minerals measured in thousands of years. Fracture sealing may occur extensively and over short timescales with calcic fluids (over tens to hundreds of years). Many modeling studies of the Maqarin analogue have been undertaken, Shao et al (2013), Steefel and Van Cappellen. (1990), Martin et al (2015), Watson et al (2016). The models broadly suggest fracture sealing, but this process is complex and is dependent upon a range of factors and modeling assumptions such as: rock composition (mineralogy, grain size, porosity); groundwater composition and flow rates; and mineral reaction kinetics.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Milodowski et al. (1989) also include Maqarin in their “catalogue of analogues”, where they focus on the longevity of calcium-silicate-hydrate phases, which are primary constituents of cementitious materials. It is noted that a wide variety of hydrated CSH minerals and gels are present, minerals include tobermorite, jennite and afwillite, along with calcium-alumino-sulphates and silico-sulphates such as ettringite and thaumasite, with waters present having a pH as high as 12.9. Milodowski et al (1989), suggests that C-S-H and C-A-S-H minerals and gels are able to persist for tens to hundreds of thousands of years. When reaction does occur, the formation of ettringite and thaumasite leads to fracture sealing. The main conclusion of these studies is that the alkaline plume will generally seal fractures by forming secondary minerals with positive reaction volumes that precipitate in fractures. Plugging of porosity was also concluded in recent modelling studies investigating these sites. Concrete or grout made with blast furnace slag cement, such as that used in the NPDDF, sets more slowly than concrete made with ordinary Portland cement, depending on the amount of slag in the cementitious material. It also continues to gain strength over a longer period and parts of the grout using blast furnace slag can remain unreacted for long periods of time. This means that the grout used in the NPDDF will seal fractures in the grout and continue to cure unreacted material when ground water reaches it forming C-S-H, C-A-S-H gels and other minerals. This process is analogous to the processes at work at the Maqarin site and gives confidence that the NPDDF grout and concrete can conservatively perform their barrier functions on the order of a thousand years as described in the Amber model. Studies of natural cements suggest that these materials are very durable. For example, ~2 million years old natural cements were found in northern Jordan Alexander (1982), and natural cements that were produced ~58 million years ago were reported in Northern Ireland, Savage (2011). It is interesting to note that these natural cements stayed impermeable within tectonically stable systems. However, if accessed by groundwater through structural damage caused by events such as tectonic activity, these systems tend to reseal with secondary calcium silicate minerals or carbonates Linklater (1998) and Cramer (1994). This is directly analogous to the concrete used in the NPDDF which has many similarities to natural cements and should be able to reseal itself due to the chemical species and processes at work within the concrete reacting with groundwater that is able to make its way into the facility. The natural cements have also been exposed to a range of conditions and cannot be narrowed down to a specific set of conditions especially when considering time frames spanning 58 million years, which encompasses multiple periods of climate change and the effects of continental drift. Temperature is usually constant at depths beyond 5 m reflecting the mean earth temperature and therefore it can be considered that climatic effects due to temperature variations can be ignored between the NPD facility and the natural analogues. Due to the depth of the calandria (greater than 5 m) in the NPDDF temperatures are expected to be relatively constant over a period of thousands of years. Of most interest is the effect water has had on the natural cements which have demonstrated their ability to reseal, showing that it is possible to safely contain the wastes for extremely long durations under less than favourable conditions, and again is analogous to the NPDDF grout. In addition to this the NPDDF grout as it is in direct contact with the building concrete will be able to provide chemical species that can also assist in sealing cracks formed in the concrete. According to (NWMO 2013), these natural cements are close to ordinary Portland cement, not the low-heat, high-durability cement being considered for radioactive disposal systems. Typically, these latter cements are similar to the cements that were developed by the Romans in the 3rd century BC or those used in Tiryns and Mycenae, around a thousand years earlier, (Middleton 1988). Recent studies of Roman cements, even those exposed to saline water (e.g. marine environment) demonstrate little degradation over approximately 2,000 years (Cramer 1994; Oleson et al. 2004, and (Vola et al. 2011). The grout used in the NPDDF is a pozzolanic cement as its major constituent is blast furnace slag.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					The NPD grout fill will be 90% blast furnace slag which is a pozzolanic material, similar to the volcanic ash used in the Roman cements. Roman and other ancient cements are analogues to show that cements can last for over 2,000 years with little degradation. Ancient anthropological cements show that even under conditions where weathering, ultraviolet radiation, large temperature changes and exposure to harsh conditions such as seawater occurs it is possible for manmade materials to survive for hundreds if not thousands of years and still maintain their integrity. The cements and grouts used in the NPDDF are subjected to less harsh conditions than the Roman/Tyrinian cements. Even though there are chemical differences between these cements and the grouts and cements used in the NPDDF they can provide confidence that cements can survive for long periods of time intact. It can be conservatively inferred from the performance of these natural cements that the NPDDF grout can survive and perform its required barrier functions for around a thousand years. It should be noted that the PostSA also considers a case with high grout permeability and a hypothetical case with no grout at all to bound implications of any uncertainty in the grout material properties over time. The Concrete Cap The NPDDF will have a reinforced concrete slab and a multi-layer cap emplaced over it at closure. The concrete cap is to divert water away from the facility to reducing the flushing out of contaminants, in particular tritium and in the longer term provides a barrier to human intrusion. The PostSA assumes that the cap starts to degrade 100 years after its emplacement and is assumed to have fully degraded (in terms of hydraulic performance) by 1,000 years after decommissioning is complete. As discussed above the NWMO considers natural cements to be close to ordinary Portland cements. These natural cements have shown themselves to be very durable over extremely long timescales up to millions of years in some cases, even when in contact with water. The concrete cap will be protected under the engineered cover, is located below the frost line and will not be exposed to chemical species such as chlorides that can attack and damage concrete. The engineered cover will reduce contact with water and the surface drainage features will divert water away from the concrete cap. Therefore, during the first hundred years of its life the concrete cap will exist under ideal conditions that following this initial period will gradually degrade over next several hundred years. Considering the long-term durability of natural cements that are similar to the ordinary Portland cements used in the concrete cap, and the initial protective conditions provided by the engineered cover it can be assumed that cap is unlikely to experience much degradation in the first several hundred years of its lifetime. The 1,000 year time period used in the PostSA model during which the concrete is assumed to fully degrade is therefore considered conservative. Engineered Cover System The NPDDF engineered cover system is a multi-layer barrier including topsoil or clay loam, clay liner, coarse sand, crushed rock, geotextile and an earth mound. The mound will be graded and surface drainage features added to capture and direct water away. These structures will be engineered to provide multiple barriers to inflowing water but will ultimately degrade. The cover will be graded to promote surface water run-off. While the final cover is designed with the best engineering practices, specifically with the NPD site characteristics in mind, it is assumed that these barriers will eventually degrade. The design life of the engineered cover is 100 years and after this period the PostSA assumes that the engineered cover starts to degrade. Anthropogenic analogues provide support for the possibility of using a cover structure made up of fine material such as clay, followed by coarse material and soil to keep the Facility dry for a long period of time Fayek and Brown (2015). Thus, ancient tombs with wooden coffins have stayed dry when covered by such layers for ~1,300-1,500 years and are generally well preserved, USGS (2010) and Watanabe (1989). Anthropogenic analogues provide support for the use of a multi-layer engineered cover to keep the NPDDF dry for a long period of time Fayek and Brown (2015). These observations provide credibility to the conservative nature of the

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					assumptions in the PostSA. These anthropogenic analogues provide credibility to the conservative nature of the assumptions in the PostSA and indicate that the engineered cover should survive significantly beyond its 100 year design life. Existing Earthen Mounds / Anthropogenic Analogues Areas covered by earthen mounds acting as covers, have been built by humans for thousands of years. Several of them still exist today, demonstrating that earthen mounds can be constructed to withstand thousands of years of natural evolution and weathering effects. Furthermore, the existence of these structures today demonstrates that humans are able to recognize human-made structures and are willing to leave them relatively undisturbed for centuries. This section describes several human-made earthen mounds in existence today and supports the idea that a Facility near the surface can be constructed to last thousands of years. It can be seen from the examples give below that earthen mounds have many similarities to the NPDDF engineered cover. There are many examples of earth mounds that have survived for time periods up to thousands of years in similar environmental conditions to that expected to be experienced by the NPDDF. These examples show that an engineered cover constructed mostly of natural materials can provide weathering protection to the grouted facility significantly in excess of the 100-year design life of the engineered cover. This again demonstrates the conservatisms used in the PostSA and gives confidence that the NPDDF design is likely to perform significantly better than the PostSA model predicts. <i>Newgrange, Ireland</i> Newgrange is a type of tomb known as a passage-grave, located in Meath, Ireland. Constructed in about 3000 Before Common Era (B.C.E), (5, 200 years ago), it is older than Stonehenge and the Great Pyramids of Giza, O’Kelly (1982). The mound is 76 meters across, 12 meters high, and covers 1.1 acres of ground. It is completely constructed of natural materials, built of alternating layers of earth and stones. The cover contains medium sized pebbles, 15-22 cm across. The Newgrange structure demonstrates that a large earthen mound can be built out of natural materials and remain undamaged by the effects of the environment for over 5,000 years. Newgrange’s location in Ireland is a particularly good comparison to the climate near the NPDDF, specifically the amount of precipitation received. Meath, Ireland receives about 73 cm of precipitation per year weather-and-climate.com, (available online), compared to the nearby Chalk River’s 86 cm per year. <i>Sutton Hoo, England</i> Sutton Hoo is a burial site located at Sutton, in Suffolk, England. Earthen mounds dating to the 6th and 7th centuries were discovered at this site. There are approximately 20 earthen mounds that were used as cemeteries, and a large mound containing an entire ship-burial Claude and Bruce-Mitford (1977). The ship contained in the mound was found to be about 27 meters long. While the wood of the ship did not survive, nearly all of the iron planking rivets were in their original places. Many metallic objects were recovered during the site investigation of Sutton Hoo: Helmets, bowls, spoons, weapons, and armour. While the items had corroded with time, the findings support the idea that water ingress into the ship burial mound was minimal over many hundreds of years. The similarities between this barrow and the NPDDF, i.e. an earthen mound covering metal artifacts, show that the metals in the NPDDF can remain in place in excess of a 1 000 years in wet conditions. <i>Serpent Mound, USA</i> The Great Serpent Mound is a 411 m-long, about 1 meter high, 20-foot wide effigy mound located in Adams County, Ohio. Carbon dating suggests that it was constructed around 300 B.C.E, making the mound over 2,000 years old. It likely served a mortuary function, directing spirits of the dead from burial mounds northward. The Great

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Serpent Mound still exists today, demonstrating that human-made mounds such as the NPDDF can be constructed to persist thousands of years Romain et al (2017), under similar environmental conditions to the NPD site. <i>Burial Mounds of British Columbia</i> There are many burial mound sites identified in British Columbia Thom (1995) and Pickford (1947). The Scowlitz Site is described here, to demonstrate that earthen mounds can exist undisturbed for over a thousand years, even in the wet climate of British Columbia. <u>The Scowlitz Site</u> The Scowlitz site is located at the confluence of the Harrison and Fraser Rivers and was historically the base of an important transportation route from the Fraser River valley to the Lillooet River valley Thom (1995). There are 42 visible burial features found at the site, dating between 1, 600 and 1, 100 years old. The mounds vary in size and form. The largest mound is 12 m on each side of the rectangular base, reaching a height of 3 meters. At the center of the mound is approximately 500 boulders, sitting on a thin layer of clay. Beneath this rock layer are the well preserved remains of an adult male. Radio-carbon dating for this mound indicates an age of about 1, 300 years. Items found preserved in these mounds include clam shell bowls, knives, worked quartz, stone pendants, composite harpoons, copper objects, and granite bowls. <i>Monks Mound</i> Monks Mound is the largest Pre-Columbian earthwork in the Americas and the largest pyramid north of Mesoamerica. The beginning of its construction dates from 900-955 CE. Located at the Cahokia Mounds UNESCO World Heritage Site near Collinsville, Illinois, the mound size was calculated in 1988 as about 100 feet (30 m) high, 955 feet (291 m) long including the access ramp at the southern end, and 775 feet (236 m) wide, resulted in area of 6.9 hectares, Skele. This makes Monks Mound roughly the same size at its base as the Great Pyramid of Giza (5.3 hectares). The geotechnical site characteristics of the mound have been studied extensively and reported in Scilling (2012), with the purpose of understanding construction methodology. Surficial geology and seismic hazards are also available in Grimley et al (2007) and Williams (2009). The level of seismic hazard at the Monks Mound site is comparable to the NPD site. The existence of Monks Mound demonstrates that man-made structures, built using earth materials, can last longer than 1, 000 years, even with limited construction methods and engineering knowledge. Site Specific Characteristics Comparison When discussing natural analogues, it is important to also compare the local climate and seismic characteristics, as these are the most important factors affecting the long-term performance of a facility on the surface. Table 1 below compares the annual yearly precipitation and peak ground acceleration (pga) at each of the sites. The pga selected corresponds to a 2% probability of exceedance in 50 years. The NPD site characteristics are comparable to the other sites, especially those with coastal climates. Canadian seismic data are from the National Building Code Canada, American seismic data is from Applied Technology Council (available online), and weather data is from NOAA (available on line). It should also be reiterated that the grouted facility is protected beneath the engineered cover, and that the majority of the waste is at least 10 m below grade in bedrock. At these depths the facility is below the frost line and at depths below 5m the ground temperature remains relatively constant. Therefore, seasonal temperature changes will not have an effect on the grouted facility or the wastes it contains.

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					Table 1 Comparison of Seismic and Precipitation Data <table><tr><th>Site</th><th>pga (g)</th><th>Annual Precipitation (mm)</th></tr><tr><td>NPDWF, ON, Canada</td><td>0.253</td><td>852</td></tr><tr><td>Chalk River, ON, Canada</td><td>0.25</td><td>852</td></tr><tr><td>Newgrange, Ireland</td><td><0.05</td><td>730</td></tr><tr><td>Sutton Hoo, England</td><td><0.04</td><td>523</td></tr><tr><td>Adams County, Ohio (Serpent Mound)</td><td>0.079</td><td>~1129</td></tr><tr><td>Scowlitz, BC, Canada</td><td>0.222</td><td>~1000+</td></tr><tr><td>Monks Mound, IL, USA</td><td>0.265</td><td>~980</td></tr></table> Conclusion The use of natural analogues to support long-term safety assessment models has its limitations. In particular, the materials and environmental conditions involved are somewhat different in the analogue compared to the NPDDF and its environment. In addition, the purpose of the structures are not always the same – many are burial sites, not disposal facilities. This is typical of natural and anthropogenic analogues. Therefore, we are using the above examples as additional lines of evidence that does not replace the safety assessment. Nonetheless, these examples support the concepts of the long- term containment provided by the engineered barriers of the NPDDF and illustrate similar long-term behavior of natural and anthropogenic systems. The above examples also show that the NPDDF barrier functions can be maintained and their required lifetimes achieved. It can also be inferred from the analogues that the PostSA has been conservative in its assumptions and that the barrier functions can be expected to perform for time durations significantly in excess of the modelled design. Change to EIS: Section 4.1.2 has been updated with the above text. References: <i>A.E. Pickford, (1947), Prehistoric Cairns and Mounds in British Columbia with a Report on the Duncan Burial Mound. British Columbia Historical Quarterly. Volume XI. Page 237-264.</i> <i>Alexander, W.R. (ed). 1992. A Natural Analogue Study of Cement-buffered, Hyperalkaline Groundwaters and their Interaction with a Sedimentary Host Rock – I: Source-term Description and Geochemical Code Database Validation. NAGRA Technical Report Series NTB-91-10. NAGRA, Wettingen, Switzerland.</i> <i>Angus, N. S., G. T. Brown and H., F., Cleere, 1962. The iron nails from the Roman Legionary Fortress at Inchtuthil, Perthshire. HJournal of iron and steel institute 200, 956-968.</i> <i>Applied Technology Council (ATC). https://hazards.atcouncil.org</i> <i>Baker, A.J., K. Bateman, E.K., Hyslop, D.J. Ilett, C.M. Linklater, C.M., A.E. Milodowski, D.J. Noy, C.A. Rochelle, and C.J. Tweed. (2002). Research on the alkaline disturbed zone resulting from cement water-rock reactions around a cementitious repository in a silicate-rich host rock. Nirex Report N/054, UK Nirex Ltd., Harwell, UK.</i> <i>Balasubramaniam, R. 2000. On the Corrosion Resistance of the Delhi Iron Pillar: Corr. Sci. 42, 2103-2129.</i>	Site	pga (g)	Annual Precipitation (mm)	NPDWF, ON, Canada	0.253	852	Chalk River, ON, Canada	0.25	852	Newgrange, Ireland	<0.05	730	Sutton Hoo, England	<0.04	523	Adams County, Ohio (Serpent Mound)	0.079	~1129	Scowlitz, BC, Canada	0.222	~1000+	Monks Mound, IL, USA	0.265	~980
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31	Government of Quebec	Section 4.1.1 Robustness of the System	p.4-2	Comment: Section 4.1.1 states: “For most of the assessed period, only a small percentage of the initial total radioactivity is released from the NPDWF as soluble contaminants. Even after 50,000 years, the vast majority of the radioactivity (i.e., over 98%) remains in the NPDWF.” What is this statement based on?	Resolved As: The Post Closure Safety Assessment Technical Supporting Document (PostSA TSD) demonstrates the effectiveness of the NPD facility at containing the radioactivity within the facility. Figure 5-3 of the PostSA TSD shows that the majority of the radioactivity remains within the Reactor Vault, even out to 50,000 years, due to the corrosion resistance of the metals that make up the reactor vessel, i.e. zircaloy and stainless steel. Figure 5-13 of the PostSA TSD also shows the environmental concentrations of radionuclides in the biosphere. The updated PostSA predicts that 96% of the radioactivity remains in the NPDWF even after 50,000 years. Comparison of Figure 5-3 with

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Expectation to Address Comment: Please clarify the above statement.	Figure 5-13 shows that at all times the radionuclide concentrations in the biosphere are at least ten thousand times smaller than the concentrations in the NPD facility. References <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
32	Government of Quebec	Section 4.1.1 Robustness of the System	p.4-2	Comment: Since the proposed project results in a definitive nuclear waste disposal after 100 years, the site should have warning signs to inform visitors in the absence of any Institutional Controls, when human intrusion could pose a risk (IAEA 2014b, 2017; Trauth et al., 1993). Nothing in the draft EIS indicates that this will be the case. Expectation to Address Comment: Please explain what the passive access controls at the site will be (e.g., physical barriers, stinging vegetation, additional layer of soil, warning signs, etc.) to ensure safety of the site in the long-term. References: <i>AIEA (2014b) Near surface disposal facilities for radioactive waste. IAEA Safety standards series, no. SSG-29</i> <i>AIEA (2017) HIDRA - The International Project On Inadvertant Human Intrusion in the context of Disposal of RadioActive Waste, Version 2.1: Comments addressed January 2017 Plenary Meeting, 25 Jan 2017</i> <i>Trauth, K. M., Hora, S. C., & Guzowski, R. V. (1993) Expert judgment on markers to deter inadvertent human intrusion into the Waste Isolation Pilot Plant (No. SAND–92–1382). Sandia National Labs, Albuquerque, NM (United States).</i>	Incorporated: Safety after closure of the facility relies on both natural and engineered controls. These are a combination of institutional and passive controls using the properties of the site, facility, and waste. Monitoring of the facility is not needed following the Institutional Controls phase. The site features and engineered barriers identified for the post-closure phase of the NPDDF are: • Concrete monolith; • Concrete cap and engineered cover; • Facility location underground in bedrock in a remote location; and • Land use controls. The concrete monolith and concrete cap provide a robust structure that make drilling or digging into the facility difficult. The engineered cover is designed to limit the rate of water ingress from precipitation into the facility. Additionally, it protects the concrete cap by reducing its exposure to the weather. The engineered cover also hides the facility. This reduces the chance of deliberate human intrusion. Examples of this would be archaeological digging, or searches for valuable materials. The facility location is a barrier to human intrusion. Its siting in bedrock in a remote area makes it difficult to access the facility. The low population in the area reduces the chances that humans will encounter the site. This will also reduce the risk of deliberate access into the site. The Institutional Control phase will be at least 100 years. After this time uncontrolled access to the site may occur. Fences, warning signs and security arrangements protecting the site may no longer be required. Site features and engineered barriers, as identified above, prevent human access into the disposal facility. AECL as the landowner will register land usage controls on the land title. These will be the same controls as used for waste disposal sites in Ontario. The title will show that the land contains a radioactive waste disposal site and lists all forbidden activities. This will be effective as long as a land registry exists, and its requirements enforced. The project will not use signage and permanent markers to identify the NPD disposal site. Signage and permanent markers can encourage interest and potentially future site investigations. Signs need continued maintenance that may not happen in the future. Markers are better suited to high-level waste repositories due to their higher hazards. Where areas are revegetated, thorny and stinging plants will not be used, to avoid attracting people and animals, as many thorny plants have edible berries; stinging plants may have medical uses or be of cultural significance. The vegetation used needs to blend into the local area so that people or animals are not drawn to the disposal site. There is also the possibility of human harm due to poisoning or allergic reactions.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Moving into the Post-Institutional Control Phase requires CNL to submit a licence amendment application to the CNSC. Removal of institutional controls will be subject to the jurisdictional authority acts and regulations in force at the time of application. Change to EIS: Section 4.1.1 of the EIS has been updated to include the above text. Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound.
33	CNSC	Section 4.1.1 Robustness of the System	p.4-2	Comment: The EIS acknowledges that barriers will degrade over time; however, a specific time period and performance requirements for the barriers, commensurate with the characteristics of the waste they are to confine, are not established. CNSC’s REGDOC-2.9.1 requires the design, maintenance and monitoring of barriers. Sufficient information about the barriers is not provided, and therefore, barrier performance over time cannot be established and supported. Expectation to Address Comment: Please address the following points for existing barriers (e.g., metal components, existing building): □ Did CNL assess the current conditions of the existing barriers against the original design requirements and function (e.g., presence of defects, permeability, cracks, corrosion, water ingress, required repairs, maintenance, etc.). If so, please provide such analysis; otherwise, please justify why it should be considered acceptable. □ Did CNL assess the confinement function of the existing barriers? This includes: - o The original design - o The current condition - o An assessment of the degradation mechanisms that the barrier may experience during the life of the facility, and its ability to perform its function (note: this is presumably up to the point where the clearance level for the waste will be reached (as in CSA N292.3, <i>Management of Low- and Intermediate Level Radioactive Waste</i>), unless CNL provides a justification for an alternate duration)	Resolved As: A graded approach has been used to determine the scope, extent and level of detail of the design of the barriers and any supporting assessments. This is a method or process by which elements, such as the level of analysis, the depth of documentation and the scope of actions necessary to comply with requirements, are commensurate with: • the relative risks to health, safety, security, the environment and the implementation of international obligations to which Canada has agreed, and the particular characteristics of a Facility or licensed activity. The graded approach was used in a review undertaken to identify systems (barriers) and determine their importance to safety, determine their design rules and quality selection (Karam 2021). The study examined the roles of each of the waste form, the reactor vault concrete walls, the reactor building concrete walls, the bedrock, grout filler, concrete cap, the engineered cover, and the facility fence. Of these, the waste form, reactor vault and reactor building walls, and the bedrock are existing. The current condition of the existing barriers was assessed against the original design requirements, where available. A structural assessment (AECOM 2018b) was performed that examined the current conditions and capacity of the existing structure relative to the design. The conclusion of the assessment was that the facility remained in satisfactory condition and would perform its role as a disposal facility for at least 100 years, which is commensurate with the proposed design life of the Nuclear Power Demonstration Disposal Facility (NPDDF), after which the Post Closure Safety Assessment Technical Support Document (PostSA TSD) assumes degradation begins in the existing barriers. Upon reactor shutdown, three Zircaloy pressure tubes were removed from the reactor and examined for corrosion, oxide thickness, and hydrogen ingress, among other properties. The results of this examination also concluded that the pressure tubes remain intact. Additionally, other metals in the facility were visually inspected during walkthroughs and assessed to be in satisfactory condition. This presented a starting point for the PostSA TSD to examine the performance of these components over time. The confinement functions of the existing barriers were assessed against their original design through the structural assessment of the existing facility (AECOM 2018b), and through testing to confirm the hydraulic conductivity of the existing concrete building walls and concrete reactor vault walls. Additionally, extensive characterization of the bedrock was carried out (Geofirma 2019) to determine its hydraulic conductivity. These assessments were inputs to the PostSA TSD and used to establish confinement properties of the NPDDF. The PostSA TSD also examined degradation mechanisms in the NPDDF through the Cementitious Materials Synthesis Report (Arcadis 2018), which describes the stages of degradation of the existing facility concrete and the

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				o A demonstration of the barrier’ ability to perform efficiently its function Please provide the following information for new barriers (e.g., grout, plugs, and engineered cover): ☐ The design requirements ☐ An assessment of the degradation mechanisms that the barrier may experience during the life of the facility, and its ability to perform its function (note: this is presumably up to the point where the clearance level for the waste will be reached (as in CSA N292.3, <i>Management of Low- and Intermediate Level Radioactive Waste</i>), unless CNL provides a justification for an alternate duration) ☐ A demonstration of the barrier’ ability to perform efficiently its function	grout. Additionally, Appendix A of the PostSA TSD discusses lifetime of the various barriers relative to the remaining waste inventory with time for an assessment period of 10,000 years. The PostSA TSD demonstrates the ability of these barriers to efficiently perform their function, concluding the doses expected are several orders of magnitude under regulatory limits using conservative modeling and scenarios for all expected normal and disruptive evolutions. For new barriers, the design requirements for the grout were determined and captured in a specification document (Johnson 2022c). Design Requirements for the concrete cap and engineered cover have been developed (AECOM 2019). Design of seals for facility penetrations (i.e. pipes, ducts) is underway. The new seals will be designed to meet or exceed the specifications of the surrounding materials (concrete). The degradation mechanisms of the new barriers are listed and the barrier performance is assessed over the 10,000 year assessment period in the PostSA TSD. Engineering design rules are defined as the relevant national or international codes, standards and proven engineering practices that should be applied, as appropriate, to the design of Structures, Systems and Components (SSCs) to meet the applicable design requirements. The long term radiological acceptability of a waste disposal facility is evaluated through two broad categories of exposure situations: natural processes and human intrusion. Natural processes include the range of conditions anticipated over the lifetime of the facility and events that could occur with a lesser likelihood. Human intrusion is disruptive scenarios to NPDDF that can lead to radiological risk to members of the public. The assessed doses from these exposure situations are then compared with dose constraint acceptance criteria. Barriers that contribute to long-term safety requirements of NPDDF by satisfying dose constraint acceptance criteria are identified as important to safety in the post closure phase of the NPDDF. Classification of barriers important to safety focused primarily on the demonstration of safety and compliance to safety requirements. Barriers (i.e., SSCs) should be designed to the appropriate standards that commensurate with their safety importance, REGDOC-2.5.2 (CNSC 2023). The graded approach utilises the dose consequences assessed for receptors identified both during decommissioning and post closure phases of the project. For events where exposure is expected to be negligible (i.e. <1 mSv), a reasoned argument may be presented in lieu of a formal calculation. These arguments are subject to the same level of review and approval as any formal calculations. For the design of the NPD disposal facility it is necessary to identify those parts of the design that have some safety importance. These are identified by removing the design feature from the analysis and calculating the dose consequences. This is done for normal operations, anticipated operational occurrences, normal evolution scenarios, disruptive events and design basis accidents. Doses that meet the dose acceptance criteria are acceptable and the design item studied is not important to safety. The design considerations for items not important to safety is achieved by application of ALARA principles through simple means. The safety assessment only needs to be a description of broad, facility-level safety and radiological protection protocols. For the NPD Project a barrier does not always have to be a system relied on for safety. Layers of defence in depth can provide additional mitigation and do not always have to be systems relied on for safety. The design of the NPDDF comprises several barriers some of which are existing to the NPD facility and others that are engineered barriers to be constructed as part of the NPD closure project. The PostSA TSD showed that absence or degradation of the engineered barriers (grout, concrete cap and engineered cover (earth barrier)) will not result in doses exceeding the acceptance criteria. The estimated doses are well below the dose acceptance criteria. Concentrations of non-radioactive contaminants meet the environmental requirements. No engineered barrier within the NPDDF is identified as being required to contribute to the long-term safety requirements and, none is identified as important to safety in the post closure phase of NPDDF. The waste form is the only barrier identified as important to safety during the Institutional Control and Post Institutional Control periods. The waste form consists of a low radioactive inventory contained within a matrix of

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					corrosion resistant metals. Thus barrier performance is of importance only for the corrosion of the Calandria metals. The majority of the radioactivity inventory remaining within NPD facility was generated by neutron activation and is found within the reactor vessel steels and zirconium alloy which will corrode very slowly in the expected alkaline environment. This process was not modelled in the PostSA TSD as it was deliberately ignored to add conservatism into the model. The PostSA TSD also accounts for the corrosion of iron-based waste forms and also includes a case with increased corrosion rates to address any residual uncertainties in the model. The corrosion rates used in the PostSA for the NPD reactor have been reviewed and compared with values available in the technical literature and from anthropogenic analogue studies, (Arcadis 2021). The corrosion behaviour of carbon steel, stainless steel, and zirconium alloys in an alkaline environment has been extensively studied in various countries and there is a large database of relevant measurements. The alkalinity leads to formation of insoluble oxides on the surface of the metal protecting it from further corrosion. For all three materials results are available from long-term studies for exposure periods up to 10 years. For these cases it is observed that the corrosion rate decreases with time and reach a steady-state value appropriate for long-term prediction after 1-3 years exposure. These long-term rates are generally consistent with the rates used in the PostSA. In many cases, the corrosion rate of the various wastes was found to decrease with decreasing temperature and the adoption from the literature of rates measured at room temperature for application to the lower sub-surface temperatures at the NPD site adds an extra degree of conservatism to the safety assessments. Evidence from archaeological and more-recent analogue studies are also consistent with the rates used in the safety assessments, (Arcadis 2021). Various factors that could lead to an enhanced rate of radionuclide release under disposal conditions have also been reviewed and none are expected to have a significant impact on the release rate. There is little evidence in the literature that radionuclides will be released to the environment at a rate that exceeds that based on the assumption of corresponding release with corrosion of the metallic waste. Galvanic coupling between the three metallic wastes will be insignificant in the alkaline grout pore-water environment, which ensures that all three materials will be in the passive state. Only once the concrete grout has been degraded and the pore-water pH decreases is there the possibility of an increased rate of carbon steel corrosion when coupled to either stainless steel or zirconium alloys. Lastly, the magnitude of the surface absorbed dose rate due to irradiation of the environment is insufficient to lead to a significant enhancement of the rate of general corrosion. Finally, the rates used in the postclosure analysis has been compared to rates used in similar international nuclear waste safety assessments. The rates for aerobic conditions and for neutral-pH anaerobic environments are generally similar to those used internationally for the same range of conditions. In the case of anaerobic alkaline conditions, the rates used for the NPD assessments are approximately one order of magnitude higher than those used internationally and, hence, are considered to be conservative. Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound. References: <i>AECOM 2018b, Structural Analysis of Existing NPD Facility – Final Report, 64-508120-ASD-001, Revision 0.</i> <i>AECOM. 2023. Design of the Concrete Cap and Engineered Barrier at NPD – Design Requirements. 64-508120-10045839.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Johnson, D, 2022c. CNL Specification, Grout Formula and Properties. 64-508300-SP-001. Revision 1.</i> <i>Arcadis. 2018. Cementitious Materials Synthesis Report – NPD Closure Project. 64-508760-REPT-008. Revision 0.</i> <i>Arcadis. 2021. NPD and WR1 In-Situ Disposal Projects Waste Form Synthesis Report, 64-508760-REPT-017, Revision 1.</i> <i>Canadian Nuclear Safety Commission (CNSC). 2023. REGDOC – 2.5.2. Design of Reactor Facilities: Nuclear Power Plants.</i> <i>Geofirma Engineering Ltd. 2019. Geoscientific Characterization of the NPD Site. 64-509410-REPT-012. Revision 0.</i> <i>Karam. 2021. Review of Safety Classification and Design Rules for In-Situ Decommissioning of NPD. 64-03620-REPT-001. Revision 1.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
34	Government of Quebec	Section 4.1.1 Robustness of the System	p.4-2	Comment: The properties of the grout are fundamental for controlling the diffusion of radioisotopes for a period of up to 100,000 years. During part of this period, the metals are subjected to an alkaline environment and the diffusion of radioisotopes is largely determined by the absorption coefficients (Kp) in the mineral matrix (Sullivan, 2014). Comparing the parameter values given by Sullivan (2014) with the most critical radioisotopes, we note that carbon-14, chlorine-36 and strontium-90 are most likely to be released in large quantities into the natural environment, supporting the findings of Helbrecht (2002). However, no mention is made of the presence of radioactive corrosion products (i.e., Chalk River unidentified deposit or Corrosion related unidentified deposit) contaminating the interior of the pipes, which could be much more mobile than the radioisotopes confined in the metal, while their presence is predictable (Kim et al., 2018). Expectation to Address Comment: Please clarify why radioactive corrosion products are not considered in the draft EIS. References: <i>Kim, W. S., Nam, S., Chang, S., Kim, H., & Um, W. (2018). Removal of Chalk River unidentified deposit (CRUD) radioactive waste by enhanced electrokinetic process. Journal of Industrial and Engineering Chemistry, 57, 89-96.</i> <i>Helbrecht, R.A. (2002) Summary of feasibility studies on in situ disposal as a decommissioning option for nuclear facilities (IAEA-TECDOC--1273). IAEA</i> <i>Sullivan, T. (2014) Recommended values for the distribution coefficient (Kd) to be used in dose assessments for</i>	Resolved As: The NPD Closure Project has produced a Post Closure Safety Assessment Technical Supporting Document (PostSA TSD) for the in-situ disposal of NPD. This was to support the draft EIS and it has been made available during the review of the draft EIS. The PostSA TSD modelling takes into account the corrosion of the metals within the NPD Disposal Facility (NPDDF). The main factor containing the radioactivity on long timescales is that 83% of the initial inventory (mostly activation products) is embedded within steels and Zircaloy which corrode very slowly, particularly in an alkaline environment, (Section 5.1.1.1 PostSA TSD). The low corrosion rates allow the radioactivity to decay before it is released into the reactor vault. Once in the reactor vault, the radioactive contaminants sorb onto the grout which further delays its diffusion out of the facility. Even after the grout has fully degraded and the pH of the volume around the wastes has dropped the zircaloy and steel still corrodes slowly, retarding the release of activation products. With respect to Chalk River Unidentified Deposits and corrosion products these are formed within the reactor, and are found for example inside pressure tubes and other components that were exposed to water in the reactor during its operation. For these corrosion products to be released the calandria has to corrode sufficiently to allow the corrosion products inside to escape. The low corrosion rates of the reactor (zircaloy and steel) therefore ensures that corrosion products within the reactor itself are unable to escape the reactor for a significant period of time. When the corrosion products are able to escape they have undergone significant decay and still have to travel a significant distance to reach the environment. At this point the radiological impact of the corrosion products is negligible and is orders of magnitude below the acceptance criteria. Aluminum will corrode very quickly within the alkaline conditions in the grouted facility, and so contaminants associated with this material are assumed by the model to be instantaneously released (PostSA TSD). The PostSA TSD has included the corrosion products in the model to determine the rate of release of contaminants. The corrosion products are included as part of the NPD waste reference inventory used in the NPD environmental assessment (EA) and have been derived from direct measurements (e.g. sampling and analysis). References: PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				<i>decommissioning the Zion Nuclear Power Plant (No. BNL–105442–2014–IR). Brookhaven National Laboratory (BNL).</i>	
35	CNSC	Section 4.1.2 Natural Analogues Also applicable to Section 4.5 Potential Project-Related Releases to the Environment, Table 4.5-1 Also applicable to the Alkaline Plume Modeling Report	p.4-2 to 4-3	Comment: A high-level description of some anthropogenic analogues is provided on page 4-3, with one citation stated to be recent, but which is in fact 15 years old. Information from the Maqarin natural analogue would add an element of robustness to the long-term safety case, in line with CNSC’s Guide G-320, <i>Assessing the Long-Term of Radioactive Waste Management</i>, especially in light of the alkaline plume modeling (which is discussed in CNL’s Alkaline Plume Modeling Report). Data about the future evolution and consequences of the alkaline plume that is associated with project-related releases in Table 4.5-1 (p. 4-29) should be further constrained using information from this well-studied natural analogue. Expectation to address comment: Please consider the Maqarin natural analogue to add robustness to the long-term safety case, with data that could verify / constrain the consequences of the creation of the alkaline plume.	Incorporated: CNL has included more detail in the EIS on the Maqarin natural analogue and the benefits of the alkaline plume. Details of the Maqarin natural analogue and its relevance to the NPD project are also described in the Cementitious Materials Synthesis Report, Section 3.3.4 (Arcadis 2018). There is no proposed change to the text in Table 4.5-1. Change to EIS: Section 4.1.2 of the EIS has been revised to include the following text: Concrete / Grout / Cement The NPDWF structure includes concrete walls. The proposed ISD activities include removing the above ground structure and placing redundant materials and demolition waste into the below grade structure. The below grade structure will be sealed by grouting. The PostSA assumes that the grout will gradually degrade as the cement constituents are slowly leached out upon contact with groundwater. A site that has been extensively studied and discussed as an analogue for cement evolution, cement-rock interaction (and radionuclide behaviour) in radioactive waste repositories, is Maqarin, Jordan (Linklater 1998; Smellie 1998, 2001; Baker et al. 2002). An overview of the site and its main features is presented by (Savage 2011). The Maqarin site is located on the south side of the Yarmouk valley in northwest Jordan and lies on the border with Syria, ~16 km north of the city of Irbid and 25 km east of the River Jordan. The hyperalkaline groundwaters in the area are the product of leaching of highly bituminous siliceous limestones. The interaction of the high-pH waters and the surrounding rock at Maqarin provides an analogue for the ‘alkaline disturbed zone’ expected in the bedrock downstream from the NPD Disposal Facility (NPDDF). The alkaline groundwaters emanating from the ‘Cement Zone’ rocks flow through fractures in the adjacent sedimentary strata, to discharge through loose, unconsolidated sediments and gravels in a series of springs along the floor of the Yarmouk valley. Extensive deposits of travertine (mineral spring deposits) are formed at the spring discharge points as the Ca(OH)₂-saturated groundwaters interact with atmospheric CO₂. Maqarin is relatively well fractured and subject to high hydraulic gradients. Moreover, the host rock is a clayey limestone, rather than a true mudstone, such as those considered for deep geological disposal systems. The principal alteration products at Maqarin includes: ettringite and thaumasite (and ettringite-thaumasite solid solutions); C-S-H gels; Poorly-crystalline or amorphous ‘zeolitic composition’ or calcium aluminosilicate hydrate (C-A-S-H) gels. For the NPDDF the blast furnace slag cements used in the grout to backfill the interior of the facility share a number of similarities with the Maqarin analogue. The NPDDF is situated in a hydraulic gradient, in an area of disturbed and fractured bedrock and in a hyperalkaline environment as a consequence of the grout and cement. The use of blast furnace slag also mimics the chemistry of the alteration products seen at the Maqarin site, e.g. C-S-H and C-A-S-H gels, and ettringite and thaumasite are observed to form in slag blended cement concretes. Therefore, the chemical performance, some of the concrete degradation phases and robustness of the NPDDF grout can be compared to the Maqarin site. Studies at Maqarin have demonstrated significant reduction in the matrix porosity of the rock, gravel and sediments through cementation with gels and zeolites. These observations suggest that reactions occurring in a repository in aluminosilicate-rich rocks will therefore tend to produce sealing and reduction in porosity. Observations at Maqarin also show that interaction with alkaline groundwater can produce narrow (1-5 mm wide) zones, adjacent to fracture walls, in which the microporosity is enhanced by the dissolution of calcite and dolomite. These alteration zones are

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					complex and include areas where the porosity is reduced by secondary calcite cementation. There is evidence for both repeated fracture sealing operating on timescales of tens to hundreds of years and for the long-term stability of newly-formed minerals measured in thousands of years. Fracture sealing may occur extensively and over short timescales with calcic fluids (over tens to hundreds of years). Many modeling studies of the Maqarin analogue have been undertaken (Steefel 1990; Shao et al. 2013; Watson et al. 2016a; Martin et al. 2016). The models broadly suggest fracture sealing, but this process is complex and is dependent upon a range of factors and modeling assumptions such as: rock composition (mineralogy, grain size, porosity); groundwater composition and flow rates; and mineral reaction kinetics. Milodowski et al. (2016) also include Maqarin in their “catalogue of analogues”, where they focus on the longevity of calcium-silicate-hydrate phases, which are primary constituents of cementitious materials. It is noted that a wide variety of hydrated CSH minerals and gels are present, minerals include tobermorite, jennite and afwillite, along with calcium-alumino-sulphates and silico-sulphates such as ettringite and thaumasite, with waters present having a pH as high as 12.9. Milodowski (2016) suggests that C-S-H and C-A-S-H minerals and gels are able to persist for tens to hundreds of thousands of years. When reaction does occur, the formation of ettringite and thaumasite leads to fracture sealing. The main conclusion of these studies is that the alkaline plume will generally seal fractures by forming secondary minerals with positive reaction volumes that precipitate in fractures. Plugging of porosity was also concluded in recent modelling studies investigating these sites. Concrete or grout made with blast furnace slag cement, such as that used in the NPDDF, sets more slowly than concrete made with ordinary Portland cement, depending on the amount of slag in the cementitious material. It also continues to gain strength over a longer period and parts of the grout using blast furnace slag can remain unreacted for long periods of time. This means that the grout used in the NPDDF will seal fractures in the grout and continue to cure unreacted material when ground water reaches it forming C-S-H, C-A-S-H gels and other minerals. This process is analogous to the processes at work at the Maqarin site and gives confidence that the NPDDF grout and concrete can conservatively perform their barrier functions on the order of a thousand years as described in the Amber model. Studies of natural cements suggest that these materials are very durable. For example, ~2 million years old natural cements were found in northern Jordan Alexander (1982), and natural cements that were produced ~58 million years ago were reported in Northern Ireland, Savage (2011). It is interesting to note that these natural cements stayed impermeable within tectonically stable systems. However, if accessed by groundwater through structural damage caused by events such as tectonic activity, these systems tend to reseal with secondary calcium silicate minerals or carbonates Linklater (1998) and Cramer (1994). This is directly analogous to the concrete used in the NPDDF which has many similarities to natural cements and should be able to reseal itself due to the chemical species and processes at work within the concrete reacting with groundwater that is able to make its way into the facility. The natural cements have also been exposed to a range of conditions and cannot be narrowed down to a specific set of conditions especially when considering time frames spanning 58 million years, which encompasses multiple periods of climate change and the effects of continental drift. Temperature is usually constant at depths beyond 5 m reflecting the mean earth temperature and therefore it can be considered that climatic effects due to temperature variations can be ignored between the NPD facility and the natural analogues. Due to the depth of the calandria (greater than 5 m) in the NPDDF temperatures are expected to be relatively constant over a period of thousands of years. Of most interest is the effect water has had on the natural cements which have demonstrated their ability to reseal, showing that it is possible to safely contain the wastes for extremely long durations under less than favourable conditions, and again is analogous to the NPDDF grout. In addition to this the NPDDF grout as it is in direct contact with the building concrete will be able to provide chemical species that can also assist in sealing cracks formed in the concrete.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					According to the NWMO, these natural cements are close to ordinary Portland cement, not the low-heat, high-durability cement being considered for radioactive disposal systems. Low-heat high-performance cement is essentially the same as the pozzolanic cements developed by the Romans in the 3rd century BC or those used in Tiryns and Mycenae, around a 1,000 years earlier Middleton (1998). Recent studies of Roman cements, even those exposed to saline water (e.g., marine environment) demonstrate little degradation over approximately 2,000 years Milodowski et al (1989), Oleson et al (2004) and Vola et al (2011). The grout used in the NPDDF is a pozzolanic cement as its major constituent is blast furnace slag. The NPD grout fill will be 90% blast furnace slag which is a pozzolanic material, similar to the volcanic ash used in the Roman cements. Roman and other ancient cements are analogues to show that cements can last for over 2,000 years with little degradation. Ancient anthropological cements show that even under conditions where weathering, ultraviolet radiation, large temperature changes and exposure to harsh conditions such as seawater occurs it is possible for manmade materials to survive for hundreds if not thousands of years and still maintain their integrity. The cements and grouts used in the NPPDF are subjected to less harsh conditions than the Roman / Tyrianian cements. Even though there are chemical differences between these cements and the grouts and cements used in the NPDDF they can provide confidence that cements can survive for long periods of time intact. It can be conservatively inferred from the performance of these natural cements that the NPDDF grout can survive and perform its required barrier functions for around a thousand years. It should be noted that the PostSA also considers a case with high grout permeability and a hypothetical case with no grout at all to bound implications of any uncertainty in the grout material properties over time. References: <i>Alexander, W.R. (ed). (1992). A Natural Analogue Study of Cement-buffered, Hyperalkaline Groundwaters and their Interaction with a Sedimentary Host Rock – I: Source-term Description and Geochemical Code Database Validation. NAGRA Technical Report Series NTB-91-10. NAGRA, Wettingen, Switzerland.</i> <i>Arcadis. 2018, Cementitious Materials Synthesis Report – NPD Closure Project, 64-508760-REPT-008, Revision 0.</i> <i>Baker, A.J., K. Bateman, E.K., Hyslop, D.J. Ilett, C.M. Linklater, C.M., A.E. Milodowski, D.J. Noy, C.A. Rochelle, and C.J. Tweed. 2002. Research on the alkaline disturbed zone resulting from cement water-rock reactions around a cementitious repository in a silicate-rich host rock. Nirex Report N/054, UK Nirex Ltd., Harwell, UK.</i> <i>Cramer, J., (1994). Natural Analogues in Support of the Canadian Concept for Nuclear Fuel Waste Disposal. AECL-10291, COG-92-258</i> <i>Linklater, C.M. 1998. A natural analogue study of cement-buffered hyperalkaline groundwaters and their interaction with a repository host rock: Phase II. Nirex Science Report S/98/003, UK Nirex Ltd., Harwell, UK.</i> <i>Martin, L.H.J., A. Leeman, A.E. Milodowski, U.K. Mäder, B. Münch, N. Giroud. 2016. A natural cement analogue study to understand the long-term behavior of cements in nuclear waste repositories: Maqarin, Jordan. Applied Geochemistry 71, 20-34.</i> <i>Middleton, J.H., (1988). On the Chief Methods of Construction Used in Ancient Rome. Archaeologie Ll, 41-60.</i> <i>Milodowski, A. E., S. Norris and W.R. Alexander. 2016. Minimal alteration of montmorillonite following longterm interaction with natural alkaline groundwater: Implications for geological disposal of radioactive waste. Applied Geochemistry, 66. 184-197.</i> <i>Nuclear Waste Management Organization (NWMO) (2013). Post-closure Safety Assessment of a Used Fuel Repository in Sedimentary Rock. NWMO-TR-2013-07</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																		
					<i>Oleson, J.P., C. Brandon, S.M. Cramer, R. Cucitore, E. Gotti and R.L. Hohlfelder. (2004). The ROMACONS Project: A Contribution to the Historical and Engineering Analysis of Hydraulic Concrete in Roman Maritime Structures. Intern. J. Nautical Archaeol. 33.2, 199-229, doi: 10.1111/j.1095-9270.2004.00020.x.</i> <i>Savage, D. 2011. A review of analogues of alkaline alteration with regard to long-term barrier performance. Mineralogical Magazine 75(4), 2401-2418</i> <i>Shao, H., G. Kosakowski, U. Berner, D. A. Kulik, U. Mäder, O. Kolditz, 2013. Reactive transport modeling of the clogging process at Maqarin natural analogue site. Physics and Chemistry of the Earth, 64, 21–31.</i> <i>Smellie, J. 1998. Maqarin natural analogue study: Phase III. SKB Technical Report TR-98-04, Swedish Nuclear Fuel and Waste Management Company, Stockholm.</i> <i>Steefel, C.I. and P. Van Cappellen. 1990. A new kinetic approach to modeling water-rock interaction: the role of nucleation, precursors, and Ostwald ripening. Geochimica et Cosmochimica Acta, 54, 2657- 2677.</i> <i>Vola, G. E., Gotti, C. Brandon, J.P. Oleson and R.L. Hohlfelder. (2011). Chemical, Mineralogical and Petrographic Characterisation of Roman Ancient Hydraulic Concretes Cores from Santa Liberata, Italy, and Caesarea Palestinae, Israel. Periodico di Mineralogia 80, 317-338.</i> <i>Watson, C., J. Wilson, D. Savage, S. Benbow, S. Norris. 2016a. Modelling reactions between alkaline fluids and fractured rock: the Maqarin Natural Analogue. Applied Clay Science, 121–122, 46–56.</i>																		
36	CNSC	4.1.2 Natural Analogues	p.4-3	Comment: This section states: “The PostSA assumes that the grout will gradually degrade as the cement constituents are slowly leached out upon contact with groundwater. The cement being considered for radioactive disposal systems is similar to early cements used in the 3rd century and approximately 1,000 years earlier.” However, the technical information about the grout mix design, testing and assessment could not be found in the EIS submission. It seems as though CNL did not have a grout design available at the time of the EIS submission. Therefore, the establishment and verification of efficient grout performance (using the actual grout design) and its relation to the analogies used is not possible due to the lack of sufficient information. Expectation to Address Comment: Please confirm and provide information on the development of the grout mix design, grout production (batch plant) and grout placement technology with their respective QA/QC requirements (which includes testing).	Incorporated: CNL has included additional detail in the EIS on the grout mix design. Change to EIS: Table 4.3-1 with the grout formula to be used at NPD has been updated in Section 4.3.1.2. <table><tr><th>Materials</th><th>Standard Reference</th><th>Quantity (kg/m³) water to binder ratio of 0.90</th></tr><tr><td>Type 90/10 Cement (90% BFS/10% OPC) note 1</td><td>ASTM C595</td><td>386</td></tr><tr><td>Sand (quartz)</td><td>ASTM C33</td><td>1375.0</td></tr><tr><td>Water</td><td>ASTM C94/CSA A23.1-14</td><td>346.2</td></tr><tr><td>SIKA Visco Crete 2100</td><td>ASTM C494 B&F</td><td>4.681</td></tr><tr><td>Diutan Gum based VMA</td><td>ASTM C94</td><td>0.299</td></tr></table> Note 1: BFS – Blast Furnace Slag, OPC – Type I/II Portland Cement	Materials	Standard Reference	Quantity (kg/m³) water to binder ratio of 0.90	Type 90/10 Cement (90% BFS/10% OPC) note 1	ASTM C595	386	Sand (quartz)	ASTM C33	1375.0	Water	ASTM C94/CSA A23.1-14	346.2	SIKA Visco Crete 2100	ASTM C494 B&F	4.681	Diutan Gum based VMA	ASTM C94	0.299
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Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					(Johnson 2022c) The following paragraph is also added in Section 4.3.1.2 to describe the validation of the grout formula: “The NPD Closure Project has worked with Golder and Associates to validate the formula using locally sourced materials. The grout is intended to prevent future subsidence and fill voids in the facility to as reasonable extent as possible. It is required then to have good flow characteristics, zero bleed and reach a compressive strength of greater than 3.4 MPa at 28 days. The testing has confirmed these performance requirements. Results are summarized in a grout specification (English 2022)”. Resolved As: With regards to grout production and placement, Section 9.2.3.4 include this information. Specifically, Section 9.2.3.4 discusses the assumption that a batch plant would be used, and states that the method of moving grout from the batch plant to the facility has been left operationally flexible for the grout contractor. CNL has stipulated that the batch plant operators have a <i>Concrete Ontario Facility Certification</i> for their mixing plant. This certification ensures that facilities, equipment, materials, material handling, product and delivery/mixer trucks have met the minimum prescribed qualifications, and that the proper “capability” of producing quality concrete exists as per Canadian Standards Association A23.1-14 – Concrete Materials and Methods of Concrete Construction, and A23.2-14 – Methods of Test and Standard Practices for Concrete. The batch plant operators will prepare an Inspection and Test Plan to document how they will control the production and placement of the grout. In this plan a third party will identify witness and hold points as part of the oversight of the work. Standard testing (slump) will be conducted to ensure the wet properties and cured properties (test cylinders). Mixers must submit certificates of compliance to the referenced standard for materials. Only ACI or CSA/CCIL Certified Concrete Field Testing Technicians can conduct the field testing. Laboratories used for testing must be certified with the Canadian Council of Independent Laboratories. References: <i>Johnson, D 2022c. CNL Specification, Grout Formula and Properties. 64-508300-SP-001. Revision 1.</i> <i>English, M. 2022, NPD Phase 2 Bulkfill Testing Summary Memo, 64-508120-REPT-003 Revision 2.</i>
37	Government of Quebec	4.1.2 Natural Analogues	p.4-3	Comment: While in-situ decommissioning is practised in the United States (mainly in Savannah River), it was only after conducting extensive research into the long-term behaviour of grout. In the case of this proposed project, the draft EIS provides no indication that such research has been performed. For example, the references demonstrating that the selected grout lasts 2,000 years are not available. In addition, there is no detailed plan for tracking and measuring data, which is essential given the technical uncertainties associated with the proposed project. Expectation to Address Comment: More evidence is needed to prove that the grout will have a useful life that is long enough to allow for radiation levels to decrease.	Resolved As: CNL worked with Savannah River Nuclear Labs (SRNL) to review and recommend the grout formulation for application at NPD. The formula chosen has been successfully applied at three reactor in-situ decommissioning projects, thus Canadian Nuclear Laboratories benefitted from the SRNL years of development. This is a non-structural grout with low strength whose purpose is to support the engineered cover and avoid future subsidence. Section 5.4.2 of the Post Closure Safety Assessment Technical Support Document (PostSA TSD) evaluates the “Role of Grout” calculation case and is primarily intended to evaluate the importance of grout within the Nuclear Power Demonstration Waste Facility as a barrier to the release of radionuclides. The “Role of Grout” case is modelled by replacing the grout with water in all the model compartments that are represented as grout in the Normal Evolution Scenario. While the results of this evaluation indicate the peak dose in the absence of grout will be higher than in the Normal Evolution Scenario (when grout is present), it is still well below the dose criterion, thus grout is not the primary barrier to the containment of the radionuclides.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Please provide information on the long-term behaviour of grout, including any studies carried out for this proposed project.	Further discussion on natural analogues for cementitious materials is provided in the Cementitious Materials Synthesis Report. In summary there are multiple lines of evidence from a variety of analogues that suggest that the solids present in modern hydrated cement (especially C-S-H gel and crystalline solids) can persist under a range of conditions from many hundreds to many thousands of years (although the conditions are not identical to those associated with engineered cover systems). The analogues show that the dissolution of such solids results in chemical disequilibrium between rock-forming silicate minerals and hyperalkaline water leading to dissolution of primary solids and precipitation of alteration products. This tends to lead to porosity reductions in the vicinity of the interface between the two material types, and can lead to clogging of fractures, thereby limiting the spatial extent of alteration (and limiting the size of the alkaline plume). The report is a summary of the materials used at the facility, along with a “state of the art” overview of scientific understanding of such materials, their possible evolution and implications for performance assessment models and calculations. This compilation of literature and studies support the parameters and scenarios evaluated in performance modelling of the facility. References: <i>Arcadis. 2018. Cementitious Materials Synthesis Report – NPD Closure Project. 64-508760-REPT-008. Revision 0.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
38	Government of Quebec	Section 4.2 Alternative Means of Carrying out the Project	General	Comment: The Quebec Government is concerned with the proposed in-situ decommissioning approach and believes that CNL should shift its attention from economic criteria (i.e., cost) to potential environmental risks and impacts in the alternative means assessment. The Quebec Government finds it difficult to grasp the advantage of in-situ decommissioning as a solution, given: ☐ The risks associated with drainage changes with respect to keeping the facility inactive, as has been the case for 38 years ☐ The proximity of the NPD site to the Ottawa River and the significant risk of contamination of the watershed ☐ The proximity of the NPD site to the Quebec border (1 km away), Rapides-des-Joachims (3 km away) and areas visited for tourism and recreational activities ☐ The proximity of the NPD site to urban centres, such as Gatineau and Ottawa (about 200 km northwest) where many people live (e.g., as many as 300,000 people for the southern portion of the Outaouais Region) Expectation to Address Comment: Please better document the above elements of concern in the EIS and provide a better rationale for choosing the in-situ decommissioning option.	Resolved As: Section 4.2 of the EIS provides a high-level summary of the alternative means assessment undertaken, however, the Alternative Means Assessment Technical Support Document (TSD) provides the detailed qualitative analysis of the environmental risks of the alternative decommissioning means. It has been prepared in alignment with the <i>CEAA</i> Operational Policy Statement: Addressing “Purpose of” and “Alternative Means” under the <i>CEAA</i> 2012. In accordance with this <i>CEAA</i> Operational Policy the first step in the alternative means assessment is to identify the technically and economically feasible alternatives. The question needed to satisfy the economic feasibility was “<i>Is the alternative within the financial guarantee limit for the facility?</i>” As the financial guarantee outlined in AECL’s liability estimate for the facility was based on the original strategy of “Full Dismantling and Removal”, which is also the most costly, all alternatives were deemed economically feasible and were advanced to the next stage in the process which is assessment of environmental risks. Potential environmental risks or effects on Valued Components (VCs) are discussed for each alternative means for each phase of the project in Section 4.3 of the Alternative Means Assessment TSD. Discussion of environmental risks to the surface water environment (including drainage and the Ottawa River) is in Section 4.3.1.2, the aquatic environment (which includes wetlands) in Section 4.3.1.3, public health effects (including downstream communities) in Section 4.3.5, and socio-economic considerations in Section 4.3.3. CNL has updated Section 4.2 of the EIS to include greater detail on how the alternative means assessment has been completed and a clear reference to the Alternative Means Assessment TSD for individuals who would like more detailed information. Change to EIS: Section 4.2 of the EIS has been updated to include additional content from the Alternative Means TSD to provide clarity on how the assessment was completed. References: <i>Alternative Means TSD: Garisto, N. and McKee, S. 2019. Alternative Means Assessment. 64-509200-ASD-002. Revision 1. Prepared by Arcadis for CNL.</i>
39	Government of Quebec	Section 4.2 Alternative Means of Carrying out the Project	General	Comment: The in-situ decommissioning approach has the advantage of being minimalistic, quick, and probably inexpensive compared to the other alternatives assessed. However, it is more difficult to unquestioningly accept that this option is less risky on the long-term for the environment than the Partial or Full Dismantling and Removal options (2 and 3). In order to reduce the long-term risks, it seems appropriate to examine in further detail the option of extracting the highly radioactive components from the reactor core, while leaving the activated concrete in place. This option should eliminate any risks of persistent environmental contamination after the 100-year Institutional Controls period. While the NPD reactor was still in operation, two pressure tubes were removed in 1984, followed by the removal of another tube in 1987. When examined, these tubes were found to have significantly degraded due to the presence of hydrogen – and this	Resolved As: As summarized in Section 9 of the EIS and detailed in the Post Closure Safety Assessment Technical Support Document (PostSA TSD), CNL’s proposal to dispose of all the waste in-situ has been demonstrated to be safe for the public and the environment over both short and long-term periods (e.g., 50,000 years). For the Decommissioning phase, an estimate of the collective dose to perform the alternate of full dismantling and removal has been performed (McVeigh 2018c). The dose estimates have been made using the same level of detail and using similar assumptions to that produced for the Detailed Decommissioning Plan (Johnson 2022a). The collective dose estimate for the full dismantling alternate is 761 person mSv which is approximately 50 times the current Detailed Decommissioning Plan dose estimate of 14 person mSv for the in-situ disposal alternative. The estimated collective dose for removal of just the calandria is of the order of 300 person mSv based on the breakdown of work packages that would need to be executed. The dose estimate for full dismantling is only for the Decommissioning Execution phase and is not inclusive of the Institutional Control phase where workers would receive doses during re-handling and packaging of this waste during transition from storage to disposal. For consideration of dose alternates in the Institutional Control or Post-Institutional Control phases, within the 2nd Iteration of the PostSA (Arcadis and Quintessa 2017) an alternative scenario is examined which considers the removal of the reactor from the NPD facility prior to closure (i.e. representative of alternate no. 2). This analysis

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				lead to the closure of the reactor. During that same period, three pressure tubes (zirconium alloy) and one tube from the calandria (aluminium alloy) were removed for research purposes (Lewis 1988). In 1988, the total radioactivity of the NPD site was estimated to be 2×10^{15} Bq, whereas in 2018, it is estimated to be 4.7×10^{13} Bq, which represents a reduction by a factor of 43. Therefore, if the removal of radioactive components was possible in 1988, shouldn't it be easier to perform today? Expectation to Address Comment: Please justify the decision of leaving radioactive components in place rather than removing and storing them at CRL or elsewhere.	indicates that although there is potentially a dose savings to the hunter receptor, as the contributing radionuclides are removed with the reactor, the total dose to the site resident is only halved from 4E-05 mSv/hr to 2E-05 mSv/yr as tritium would continue to be a key dose contributing radionuclide. It should also be noted that although there is a dose reduction to a future resident, however minimal, the removed inventory would be emplaced elsewhere thereby transferring the potential dose to a future repository. The long-term dose at an alternative site cannot be estimated as the full extent of the radiological inventory cannot be conceivably comprehended for the purpose of this exercise. In addition to the discussion about radiological dose consequences, it must also be noted that the activity of removing radioactive components from the facility introduces significant industrial hazards to workers performing the tasks, hazards that are eliminated with in-situ disposal. References: <i>Johnson D. 2022a Detailed Decommissioning Plan for Nuclear Power Demonstration Waste Facility. 64-508310-DDP-001. Revision 3.</i> <i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). (2017). Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project. (2nd Iteration) 64-508760-ASD-003 Revision 0. Prepared by Arcadis and Quintessa for CNL.</i> <i>McVeigh, A. 2018c. Alternate Decommissioning Dose Estimate for the NPD Waste Facility Closure Project. 64-508740-021-000-0018. 2018 January 30.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
40	Government of Quebec	Section 4.2 Alternative Means of Carrying out the Project	General	Comment: The Government of Quebec notes that in-situ decommissioning does not meet international standards. First, the IAEA does not recommend in-situ decommissioning, except under special circumstances (e.g., when other options are unfeasible, ineffective or prohibitive). It appears that the NPD site does not constitute an exceptional situation warranting in-situ decommissioning. Second, entombing the NPD facility would result in a permanent near-surface disposal facility after the 100-year Institutional Controls period (IAEA 2006, 2007). In-situ decommissioning may be an acceptable solution if half-lives are short (less than 31 years for ILW) or if long-lived radionuclides are present in very low quantities; otherwise radioactive waste should be buried tens or hundreds of meters underground (IAEA, 2011). Given the presence/nature of ILW and long-lived radionuclides at the NPD site, in-situ decommissioning does not meet international standards for the final disposal of nuclear waste. Finally, there is expertise in Canada to carry out the dismantling of the reactor; a deep geological repository is currently being developed; and the NPD site is not particularly isolated, nor at the centre of an operational nuclear site. Expectation to Address Comment:	Resolved As: The decommissioning strategy is dependent on whether in-situ disposal is suitable for the planned permanent shutdown of a facility and the meaning of 'exceptional circumstances. In GSR-6, (IAEA 2014c), the example given is an event that causes severe accidents leading to early closing of the facility. GSR-6 does not describe what other situations would make entombment an acceptable strategy. It is thus assumed that situations exist for which entombment is acceptable. GSR-6 also recognises that for existing facilities, the standard does not always apply in full. Under the Section on application of the standard GSR-6 states: “There will also be some special aspects of safety that need to be assessed at the national level. For example, many of the IAEA safety standards, in particular those addressing aspects of safety in planning or design are intended to apply primarily to new facilities and activities. The requirements established in the IAEA safety standards might not be fully met at some existing facilities that were built to earlier standards. The way in which IAEA safety standards are to be applied to such facilities is a decision for individual States. The scientific considerations underlying the IAEA safety standards provide an objective basis for decisions concerning safety; however, decision makers must also make informed judgements and must determine how best to balance the benefits of an action or an activity against the associated radiation risks and any other detrimental impacts to which it gives rise.” Further to the guidance given in GSR-6, Canada through the Canadian Nuclear Safety Commission (CNSC) regulates the decommissioning of nuclear facilities in accordance with Regulatory document REGDOC-2.11.2, Decommissioning, (CNSC 2021c). Regdoc 2.11.2 sets out requirements and guidance regarding the planning and preparation, execution and completion of decommissioning, and is based on the guidance given in GSR-6. In-Situ Decommissioning is specifically addressed in Section 5.1 of REGDOC 2.11.2 and describes the permitted use of ISD for legacy sites that meet the specified criteria, i.e.:

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				For all the reasons above, CNL should better demonstrate that in-situ decommissioning is the preferred option.	<i>“In situ decommissioning for legacy sites is only considered viable where the use of in situ will be protective of workers, the public and the environment; decommissioning was not planned as part of the design; the fuel has been removed; and the site will remain under institutional control for the period defined in the safety case.”</i> NPD meets all of these criteria, in that: • it is a legacy site; • the proposed ISD is protective of workers, the public and the environment as shown in the PostSA TSD; • the reactor was not designed with it’s decommissioning in mind; • the fuel has been removed and is safely stored at Chalk River Laboratories; and • the site will remain under institutuional control for a minimum of 100 years. The risks associated with in-situ disposal are lower than other options. In-situ disposal is a well--known technique used since the 1960's at many nuclear sites worldwide. Sites contaminated with toxic and hazardous wastes are also remediated using this technique. This approach requires the project to apply for a license as a disposal facility, and hence the facility must also meet the regulations for a disposal facility. In Canada, there are no suitable repositories for the disposal of radioactive waste created from decommissioning old nuclear reactors. The deep geological repository mentioned is only able to accept high-level waste (i.e., used nuclear fuel). As stated, the expertise exists in Canada to dismantle the reactor. The issues involved with dismantling the NPD reactor are the increased risks and costs to remove a hardened underground structure. The alternatives are to continue with storage with surveillance or to remove the facility and store it within a waste store. No existing waste store can presently accept this volume and type of waste. Only storage with surveillance is practical. Storage of this waste would need the construction of a new storage facility. A new storage facility would increase the national nuclear waste problem, as its disposal will generate additional waste from contamination of the facility during operation. Operating a nuclear facility also will generate low level waste such as contaminated clothing and wipes. For NPD, CNL’s position is that the features of the facility and its location support in-situ disposal. The in-situ disposal of the NPD facility will meet the requirements of all current Canadian laws and will do so by meeting or exceeding the requirements of all current safety standards. The project acknowledges that Section 1.11 of IAEA SSG-29 (IAEA 2014a) provides the general guidance that near surface disposal is only suitable for the disposal of Very Low Level Waste (VLLW) and Low Level Waste (LLW). This is true for the NPD facility in that only the portion of the NPD waste inventory above the bedrock be considered near surface disposal. The NPD reactor has a low inventory. Tritium is the major radionuclide and will decay to low levels during the Institutional Control period. The longer-lived Intermediate Level Waste (ILW) consists of small quantities of low energy beta emitters. The beta emitters have low radiotoxicity and do not generate heat. These are activation products inside the metal of the calandria in the reactor vault. The reactor vault is reinforced concrete with walls 3 m thick located around 10 m below grade in bedrock. The location of the reactor vault isolates the wastes making it hard to access. These are all features that are consistent with IAEA Safety Standard SSR-5, Disposal of Radioactive Waste (IAEA 2011), regarding cavern or vault disposal for ILW. CNL has written a report summarising facilities worldwide that use in-situ disposal, (Aikens 2019b). The report is not limited to nuclear reactors or processing facilities, and also includes mines and hazardous waste sites. The report also describes what each of the facilities have in common, why in-situ disposal is the preferred approach and how it applies to NPD. In summary, in-situ disposal is a viable option for NPD. It is CNL’s belief that the NPD facility has characteristics considered as exceptional circumstances that support in-situ disposal and more importantly meets the requirements of

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					CNSC REGDOC 2.11.2 (CNSC 2021c). This strategy aligns with GSR-6, as again the in-situ disposal option is a result of choosing the safest option with the lowest risks. References: <i>Aikens, A.E. 2019b, Review of In Situ Disposal (ISD). 64-508300-REPT-001. Revision 0.</i> <i>Canadian Nuclear Safety Commission (CNSC) 2021c, REGDOC 2.11.2, Decommissioning.</i> <i>International Atomic Energy Agency (IAEA). 2011. Disposal of Radioactive Waste, IAEA Specific Safety Requirements Series No. SSR-5.</i> <i>International Atomic Energy Agency (IAEA). 2014c. Decommissioning of Facilities, IAEA General Safety Requirements Part 6.</i> <i>International Atomic Energy Agency (IAEA). 2014a. Near Surface Disposal Facilities for Radioactive Waste, SSG-29.</i>
41	CNSC	Section 4.2 Alternative Means of Carrying out the Project	p.4-7 (also applicable to p.4-11)	Comment: On page 4-7, the EIS indicates the following: “The environmental effects of each alternative means were assessed with respect to the key VCs identified in this study.” However, Tables 4.2-2 to 4.2-4 only show that alternative means were assessed for key environmental components (e.g. atmospheric environment, surface water environment, etc.), <u>not for key Valued Components (VCs).</u> Expectation to Address Comment: Please explain or revise accordingly. The main body of the EIS should summarize information that is available in TSDs in sufficient detail to serve as a stand-alone document.	Incorporated: The Alternative Means Assessment assesses risk from the environmental effects of the project to VCs, however the VCs are grouped together within the respective environmental components. The EIS has been updated to include the following text: “Environmental components were analysed as either pathways to other components, or as the VCs within those components.” “For the sake of simplicity, the results of the assessment of individual VCs are presented by group. The presentation of risk is inclusive of risks to all VCs within each group.” The EIS has also updated the relative risk assessment (Tables 4.2-4 to 4.2-6) to show greater detail, including examples of VCs, within each environmental component. Change to EIS: The following text has been added to EIS Section 4.2.4.1: Environmental components were analysed as either pathways to other components, or as the VCs within those components. The following text has been added to EIS Section 4.2.4.2: For the sake of simplicity, the results of the assessment of individual VCs are presented by group. The presentation of risk is inclusive of risks to all VCs within each group. Tables 4.2-4 to 4.2-6 have been updated to show additional detail within each environmental component, including examples of VCs.
42	Government of Quebec	Section 4.2 Alternative Means of Carrying out the Project, Tables 4.2-2 to 4.2-4	p.4-8 to 4-10	Comment: Section 2.2.2 states: “Although each of the four alternative means were determined to be technically feasible based on the use of reliable technology, regulatory compliance, and cost, the in-situ decommissioning offers a lower risk option than all other alternatives.”	Resolved As: The Alternative Means Assessment Technical Support Document (TSD) is summarized in Section 4.2 of the EIS but the full report provides a thorough evaluation of the four alternatives considered by CNL. A qualitative analysis of the environmental risks (including health) of alternatives decommissioning techniques and selection of a preferred means was carried out in the Alternative Means Assessment TSD. The process of this selection follows the framework laid out in the CEAA Operational Policy Statement: Addressing “Purpose of” and

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		Also applicable to Section 2.2.2 Alternatives, p.2-3 to 2-4		What supports this statement? CNL should provide references, a methodology, risk calculations, etc. Tables 4.2-2 to 4.2-4 only present synthetic results of the relative risks associated with each alternative mean, without providing a technical discussion. According to those tables, in-situ decommissioning would pose fewer environmental risks during the Decommissioning Execution stage, because the likelihood of radioactive materials being released is much lower, and workers’ exposure to radiation would also be lower. For the Institutional Controls period, in-situ decommissioning would pose fewer risks to the atmospheric, surface water, aquatic, and geological and hydrogeological environments. In the case of health effects, in-situ decommissioning would be much less risky than the other options, including continued SwS, which raises questions given that at this stage, the reactor would remain under Institutional Controls, with only the content of nuclear material changing from one option to another. For the Post-Institutional Controls period, the risk analysis is even more difficult to understand, and in-situ decommissioning is presented as significantly less risky than all other options. Moreover, in the case of socio-economic effects and effects on Aboriginal people’s interests, it is difficult to understand how there can be differences between each option when all cases involve the abandonment of the NPD site. Expectation to Address Comment: Please justify the in-situ decommissioning choice in the context of relative risk for all three project phases, and address the above-noted concerns.	“Alternative Means” under the <i>Canadian Environmental Assessment Act, 2012 (CEAA 2015)</i>. Following the CEAA Operational Policy Statement (CEAA 2015), the first step is to identify technically and economically feasible alternative means. This includes the selection of feasibility criteria and the definition of the alternative means. Following this, the assessment of the alternative means against the criteria determines which alternative means are technically and economically feasible. The EIS provides the summary of the relative risk comparison. The project has made the Alternative Means Assessment TSD, available to any stakeholders who are interested in a more detailed discussion of the assessment, including members of the public. For each environmental component, at each timeframe the Alternative Means Assessment TSD assessed each of the four alternatives, their risk relative to the baseline case, and an explanation of the key factors that affect that risk. Full details of the how the relative risks were evaluated is given in the Alternative Means Assessment TSD. Storage with Surveillance is the current safe mode of operation, but workers are subjected to risks due to exposure to radiation and hazardous substances when they access the building to conduct routine monitoring and other license required activities. Decommissioning will in the long-term result in a reduction in worker risks by removing their exposure to these hazards. In the near term encompassing the Decommissioning Execution stages all of the alternatives carry increased risk relative to the baseline case of storage with surveillance. This is due to the increase in activities that are associated with each of the options that are significantly in excess of the activities required for storage with surveillance. Safety risks associated with construction and demolition are also greater than for a facility in storage with surveillance even though the activities can and are safely performed. The risks are only higher for the short period of time that the decommissioning activities are taking place. Once these activities are complete and the facility enters the Institutional Control then the safety risks lower due to the removal or increased isolation of the hazards. In the Institutional Control phase, the differences between the alternative options results in greater divergence between the safety risk levels for each option. This is a result of the reduction of hazards and risks during active decommissioning. It is assumed that during Institutional Control a disposal facility for ILW becomes available. Although the waste will be apportioned to two disposal facilities (for both LLW and ILW), given that the total inventory is the unchanged, the risk associated with this alternative will be similar to In-Situ Disposal. In the post- institutional controls timeframe, the benefits of in-situ disposal are more obvious where the risks are lower than with storage and surveillance, as the contaminants are all held in the grouted monolith. It is also assumed that a disposal facility will become available at the CRL site suitable to accept all the waste generated from Options 2 and 3, therefore, the risks associated with these alternatives will be similar to In-Situ Disposal. In summary in-situ disposal puts the waste in its final end-state sooner than all other options, is generally less complex to implement than typical demolition and results in better utilisation of resources. It also limits radiation exposure and industrial hazards to workers more so than would be seen implementing the proposed alternatives. References: <i>Alternative Means TSD: Garisto, N. and McKee, S. 2019. Alternative Means Assessment Revision 1. 64-509200-ASD-002. Revision 1. Prepared by Arcadis for CNL.</i> <i>Canadian Environmental Assessment Agency (CEAA). 2015. Operational Policy Statement: Addressing “Purpose of” and “Alternative Means” Under the Canadian Environmental Assessment Act, 2012. March..</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
43	Government of Quebec	Section 4.2 Alternative Means of Carrying out the Project, Tables 4.2-2 to 4.2-4	p.4-8 to 4-10	Comment: Although the risk of radiation exposure to workers is lower for the in-situ decommissioning option than for the other options assessed (e.g., there is a 50% greater risk for full dismantling compared to in-situ decommissioning, according to Unsworth (1979)), the absolute radiological risk would remain minimal, because in all cases, the maximum dose for workers is less than 1 mSv (based on Section 9 of the draft EIS). Expectation to Address Comment: Please justify the in-situ decommissioning choice in the context of worker health. Reference: Unsworth, G.N. 1979. <i>Decommissioning of the CANDU-PHW reactor – Decommissioning of nuclear facilities</i>, Summary of International Symposium organized by the IAEA and the OECD, Vienna, November 13-17, 1978	Resolved As: The Detailed Decommissioning Plan for NPD Johnson (2022a) estimates the collective occupational radiation dose for in-situ disposal as 14.3 person mSv. To compare in-situ disposal with the complete removal option a dose estimate has been completed with the same level of detail (McVeigh 2018c), using similar assumptions to that produced for the DDP and is therefore considered reasonable for comparison. (McVeigh 2018c) analysed the collective doses for complete removal of the facility broken down into 15 high level work packages including staffing and duration requirements. This data was combined with facility dose rate information documented in routine zoning compliance surveys, specific plant radiological surveys as well radiological scoping survey results performed in 2014 and combined these with assumed occupancy factors to allow for As Low As Reasonably Achievable (ALARA) work controls that would be applicable at the point of work execution. The collective dose estimate for the complete removal option using these assumptions was determined to be 761 person mSv which is approximately 50 times the current DDP dose estimate for in-situ disposal. The four major contributors to this estimate account for 85% of the total dose and are those activities which are anticipated to involve extended hours in either the higher hazard areas of the facility or involve closer interaction with the higher hazard former nuclear systems and components for removal, handling and packaging. The major dose contributors are: • Boiler Room Decommissioning, • Remove Feeder, Pressure & Calandria Tubes, • Fuel Handling Rooms Decommissioning, • Remove Calandria and Associated Biological Shielding. Even though the radiological risks in all cases are relatively low, CNL has a duty to ensure that doses received are minimised by the application of the ALARA principle. Of the 4 options proposed the in-situ disposal option results in the lowest doses and risks to workers, and hence is the preferred option to ensure worker doses are minimized. Safety is a core value at CNL; a safety culture governs the actions of all activities undertaken. It is possible during the Decommissioning Execution phase that injuries will occur, and that some may result in lost-time, or even fatality. CNL will minimize the quantity and magnitude of these incidents as much as possible using safe work practices. Procedures and programs will be in place to ensure safe working conditions and compliance with provincial health and safety regulations. CNL requires that contractors and their subcontractors maintain a level of safety equivalent to that of CNL employees while on-site to ensure that the site preparation and construction activities at NPD are carried out safely. All work activities carried out at NPD will be subject to the province of Ontario Occupational Health and Safety Act. Using the projected duration of Decommissioning Execution activities, and the sector-specific injury rates from the Infrastructure Health & Safety Association (IHSA) for lost-time, non-lost time injuries, and traumatic fatalities, the estimated number of injuries for each alternative was calculated. These estimates are presented in Table 4.3 1 of the Alternative Means Assessment Technical Supporting Document. The estimated number of injuries for the “3. Full Dismantling and Removal” is 5.61, which is over 5 times greater than the estimate of 0.97 for “4. In-Situ Disposal”, and approximately two-times higher than “2. Partial Dismantling”. The estimated number of injuries is directly linked with the duration of activities (i.e., extent of effort) in the Decommissioning Execution phase.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					It is expected that the rates of injury or fatality for employees working during the Decommissioning Execution phase will be similar to those at other construction sites for jobs of similar duration and complexity in Ontario. Therefore, if the workers were not employed at the NPD site, they would be exposed to similar risk at another construction site within the province. References: <i>Johnson, D. 2022a. Detailed Decommissioning Plan Nuclear Power Demonstration Waste Facility. 64-508310-DDP-001. Revision 3.</i> <i>McVeigh, A. 2018c. Alternate Decommissioning Dose Estimate for the NPD Waste Facility Closure Project. 64-508740-021-000-0018. 2018 January 30.</i>
44	Ontario Ministry of the Environment and Climate Change (MOECC)	Section 4.3.1 Project Components and Activities	p.4-12 to 4-13	Comment: As per Section 34 of the <i>Ontario Water Resources Act</i>, a Permit to Take Water may be required for water takings associated with cement / grout mixing, if takings from the Ottawa River may exceed 50,000 L/day. More information can be found here: https://www.ontario.ca/page/guide-permit-take-water-application-form Expectation to Address Comment: Please confirm if a Permit to Take Water will be required for any component or activity associated with the NPD Closure Project.	Incorporated: The water source, volume of water and intake rate required for grout production (and other activities requiring water) have not been finalized. The NPD Closure Project will evaluate if a Permit to Take Water (as per Section 34 of the Ontario Water Resources Act) is required. Change to EIS: Section 3.5.3.6 (Ontario Provincial-Level Permits/Authorizations) has been updated to include this text: <i>“The water source, volume of water and intake rate required for grout production (and other activities requiring water) have not been finalized. The NPD Closure Project will evaluate if a Permit to Take Water (as per Section 34 of the Ontario Water Resources Act) is required”.</i>
45	CNSC, Government of Quebec	Section 4.3.1 Project Components and Activities	p.4-13	Comment: Section 4.3.1, among other sections (e.g., sections 3.2, 4.1, etc.), states that an engineered barrier will be placed over the entire grouted facility to reduce / mitigate infiltration. Depending on its design, the barrier could be impacted by external events (e.g., seismicity), which might impact the safety of the project. However, sufficient details on the engineered barrier design have not been provided. Expectation to Address Comment: Please provide the design of the engineered barrier in sufficient detail to support the EIS and the safety assessment.	Resolved As: The design of the concrete cap and engineered cover has been submitted to the CNSC and is discussed in the updated Design Description of the NPD Disposal Facility (NPDDF) (CNL 2022), including details regarding the thickness of the concrete cap and engineered cover. The EIS has been updated to clarify that the engineered cover is constructed of earthen materials and contains a geosynthetic clay liner to ensure very low permeability. The impacts to the entire NPDDF from external events, including seismic events, are detailed in the Post Closure Safety Assessment (PostSA), which is a Technical Supporting Document (TSD) to the EIS. Change to EIS: The text in Section 4.3.1.8 of the EIS has been replaced with the following: “After all below-grade grouting has been completed, a reinforced concrete cap will be placed over the nuclear area of the NPDWF. The concrete cap provides a redundant barrier to inadvertent human intrusion and excavation. The concrete cap will be up to approximately 71 cm thick and is designed to withstand the loads of the engineered cover and its construction. The cap will be present only over the nuclear area because of the long-lived radionuclides present and the consequences of intrusion are higher than elsewhere. A multi-layered engineered cover will be placed over the grouted facility, following placement of the concrete cap. The engineered cover consists of a compacted layer of select fill at the bottom, placed over the concrete cap, or the existing facility floor or grout at 425’-0” elevation. This bottom layer is overlain by a very low permeability membrane called a geosynthetic clay liner (GCL) and a geogrid and covered by a sand cushion supporting a layer of clear stone. The GCL is designed to intercept water percolating through the top of the engineered cover and direct the

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					water to the outside of the engineered cover where it can drain away. The clear stone serves as a drainage layer, and an initial barrier to inadvertent intrusion, while the sand cushion also provides some drainage capability and acts as a protective layer to the GCL. Over the clear stone, a geotextile will be placed and covered by a layer of select fill, upon which topsoil is placed and seeded, to form a shallow-rooted vegetative cover at the top of the engineered cover. The geotextile allows water to drain through the select fill to the drainage layer below, while preventing the select fill from being washed into and clogging the drainage layer. The top of the engineered cover will be graded with a slope to allow for surface drainage, which together with the vegetative cover, will protect the engineered cover against erosion. Adjacent to the engineered cover will be drainage swales. These swales will receive surface runoff from the top surface of the engineered cover and will intercept water that percolates through the engineered cover and runs along the GCL through the sand and crushed rock layers.” Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound. References: <i>Canadian Nuclear Laboratories (CNL). 2022c. Design Description of NPD Disposal Facility, CNL 64-508120-DD-001, Revision 3.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
46	Government of Quebec	Section 4.3.1 Project Components and Activities	p.4-13	Comment: The draft EIS lacks information about the process of grouting below-grade structures. More specifically: ☐ How will gaps be avoided? ☐ Will the pipes, tanks and reactor core be filled with grout? ☐ Will pathways towards the ventilation stack and the Ottawa River be filled with grout? ☐ Hydrogen release is expected when grouting, because of chemical reactions with aluminium. If the risk of explosion is mitigated, what are the consequences of such a release into the grout? This is unclear, especially given that hydrogen attacks most metals and may create less sealed space near aluminium tubing. Due to these uncertainties, it is difficult to predict the long-term structural integrity of cavities within the facility, which represent many pathways for water infiltration. Similarly, the several layers of grout could produce cold joints, which are also potential pathways for water infiltration. Expectation to Address Comment:	Resolved As: Avoiding all gaps and voids in the grout is not a defined requirement, and it is known that there will be some voids present when grouting is complete. The requirement of the grout is to fill significant voids to prevent subsidence and to create a high pH environment which helps to slow contaminant transport through and out of the facility. Taking the above into consideration, larger volume systems will be penetrated and filled with grout, including large volume piping, tanks, and the calandria (reactor core). The Post Closure Safety Assessment Technical Support Document (PostSA TSD) has conservatively made the assumption that all aluminum, including the calandria shell and calandria tubes will degrade very quickly leaving aluminum related contaminants available for transport. All penetrations through the facility foundation walls will be closed with an engineered seal with a minimum thickness of the foundation walls. The effluent discharge pipe, and the tile drain system have been assessed as transport pathways to the Ottawa River, and given the fact that pathways through the overburden are very permeable, the transit time provides little delay to the release of contaminants to the river relative to the tile drains and discharge pipes themselves. With that being said the process piping between the facility and the river will be grouted to reduce potential release via this pathway. The ventilation stack will be isolated from the building by filling the concrete ventilation duct with grout, including the base of the stack up to an elevation just above the surface of the engineered cover. Additionally, drain holes will be penetrated into the stack at this elevation to allow precipitation drainage. It is known that hydrogen will be generated from the contact of grout with aluminum, however even if this hydrogen were to migrate to voids within the facility, the explosion hazard is eliminated since there will be no source of ignition. The presence of hydrogen in the pores of cement is known and is a common manufacturing practice, low density foaming concrete is manufactured by adding aluminum powder as a constituent. The precautions are to

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Please address the questions and concerns above.	ensure that the hydrogen evolved from the surface of the concrete (or grout) is ventilated if in an enclosed area with ignition source, which is not the case for the grouted NPD facility during the post closure phases. The generation of hydrogen is a hazard that has been assessed in Section 8.5.2.1 of the Decommissioning Safety Assessment TSD (DecomSA TSD). Having completely sealed spaces around all metallic components is not a specific requirement of the grout or facility, the low pH of the grout creates an environment that reduces the solubility of contaminants in water and therefore slows its transport rate within the water through the facility, the same is true for “cold joints” between the several layers of grout. Additionally, a “role of grout” case was assessed in Section 5.4.2 of the PostSA TSD. In this case it was assumed that an open “fast pathway” between the Reactor Vault and the Boiler Room was present such that there was no retardation of contaminants between the rooms, enabling them to flow freely. The resultant dose to public was only marginally increased and is still well below acceptable limits. Change to EIS: Section 4.3.1.6 has been updated with the following statements: “The process piping between the facility and the river will be filled with grout, this does not include the external tile drain system used to divert ground water from the building.” “All penetrations through the facility foundation walls will be closed with an engineered seal to maintain the structural integrity of the wall.” “All below-grade areas are to be filled with grout. Using a master fill schedule, lifts of grout pours will be planned to systematically fill the entire structure. The grout pours will be designed to balance forces across walls and between rooms such that failures of the current structures will not occur. Pathways created during preparation of rooms will minimize void space and allow for dissipation of heat during curing of the grout. Quality control measures on grouting operations will be implemented to ensure that the finished product will meet specified parameters. The systems within NPDWF will be grouted to the extent practical and the outfall discharge pipes will be capped and grouted. (Johnson 2022a). The NPDWF will be grouted. The grout function is to fill voids to prevent subsidence and to create a high pH environment which helps to slow contaminant release and transport through, and out of, the facility. Open voids such as large pipes and tanks will be penetrated to allow for grout flow to fill in these voids. The ventilation stack will be isolated from the building by filling the concrete ventilation duct with grout, including the base of the stack up to an elevation just above the surface of the engineered cover (i.e., the multilayered earth and geotextile cover that will overlie the NPDDF). All penetrations through the facility foundation walls will be closed with an engineered seal with a minimum thickness of the foundation walls.” References: <i>DecomSA TSD: Garisto, N., Kovacs, R., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i> <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> <i>Johnson, D. 2022a. Detailed Decommissioning Plan Nuclear Power Demonstration Waste Facility. 64- 508310-DDP-001 Revision 3.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
47	MOECC	Section 4.3.1 Project Components and Activities	p.4-12 to 4-14	Comment: The EIS seems to indicate that all penetrations of the concrete structure (i.e., inlet and outlet pipes) and all buried utilities and systems (i.e., subsurface drains) will be disconnected and capped, but left in place. However, the EIS does not appear to adequately address the potential for infrastructure left in place to act as a preferential pathway for groundwater migration to the Ottawa River, which represents a significant concern. Furthermore, it is unclear whether the subsurface drains (Drain 1 and Drain 2) will be retained to direct surface water and groundwater away from the grouted structure. Retention of the drains would not be considered an acceptable alternative due to the potential for interception and discharge of contaminated groundwater to the Ottawa River. Any infrastructure that exits the NPD walls / foundations should be removed and the exit point sealed. A simple plug/cap is insufficient. A compromised plug/cap may cause the pipe to become highly transmissive and accelerate the flow of groundwater through and out of the monolith. In addition, corrosion of infrastructure where it exits at the NPD walls / foundations may also create an enhanced seepage pathway. Leaving these connections in place and not sealed creates a risk that contaminated groundwater exiting the monolith can travel more rapidly through these pipes. Expectation to Address Comment: Please explain which pipes and drains will be left in place, and discuss their potential to act as a preferential pathway for groundwater migration to the Ottawa River. Clarify if the subsurface drains will be retained to direct surface water and groundwater away from the grouted structure, and if so, provide a rationale for why it is an acceptable alternative. Evaluate the benefit of leaving these drains in place versus the potential risk they may pose (e.g., as enhanced pathways for contaminant migration) and describe how potential risks of these features could be mitigated (e.g., by removing them or sealing exit points).	Incorporated: All penetrations through the foundation walls from piping or other use, will be sealed with an engineered plug. The seals have been designed to meet or exceed the specifications of the surrounding materials. Piping exiting the facility and extending towards the river will be filled with grout and left in place. Change to EIS: The following statement has been added to Section 4.3.1.6 of the EIS: “The process piping between the facility and the river will be filled with grout; this does not include the external tile drain system used to divert ground water from the building.” Resolved As: The Postclosure Safety Assessment (PostSA) modelling accounts for the tile drains and the cooling pipe trench, as follows: Tile Drains Contaminated water is assumed to enter the tile drains in the period after resaturation of the monolith and before the drains fail i.e. at 100 years post closure. Transport of contaminants from the rooms in the facility to the tile drains is based on the results of the groundwater modelling (Calder 2024b). This modelling shows that a relatively small portion of the total amount of contaminants in the NPD Disposal Facility (NPDDF) are released via the Tile Drain: 8.3% of the contaminants in the Fuel Storage Room above bedrock, 2.8% of the contaminants in the Fuel Storage Room below bedrock, 5% of the contaminants from the Fueling Room, and 2.9% of the contaminants from the Turbine Room. The main action of the Tile Drain is to capture and divert uncontaminated groundwater from upstream. Contaminants entering the tile drain are assumed to move rapidly with no sorption to the river shore. The tile drain piping system does not penetrate the building foundation, and will be left in place. The model assumes that the drains collapse after 100 years and become infilled with the surrounding overburden material and cease to be a preferential pathway. Cooling pipe trench The cooling pipes are not represented in the PostSA model as they are assumed to be sealed prior to closure. The trench is not explicitly represented as a feature in the model, but is represented in the groundwater model (Calder 2024b). Transport through the geosphere in the PostSA model is based on the results of the groundwater modelling whereby two pathways, one shallower and one deeper, are found to be the main locations of radionuclide transport between the NPD and the river. The shallower pathway is in the overburden and the deeper pathway is associated with the cooling pipe trench. In this way, the preferential pathway associated with the cooling pipe trench is accounted for in the PostSA model. With regards to the benefit of leaving these drains in place versus removal, the preferential pathway for any contaminants leaving the disposal facility is the trench that is excavated into the bedrock because the groundwater flows approximately at bedrock level. Removing the drains would simply increase the flow of groundwater towards the facility and result in resaturation of the facility sooner but not change the preferential pathway. The same is true for the cooling pipes; therefore, there is no benefit in removing the drains.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																		
					References: <i>Groundwater Modelling TSD: Calder, N. 2024b. 2023 Groundwater modelling at the site of the proposed decommissioned Rolphoton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i>																		
48	Government of Quebec	Section 4.3.1 Project Components and Activities	p.4-13 to 4-15	Comment: Section 4.3.1 states: “Grouting is the process of placing, by pumping, a mixture of Portland Cement and water that produces a pourable, concrete-like, mixture to ensure filling of gaps and crevices throughout the facility. [...] Any remaining aggregate or sand will be used as backfill in the facility before final capping, thereby minimizing or eliminating waste generation (Aikens 2017).” CNL should clarify whether the aggregates and sand are in the grout. More generally, CNL should explain what the grout will be composed of. Moreover, Table 4.3-1 mentions fly ash, but nowhere is it mentioned that fly ash is a component of the grout. Expectation to Address Comment: Please provide more information on the grout composition and its potential inputs.	Incorporated: CNL has incorporated additional detail into the EIS on the grout composition. All references to fly ash in the grout will be removed from the EIS as the final grout formula does not contain fly ash. For clarification, materials that have been stockpiled for use in mixing the grout that may be left over after the filling operation, could be used as fill when constructing the engineered cover or when contouring the property during close out activities. The aggregate or sand would not be used in filling the below ground facility. Change to EIS: Table 4.3-1 with the grout formula to be used at NPD has been updated in Section 4.3.1.2. <table><tr><th>Materials</th><th>Standard Reference</th><th>Quantity (kg/m³) water to binder ratio of 0.90</th></tr><tr><td>Type 90/10 Cement (90% BFS/10% OPC) note 1</td><td>ASTM C595</td><td>386</td></tr><tr><td>Sand (quartz)</td><td>ASTM C33</td><td>1375.0</td></tr><tr><td>Water</td><td>ASTM C94/CSA A23.1-14</td><td>346.2</td></tr><tr><td>SIKA Visco Crete 2100</td><td>ASTM C494 B&F</td><td>4.681</td></tr><tr><td>Diutan Gum based VMA</td><td>ASTM C94</td><td>0.299</td></tr></table> Note 1: BFS – Blast Furnace Slag, OPC – Type I/II Portland Cement (Johnson 2022c) The following paragraph is also added in Section 4.3.1.2 to describe the validation of the grout formula: “The NPD Closure Project has worked with Golder and Associates to validate the formula using locally sourced materials. The grout is intended to prevent future subsidence and fill voids in the facility to as reasonable extent as possible. It is required then to have good flow characteristics, zero bleed and reach a compressive strength of greater than 3.4 MPa at 28 days. The testing has confirmed these performance requirements. Results are summarized in a grout specification (English 2022)”	Materials	Standard Reference	Quantity (kg/m³) water to binder ratio of 0.90	Type 90/10 Cement (90% BFS/10% OPC) note 1	ASTM C595	386	Sand (quartz)	ASTM C33	1375.0	Water	ASTM C94/CSA A23.1-14	346.2	SIKA Visco Crete 2100	ASTM C494 B&F	4.681	Diutan Gum based VMA	ASTM C94	0.299
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Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					References: <i>Johnson D, 2022c. CNL Specification, Grout Formula and Properties, 64-508300-SP-001, Revision 1</i> <i>English, M. 2022, NPD Phase 2 Bulkfill Testing Summary Memo, 64-508120-REPT-003 Revision 2.</i>
49	CNSC	Section 4.3.2 Project Schedule, Table 4.3-1	p.4-15 to 4-16	Comment: CNSC’s <i>Generic EIS Guidelines</i> require (on p.11) that the EIS include a schedule of the project with the following information: time of year, frequency, and duration for all project activities. Table 4.3-1 is missing information on the frequency of project activities. Expectation to Address Comment: Please revise accordingly.	Incorporated: For the NPD Closure Project, there is a sufficient level of detail in Table 4.3-2 to provide the planned start (i.e. time of year) as well as the duration of activities. There are no reoccurring activities, so frequency of a given activity does not apply. Change to EIS: The statement “These activities are not recurring; therefore, frequency does not apply for any given activity.” has been added to Section 4.3.2 of the EIS. Table 4.3-2 of the EIS has been updated to reflect the current Project schedule.
50	CNSC	Section 4.3.2 Project Schedule, Table 4.3-1	p.4-15 to 4-16	Comment: The term “WBS” is not defined in the header of the third column. This acronym is not defined in the glossary either. In addition, the number list under this column is not explained (e.g., <u>8.1.003</u> for Decommissioning Works). Does this series of numbers have a specific meaning (e.g., serve as a reference in another document)? Expectation to Address Comment: Please revise accordingly.	Incorporated: The following statement will be added to the Glossary “WBS - Work Breakdown Structure is a hierarchical break-down of project scope into increasing levels of definition.” The series of numbers are used to distinguish the various activities and the same structure has been used to assess the hazards in the Decommissioning Safety Assessment TSD. Change to EIS: The acronym of WBS has been defined in Table 4.3-2 and the definition above has been added to the Glossary.
51	CNSC	Section 4.3.2 Project Schedule, Table 4.3-1	p.4-15 to 4-16	Comment: This table is inconsistent with Table 3.2-1 (p.3-9) in terms of the duration of the Institutional Controls Phase. Table 3.2-1 indicates that this phase will last 100 years while Table 4.3-1 indicates “To be determined”. Expectation to Address Comment: Please revise accordingly.	Incorporated The duration of Institutional Controls in Table 4.3-2 has been revised from “to be determined” to “at least 100 years” to be consistent with the rest of the EIS. Change to EIS: Table 4.3-2 of the EIS has been revised to reflect the response above.
52	CNSC	Section 4.3.2 Project Schedule, Table 4.3-1	p.4-15 to 4-16	Comment: To allow the reader to quickly refer to the EIS Interaction Matrix, please provide its location in the EIS in the header of the fourth column (where it is mentioned). Expectation to Address Comment: Please revise accordingly.	Incorporated: The location of the Interaction Matrix has been added to the header of the fourth column (where it is mentioned). Change to EIS: Table 4.3-2 of the EIS has been revised to reflect the response above.
53	CNSC	Section 4.3.2 Project Schedule, Table 4.3-1	p.4-15 to 4-16	Comment: CNSC’s <i>Generic EIS Guidelines</i> require (on p.10) a description of the activities to be carried out during each phase of the project. The following physical activity is listed in Table 4.3-1, but is not	Incorporated: Large vessels are located in the Nuclear Area and include such items as the helium gas holder tank, heavy water dump tank, moderator storage tank and steam drum. To ensure the grout fills voids to the extent reasonably practicable, these vessels will be opened up by placing grout filling and grout venting holes to allow grout to flow

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				explained in sufficient detail in the table or in the text: “Systems Preparation Large Vessels”. Expectation to Address Comment: Please provide sufficient detail to enable the reader to understand what this activity entails.	inside. This fills large voids that might contribute to future subsidence or become buoyant during grout filling. The Detailed Decommissioning Plan (Johnson 2022a) provides additional detail. Change to EIS: Table 4.3-2 has been updated to include a footnote for “Systems Preparation Large Vessels”, the footnote will state: “To ensure the grouting fills voids to the extent reasonably practicable, large vessels will be opened by placing grout filling and venting holes to allow grout to flow inside. This fills large voids that might contribute to future subsidence or become buoyant during grout filling.” References: <i>Johnson, D. 2022a Detailed Decommissioning Plan Nuclear Power Demonstration Waste Facility. 64-508310-DDP-001. Revision 3.</i>
54	Government of Quebec	Section 4.3.3 Scope Changes	p.4-17	Comment: The Project Description indicates that the ventilation stack will be demolished and placed below-grade, which is different from the plans detailed in the draft EIS document. Expectation to Address Comment: Please clarify the current plans for the ventilation stack.	Resolved As: The purpose of Section 4.3.3 is to provide a summary of the changes that have been made to the project since originally proposed. The original plan (described in the Project Description) was to demolish the ventilation stack and construct an alternative roosting habitat for chimney swifts. However, due to the large uncertainties related to the successful use of the alternative habitat by the chimney swifts, a decision was made to retain the existing stack instead of demolishing it. This decision was made after considering input from a panel of experts from academia, government agencies and Non-Governmental Organizations (NGOs).
55	Government of Quebec	Section 4.3.3 Scope Changes	p.4-18	Comment: Section 4.3.3 states: “As a result of this decision it requires clarification that the engineered barrier is intended to be installed over the Main Building footprint of the disposal facility and not just over the grouted reactor system and components.” Why and how will this engineered barrier be designed? Expectation to Address Comment: Please provide more information on the engineered barrier, and if possible, include the plans and specifications developed to date.	Incorporated: The Environmental Impact Statement has been updated with information on the design of the engineered cover. Change to EIS: The text in Section 4.3.1.8 of the EIS has been replaced with the following: “After all below-grade grouting has been completed, a reinforced concrete cap will be placed over the nuclear area of the NPDWF. The concrete cap provides a redundant barrier to inadvertent human intrusion and excavation. The concrete cap will be up to approximately 71 cm thick and is designed to withstand the loads of the engineered cover and its construction. The cap will be present only over the nuclear area because of the long-lived radionuclides present and the consequences of intrusion are higher than elsewhere. A multi-layered engineered cover will be placed over the grouted facility, following placement of the concrete cap. The engineered cover consists of a compacted layer of select fill at the bottom, placed over the concrete cap, or the existing facility floor or grout at 425’-0” elevation. This bottom layer is overlain by a very low permeability membrane called a geosynthetic clay liner (GCL) and a geogrid and covered by a sand cushion supporting a layer of clear stone. The GCL is designed to intercept water percolating through the top of the engineered cover and direct the water to the outside of the engineered cover where it can drain away. The clear stone serves as a drainage layer, and an initial barrier to inadvertent intrusion, while the sand cushion also provides some drainage capability and acts as a protective layer to the GCL. Over the clear stone, a geotextile will be placed and covered by a layer of select fill, upon which topsoil is placed and seeded, to form a shallow-rooted vegetative cover at the top of the engineered cover. The geotextile allows water to drain through the select fill to the drainage layer below, while preventing the select fill from being washed into and clogging the drainage layer. The top of the engineered cover will be graded with a slope to allow for surface drainage, which together with the vegetative cover, will protect the engineered cover against erosion. Adjacent to the engineered cover will be drainage swales. These swales will receive surface

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					runoff from the top surface of the engineered cover and will intercept water that percolates through the engineered cover and runs along the GCL through the sand and crushed rock layers.” Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound. References: <i>Canadian Nuclear Laboratories (CNL). 2022c. Design Description of NPD Disposal Facility. CNL 64-508120-DD-001. Revision 3.</i>
56	Government of Quebec	Section 4.4.1 Waste Types	p.4-19	Comment: Section 4.4.1 states: “The radiological inventory comprises the radionuclides that would remain in NPDWF as part of the in-situ decommissioning strategy. These will primarily be associated with [...] historic drummed waste.” Expectation to Address Comment: Please provide the following information: ☐ The number of drums ☐ Their content ☐ Their level of radioactivity ☐ Their final storage location (Chalk River or elsewhere) ☐ If they will be entombed, and if so, their behaviour in the grout	Resolved As: - The Fuelling Machine Room houses 27 legacy waste drums. - These drums contain metal and piping from process systems, filters, concrete and personal protective equipment (PPE) wastes, one drum of sludge from the Bay Area sump clean up, as well as several empty drums with internal surface contamination from heavy water storage. The drums were repackaged into 55-gal overpacks which is the configuration they can be currently found in. - Out of the 27 drums in the Fuelling Machine room, only four drums have a gamma dose rate of any significance (i.e. greater than 100 µSv/hr on contact). The total inventory of all twenty-seven drums within the Fuelling Machine Room has been estimated to be 4.19E+09 Bq. It should be noted that this inventory is primarily dominated by Sr-90 and Cs-137. The radiological inventory has been captured under “Fuelling Room” in Table 4.4-1 (b) of the EIS. - All drummed waste has been determined to be Low Level Waste and will remain within the Fuelling Machine room to be grouted in place. - Behavior of these drums will be similar to a small vessel, and since grout will be poured in lifts, the drums that may not be completely filled will be anchored within the first layer of grout. The drums are carbon steel and because of the grouting of the facility it will result in slow corrosion rates of the steel due to the resulting alkaline conditions in the cement pore water. The corrosion of carbon steel is discussed in the Waste Form Synthesis Report and contains additional information justifying the expected long-term performance of the metal waste forms, (Arcadis 2021). References <i>Arcadis. 2021. NPD and WRI In-Situ Disposal Projects Waste Form Synthesis Report, 64-508760-REPT-017, Revision 1.</i>
57	Government of Quebec	Section 4.4.1 Waste Types	p.4-19 to 4-20	Comment: The main radioactive parts of the reactor are underground, and therefore, water infiltration into the facility is a potential problem. Surface contaminants present on metal components, pipes, etc. can be released instantaneously (i.e. radionuclides of the “instant	Resolved As: Once The facility and systems resaturate surface contaminants may become soluble and become able to be transported. The principles of in-situ disposal is to provide containment and isolation of the NPD inventory. The majority of the contaminants in the facility are activation products in the calandria’s metal matrices. The calandria is made from zircaloy and stainless steel both of which take in excess of 30,000 years to corrode in the alkaline

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				released surface contamination” type), and thus possibly causing additional risks. Expectation to Address Comment: Please explain how the proposed measures will limit the dissolution of readily soluble surface contaminants.	environment. Further containment of the radioactive contaminants in the facility is provided by the grout. Grout backfill inhibits movement of contaminants and creates an alkaline environment that limits solubility. The Post Closure Safety Assessment Technical Supporting Document (PostSA TSD) models the long-term releases from the facility and in the case of surface contamination it conservatively assumes that it dissolves instantly. The contaminants in solution may then migrate by diffusion and, as the concrete structure degrades, by advection. The porewater will be alkaline due to the conditioning effect of the cement. Contaminants will sorb to the cement and their migration will be retarded. Groundwater will gradually leach cement constituents and degrade the concrete and grout, increasing its permeability and ultimately reducing the pH to near neutral. It can be seen from the results obtained in the PostSA TSD (Section 5) for the normal evolution scenario that even with rapid dissolution of contaminants the acceptance criteria are still easily met and pose no long-term hazards to humans or the environment. References: <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
58	Government of Quebec	Section 4.4.1 Waste Types	p.4-20	Comment: Section 4.4.1 states: “The majority of the radioactivity, i.e., 75%, is contained in the reactor vault, mainly associated with the disused reactor vessel, the calandria.” If all activities provided in Table 4.4-1 are added, the percentage obtained is 93%, not 75%, why? Moreover, how does this percentage reconcile with the 98% stated in Section 4.1.1 (p. 4-2)? Expectation to Address Comment: Please respond to the above questions.	Resolved As: The discussion in Section 4.4.1 describes where the radioactivity currently sits within the NPD Waste Facility. With the majority of the radioactivity, i.e., 95%, contained in the reactor vault and components. The reference to 75% has been removed. Section 4.1.1 is describing total inventory at year 50,000 and how much of that inventory is still contained within the NPD Disposal Facility and comparing to how much of that inventory has migrated into the surrounding environment.
59	Government of Quebec	Section 4.4.1 Waste Types, Table 4.4-1 (a and b)	p.4-21 to 4-24	Comment: According to Table 4.4-1, the bulk of the activity (89%) is contained in aluminium, stainless steel and zircaloy within the reactor vault. CNL states that about 125 m³ of the waste could be classified as intermediate-level waste (ILW). Expectation to Address Comment: For more clarity, please identify the radioactive elements that form the ILW present on-site, and specify their radioactive properties as well as their fate in the environment during the Institutional Controls and Post-Institutional Controls phases.	Resolved As: CSA 292.0-14 guidance suggests that classification of Intermediate Level Waste (ILW) can be based on the presence of long-lived beta and/or gamma emitting radionuclides to an average of tens of kBq/g. Radionuclides such as C-14, Ni-63 and Zr-93 are present in the reactor components at concentrations exceeding this guideline concentrations for Low Level Waste (LLW). Specifically, the zircaloy pressure tubes and aluminum calandria should be classified as ILW. However, presence of these radionuclides at these concentrations does not necessarily result in a release to the environment. The release of these radionuclides into the environment is controlled through the corrosion rate of these components, sorption by the grout or concrete as well as solubility within the alkaline environment created by the grout backfill. In fact, none of these radionuclides are present in the environment in any appreciable concentration. The fate of radionuclides in the environment during the Institutional Control and Post-Institutional Control Phases are discussed in detail in Section 5.1.2 of the Post Closure Safety Assessment Technical Support Document (PostSA TSD). The dominant radionuclides in each environmental matrix (i.e. groundwater, surface water, soil, sediment) is presented and discussed. The five most dominant radionuclides by concentration in the groundwater and surface water are H-3, Ca-41, Ni-59, Cl-36, and C-14. The five most dominant radionuclides by concentration in the river sediment are H-3, Ni-59, C-14, Ca-41 and Cl-36. The five most dominant radionuclides by concentration in the cap are H-3, Ni-59, Ca-41, C-14 and Cl-36.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Properties for all radionuclides in the NPD waste inventory are presented in Appendix E (Conceptual Models and Data) of the PostSA TSD. This includes fundamental radionuclide properties such as decay, internal dose coefficients, and external dose factors. References: <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
60	Government of Quebec	Section 4.4.1 Waste Types, Table 4.4-1 (a and b)	p.4-21 to 4-24	Comment: Table 4.4-1 indicates that a large portion of the radionuclides have a half-life that is long enough for decay to be minimal, even for the 100-year Institutional Controls period. Therefore, the following radionuclides will exceed by 1,000 times the exemption limit for 1,000 years: • Carbon-14 • Chlorine-36 • Nickel-59 and -63 • Zirconium-93 • Niobium-93m • Silver -108m • Plutonium-239 and -240 • Americium-241 and 243 To these are added the following radionuclides, which exceed by 100 times the exemption limit for 100 years: • Calcium-41 • Cobalt-60 • Strontium-90 • Tin-121m • Cesium-137 • Europium-152 • Plutonium-238 and -241 Similarly, quantities greater than 100,000 times the radioisotope exemption limit for plutonium and americium are not small amounts (IAEA, 2012). In light of this data, it appears that the in-situ decommissioning approach does not comply with the established rules of best practice.	Resolved As: The NPD Project will result in the creation of a disposal facility. Thus, it is the NPD project’s position that application of exemption limits to the NPD inventory is not appropriate. As we are applying for a disposal licence we do not need to meet unconditional clearance levels. There is no requirement to meet background radioactivity levels in a disposal facility. The radiological inventory determined for the NPDDF, combined with the facility design, must ensure that doses to the public and risk to the environment remain below the regulatory limits. The EIS and the PostSA and EcoRA perform these analyses and conclude that the dose to receptors and risk to the environment do meet regulatory criteria. The NPD Project has proposed acceptance criteria within the Post Closure Safety Assessment Technical Support Document (PostSA TSD). As suggested by the guidance in the CNSC’s Regulatory Document, REGDOC-2.11.-1, and Volume III Assessing the Long Term Safety of Radioactive Waste Management, the project’s proposed acceptance criteria includes environmental concentrations aligned with federal and provincial environmental quality guidelines as well as a dose-based constraint. The project’s suggested dose-constraint of 0.25 mSv/yr is lower than the 0.3 mSv/yr in REGDOC 2.11.1 Volume III, Assessing the Long Term Safety of Radioactive Waste Management (CNSC 2021a) and the International Commission on Radiological Protection recommendations for a dose constraint of 0.3 mSv/yr for the disposal of long-lived radioactive waste. References: <i>Canadian Nuclear Safety Commission (CNSC) 2021a, REGDOC 2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. Version 2.</i> <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Expectation to Address Comment: Please address the above-noted concerns. Reference: IAEA, <i>The Safety Case and Safety Assessment for the Disposal of Radioactive Waste</i>, IAEA Specific Safety Guide No. SSG-23, 2012.	
61	Government of Quebec	Section 4.4.1 Waste Types, Table 4.4-1 (a and b)	p.4-21 to 4-24	Comment: Helbrecht (2002) appears to be the most relevant source for the performance of the in-situ decommissioning approach for the NPD site with respect to containment of radioactive materials. However, there are significant differences between the list of radioactive elements presented in this article and the list presented in the draft EIS. In particular, tritium, uranium, plutonium and americium isotopes are absent from Helbrecht (2002). Conversely, iron-55 is present. Expectation to Address Comment: Please clarify the applicability of the list of radioactive elements from Helbrecht (2002) to the proposed project, and explain the differences with the list presented in the draft EIS. Reference: Helbrecht, R.A. 2002. <i>Summary of feasibility studies on in situ disposal as a decommissioning option for nuclear facilities</i> (IAEA-TECDOC--1273). International Atomic Energy Agency.	Resolved As: The NPD Closure Project performed a new performance assessment for the in-situ disposal of NPD, it is referred to as the Post Closure Safety Assessment Technical Supporting Document (PostSA TSD). The reference inventory in the NPD draft EIS includes all the radioactive elements listed in Helbrecht (2002). The differences arise because the radionuclides addressed in Helbrecht were determined based on neutron activation calculations and a limited number of measurements for fission products. The reference inventory used in the NPD draft EIS was derived from a combination of neutron flux calculations as well as a comprehensive characterization program which required a substantial number of direct measurements (e.g. sampling and analysis). Radioactive inventory data is available for a total of 115 radionuclides. Many of these have relatively short half-lives which mean they will decay while the facility remains under institutional control and will not pose a hazard in the post closure period. Other radionuclides are present with very low activity in the wastes so constitute a trivial hazard. The radionuclide inventory has therefore also been screened to remove radionuclides with a trivial risk. After the screening 41 radionuclides remained to form the inventory. A further 16 radionuclides have been included in the model as they are radioactive progeny of one or more of the included radionuclides, and therefore will grow in during the assessment timeframe, for example Pb-210, Ra-226, Th-228. Tritium is present in the NPD facility as contamination that has been absorbed into the concrete in the facility. Uranium, plutonium and americium are listed in the reference inventory as a result of fuel failures that occurred during the operation of the reactor and are mostly located in the primary circuit. This part of the reference inventory was derived from direct measurements (e.g. sampling and analysis). The NPD reference inventory also contains two separate concrete components which have different inventories dependent on proximity to the reactor, unlike the Helbrecht inventory. The reference inventory in the concrete immediately surrounding the reactor is presented in EIS Table 4.4-1 (a) in the column labelled “Concrete”. The reference inventory of the whole concrete facility structure is presented in Table 4.4-1 (b) in the column labelled “Generic Contamination”. The inventory of Fe-55 is 3.51E+12 Bq. However, it was screened out as a radiological contaminant of interest for NPD as Fe-55 peak dose was trivial. Please see Section 4.3.1 of the PostSA TSD for a description of the screening process applied to determine the radiological contaminants of interest. References: <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
62	Government of Quebec	Section 4.4.1 Waste Types	p.4-25	Comment: Section 4.4.1 states: “CSA 292.0-14 (2014b) guidance [...] suggests limiting the amount of long-lived beta and/or gamma emitting radionuclides (C-14, Cl-36, Ni-63, Zr-93, & Nb-94) in	Resolved As: Standard CSA 292.0-14 provides guidance on radioactive waste classification. According to Annex A of the standard, radioactive waste can be classified as: low level radioactive waste, intermediate level radioactive waste,

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				LLW to an average of up to tens of kBq/g. Radionuclides such as C-14, Ni-63 and Zr-93 are present in the reactor system at concentrations exceeding this value.” Why are certain radionuclides present in the reactor system exceeding the concentration limit in CSA 292.0-14? Expectation to Address Comment: Please provide a justification for exceeding CSA 292.0-14 guidance.	high level radioactive waste and uranium mine and mill tailings. The standard also provides guidance on the parameters for classification. The project references CSA 292.0-14, in order to classify the NPD waste inventory. The only types of radioactive waste within the NPD facility are low level waste (LLW) and intermediate level waste (ILW). There is no high level radioactive waste nor uranium mine and mill tailings waste within the NPD facility. Utilizing the guidance from Annex A of CSA 292.0-14, due to the long-live radionuclides within, the reactor system is classified as ILW and the rest of the NPD waste inventory is classified as LLW. The long-lived radionuclides were generated through neutron activation thus are embedded in the material matrices of the reactor systems and cannot be removed or limited by processes. However, the historic siting of the reactor system, comprising the ILW inventory in the NPD facility, is in the bedrock, within a concrete vault, tens of meters below the ground level. These are all features that are consistent with IAEA Safety Standard SSR-5, Disposal of Radioactive Waste, regarding cavern or vault disposal for ILW.
63	CNSC	Section 4.4.1 Waste Types	p.4-26, 2 nd paragraph	Comment: What does the acronym “PPE&C” mean? It is not defined in the glossary (only “PPE” is). Expectation to Address Comment: Please revise accordingly.	Incorporated: The acronym “PPE&C” has been replaced with “PPE”. PPE&C stands for personal protective equipment and clothing and is functionally the same as PPE. It has been confirmed that this was the only place in the document that the term “PPE&C” was used. Change to EIS: Section 4.4.1 of the EIS has been revised to reflect the response above.
64	Government of Quebec	Section 4.4.2 Waste Characterization	p.4-26 to 4-27	Comment: The Government of Quebec would like to know what would be the long-term evolution (up to 10 000 years) of the radioisotope content at the NPD site. Expectation to Address Comment: Please respond to the above question related to the radiological inventory of the NPD facility in the long-term.	Resolved As: A detailed description of the change in radioactive inventory in NPD is given in the Appendix G of the Post Closure Safety Assessment Technical Supporting Document (PostSA TSD). All radioactivity initially contained within the reactor vault, is distributed between four types of metal as well as in the reactor vault void and the concrete walls. The change in amount of radioactivity within the reactor vault through time reflects the decay of radionuclides as well as transport of radionuclides out of the reactor vault. This therefore, provides some information on the amount of radioactivity that is released to the wider Facility and on into the geosphere, as well as indicating how effectively the materials within the reactor vault retard transport. Because of the prevalence of long-lived radionuclides, and their effective confinement, the average concentration in the Reactor Vault only decreases slowly. Initially, the average concentration exceeds 2E7 Bq kg⁻¹ but this declines to 3E6 Bq kg⁻¹ after 1000 y, as the initially dominant radionuclides decay. The average concentration drops below 5E5 Bq kg⁻¹ by 10,000 y. This illustrates that the Facility is very effectively containing radionuclides within the structure. Of the remaining radioactivity in the system the majority is contained within the reactor vault, specifically within the zircaloy components of the reactor vessel. The majority of the radioactivity in the reactor vault is associated with the zircaloy components in the reactor vessel. The inventory within the zircaloy is dominated by longer lived radionuclides (principally, Zr-95, Ni-59/63 and C-14) and the zircaloy is assumed to corrode very slowly in the alkaline environment of the reactor vault. The corrosion of the activated metals associated with the reactor vault is discussed in the Waste Form Synthesis Report and contains additional information justifying the expected long-term performance of the metal waste forms, (Arcadis 2021). The average concentration of specific radionuclides in the Reactor Vault is calculated as the total radioactivity of all materials in the vault divided by the total mass. With the exception of Nb-93m, a daughter of Zr-93, all concentrations fall with time, largely due to radioactive decay. Radionuclides present in the zircaloy matrix (Zr-93,

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Ni-59 and Cl-36) remain unchanged until more than 10,000 y as they have long half-lives and are retained in the metal. The concentrations in water that fills the Reactor Vault are up to 1×10^6 Bq l⁻¹, dominated by different radionuclides through time. Initially, tritium is dominant but decays rapidly after 100 y. From 150 to 240 y Ni-63 is dominant; this radionuclide has relatively low sorption in the initial “fresh cementitious” conditions, but has a relatively short half-life of 100 y. Beyond this, the long-lived radionuclides remain well contained in the Reactor Vault for thousands of years and concentrations in the water remain below 1,000 Bq L⁻¹. Concentrations of most radionuclides monotonically decrease, but Ca-41, Ag-108m and Ni-59 can be seen to increase before peaking and then decreasing. This is because these radionuclides are dominantly present in activated metals and are released by corrosion faster than they are released from the Reactor Vault in groundwater. It is only once radioactive decay dominates the rate of accumulation that the concentrations fall. Figure 5-4 of the PostSA TSD shows the average concentration of radionuclides in the reactor vault, and Figure 5-5 of the PostSA TSD shows the concentration of radionuclides in water in the reactor vault. These figures only show the most significant radionuclides present in the Reactor Vault. More discussion on the long-term evolution of the radionuclide inventory can be found in Section 5 of the PostSA TSD. References: <i>Arcadis. 2021. NPD and WR1 In-Situ Disposal Projects Waste Form Synthesis Report, 64-508760-REPT-017, Revision 1.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
65	Government of Quebec	Section 4.5 Potential Project-Related Releases to the Environment, Table 4.5-1	p.4-28 to 4-29	Comment: In Table 4.5-1, for the Execution and Closeout phases, more information should be provided on the type and concentrations of the radiological and non-radiological contaminants (organic and inorganic) that will be contained in the settling ponds and occasionally discharged into the Ottawa River. For this purpose, the exposure pathways and doses (if any), to which Ottawa River users, including the vulnerable population (infants and children), would be subject (e.g., source of drinking water, swimming, fishing, etc.) should also be provided. Expectation to Address Comment: Please provide the above-mentioned information.	Resolved As: Alternatives to a settling pond/wash out pit are under assessment by the project, such as super packs to collect all the washout. Super packs allow the solids to settle out and the water is either re-used or released. The project will take every opportunity to reuse the water in the batch plant. Non-radiological parameters which will be monitored are typical of concrete production such as pH and total suspended solids. Although radiological parameters are not expected, since the batch plant will be located outside the footprint of the licensed area, tritium will be monitored. Any liquids generated by the NPD Closure Project will be handled as a non-routine discharge following approved CNL Environmental Protection processes (Matasich 2021), which outline appropriate disposition routes depending on the analysis results. The key aspect is that no un-assessed liquid effluent releases will occur as part of the decommissioning work. In general, compliance to the Fisheries Act is a priority, i.e. ensuring deleterious substances do not enter the Ottawa River. A draft detailed follow-up monitoring program was developed in accordance with the systematic informed planning process outlined in CSA Standards N288.4 (environmental monitoring), N288.5 (effluent monitoring), and N288.7 (groundwater monitoring). These monitoring plans specify the radiological and non-radiological contaminants that require monitoring, as well as the location, frequency and duration of monitoring. The draft follow-up monitoring plan was submitted to the Canadian Nuclear Safety Commission in 2018 October.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Please note that the plans are complete reports. They include "Draft" in the title to reflect the fact that the NPD Closure Project is seeking input from interested parties including Indigenous Nations, communities, and organizations. The plan will be finalized after an EA Decision is reached so that any additional monitoring requirements from the EA Decision can be incorporated. References: <i>Matasich, C. 2021. Acceptability Criteria for Routine and Non-Routine Discharge of Liquids at Canadian Nuclear Laboratories Sites, 900-509200-MCP-005. Revision 1.</i>
66	CNSC	Section 4.5 Potential Project-Related Releases to the Environment, Table 4.5-1	p.4-28 to 4-30	Comment: There is a lack of consistency in the EIS with respect to the description of the project phases. Why does Table 5.4-1 show four project phases, whereas in the earlier sections of the EIS (e.g., p.2-2, p.3-9, p.4-7, etc.), only three phases are described? Expectation to Address Comment: Please revise accordingly.	Incorporated: The correct description is three project phases. The NPD Closure Project has corrected this inconsistency throughout the EIS document, to reflect only three project phases. Change to EIS: In Table 4.5-1, the “Closeout” phase has been revised to the Decommissioning Execution phase. Similarly, “Execution” in this column has been updated to “Decommissioning Execution” for consistency. In addition, the term “Execution” has been changed to “Decommissioning Execution” throughout the text.
5. Scope of the Environmental Assessment					
67	CNSC	Section 5.1 Factors to be Considered	p.5-1, last paragraph	Comment: “Environment and Climate Change Canada” is the correct name for this federal department. Expectation to Address Comment: Please correct the name in the last paragraph.	Incorporated: The term “Environment Canada and Climate Change” has been corrected to “Environment and Climate Change Canada”. The NPD Closure Project has corrected this error throughout the EIS document. Change to EIS: Sections 3.5.3.1, 5.1, 8.2, 8.12.5 have been revised to reflect the correct name: “Environment and Climate Change Canada”.
68	CNSC	Section 5.2 Scope of Factors, Table 5.2-1	p.5-8 to 5-10	Comment: Table 5.2-1 indicates where there are “potential interactions” or “positive interactions” between the project and the environment. This classification, however, is confusing since both types of interactions have the potential to occur. Do the diamonds identify “potential adverse interactions”, while the squares identify “potential positive interactions”? Expectation to Address Comment: For clarity, please revise accordingly.	Incorporated. The symbol key below Table 5.2-1 has been clarified. Change to EIS: For clarity, the symbol key below Table 5.2-1 has been revised to “potential adverse interactions” for closed diamonds and “potential positive interactions” for open squares.
69	Health Canada	Section 5.2.1 Spatial and Temporal Boundaries, Figure 5.2-2	p.5-5	Comment: The general Local Study Area appears to exclude certain areas without providing an explanation. It seems to exclude roads and other areas south of the Site Study Area, and includes a very limited portion of the Ottawa River.	Resolved As: The rationale for the spatial boundaries is provided in Section 5.2.1.1 of the EIS. As per the <i>Generic Guidelines for the Preparation of an EIS</i>, the Local Study Area must include the area where measurable changes to the environment resulting from the proposed activities from any phase of the project, either through normal activities, or from possible accidents or malfunctions, may be anticipated. Early in the assessment process, the Local Study Area was chosen to be the NPD property as a convenient estimate of this area, with the intention of increasing the boundary if required,

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Expectation to Address Comment: Please provide additional detail and rationale regarding the determination of study area boundaries, including why certain roads and other areas in the Local Study Area, where human receptors may be present, were excluded.	based on the results of the assessment. In Section 9 of the EIS, the assessment confirmed that there are no measurable effects for any environmental component beyond the Local Study Area (LSA). Although concentrations calculated through modelling show concentrations beyond LSA, for example Appendix F of the Decommissioning Safety Assessment TSD shows incremental concentration increases of certain air quality contaminants (NO₂, SO₂ TSP etc.) which extend across the Ottawa River to Quebec or extend to Highway 17, these concentrations are not in practice measurable / distinguishable from background values. Highway 17 is excluded as it is a major highway (the Trans-Canada Highway) with almost constant traffic, and has little to do with the facility/project. However, Highway 17 is considered as part of the Regional Study Area. Human receptors present in the areas excluded from the Local Study Area are considered as part of the Regional Study Area. Also, for human receptors, exposure to radioactive and non-radioactive contaminants to workers (who would be most exposed to contaminants during the Decommissioning Execution phase) and to hypothetical receptors undertaking hunting and gathering activities above the grouted facility (in the Post-Closure phase) are all below benchmark values, so it follows that any human receptor beyond the boundaries of the grouted facility, would also be protected. In terms of the Ottawa River, the general Local Study Area extends 50 m into the Ottawa River which is also a conservative boundary taking into consideration that there are no adverse residual effects predicted to surface water and aquatic environments. Change to EIS: The above discussion has been added to EIS Section 5.2.1.1 Approach (of effects assessment) about 'measurable effects' and how although results of modelling indicate incremental concentrations beyond the Local Study Area, these concentrations are not in practice measurable/ distinguishable from background values.
70	CNSC	5.2.1 Spatial & Temporal Boundaries	p.5-6	Comment: The design life value of the barriers (i.e., the existing structure, grout, metal equipment/piping and engineered cap) is missing in the EIS. The design life should be based on the specific waste that is to be in the NPD facility, as well as on the design used to confine the waste. The current estimate of the waste activity shows periods significantly longer than the 100 years mentioned in Section 5.2.1. The design life should be consistent with the time when the clearance level is expected to be reached. Expectation to Address Comment: Please provide information on the target design life (in terms of number of years), including a rationale, for the following barriers: the existing structure, grout, metal equipment/piping and engineered cap.	Resolved As: Peak dose is used as the performance criteria for comparison with the dose acceptance criteria not clearance levels and is used to determine the assessment timeframe and the required lifetime of the engineered barriers, as outlined in CNSC REGDOC 2.11.1 Volume III (CNSC 2021a). A graded approach has been used to determine the scope, extent and level of detail of the design and any supporting assessments. This is a method or process by which elements, such as the level of analysis, the depth of documentation and the scope of actions necessary to comply with requirements, are commensurate with the relative risks to health, safety, security, the environment, the implementation of international obligations to which Canada has agreed, and the particular characteristics of a Facility or licensed activity. The graded approach utilises the dose consequences assessed for each of the receptors both during decommissioning and post closure phases of the project. For events where exposure is expected to be negligible (i.e. <1 mSv), a reasoned argument may be presented in lieu of a formal calculation. For the design of the NPD disposal facility it is necessary to identify those parts of the design that have some safety importance. These are identified by removing the design feature from the analysis and calculating the dose consequences. This is done for the normal evolution of the disposal facility and potential disruptive events. Doses that meet the dose acceptance criteria are acceptable and the design item studied is not important to safety. The design considerations for items not important to safety is achieved by application of ALARA principles through simple means. The safety assessment only needs to be a description of broad, facility-level safety and radiological protection protocols. For the NPD Project a barrier does not always have to be a system relied on for safety instead, these are layers of defence in depth that can provide mitigative effects.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					For the NPD Disposal facility the design features that act as barriers and provide defense in depth are as follows: • Reactor vault walls; • Building walls; • Grout; • Bedrock; • Concrete cap; and • Engineered cover. Based on the results of the assessed doses for both decommissioning and post closure phases and applying the graded approach these items are not credited with any safety importance. This is a result of the high corrosion resistance of the waste form and the low radioactive inventory. Therefore, the design requirements for the life of these items is determined by the application of the ALARA principle. Of all these items only the concrete cap and engineered cover have an ALARA requirement that relies on the lifespan of the item. The purpose of the concrete cap and engineered cover is to reduce the infiltration of surface water into the facility and to direct surface runoff away from the facility. Limiting re-saturation of the concrete and grout structure will slow the rate of groundwater through the facility preventing the short lived radionuclides, mostly tritium, from being flushed out before they have decayed away. The time for the tritium to decay to insignificant levels determines the design life. The design life for the concrete cap and engineered cover for this reason shall be 100 years. In this time period the tritium will have decayed below clearance levels. The majority of long-lived radionuclide inventory remaining after 100 years is tens of meters below the ground surface in bedrock. This remaining radioactivity was generated by neutron activation and is found within the reactor vessel steels and zirconium alloy which will corrode very slowly in the alkaline environment. The alkalinity leads to formation of insoluble oxides on the surface of the metals protecting them from further corrosion. The concrete and grout maintain an alkaline environment in excess of 1,000 years. The alkalinity prevents the early or rapid release of radionuclides contained within the metal matrices. The corrosion of the metals are minimised until the concrete has degraded to such a point that the pH of the concrete is no longer providing a protective environment. The model estimates that it will take longer than 30,000 years for the least corrosion resistant metals to corrode. This allows most of the long lived radionuclides to decay as the degradation is reliant on the physical and chemical properties of the concrete and the environment in which it is located. Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound. References: <i>Canadian Nuclear Safety Commission (CNSC) 2021a, REGDOC 2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. Version 2.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
71	CNSC	Section 5.2.3 Constituents of Potential Concern Also applicable to Section 9.2.3 Identification of Residual Effects (Atmospheric Environment), p.9-19 to 9-20	p.5-11 to 5-13	Comment: The selection of chemical contaminants of potential concern (COPCs) in section 5.2.3 of the EIS indicates that the NO₂ (for NO_x), SO₂ and PM_{2.5} were identified as COPCs based on existing site conditions. Asbestos, lead, PCBs and mercury were also identified as COPCs as a result of knowledge of the hazardous substances present at the facility. Later in the EIS, in Section 9.2.3.3, in addition to the three COPCs identified (e.g., NO₂, SO₂ and PM_{2.5}), VOCs (as represented by acrolein), CO, TSP and PM₁₀ are also considered in the assessment of the atmospheric environment of the project. The presentation of how COPCs were screened is confusing. It is not clear from the information presented if asbestos, lead, PCBs and mercury were considered as COPCs for the atmospheric environment, nor is it clear how VOCs, CO, TSP and PM₁₀ were added to the list of COPCs. A complete list of all COPCs which were considered for atmospheric environment should be clearly listed. This list of COPCs should remain consistent throughout the assessment. In addition, it should be clearly demonstrated how each COPC was screened for further assessment. Expectation to Address Comment: Please clarify the full suite of COPCs that were considered for the atmospheric environment. It should be clearly demonstrated how each COPC was screened for further assessment.	Resolved As: CEAA 2012 is not specific in defining how COPCs should be identified. In this EIS, the COPC screening is based on (1) available baseline conditions (Table 5.2-2), and (2) major hazardous substances known to be in the facility. Emissions associated with typical construction activities (e.g., VOCs, CO, noise) are not included in the COPC screening since they are anticipated to have negligible impact. Although not defined as COPCs, these emissions are treated largely in the same manner as COPCs in that the potential effects for all emissions are considered. For example, emissions of VOCs and CO are assessed in the Greenhouse Gas Emissions TSD. Noise is assessed in the EIS as well. A comprehensive list of parameters (COPCs and non-COPCs) considered in the assessment of effects in the Atmospheric Environment is presented for the Decommissioning Execution phase in Section 9.2.3.3 of the EIS.
72	CNSC	Section 5.2.3 Constituents of Potential Concern	p.5-11 to 5-13	Comment: Section 5.2.3.2 (Chemical COPCs) states that hazardous substances, such as asbestos, lead, mercury and PCBs, are known to be in the facility. It is not clear from the description in the EIS if there could be any halocarbon-containing inventories present in refrigeration or air-conditioning systems at the facility. The EIS should clarify whether there are any halocarbon-releasing systems that may meet the reporting requirements of the Federal Halocarbon Regulations, 2003. Expectation to Address Comment: Provide clarification regarding the presence of any halocarbon-containing systems, and if they meet the reporting requirements of the Federal Halocarbon Regulations, 2003.	Incorporated: The NPD site has the following halocarbon-containing equipment: <u>Air conditioning units</u> Guard House roof A/C unit (capacity 5.2 lbs/2.36 kg) Office Trailer A/C units (2 units, each with capacity 5.1 lbs/2.31 kg) Break Trailer A/C unit (capacity 67 oz/1.9 kg) <u>Refrigerators</u> Office Trailer refrigerator (capacity 4.16 oz/0.1 kg) Break Trailer refrigerator 1 (capacity 4.16 oz/0.1 kg) Break Trailer refrigerator 2 (capacity 1.94 oz/0.05 kg) Break Trailer refrigerator 3 (capacity 1.76 oz/0.05 kg) <u>Water coolers</u> Office Trailer water cooler (capacity 30 g/0/03 kg)

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Break Trailer water cooler (capacity 1.4 oz/0.04 kg) Guard House water cooler (capacity 30 g/0.03 kg) Fire extinguishers at the NPD site are all ABC type extinguishers and do not contain halocarbons. Since all of the halocarbon-containing equipment contain far below 10 kg of halocarbons, the reporting requirements as per sections 32 and 33 of Federal Halocarbon Regulations 2003 do not apply (i.e. bi-annual report for any releases between 10 kg and 100 kg and immediate reporting to Environment and Climate Change Canada for releases greater than 100 kg). As part of the NPD Closure Project, all halocarbon containing equipment will be appropriately dispositioned by trained HVAC staff and will not be placed in the facility during in-situ disposal. CNL complies with environmental laws and regulations applicable to our activities. Accordingly, CNL’s Environmental Protection Program has a process in place to ensure that any halocarbon containing equipment located at CNL sites is in compliance with the Federal Halocarbon Regulations. Change to EIS: The following text has been added to the first row of Table 5.2-2 “Contaminants Considered: Halocarbons Measurement Location: NPD site Applicable Criteria: Sections 32 and 33 Federal Halocarbon Regulations, 2003 (bi-annual report for any halocarbon releases between 10 kg and 100 kg and immediate reporting to Environment and Climate Change Canada for halocarbon releases greater than 100 kg) Exceeds any of the Criteria: No. Halocarbon-containing equipment on the NPD site are air-conditioning units, refrigerators, and water coolers. All of the halocarbon-containing equipment contain far below 10 kg of halocarbons. Therefore, the reporting requirements as per sections 32 and 33 of Federal Halocarbon Regulations 2003 do not apply. As part of the NPD Closure Project, all halocarbon containing equipment will be appropriately dispositioned by trained HVAC staff and will not be placed in the facility during in-situ disposal.”
73	MOECC	Section 5.2.3 Constituents of Potential Concern	p.5-11 to 5-13	Comment: Given the limited baseline characterization for non-radiological parameters, combined with the high level of uncertainty in groundwater models and degradation scenarios, and potential for preferential pathways (i.e., granular materials associated with drains and pipes left in place), there is uncertainty on whether the proposed list of COPCs for surface water and sediment is comprehensive enough, or if changes from baseline will be promptly captured through ongoing monitoring. For example, Table 5.2-2 does not include parameters known to be at high concentrations in subsurface drains or the Wells Area Sump (WAS), or metals exceeding relevant guidelines in sediment with the potential to be elevated in discharge(s) from the site. Expectation to Address Comment:	Incorporated: In 2018 August and 2023 July, the CNSC undertook environmental monitoring around NPD as part of their Independent Environmental Monitoring Program (IEMP). Monitoring of the Ottawa River was included as part of the monitoring program. Non-radioactive parameters monitored were copper, lead, mercury and cadmium. The results from the 2023 campaign are not yet available, however, the 2018 IEMP results confirm that the public and the environment around the NPDWF are protected and that there are no expected health impacts. Also, CNL developed three draft detailed follow up monitoring plans in accordance with CSA N288 standards for effluent, environmental and groundwater monitoring (Gilbert and Kovacs 2018, Kovacs 2018, McKee and Kovacs 2018) which were submitted to the CNSC in 2018 October for review. The groundwater follow-up monitoring plan includes wells placed in the area of preferential pathway, i.e., where granular materials are associated with drains and pipes left in place. Additional characterization is planned as the first phase of the follow up monitoring program, including baseline monitoring of the Ottawa River. Non-radioactive parameters to be monitored are pH, iron, lead, mercury, total PCBs and total dioxins and furans. These parameters were identified from the 2015 characterization of the facility effluents

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Please consider a more comprehensive characterization of water quality within the Ottawa River offshore from the NPD site in order to assess the assimilative capacity of the receiving waters, consistent with the MOECC’s Procedure B-1, <i>Water Management Policies, Guidelines and Provincial Water Quality Objectives</i> (1994). Include as COPC any parameter with the potential to be released at concentrations exceeding relevant water or sediment quality guidelines.	including the Wells Area Sump (WAS) (see the report “Results of Sampling Effluent Streams from CNL’s Prototype Reactor Decommissioning Sites” in the EIS Supplementary Documentation TSD). The project also completed a study using MIKE-3 to model the hydrology of the Ottawa River and represent the near-field, where e.g., ecological receptors could potentially be exposed to concentrations close to the groundwater discharge area in the Ottawa River. The MIKE-3 calculations evaluated the potential impacts of transient operational releases of liquid effluent from the NPD Facility into the Ottawa River (e.g., from the Wells Area Sump). Please note that this study was based on the discontinued practise of periodically discharging water from the Wells Area Sump to the Ottawa River. As such the results of the study are a very conservative representation of the releases that would happen from the grouted facility. The study included consideration of the assimilative capacity (taking into account bathymetry, flow, temperature, wind, etc.) of the receiving waters to determine the actual discharge concentrations in the surface water environment. Additionally, available water quality data were reviewed for locations upstream of the NPD Site (MOECC 2016 and MOECC 2018), however no data was available for parameters relevant to the NPD Closure Project. This study compares environmental concentrations in the Ottawa River with the MOECC’s Procedure B-1, <i>Water Management Policies, Guidelines and Provincial Water Quality Objectives</i> (1994). This comparison demonstrates that the transient release of liquid effluent from the NPD facility into the Ottawa River is in line with regulatory requirements, as the calculated maximum concentrations of tritium, gross beta, and other effluent parameters are orders of magnitude below these surface water quality guidelines. These water quality objectives ensure protection of both human health and aquatic life, therefore there is no impact within the mixing zone of the NPD process outfall. It is also important to note that liquids collected during the Decommissioning Execution phase (for example excess water in the wash-out pit or water collected from the facility during grouting) would be analysed and transported to Chalk River Laboratories for management. Change to EIS: Section 9.3.3.3 of the EIS have been revised to reflect the results of the updated PostSA and EcoRA. References: <i>EIS Supplementary Documentation TSD: Multiple Authors. 2023. EIS Supplementary Documentation – NPD Closure Project. 64-509200-041-000-0011. Revision 2. 2023 August.</i> <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i> <i>Ministry of the Environment and Climate Change (MOECC) 2016. Data Catalogue - Industrial wastewater discharges. https://www.ontario.ca/data/industrial-wastewater-discharges. Accessed in 2018 March.</i> <i>Ministry of the Environment and Climate Change (MOECC) 2018a. Map: Provincial (Stream) Water Quality Monitoring Network. https://www.ontario.ca/environment-and-energy/map-provincial-stream-water-quality-monitoring-network. Accessed in 2018 March.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
74	CNSC	Section 5.2.4 Valued Components, Table 5.2-3 (d) Also applicable to Section 9.5 Geological and Hydrogeological Environment, p.9-55	p.5-17	Comment: There are no VCs for the geological and hydrogeological environment. Therefore, the identification of VCs for the geological and hydrogeological environment requires further assessment. Based on the pathways and rationales presented, and the described project, specific VCs that have the highest relevance (in terms of being affected by the project) should be identified in Table 5.2-3 (d). Specific VCs that should be used to assess the effects of the NPD Closure Project on the geological and hydrogeological environment include: overburden soil quality, overburden groundwater characteristics (quality, flow) and shallow bedrock groundwater characteristics. Natural factors that can impact the VCs of the geological and hydrogeological environment, and that are relevant for this project, which proposes to isolate and contain waste for up to 50,000 – 100,000 years, include future seismicity and erosion. In addition, project -related processes that seem to be relevant include waste degradation and resaturation of the grout material. Expectation to Address Comment: Please identify specific VCs for the geological and hydrogeological environment. The approach proposed by CNL, to “transfer the effect to another environmental component (e.g., surface water environment, aquatic environment)” is not acceptable for a project that relies on specific site characteristics. How are the natural and project-related factors likely to influence VCs? Please provide supporting evidence and discussion.	Incorporated: The NPD Closure Project has added Valued Components (VCs) for the geological and hydrogeological environment to the EIS, specifically the following: • soil quality; • groundwater quality; and • groundwater flow. Baseline characteristics and potential effects of the project on these VCs is summarized in the EIS from information available in reference documents, including the new Geosynthesis Technical Support Document (TSD) and the updated Groundwater Modelling Report, as well as associated documents such as the Post Closure Safety Assessment (PostSA) TSD. It is noted that in order to demonstrate a consistent approach to assessment, the NPD Closure Project has retained the geological and hydrogeological environment as pathways, in addition to adding them as VCs. Change to EIS: Sections 5.2.4, 8.5 and 9.5 have been revised to reflect the response above.
75	CNSC	Section 5.2.4 Valued Components, Table 5.2-3 (g) and (i)	p.5-20 to 5-21	Comment: As required under paragraph 5(1) (c) of the <i>Canadian Environmental Assessment Act, 2012</i> (CEAA 2012), the EIS should describe the effects of any changes the project may cause to the environment, with respect to Aboriginal peoples, on health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. However, there is no specific and distinct discussion of any effects on the health and socio-economic conditions of Aboriginal peoples resulting from a change to the environment. In particular, there are no VCs related to Aboriginal health identified in Section 5.2.4 (Valued Components), Section 9.8 (Human Health) or Section 9.10 (Socio-Economic Environment).	Incorporated: In response to the Canadian Nuclear Safety Commission (CNSC) recommendations to fulfill the requirements of <i>CEAA, 2012</i>, as well as feedback from Indigenous comments on the 2017 draft Environmental Impact Statement (EIS) on the Nuclear Power Demonstration (NPD) Closure Project, Canadian Nuclear Laboratories (CNL) has included a stand-alone section – Section 9.10 – that provides a specific discussion of effects on the health and socio-economic conditions of Indigenous peoples resulting from the project. CNL recognizes that <i>CEAA, 2012</i> is clear in 5(1) (c) that the EIS should describe the effects of any changes the project may cause to the environment, with respect to Indigenous peoples, on health and socioeconomic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. The scope of the NPD Closure Project’s socio-economic impact assessment was expanded beyond the requirements of <i>CEAA, 2012</i> to include potential indirect socio-economic effects given these effects are of interest to stakeholders and Indigenous Nations, communities, and organizations. In doing this, the EIS has fulfilled or exceeded the

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Expectation to Address Comment: Please include a stand-alone section that provides a specific discussion of any effects on the health and socio-economic conditions of Aboriginal peoples resulting from a change in the environment. In situations where the EIS has identified changes to the environment, provide a description and analysis of how these changes could affect the health and socio-economic conditions of Aboriginal peoples.	requirements of <i>CEAA, 2012</i> to describe the effects of the project with respect to Indigenous socio-economic and health. The EIS defines the scope of Indigenous socio-economic and health in describing the baseline environment for both of Indigenous socio-economic and Indigenous health in Section 8.10 of the EIS. Section 8.10.1 of the EIS describes in detail the Indigenous socio-economic baseline environment. This includes details on the locations of Indigenous Nations, communities and organizations in relation to the NPD site in Table 8.10-1. Though the Indigenous Engagement Report Technical Supporting Document (IER TSD) and the EIS identify many Indigenous Nations, communities and organizations with interests in the region, through research using Aboriginal and Treaty Rights Information System (ATRIS) and the Indigenous and Northern Affairs Canada (INAC) websites, it was determined that only one Indigenous Nation / community, the Algonquins of Pikwàkanagàn First Nation (AOPFN), is physically located within 100 km of the NPD site. Section 8.10.1.3 of the EIS describes the Indigenous socio-economic environment for AOPFN, including demographics, languages spoken, and employment data. Section 8.10.2 of the EIS describes in detail the Indigenous health baseline environment. The spatial boundaries with respect to the Indigenous health are the same as employed for human health. However, describing local food consumption for Indigenous health requires further details to account for the traditional activities that may lead to greater and / or more specific local foods consumption. The 2020 March draft EIS and Indigenous Engagement Report (IER) technical supporting document (TSD) were both shared with Indigenous Nations, communities, and organization in May 2020 for further feedback and input. Note that, as stated in Section 8.10 of the EIS: “The description of the existing environment with respect to Indigenous Health in the Regional Study Area is the same as the description under Human Health. There is no Indigenous-specific health information available for the Regional Study Area.” The EIS, following <i>CEAA, 2012</i>, describes the potential effects on the Indigenous socio-economic and health environment from the project in Section 9.10. The following Valued Components (VCs) related to Indigenous socio-economic factors are described in Section 9.10 of the EIS: population and demographics; economy and employment; housing and infrastructure; Indigenous resident - use and enjoyment of private property; decision-making and resource industries. These are based on potential changes to the socio-economic environment directly from the Project itself, with the exception of the VC “Indigenous resident – use and enjoyment of private property”, where there could be indirect socio-economic effects as a result of a change from the Project on the environment (<i>i.e.</i>, noise or dust). Table 9.10-3, titled Project-Environment Interactions in the Indigenous Socio-Economic Environment, describes what impacts may occur on these VCs during each project phase. Table 9.10-4, titled Summary of Residual Effects in the Indigenous Socio-Economic Environment, describes the potential impacts and mitigation measures for the Indigenous Socio-Economic VCs. For instance, during the Decommissioning Execution phase there are potential impacts from increased traffic volume, which could affect the safety of road users. One mitigation measure to increase road safety is to stagger the timing of shipments whenever possible. Another potential impact on the Indigenous socio-economic environment could be nuisance effects such as, dust, and noise. Applicable mitigation measures include dust suppression, restricting hours of activity and communications. After mitigation, there are anticipated to be no adverse residual effects for any of the Indigenous socio-economic VCs at any point during the project. It is understood that direct effects on the environment may in turn produce indirect socio-economic effects related to Indigenous peoples. The potential effects on traditional land and resource use are described in Section 9.9 of the EIS. However, this assessment could potentially exclude indirect socio-economic effects on resource-based uses that are of a more commercial nature (undertaken by Indigenous peoples), and which could be affected by direct changes to the environment. The most typical resource-based use activities undertaken by Indigenous peoples that can have a

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					commercial component to them include trapping and commercial fishing (and possibly gathering). It is also possible that Indigenous peoples participate in or operate resource-based tourism enterprises that could be potentially impacted by changes to the environment. The text provided below for each resource industry has been added to Section 8.9 or 8.10 of the EIS: Trapping is one resource-based activity that has both a traditional and commercial aspect to it. Most Indigenous trappers trap for personal and cultural reasons as well as for the financial benefit of selling the furs and accessing country foods. Trapping, among other areas of importance, can produce some income to offset a trapper’s costs and time. The vast majority of lands within the Ontario portion of the Local Study Area (LSA) are federal lands owned by AECL with remaining lands in private tenure. A small portion of the Local Study intersects one designated Trapline Area (PE026) (MNRF 2010b). Engagement with all Indigenous Nations, communities, and organizations to the end of August 2021 has not resulted in the identification of any Indigenous trappers operating within the Site Study Area (SSA), although it is possible. The Regional Study Area (RSA) intersects two designated Trapline Areas (PE026 and PE027) (MNRF 2010b). It is possible but not yet determined whether there are Indigenous peoples holding these traplines. Engagement with all Indigenous Nations, communities, and organizations to the end of August 2021 has not resulted in the identification of any Indigenous trappers operating within the RSA, although it is possible through ongoing engagement. The right to trap furbearing animals is outlined in section 8.3.24 of the Algonquins of Ontario (AOO) Agreement--In--Principle. The inclusion of such a chapter indicates the importance of trapping as a cultural activity to the AOO. Targeted species include (but are not limited to) beaver (<i>Castor canadensis</i>), fisher (<i>Martes pennant</i>) and marten (<i>Martes Americana</i>) (OVF 2011a). CNL has assumed that trapping is occurring on provincial land in the OVF (and the nearby Algonquin Park Forest) by registered Algonquins who are members of one of the ten AOO communities. Evidence from the AOO AKLUS confirms this. While most of the trapping documented in the AKLUS is occurring several kilometers south and west of the NPD site, trapping was identified as close as immediately southwest of both Rolphton and Rapides-des-Joachims (SVS, AOO, 2020). Trapping or snaring was also identified in the AOPFN AKLUS study area in Algonquin Park significantly southwest of the NPD site (SVS, AOPFN, 2020). In the Métis Nation of Ontario (MNO) TKLUS, it was identified that trapping has been a foundational element of Métis way of life and land use since the genesis of the Métis. Of the 11 participants in the MNO TKLUS, 7 individuals reported participation in trapping, although none had trapped within the 50 km study area. Trapping may also be occurring by landowners on private land adjacent to the NPD site. This trapping on private land may or may not be undertaken by Indigenous peoples. As section 9.9 explains, no effects on trapping are expected because trapping itself does not occur on the NPD site where the project will occur; the project will implement a series of mitigation measures to mitigate potential effects for adjacent lands; and as determined in the Ecological Risk Assessment (EcoRA) TSD, no adverse residual effects have been predicted for terrestrial or aquatic biota. Commercial fishing is another resource-based activity that could be affected by direct changes to the environment. Indigenous peoples do maintain some commercial fish licenses for inland waters in Ontario. However, there is currently no commercial fishery on the Kichi-Sibi (Ottawa River). Historically, there likely was a commercial sturgeon fishery on the Kichi-Sibi (Ottawa River) and members of the MNO in their TKLUS indicated that they had historically at one point participated in a commercial fishery. As described in the EcoRA TSD, no adverse residual effects have been predicted for aquatic biota and therefore no adverse effect is predicted on the fishery for the Kichi- -Sibi (Ottawa River).

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Gathering (as a commercial activity) could be a resource activity that could be affected by direct changes to the environment. The most common gathering resource that does have a commercial component to it is blueberry picking. Other gathering activities might have a commercial component to them such as gathering other plant materials for food or craft use. Gathering is a common activity undertaken by Indigenous peoples. As described in the EcoRA TSD, no adverse residual effects have been predicted for terrestrial biota, Section 8.9 of the EIS describes that due to restricted access (<i>e.g.</i>, there are “no trespassing” signs and gates at roadways) to the site, there is no gathering on the NPD site or within the boundaries of the AECL property surrounding the NPD site. The final resource-based activity that could be affected by direct changes to the environment, could be resource-based tourism such as sport fishing or hunting or eco-tourism. Such commercial activities would not be rights based but could be operated by Indigenous peoples. CNL is unaware of any such enterprises operating in the Study Area but it is possible. The proposed NPD Closure Project would reduce the visual presence of the NPD site on the Ottawa River (the ventilation stack at the NPD site will be retained to protect species at risk habitat). Therefore, it would be expected that if anything the visual environment may be enhanced from the present situation. Overall, no effect would be predicted. To address the above potential indirect effects on the socio-economic environment with respect to Indigenous peoples, an additional VC and sub-section has been added within Section 8.10.1 of the EIS to describe “Resource Industries”. CNL notes that, to date, questions about the commercial nature of these resources industries have not been asked by Indigenous Nations, communities or organizations. The following VCs related to Indigenous health are described in Section 9.10.2 of the EIS: Indigenous worker and Indigenous peoples. Table 9.10-7, titled Project-Environment Interactions in Indigenous Health, describes what impacts may occur on these VCs during each project phase. Table 9.10 9, titled Summary of Residual Effects in Indigenous Health, describes potential impacts and mitigation measures for the Indigenous Health VCs. For example, during the Decommissioning Execution phase, potential impacts to the Indigenous worker include (but are not limited to): drilling holes for slip pipe access has the potential to increase radiation doses to Indigenous workers and displacement of air from the facility containing lead, asbestos and tritium which may affect Indigenous workers. Mitigation measures for these potential impacts include following work control documents and radiation protection and knowledge that levels of potential exposure to lead and asbestos are well below benchmark values for workers as well as knowledge that tritium exposure calculations for workers are below worker dose criterion. With respect to the Indigenous public, during the Institutional Controls and Post-Institutional Controls period, exposure to radionuclides in groundwater, surface water, sediment, food, as well as external radiation could affect Indigenous health. In-design mitigations for this potential impact are to isolate and contain the inventory to reduce the potential of groundwater contamination and effects on Indigenous health. The EIS has assessed that the levels of dose exposure on the Indigenous public will fall well below relevant dose criteria. After mitigation, the EIS has assessed that there are no adverse residual effects on Indigenous Health. Change To EIS: Two new sections, 8.10 and 9.10, have been added to the EIS to present information on Indigenous Socio-economic and Health Baseline and Effects. Section 9.8 has been updated to reflect the Indigenous receptor in the PostSA; Section 2 (Executive Summary) has also been updated to reflect this change. References: <i>EcoRA TSD: Garisto, N., Manolopoulos, H., Arbaban-Esfahani, E., and Tong, X. 2020. Ecological Risk Assessment. 64-509200-ASD-004. Revision 2. Prepared by Arcadis for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>IER TSD: Chenette, R. 2024. Nuclear Power Demonstration (NPD) Indigenous Engagement Report. 64-513130-REPT-001. Revision 5.</i> <i>KnowHistory. 2019. Chalk River TKLUS Report. 2019 February 28.</i> <i>Ontario Ministry of Natural Resources and Forestry (MNR). 2010b. Map: Trapline Areas: Ottawa Valley Forest 2011-2021. Queens Printer for Ontario. <u>Electronic Forest Management Plans v3.6.0.2 - Final Plan Phase 2 (2011-2021)</u> (gov.on.ca)</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Ontario (AOO). 2020 December 15.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Pikwàkanagàn First Nation (AOPFN). 2020 September 24.</i>
6. Public and Stakeholder Engagement Note: The order of EIS sections has been changed in the 2021 revised draft EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples.					
76	Government of Quebec	Section 6.2 Engagement Methods and Activities	p.6-2 to 6-18	Comment: According to Section 6.2 of the draft EIS, to inform the Quebec population, CNL held information sessions in the municipality of Rapide-des-Joachims, as well as an information meeting with the Council of Mayors of the Pontiac Regional County Municipality. However, it would have been relevant for information sessions to also have been held in other municipalities bordering the Ottawa River. Expectation to Address Comment: Please indicate which public engagement activities were intended for the Quebec population, as well as what the results were (e.g., concerns and opinions heard), and the way these results were taken into account as part of the proposed project.	Resolved As: Since the launch of the NPD Closure Project, Canadian Nuclear Laboratories (CNL) has hosted fourteen (14) public information sessions in Quebec (Sheenboro, Rapides-des-Joachims and Chapeau), attended two information sessions upon invite in Quebec (Gatineau and Fort William), met with Indigenous communities based in Quebec fifty (50) times (in-person and virtually), and met with representatives of all levels of government in Quebec including Martine Ouellet, the leader of the Bloc Quebecois, Pontiac MP Will Amos, Hull-Aylmer MP Greg Fergus, Gatineau City Councillor Mike Duggan and MRC Pontiac Warden Jane Duggan. These events discussed both the NPD Closure Project and the Near Surface Disposal Project (NSDF). In 2020 March, the COVID-19 pandemic impacted in-person engagement activities. CNL adapted to the restrictions providing online platforms for virtual meetings. In response to growing interest from a wider geographic area, CNL has held twenty-two (22) online webinars in both official languages since 2018, focusing on the NPD Closure Project. These bilingual webinars are being held on a routine basis to update individuals remotely, with maximum accessibility. Locally, CNL engages on a regular basis with its neighbors in Quebec specifically municipalities in the MRC (Municipalité régionale de comté or Regional county municipality) Pontiac. The MRC Pontiac and the Old Fort William Cottagers’ Association are both members of the CNL Environmental Stewardship Council (ESC). All public facing information on our website, printed material, poster material and newsletters are available in both official languages. CNL responds and engages with different groups that request meetings. For instance, at the request of the Mayor of L’Isle-aux-Allumettes, CNL hosted a Public Information Session in Chapeau. Upon request CNL has also been hosted in Fort William by the Old Fort William Cottagers’ Association and in Gatineau for a Town Hall hosted by Hull-Aylmer MP Greg Fergus. CNL will continue to be responsive to requests to discuss the project. During 2020 and 2021, all live in-person community events and conferences were postponed or replaced by virtual alternatives such as the NPD Virtual Open Houses (VOH) or public webinars. CNL’s VOH content and livechats were available in both official languages and updated for each session. CNL based the content on feedback received. CNL hosted three VOHs in 2020, 2021 and 2022. Due to the feedback received CNL has continued to host hybrid events to accommodate all those who are interested.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					The Environmental Impact Statement (EIS) includes public feedback, including concerns and opinions heard from the residents of Quebec. Change to EIS: Section 6 of the EIS is now the Indigenous Engagement chapter and Section 7 covers Stakeholder Engagement. Section 7.2 has been updated to reflect all of CNL’s engagement activities including those in Quebec to end of cutoff date of 2024 January 31. Change to Stakeholder Engagement Report (SER): Section 3 has been updated to reflect CNL’s engagement activities in Quebec. Appendices have also been updated to reflect all comments’ geographic origin and CNL’s disposition of comments. References: <i>Stakeholder Engagement TSD: Chennette, R. 2024. Nuclear Power Demonstration (NPD) Stakeholder Engagement Report. 64-513440-REPT-002 Revision 1.</i>
77	CNSC	Section 6.2.7, Participant Funding Also applicable to Section 5.0 Participant Funding of the Stakeholder Engagement Technical Supporting Document, p.5-1	p.6-18	Comment: CNL mentions the CNSC Participant Funding Program in their EIS submission. This is a CNSC-driven program, and should not be considered as part of CNL’s consultation efforts. Expectation to Address Comment: CNL must remove this section in the EIS and Stakeholder Engagement TSD.	Resolved As: Information on the Canadian Nuclear Safety Commission’s (CNSC) Participant Funding Program (PFP) is relevant to Canadian Nuclear Laboratories’ (CNL) stakeholder engagement efforts as it identifies individuals or groups who have expressed interest in the project and a desire to proactively learn more. CNL has made it a priority to engage directly with recipients of participant funding due to their expressed interest in the project. Change to EIS: Section 6 of the EIS is now the Indigenous Engagement chapter and Section 7 covers Stakeholder Engagement. Section 7.2.20 has been revised to include this context as to why the CNSC PFP is relevant to CNL’s engagement efforts with stakeholders. Change to Stakeholder Engagement Report (SER): Section 3.18 has been revised to include the context as to why the CNSC PFP is relevant to CNL’s engagement efforts. References: <i>Stakeholder Engagement TSD: Chennette, R. 2024. Nuclear Power Demonstration (NPD) Stakeholder Engagement Report. 64-513440-REPT-002 Revision 1.</i>
78	Government of Quebec	Section 6.3.4 Planned Future Engagements	p.6-26	Comment: Section 6.3.4 states: “CNL has additional engagements planned for the remainder of 2017 [...] for which the records and feedback will be summarized in future final revisions of the EIS (or EIS addendum).” CNL should specify the communication plan established until the end of the EA process, as well as during the Execution and	Resolved As: A current focus of engagement is concentrated on direct interaction with intervenors and Indigenous Nations, communities, and organizations through open and transparent dialogue which will include the review and disposition of their comments as well as an option of one-on-one meetings and discussions. Regular broader engagement activities such as Breakfast Briefings and the quarterly webinar will also continue. CNL will continue to engage the public through a variety of mechanisms demonstrating transparency in the process and access to information. CNL will continue to be pro-active with the media and engaged stakeholders to

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Institutional Controls phases, in order to inform the neighbouring population of the project’s progress and environmental monitoring results. Expectation to Address Comment: Please provide more information on planned future engagements.	communicate the benefits of the project and to correct errors. CNL will promote all milestones and significant events for the project through public information sessions, site tours, meetings of the Environmental Stewardship Council and engagement with Indigenous peoples. Key information updates will be shared with stakeholders through new web content, social media and emails to stakeholders. CNL will also continue to share information in more interactive ways, such as video and infographics. Overall, the planned engagements that will continue through the EA process include: • ESC Meetings. At these meetings the NPD Closure Project will provide an update. • Breakfast briefings in Deep River and Pembroke for interested members of the public. • Public Webinars. • Renfrew County Municipal Council meetings – project updates. • MRC Pontiac Municipal Councils – project updates. • Stakeholder updates via email, newsletters and advertising. • Updated online content. • Meetings with Indigenous Nations, communities, and organizations. • Community specific webinars with Indigenous Nations, communities, and organizations. • NPD Closure Project virtual open houses. • Virtual bi-monthly webinars. • Community Advisory Panel Meetings (CAP). At these meetings the NPD Closure Project will be able to seek feedback on engagement tactics from CAP members. • NPD Closure Project participation in industry conferences and events (CNS, NWMO etc.). Leading up to the two-part Hearing information shared will focus on how individuals and groups can participate. Project Execution Phase Pending regulatory approval, the NPD Closure Project’s execution phase could be underway in 2027. During this period, CNL and the Project will continue to update stakeholders and encourage continued feedback, for instance on noise or other nuisance impacts that may occur, so as to enable mitigation while the project progresses. CNL and the Project will also continue to involve stakeholders in monitoring plans and regularly update the community on project developments. Institutional Control Phase Details of engagement activities for this phase of the project are not developed at this time. The final monitoring plans and outcomes of the EA decision may include specific communication requirements. CNL will continue to adapt its engagement activities and engagement will continue into the Institutional Control Phase with levels of engagement proportionate to CNL’s other activities. Information on future engagements with the public is shared in Section 5 of the Stakeholder Engagement Report (SER), and information on future engagements with Indigenous communities can be found in Section 4.5 of the

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Indigenous Engagement Report (IER). Both of these are also Technical Support Document (TSD) and are available to any interested party upon request. This information can also be found in Sections 6.5 and 7.4 of the EIS. Future engagements will continue with stakeholders and Indigenous communities in Quebec throughout the EA process and into the project execution phase. Change to SER: Section 5 contains information on planned future engagements and has been updated to reflect stakeholder engagement strategies extending into the execution phase. Change to IER: Section 4.5 contains information on planned future engagement with Indigenous Nations, communities, and organizations. Change to EIS: Section 6 of the EIS is now the Indigenous Engagement chapter and Section 7 covers Stakeholder Engagement. As noted above the EIS repeats the stakeholder engagement information and therefore Sections 6.5 and 7.4 contain information on planned future public and Indigenous engagements and has been updated to reflect stakeholder engagement strategies extending into the execution phase. References: <i>IER TSD: Chennette, R. 2024. Nuclear Power Demonstration (NPD) Indigenous Engagement Report. 64-513130-REPT-001. Revision 6.</i> <i>Stakeholder Engagement TSD: Chennette, R. 2024. Nuclear Power Demonstration (NPD) Stakeholder Engagement Report. 64-513440-REPT-002 Revision 1.</i>
7. Aboriginal Engagement Note: The order of EIS sections has been changed in the 2021 revised draft EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples. This is the reverse of the Section order in the 2017 draft EIS.					
79	CNSC	Section 7.5 Engagement Activities Completed, Table 7.5-1	p.7-7 to 7-29	Comment: Information is missing in Table 7.5-1. ☐ Please make sure that all rows are filled and that no date or other type of information is missing (e.g., date missing on p.7-10). ☐ In the last column, please make sure that the number and document title of each referenced Appendix is provided (e.g., the second to last row on p. 7-18 only indicates “See Appendix for presentation”). Expectation to Address Comment: Please revise the table accordingly.	Incorporated As: Records of Engagement for each Indigenous Nation, community or organization have been updated and are now contained within Appendix C of the EIS (one table per Indigenous Nation, community and organization). Appendices J through BB in the Indigenous Engagement Report (IER), each contain a table with the record of engagement for each Indigenous Nation, community, or organization (formerly Table 4-1). These have been updated to resolve any gaps in relevant information. Change to EIS: Section 6 of the EIS is now the Indigenous Engagement chapter and Section 7 covers Stakeholder Engagement. Table 7.5-1 has been replaced by community specific engagement record tables in Appendix C of the EIS. The tables in Appendix C have been updated to resolve any gaps in relevant information. Change to IER: Appendices J through BB has been updated to resolve any gaps in relevant information.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					References: <i>IER TSD: Chennette, R. 2024. Nuclear Power Demonstration (NPD) Indigenous Engagement Report. 64-513130-REPT-001. Revision 5.</i>
8. Description of the Existing Environment					
80	CNSC	Section 8.1 Baseline Characterization Approach	p.8-1 to 8-4	Comment: The need for an environmental monitoring program is based on criteria set out in CSA N288.4-10, <i>Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills</i> . CNL indicates that there is no Environmental Risk Assessment (ERA) for this facility, that there are no stakeholder concerns related to this project, and therefore, that an environmental monitoring program is not required. It could be argued that the EIS is a predictive ERA with uncertainties related to the release rates of COPCs from the facility. Hence, there is an ERA for this facility. There are also stakeholder concerns with this proposed project. Expectation to Address Comment: Please provide a justification for not including, at a minimum, groundwater and atmospheric monitoring programs at the NPD site.	Resolved As: Current releases to the environment from the NPD Waste Facility are minimal and are monitored in accordance with NPD's Effluent Monitoring Plan (CNL, 2022) which was developed in accordance with CSA N288.5. Emissions to the atmosphere are included in the NPD Effluent Monitoring Plan (monitoring of tritium and gross beta/gamma in the ventilation stack emissions and annual checks against the National Pollutant Release Inventory (NPRI) and Greenhouse Gas Emissions reporting requirements). Section 8.1 of the EIS summarizes the routine monitoring activities that are undertaken at the NPD site, and Section 8.2.3 of the EIS summarizes monitoring results for ventilation stack. Results of effluent monitoring indicate very little impact on the environment. Results are submitted annually to the CNSC in the Annual Compliance Report. With respect to groundwater monitoring, there have been several specific groundwater sampling campaigns conducted at NPD. Beta activity concentrations as well as a suite of non-radiological contaminants were measured. The studies did not detect any instances of groundwater contamination that exceed available federal water quality guidelines for drinking water. Section 8.5.6 of the EIS summarizes groundwater sampling campaigns that were undertaken at the NPD site (e.g. Killey 2014, Golder 2017b). Results of these campaigns show that groundwater is not impacted by the facility. In terms of monitoring related to the proposed in-situ disposal activities, three draft follow-up monitoring plans have been prepared (Gilbert and Kovacs 2018, Kovacs 2018, McKee and Kovacs 2018): a groundwater monitoring plan prepared in accordance with CSA N288.7, an environmental monitoring plan prepared in accordance with CSA N288.4, and an effluent monitoring plan prepared in accordance with CSA N288.5. (The effluent monitoring plan for the NPD Closure Project builds upon the current N288.5 Effluent Monitoring Plan). Annual groundwater monitoring is now occurring at the NPD site in accordance with the draft groundwater monitoring plan. Routine groundwater monitoring began in 2021. Please note that these plans are complete reports. They include "Draft" in the title to reflect the fact that the NPD Closure Project is seeking input from interested parties including Indigenous Nations, communities, and organizations. The plans will be finalized after an EA Decision is reached so that any additional monitoring requirements from the EA Decision can be incorporated. References: <i>Canadian Standards Association (CSA). 2019. CSA Standard N288.4-19. Environmental Monitoring Programs at Nuclear Facilities and Uranium Mines and Mills.</i> <i>Canadian Standards Association (CSA). 2023. CSA Standard N288.7-23. Groundwater Protection and Monitoring Programs for Nuclear Facilities and Uranium Mines and Mills.</i> <i>Canadian Standards Association (CSA). 2022. CSA Standard N288.5-22. Effluent and Emissions Monitoring Programs at Nuclear Facilities.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Canadian Nuclear Laboratories (CNL). 2022. Nuclear Power Demonstration Effluent Monitoring Plan. 64-509200-PLA-001. Revision 1.</i> <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Golder Associates Limited. 2017b. Environmental Site Assessment Report – NPD Closure Project. 64-509410-REPT-006. Revision 0.</i> <i>Killey, D. 2014. Current Groundwater Quality at NPD. 64-509247-REPT-001. Revision 0.</i> <i>Klukas, M. 2021. Addendum – Gap Analysis of Groundwater Protection Elements for the Draft Groundwater Follow-up Monitoring Plan NPD Closure Project. ENVP-21-083.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i>
81	Government of Quebec	Section 8.1 Baseline Characterization Approach, Table 8.1.1	p.8-2	Comment: Table 8.1-1 states (as Monitoring Criteria under row (c): “The effective dose to members of an off-site critical group from all radioactive releases from the site during normal operations and anticipated transients is estimated to exceed 5x10⁻⁵ Sv (or 0.05 mSv) per year.” However, in other sections, the choice of acceptable exposure level is different (e.g., 250 µSv/year or 1,000 µSv/year (p. 9-121)). This choice should be clarified, because it does not appear to be used consistently in the draft EIS. Furthermore, as a comparison, the Swedish acceptable exposure level is 14 mSv/year (Andersson et al., 2016) and the conditional clearance criterion, as defined in the <i>Nuclear Substances and Radiation Devices Regulations</i>, is 10 µSv/year. Expectation to Address Comment: Please clarify what the acceptable exposure level is for this proposed project. Reference: Andersson, E., Källström, K., Morén, L., Skagius, K., Hjerpe, T., & Smith, G. 2016. <i>Assessment of Human Intrusion and Future Human Actions—Example from the Swedish Low and Intermediate Level Waste Repository SFR</i> (No. IAEA-CN–242).	Resolved As: Table 8.1-1 of the EIS presents a 0.05 mSv/yr threshold as a trigger for monitoring – this value is not a dose criterion. It is the NPD Closure Project’s position that application of conditional clearance levels is not appropriate for the proposed project. The NPD Closure Project has proposed acceptance criteria within the Post Closure Safety Assessment Technical Support Document (PostSA TSD). As suggested in CNSC REGDOC 2.11.1 (CNSC 2021a), the NPD Closure Project’s proposed acceptance criteria includes environmental concentrations aligned with federal and provincial environmental quality guidelines as well as a dose-based constraint. The NPD Closure Project uses dose criteria of 0.25 mSv/yr (for normal evolution) and 1 mSv/yr (for disruptive events). The project’s suggested dose-constraint of 0.25 mSv/yr (for normal evolution) is lower than the 0.3 mSv/yr in (CNSC 2021a) and the International Commission on Radiological Protection recommendations for a dose constraint of 0.3 mSv/yr for the disposal of long-lived radioactive waste. Reference: <i>Canadian Nuclear Safety Commission (CNSC) 2021a, REGDOC 2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. Version 2.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
82	CNSC	Section 8.1 Baseline	p.8-4, 2 nd and 3 rd	Comment: Please clarify the meaning of the following sentences as they seem to contradict each other: “...the Local and Regional study areas are	Resolved As: The definitions and role of each study area are provided in Section 5.2.1.1 Spatial Boundaries and Scale, in line with CNSC’s <i>Generic EIS Guidelines</i> (p.13 to 15).

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		Characterization Approach	paragraphs	outside the project footprint, and are likely to capture a larger area than where effects are expected. For many of the environmental components, data from the Regional Study Area can be assumed to be relevant for the baseline characterization of the Site and Local Study Areas.” If the effects are not likely to be expected outside of the Site Study Area, then why is CNL relying on data from the Regional Study Area to represent the Site and Local Study Areas? If impacts are likely to be localized (i.e., onsite impacts), the baseline environment at the project site becomes particularly important and would need to be well characterized. Expectation to Address Comment: Please clarify this assumption and explain with more clarity the general role of each study area (or spatial boundary) in assessing the potential adverse environmental effects of the project. Refer to CNSC’s <i>Generic EIS Guidelines</i> (p.13 to 15) for a definition of each study area.	The aspects of the environment for which baseline data from the Regional Study Area are used to represent baseline conditions in the Site and Local Study Areas, as well as the justification for, are as follows: Climate: there are no meteorological stations on the NPD site. Long-term meteorological data is available for the CRL site and is considered to be the most representative of conditions at NPD, due to proximity and similarity in geographic siting (as stated in Section 8.2.2). Noise: noise data from the CRL site are assumed to be an appropriate representation of noise conditions for the Site and Local Study Areas. Ambient noise measurements from the CRL site range from 28 to 42 dBA, which are typical for a quiet rural area, which is the quietest (i.e. most conservative) category for baseline noise estimation according to Health Canada’s Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise Aquatic biota: It is expected that the aquatic biota would be similar to those described for the Regional Study Area, since the portion of the river adjacent to the NPD site is part of the reach of the Ottawa River (from Des Joachims to La Passe) which was characterized as part of Ontario Ministry of Natural Resources and Forestry Ottawa River review (Haxton and Chubbuck 2002). This reference was used as a source of information for fish species present or potentially present in the Ottawa River in the Site and Local Study Areas. Human Health: As described in Section 8.8.2, as discussed above, there are no residents present within the Site / Local Study Area, as it is owned by the Federal Government. The only people present in the Site/Local Study Area are workers and visitors. Workers are assumed to live within the Regional Study Area. As such, the results presented for the Regional Study Area are also applicable to the workers at the site. Change to EIS: Section 5.2.1.1 has been revised to provide further explanation of the “General Local Study Area”. References: <i>Haxton, T. and D. Chubbuck. 2002. Review of the historical and existing natural environment and resource uses on the Ottawa River. Ontario Ministry of Natural Resources, Science and Information Branch, Southcentral Science and Information Section Technical Report #119.</i>
83	CNSC	Section 8.2 Atmospheric Environment	p.8-4 to 8-5 and p.8-26	Comment: The Regional Study Area for the atmospheric environment was defined to extend 5 km beyond the Site Study Area. The defined Regional Study Area is not large enough to consider other projects that might result in cumulative effects. It should be sufficiently large to encompass the cumulative effects of other reasonable foreseeable projects occurring in the region (e.g., those activities occurring at the Chalk River Laboratories (CRL) site). Additionally, meteorological data from CRL was used to represent the Regional Study Area. If data from CRL is used in the assessment to represent this area, then it should be expanded to include the CRL site. Expectation to Address Comment: The size of the Regional Study Area should be expanded to encompass the CRL site to ensure that other projects that might	Resolved As: There are no adverse residual effects to the atmospheric environment resulting from the project. Therefore, there is no potential for cumulative effects to occur, and the CRL Site does not require consideration for potential cumulative effects with the NPD Closure Project in the atmospheric environment. The Regional Study Area defined within the EIS (extending 5 km beyond the Site Study Area) is sufficiently conservative. Meteorological data from the CRL station beyond the Regional Study Area are used to characterize the baseline atmospheric conditions, as the CRL station represent the closest available sources of information. Change to EIS: Section 8.2.2 has been revised to include the following text: In the absence of site-specific information, meteorological data from the CRL climate station are considered appropriate to describe the climate conditions at the NPD site. The CRL station, located approximately 25 km south-east from the NPD site, in similar geographic settings, is the closest station to the NPD site with climate and meteorological data available. Overall, the CRL climate data are considered to be an adequate representation of the climate in the Site, Local and Regional Study Areas for the following reasons: these sites are rural, close to the

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				result in cumulative effects are considered, and to justify the use of the data from the CRL site for the Regional Study Area.	Ottawa River, share a similar topography and are at a similar latitude. Although there is some uncertainty involved with using this data, the uncertainty is deemed to be very minor. The use of long-term climate data available from the CRL station (1981 to 2010) further supports the validity of the data used.
84	CNSC	Section 8.2.2 Climatic Data	p.8-6	Comment: There is no site-specific meteorological data for the NPD site. CNL has used meteorological data from the climate stations located at various locations at the CRL site to describe meteorological conditions for the Site, Local and Regional Study Areas. Although site-specific data is preferred, the approach used by CNL can be appropriate if no site-specific data is available. However, the EIS should include a discussion regarding the validity and uncertainty associated with using meteorological data from the CRL site to describe the climatic and meteorological conditions for the NPD site. Expectation to Address Comment: Please provide a discussion regarding the validity and uncertainty associated with using meteorological data from the CRL site for the description of climatic data for the NPD site.	Resolved As: In the absence of site-specific information for NPD, meteorological data from the Chalk River Laboratories (CRL) climate stations were used to describe the climate conditions at the NPD site as the closest station to the NPD site with climate and meteorological data available. The CRL station is located approximately 25 km south-east from the NPD site, in the similar geographic settings. As such, there is some uncertainty involved with using this data. Generally, this uncertainty is deemed to be very minor. Overall, the CRL climate data are considered to be an adequate representation of the climate in the Site, Local and Regional Study Areas for the following reasons: these sites are rural, close to the Ottawa River, share a similar topography and are at a similar latitude. The use of long-term climate data available from the CRL station (1981 to 2010) further supports the validity of the data used. Change to EIS: Section 8.2.2 has been revised to include the following text: In the absence of site-specific information, meteorological data from the CRL climate station are considered appropriate to describe the climate conditions at the NPD site. The CRL station, located approximately 25 km south-east from the NPD site, in similar geographic settings, is the closest station to the NPD site with climate and meteorological data available. Overall, the CRL climate data are considered to be an adequate representation of the climate in the Site, Local and Regional Study Areas for the following reasons: these sites are rural, close to the Ottawa River, share a similar topography and are at a similar latitude. Also, the use of climate data from the CRL station enables several decades’ worth of climate data to be used for air modelling. Although there is some uncertainty involved with using this data, the uncertainty is deemed to be very minor.
85	CNSC	Section 8.2.2 Climatic Data	p.8-10	Comment: The EIS states that the “meteorological data used as model input consists of five years of hourly data.” Although details on the air dispersion modelling are presented in Appendix C and Appendix F of the Decommissioning Safety Assessment TSD, the main EIS should provide enough details regarding the meteorological data used in subsequent modelling work. Additional details regarding where the meteorological data was obtained from, and the five-year period covered, should also be described in the main EIS. Expectation to Address Comment: The source of the meteorological data used as input for the air dispersion model should be specified in the main EIS.	Incorporated: Additional details regarding the meteorological data used in the air dispersion modelling has been added to the EIS. Change to EIS: Section 8.2.2.1 has been revised to include the following text: The meteorological data used for the air dispersion modelling was the AERMOD regional data for Ottawa (applicable for the Eastern region), prepared by MOECC, with forest type of land use, for the 5-year period from 1996 to 2000. Surface data (wind speed and direction, air temperature, ceiling, total opacity and total cloud amount) was taken from the Ottawa airport (approximately 180 km SE from the NPD site). Upper air data was taken from the Maniwaki upper air station (approximately 134 km E from the NPD site).
86	ECCC	Section 8.2.2 Climatic Data (Precipitation), Tables 8.2-3 and 8.2-4	p.8-10 to 8-12	Comment: Section 8.2.2 states: “...Table 8.2-3, shows a similar pattern and seasonal distribution as the climate normals for 1981 to 2010, Table 8.2-4.”	Incorporated: The EIS has been updated to describe the differences between the 5-year and 30-year precipitation datasets. Specifically, the following additional details regarding the data shown in Table 8.2-3 have been included in Section 8.2.2 Climatic Data: “The comparison of the 5-year total precipitation data shown in Table 8.2-3 with the climate normals of total precipitation for 1981 to 2010 shows somewhat lesser precipitation through the recent years except in April, June,

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				With respect to this statement, ECCC is of the position that there is substantial variation in the monthly averages between the 5-year series and the 30-year series. For example: - For February, the monthly average precipitation is 24.7 mm from the 5-year series, and 43.7 mm from the 30-year series - For August, the monthly average precipitation is 95.3 mm from the 5-year series, and 80.7 mm from the 30-year series Existing long-term data sets should be used preferentially. It is typical to use the 30-year climate normal, but other data sets may be relevant depending on the context. For example, design storms would be used to ensure appropriate sizing of water management infrastructure, such as drainage ditches and stormwater management ponds. For a water balance model, one would use data sets that considered wet and dry periods that are relevant to upper and lower percentile bounds (e.g., 10th percentile and 90th percentile data). It is not clear for what purpose CNL has used the 5-year data set. Expectation to Address Comment: Please consider removing from the EIS the quote referenced above and any other related text that makes similar statements or conclusions. Furthermore, please identify what the 5-year data set is being applied to, and for what purpose, and consider revising, where necessary, any analyses or conclusions that used the 5-year precipitation data set. In such instances, apply the 30-year climate normal and other data sets (e.g., design storms), as may be appropriate to the purpose. For projects with a very long timeframe, the potential effects of climate change upon the project also need to be considered.	August and October. This variability between the two precipitation data sets is expected given that the climate normals are based on a 30-year period, while the most recent data set covers only five years that are not included in the existing climate normals.” Clarification: (a) With respect to how and why the 5-year precipitation data set was used: - The 5-year precipitation data set from the CRL station was used to describe the existing conditions on the site for the period from 2011 to 2015. (The 30-year climate normal data only goes up to 2010). - The 5-year precipitation data was compared to the (30-year) climate normals to check whether they are representative of long-term climate at the site. The variability observed was considered acceptable. - The 5-year precipitation data set (or, precipitation data in general) was not used in any analyses. It was not used in the air dispersion modelling. To be conservative, AERMOD was used with no deposition and plume depletion option (which does not require precipitation data). (b) The effects of climate change on the project are considered in the Postclosure Safety Assessment Technical Support Document (PostSA TSD). The results of the PostSA have been incorporated into the Ecological Risk Assessment TSD and EIS. Change to EIS: Sections 8.2.2 and 8.12.4.3 of the EIS have been revised to reflect the response above. References: <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
87	CNSC	Section 8.2.2 Climatic Data Also applicable to Appendix C (Atmospheric Dispersion Modelling) of the Decommissioning Safety Assessment Technical Supporting	p.8-14 to 8-15	Comment: Section 8.2.2.3 presents wind direction and speed data obtained from the CRL site. The data is obtained from the top of an office building in the CRL main campus, at approximately 40 meters and at heights of 30 and 60 meters from Perch Lake. As outlined in Appendix C.2 (Atmospheric Dispersion Modelling for Normal Operations), the regional data set for Ottawa, as prepared by the MOECC, was used for the dispersion modelling for normal operations. Appendix C.2 further states that the CRL dataset was combined with the Ottawa dataset for dispersion modelling using AERMOD and CALPUFF in screening mode. The information in the main EIS does not make reference to the use of the Ottawa regional meteorological dataset in the description of the climatic conditions for the NPD site. If the meteorological dataset for the Ottawa region was used, as obtained	Incorporated: The EIS has been updated to include the regional meteorological dataset used in the dispersion modelling for normal operations (from Appendix C of the Decommissioning Safety Assessment Technical Support Document (DecomSA TSD), including a discussion of the uncertainty associated with using this data set. Resolved As: Additional information with respect to uncertainty: The uncertainty associated with using the regional meteorological data set was addressed by a comparison with the CRL data. Please note three data sets have been considered as follows: Data set #1: The AERMOD regional meteorological data set for Ottawa (a complete data set). This data set consists of surface data from the Ottawa International Airport and upper air data taken from the Maniwaki station for the 5-year period from 1996 to 2000. Data set #2: The CRL data set (an incomplete data set) complemented by the Ottawa regional data (data set #1). The CRL data set does not contain all meteorological parameters required for modelling (such as ceiling, total opacity

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		Document, p.C-11 to C-12		from the MOECC, it should also be presented in the main EIS along with a discussion regarding the validity and uncertainty associated with using this dataset compared to the dataset for the CRL site. Expectation to Address Comment: The regional meteorological dataset used in the dispersion modelling for normal operations (Appendix C) should also be presented in Section 8.2.2.3 of the main EIS, along with a discussion of the uncertainty associated with using this dataset versus the dataset for the CRL site.	and cloud amount). The wind and temperature data from the CRL were complemented by the Ottawa regional data for the missing parameters because wind data from the CRL are more representative for the NPD site than the Ottawa wind data (see Appendix C of DecomSA). Data set #3: The CRL data set (incomplete) complemented by meteorological data from the following stations: Petawawa AWOS 2, Pembroke, Ottawa International Airport and Maniwaki, for the 5-year period 2011 to 2015, endorsed by the Ontario Ministry of the Environment and Climate Change (OMOECC data set). Data Set #2 (which includes Data Set 1 plus CRL data) were used for air dispersion modelling in the DecomSA. The DecomSA’s conclusions were based on air dispersion modelling results derived using Data Set #2 and CALPUFF. These were chosen: 1) Because Data Set #2 incorporates CRL data which is more representative for the NPD site than Data Set #1 (the Ottawa data alone); and, 2) Because between AERMOD and CALPUFF, CALPUFF results for Data Set #2 were more conservative than AERMOD results using Data Set #2. Change to EIS: Section 8.2.2.3 of the EIS has been updated to include the regional meteorological dataset used in the dispersion modelling for normal operations (from Appendix C of the DecomSA TSD), along with a discussion of the uncertainty associated with using this data set. References: <i>DecomSA TSD: Garisto, N., Kovacs, R., Music, S., Gilbert, J., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i>
88	CNSC	Section 8.2.4 Air Quality	p.8-25 to 8-27	Comment: In Section 5.2.3 (Constituents of Potential Concern), the assessment identified COPCs by considering hazardous substances that are known to be in the facility, such as asbestos, lead, PCBs and mercury and other contaminants such as metals and PAHs. Baseline air quality for these COPCs is absent from Section 8.2.4 (Air Quality). Knowledge of the baseline air quality for these hazardous substances is needed to demonstrate how they were screened for further assessment. Expectation to Address Comment: Please provide the baseline air quality for asbestos, lead, PCBs and mercury, as well as for other contaminants such as metals and PAHs. If this information is not available, a narrative should be provided regarding how these constituents were screened in the assessment for the atmospheric environment.	Incorporated: Of the hazardous substances considered in the EIS COPC screening, asbestos, specific metals (focusing on lead and mercury, due to their presence as hazardous compounds in the facility), and PCBs were identified as COPCs based on information from supporting documents (namely, the Decommissioning Safety Assessment). PAHs were screened out based on remediation of previously contaminated areas, as well as current measurements at the site. <u>PCBs:</u> With respect to PCBs, PCB containing light ballasts will be removed prior to decommissioning activities. CNL has sampled the paint and caulking in the NPD facility for PCBs, and all samples contained less than the regulated level of 50 mg/kg of PCBs in solids (McVeigh 2018a). As such, PCB-containing paint and caulking do not warrant further assessment. Due to the nature and waste form of PCBs, as well as anticipated project activities, PCB releases to air are not expected (DecomSA). <u>Mercury:</u> All known mercury-containing thermostats and switches will be removed from the facility before decommissioning begins. As such, the remaining source of mercury is limited to only residual mercury contamination from past operations, most likely to be in the Boiler Room. CNL (2017c) estimates this to be less than 10 g, based on measurements taken of liquids in the Wells Area Sump, only one of which produced a result of 650 ng/L (others were non-detect). Given this assumed location and form and based on the anticipated project activities (which do not include cutting activities in the Boiler Room floor), mercury releases to air are not expected as part of Normal Operations (see the DecomSA TSD). The DecomSA TSD also considered mercury in its assessment of Accidents. The DecomSA TSD found that releases of mercury are not expected for most accident scenarios, given its assumed

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					location and form. The DecomSA TSD did identify mercury as a potential release contaminant in an indoor fire accident event, and as such, mercury was directly assessed and the results were found to be less than corresponding criteria indicating that no undue adverse effects were anticipated. See the DecomSA TSD for assessment details. <u>Lead:</u> Lead is assessed directly in the DecomSA TSD, as part of Normal Operations and for Accident scenarios. <u>EIS Baseline Air Quality Information (Metals, PCBs, Asbestos, PAHs):</u> Baseline air quality data has been updated in the EIS to include the concentrations in air of asbestos, lead, mercury and other metals within the NPD facility, based on baseline industrial hygiene information. A statement on the screening of PAHs and PCBs in the atmospheric environment has also been added to the EIS. Asbestos and lead releases were not screened out, they were carried forward and assessed in the DecomSA TSD. Change to EIS: Baseline air quality data has been updated in the EIS (Section 8.2.4) to include the concentrations in air for asbestos, lead, mercury and other metals within the NPD facility. An expanded discussion of screening of PAHs and PCBs in the atmospheric environment has also been included. The following text has been added to Sections 2.2.3, 2.2.5, 3.5.3.1, 4.4.1.2, 5.2.3.2, and 9.2.3.3: “PCB containing light ballasts will be removed prior to decommissioning activities”. References: <i>CNL. 2017c. Inventories and Locations of Hazardous Substances in the NPD Facility. 64-509215-021-000-0001. March.</i> <i>DecomSA TSD: Garisto, N., Kovacs, R., Music, S., Gilbert, J., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 3. Prepared by Arcadis for CNL.</i> <i>McVeigh, A. 2018a. NPD Building Characterization Report. NPD Decommissioning. CNL No. 64-509410-REPT-011. Revision 0.</i>
89	CNSC, ECCC	Section 8.2.4 Air Quality Also applicable to Appendix F (Air Quality Assessment for the NPD Project) of the Decommissioning Safety Assessment Technical Supporting Document	p.8-26 to 8-27	Comment: CNL used the National Ambient Air Quality Standards as screening criteria in the air quality assessment. These standards have been superseded by the Canadian Ambient Air Quality Standards (CAAQS) for PM_{2.5}, NO₂, SO₂ and ozone. CAAQS for SO₂ have been recently released and come into effect in 2020, while CAAQS for PM_{2.5} came into effect in 2015. CAAQS for NO₂ have recently been endorsed and come into effect in 2020. The appropriate standards should be used as screening criteria in the assessment of chemical COPCs for the atmospheric environment, especially given that the CAAQS for fine particulate and ozone are set at lower (more stringent) levels than the National Ambient Air Quality Standards and Ontario Ambient Air Quality Guidelines used by CNL. Expectation to Address Comment:	Incorporated: The NPD Closure Project will comply with the standards or screening criteria that are in effect at the time of the project. With respect to NO₂ and SO₂: The new Canadian Ambient Air Quality Standards (CAAQS) for NO₂ were issued in November 2017 and the new CAAQS for SO₂ were issued in October 2016, both after the NPD Closure Project draft EIS was initiated. With respect to SO₂, updated Ambient Air Quality Criteria (AAQC) will take effect on 2023 July 01. The NPD Closure Project has updated Appendix F of the Decommissioning Safety Assessment (DecomSA) TSD to reflect the updated CAAQS and AAQC for NO₂ and SO₂. Please note that there are no implications to the conclusions of the DecomSA (i.e., concentrations at sensitive receptors are all below criteria). Regarding PM_{2.5}, the NPD Closure Project has updated Appendix F of the DecomSA to reflect the CAAQS for 24-hour and annual PM_{2.5} of 27 µg/m³ and 8.8 µg/m³ respectively that come into effect in 2020. The Table below provides a summary of the maximum predicted 24-hour and annual TSP, PM₁₀ and PM_{2.5} concentrations at sensitive receptor locations. The maximum predicted 24-hour average and annual average of PM_{2.5} at sensitive receptors (including background concentrations) are well below their respective CAAQS and confirm the conclusions reached in the EIS.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response							
				The screening criteria for the air quality should be updated to incorporate the CAAQS for PM_{2.5}, NO₂ and SO₂. More specifically, the air quality should be screened against the standards for 2015 and 2020, as the project execution phase may still be ongoing beyond 2020. Furthermore, CNL should assess if the revised values change any of the conclusions reached in the EIS. For additional information on the new SO₂ standards, visit: https://www.ccme.ca/en/resources/air/air/sulphur-dioxide.html For additional information on the new PM_{2.5} standards, visit: http://www.ccme.ca/en/resources/air/pm_ozone.html For additional information on the new NO₂ standards visit: https://www.ccme.ca/en/current_priorities/air/caaqs.html		Averaging Period	Criterion (µg/m³)	Upwind Background (µg/m³)	Receptor Type			
									Residential (µg/m³)	Residential (µg/m³)	Residential (µg/m³)	Recreational (µg/m³)
									R1	R2	R3	R4
					TSP	24 hour	120	36	38	40	39	38
						Annual	60	20	20	20	20	20
					PM ₁₀	24 hour	50	18	19	19	19	19
					PM _{2.5}	24 hour	27 ^a	9	9	9	9	9
						Annual	8.8 ^b	5	5	5	5	5
					^a The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations (CCME 2012). ^b The 3-year average of the annual average concentrations (CCME 2012). Change to the DecomSA Appendix F: The results tables in Appendix F (Tables F-1, F-7, F-9, and F-12) of the DecomSA TSD for NO₂, SO₂ and PM_{2.5} have been updated to include the applicable CAAQS. The provincial Ambient Air Quality Criteria (AAQC) for SO₂ have also been updated to include the new 2023 criteria which may come into effect during the Decommissioning Execution phase. Change to EIS: Section 8.2.4 of the EIS has been revised to include some clarification on what version of the CAAQS and AAQCs we are using as screening criteria in the EIS. References: GUIDANCE DOCUMENT ON ACHIEVEMENT DETERMINATION CANADIAN AMBIENT AIR QUALITY STANDARDS FOR FINE PARTICULATE MATTER AND OZONE PN 1483 978-1-896997-91-9, https://ccme.ca/en/res/pn1483_gdad_eng-secured.pdf <i>DecomSA TSD: Garisto, N., Kovacs, R., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i>							
90	CNSC, Health Canada	Section 8.2.4 Air Quality	p.8-26 to 8-27	Comment: The four closest ambient air monitoring stations (i.e., Petawawa, Napanee, Ottawa and North Bay) were considered as the sources of background air quality data. It was noted that not all stations measure all the constituents. From the information in the EIS, it seems the following assumptions were used:	Incorporated: In response to this comment, the NPD Closure Project has added a summary of the ambient air quality monitoring stations used as data sources, their distances from the NPD site along with the year(s) from which data was obtained. This information is presented in Table 8.2-12 of the EIS.							

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																																						
				☐ NO₂ data from North Bay ☐ PM_{2.5} data from Petawawa No ambient air monitoring station was indicated as the source of the SO₂ background air quality data. In addition, limited explanations were provided regarding the validity or uncertainty of using one monitoring location versus another. There is also no information regarding the year(s) from which the data was obtained. In addition, the distance between the NPD site and each station is not provided. Expectations to Address Comment: Please clearly indicate the ambient air monitoring stations used as the source of background air quality for each of the COPCs (i.e., this information is missing for SO₂). Include a discussion of the validity and uncertainty associated with using one monitoring site versus another, along with the year(s) from which the data was obtained. Furthermore, specify the distance between the NPD site and each station used to determine the background air quality concentrations.	EIS Table 8.2-12 National Air Pollution Surveillance Monitoring Stations used for Background Air Quality <table><tr><th rowspan="2">Station ID</th><th rowspan="2">Station Location</th><th colspan="3">Contaminant</th><th rowspan="2">Distance from NPD (km)</th><th rowspan="2">Year</th></tr><tr><th>NO₂</th><th>SO₂</th><th>PM_{2.5}</th></tr><tr><td>60104</td><td>Ottawa-Rideau And Wurtenberg</td><td>☐</td><td>☐</td><td>☐</td><td>200</td><td>2013, 2014</td></tr><tr><td>60106</td><td>Ottawa-960 Carling Ave</td><td>☐</td><td>ND</td><td>☐</td><td>195</td><td>2013, 2014</td></tr><tr><td>62001</td><td>North Bay-Chippewa St.</td><td>☐</td><td>ND</td><td>☐</td><td>138</td><td>2013, 2014</td></tr><tr><td>66201</td><td>Petawawa Research Forest Facility, Clouthier Rd.</td><td>ND</td><td>ND</td><td>☐</td><td>42</td><td>2013, 2014</td></tr></table> The NO₂ background air quality data used in the EIS were measured at North Bay air quality monitoring station. The NO₂ levels measured in North Bay are considered to be more representative of NPD Closure Project background levels, since this station is less populated and industrialized than Ottawa. However, the North Bay Station is located in an urban setting, and is likely to overestimate concentrations at the NPD Site. As such, use of data from this station is likely conservative. The SO₂ background air quality data used in the EIS were measured at the Ottawa-Rideau and Wurtenberg air quality monitoring station. There is some uncertainty associated with utilizing data from this station, since it is 200 km away, and in an urban setting. This air quality monitoring station is the closest station to the NPD site that monitors SO₂ concentrations. As this station is located in an urban environment, it is likely to overestimate SO₂ concentrations at the NPD Site. As such, use of data for background air quality from this station is likely conservative. The PM_{2.5} background air quality data used in the EIS were measured at the Petawawa monitoring station. The measured PM_{2.5} concentrations in Petawawa are more representative of the conditions at the NPD site than the other stations, based on proximity to the site, the rural setting of the station, and proximity to Highway 17. Given the similarity of the data between the Petawawa and North Bay stations (the two closest and less industrialized stations), the uncertainty associated with using data from the Petawawa site as representative of the NPD site is likely to be minor. As per the Draft Effluent Follow-up Monitoring Program, High Volume Air Samplers (HiVols) have been set up to collect baseline air quality data at the NPD site. The HiVols have been operational since October of 2022 and run a 24-hour sample monthly. The samples collected are analyzed for: particulate (TSP, PM₁₀, PM_{2.5}), metals (lead) and radionuclides (gross beta, Co-60 and Cs-137). This data is collected to establish baseline air quality as the basis to assess air quality measurements during decommissioning. Change to EIS: Section 8.2.4.2 of the EIS has been updated to include the summary of the ambient air quality monitoring stations used as data sources, their distances from the NPD site, along with rationale for and uncertainty associated with their selection for each COPC.	Station ID	Station Location	Contaminant			Distance from NPD (km)	Year	NO ₂	SO ₂	PM _{2.5}	60104	Ottawa-Rideau And Wurtenberg	☐	☐	☐	200	2013, 2014	60106	Ottawa-960 Carling Ave	☐	ND	☐	195	2013, 2014	62001	North Bay-Chippewa St.	☐	ND	☐	138	2013, 2014	66201	Petawawa Research Forest Facility, Clouthier Rd.	ND	ND	☐	42	2013, 2014
Station ID	Station Location	Contaminant			Distance from NPD (km)			Year																																			
		NO ₂	SO ₂	PM _{2.5}																																							
60104	Ottawa-Rideau And Wurtenberg	☐	☐	☐	200	2013, 2014																																					
60106	Ottawa-960 Carling Ave	☐	ND	☐	195	2013, 2014																																					
62001	North Bay-Chippewa St.	☐	ND	☐	138	2013, 2014																																					
66201	Petawawa Research Forest Facility, Clouthier Rd.	ND	ND	☐	42	2013, 2014																																					

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					References: <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i>
91	CNSC	Section 8.3.2 Hydrology, Figure 8.3-3	p.8-34	Comment: There is no legend for Figure 8.3-3, which makes it difficult for the reader to understand the Ecological Land Classification Designations that are present near the NPD site. Also, not all of these designations are defined in the text on p.8-33. Expectation to Address Comment: Please include a legend that defines all the Ecological Land Classification Designations shown on Figure 8.3-3.	Incorporated: A legend has been added to Figure 8.3-3, defining the Ecological Land Classification (ELC) designations used in the figure. Resolved As: The ELC designations listed in the text on p. 8-33 are only those that relate to wetlands. Other ELC designations from Figure 8.3-3 are not relevant for the surface water environment section. Change to EIS: A legend has been added to Figure 8.3-3, defining the Ecological Land Classification designations that are present near the site, as follows: FOC1-1 – Dry Jack Pine Coniferous Forest Type FOC1-2 – Dry-Fresh White Pine-Red Pine Coniferous Forest Type CUM1-1 – Mineral Cultural Dry-Moist Old Field Meadow Type CUP3-1 – Red Pine Coniferous Plantation Type CUP3-2 – White Pine Coniferous Plantation Type CUP3-4 – Jack Pine Coniferous Plantation Type CUW1 – Mineral Cultural Woodland BBS1-2 – Willow Gravel Shrub Beach/Bar Type MAM2-10 – Forb Mineral Meadow Marsh Type MAS2-1 – Cattail Mineral Shallow Marsh Type MAS2-3 – Narrow-leaved Sedge Mineral Shallow Marsh Type MAS2-9 – Forb Mineral Shallow Marsh Type SAF1-1 – Water Lily – Bullhead Lily Floating-leaved Shallow Aquatic Type SAM1 – Mixed Shallow Aquatic Ecosite SAM1-7 – Water Milfoil Mixed Shallow Aquatic Type”
92	CNSC	Section 8.3.3 Surface Water Releases Also applicable to Section 8.3.4 Surface Water	p.8-37	Comment: Table 8.3-1 provides the number of discharges, total volume (m ³), as well as concentrations of I-131, Cs-137, Ce-144, C-14, Co-60, HTO (tritiated water), gross beta and gross gamma. However, the regional monitoring water quality data (Table 8.3-7, p.8-46 to 8-49) only reports for HTO, Cs-137 and Sr-90. Similarly,	Incorporated: Radionuclides are not reported in the same way in Tables 8.3-1, 8.3-7 and 8.3-9 because the three tables represent different sampling campaigns with different objectives. <u>Monitoring of the Wells Area Sump (Table 8.3-1)</u> Table 8.3-1 represents radioactive release information from the Wells Area Sump (WAS) from 1997 - 2015. From 2016 to 2017, liquid effluent releases from the NPD facility were monitored in accordance with the Effluent Monitoring Plan (CNL 2022), which is aligned with CSA N288.5. CNL 2022 provides a justification for which

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		Quality and Section 8.3.5 Sediment Quality		radionuclide concentrations in sediment samples (Table 8-3.9, p.8-54) are not provided for C-14, Co-60, I-131 and Ce-144. Expectation to Address Comment: Please justify why the radionuclides released are not consistently reported in surface water and sediment for Tables 8.3-1, 8.3-7 and 8.3-9.	radioactive parameters were required to be monitored from the WAS, specifically tritium oxide (the predominant contaminant in the Wells Area Sump) and gross beta activity (also detected in the Wells Area Sump). CNL 2022 also provides a rationale for not monitoring certain parameters. C-14 is not monitored in the Wells Area Sump; results of a characterization campaign undertaken in 2015 (Audet 2016) did not detect concentrations of C-14 at levels higher than the CCME drinking water quality guidelines of 200 Bq/L. Gross gamma and gross alpha are also not monitored since the predominant contaminants potentially present are not pure gamma emitters, and are rather beta-gamma emitters which will be captured in the gross beta activity monitoring. The gross beta monitoring would capture any Cs-137 and Co-60 concentrations. Also, empirical results of Audet 2016 did not indicate any elevated (or detected) gross alpha activity levels. Due to their relatively short half-lives I-131 and Ce-144 have not been monitored in the Wells Area Sump for several years since their respective inventories have decayed appreciably over the last 30 years. The last discharge of liquid effluent from the NPD facility sumps to the Ottawa River occurred in 2017 October. Starting in 2019, liquids collected within the building sumps are managed by pumping into transport containers followed by shipment to the Chalk River Laboratories Waste Treatment Centre for processing. <u>Surface Water monitoring (Table 8.3-7)</u> Due to the low risk of the current state of the NPD facility to the environment, a formal environmental monitoring program is not required. (As explained in Table 8.1-1 of the EIS). Although NPD as a stand-alone site does not require an environmental monitoring program, Chalk River Laboratories’ environmental monitoring program regionally overlaps with the NPD site, so information from CRL off-site environmental monitoring of the Ottawa River is relevant for the NPD Site. An additional table (Table 8.3-8) has been added to the EIS that shows monitoring results (from the Chalk River Laboratories’ monitoring program) for Rolphton (upstream of NPD) and Deep River (downstream of NPD) over the past 5 year period for gross beta and gross alpha. The difference between concentrations at Rolphton and Deep River monitoring stations is not significant. The observed concentrations are at natural background levels, and far below the Maximum Acceptable Concentrations specified by Health Canada (Health Canada 2017). These guidelines specify that if screening levels are exceeded (0.5 Bq/L for gross alpha and 1.0 Bq/L for gross beta), then concentrations of specific radionuclides should be analysed. As gross alpha and gross beta levels in Ottawa River monitoring are far below these screening levels, analysis for specific radionuclides is not required. <u>Sediment (Table 8.3-9)</u> With respect to the sediment analysis results presented in Table 8-3.9 of the EIS, this table represents the results of a 2014 study designed only to search for and quantify the presence of gamma-emitting isotopes in the surficial sediments, specifically to search for possible radioactive particles (particles containing Cs-137). A Phase Two Environmental Site Assessment (Phase Two ESA) of the NPD property was completed over 2016 and 2017. More detailed information on baseline sediment quality has been added to the EIS. Ottawa Riverbed sediment samples were obtained from a small boat using a Ponar sampler (McVeigh 2018b). Eight random samples were retrieved from an upstream area and eight from a downstream area. Table 8.3-14 has been added to the EIS and shows the average results and Unconditional Clearance Levels (SOR 2000-207) for radionuclides of concern. When the upstream data is compared to the downstream data using the appropriate statistical test (Wilcoxon Mann-Whitney) the results show that the sediments immediately downstream of the NPD river outfalls are comparable to the upstream area.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					The assessment of the radiological results demonstrates that the sediment conditions at the NPD site are non-impacted and measured radiological concentrations are below the unconditional clearance criteria (SOR 2000-207). Furthermore, in 2020 June, CNL undertook sediment sampling in the Ottawa River to better understand baseline conditions in the context of EA follow-up monitoring (Bond and Carr, 2021). Sediment was sampled along seven transects, five of which are located partly within the Site/Local Study Area and extend into the Regional Study Area. The remaining two transects are located within the Regional Study Area and include an upstream reference transect as well as a downstream transect at Deep River. Within each transect, a sediment sample was collected from each of four water column depth bins. The results from this study are summarized in Table 8.3-10 of the EIS. These results include the analysis of C-14 and Co-60, however I-131 and Ce-144 were omitted due to their relatively short half lives, and their respective inventories have decayed appreciably over the last 30 years. Change to EIS: Table 8.3-8 has been added to Section 8.3.3.5.1, showing monitoring results (from CRL’s monitoring program) for Rolphton (upstream of NPD) and Deep River (downstream of NPD). Section 8.3.5 of the EIS has been updated to include more baseline sediment data (from the Phase Two Environmental Site Assessment (Golder 2017b) and McVeigh 2018b), including Table 8.3-14. Within Section 8.3.5.1, results from the June 2020 study (Bond and Carr 2021) were added. References: <i>Audet, M. 2016. Results of sampling Effluent Streams from CNL’s Prototype Reactor Decommissioning Sites. 3640-509000-021-000. Revision 0. 2016 March 28.</i> <i>Bond, M. and J. Carr. 2021. Baseline Conditions for Ottawa River Sediment, Benthic Invertebrates and Fish Habitat Features near NPD. 64-509246-ENA-001. Revision 0. 2021 May 06.</i> <i>Canadian Nuclear Laboratories (CNL). 2022. Nuclear Power Demonstration Effluent Monitoring Plan. 64-509200-PLA-001. Revision 1.</i> <i>Golder Associates Limited. 2017b. Environmental Site Assessment Report – NPD Closure Project. 64-509410-REPT-006. Revision 0.</i> <i>Health Canada (HC). 2017. Guidelines for Canadian Drinking Water Quality Summary Table Prepared by the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment. February.</i> <i>McVeigh, A. 2018b. NPD Balance of Site Characterisation Report, 64-509410-REPT-009.</i>
93	CNSC	Section 8.3.3 Surface Water Releases	p.8-38, 1 st paragraph	Comment: The first sentence on this page indicates that data from “1997 – <u>2007</u>” is presented in Table 8.3-1. However, this table covers data from 1997 to <u>2015</u>. Expectation to Address Comment: Please revise accordingly.	Incorporated: The discrepancy for the data dates has been corrected in Section 8.3.3. Change to EIS: The text preceding Table 8.3-1 has been revised as follows: “The data associated with the annual monitoring of the WAS radioactive releases between 1997 and 2017 are reported in Table 8.3-1. The information reported in the table includes the number of discharges, the total volume discharged and the total amount of various contaminants released. The date and the volume of each release are recorded (Wills 2013, Primeau 2016, Primeau 2017, Athatuda-Arachchige 2018).”

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					References” <i>Athauda-Arachchige, H. 2018. 2017 Annual Compliance Report for Nuclear Power Demonstration Waste Facility, 64-00521-REPT-023. May.</i> <i>Primeau, K. 2016. 2015 Annual Compliance Report for Prototype Waste Facilities (Douglas Point, GentillyI & Nuclear Power Demonstration). 3640-00521-REPT-002. May.</i> <i>Primeau, K. 2017. 2016 Annual Compliance Report for Prototype Waste Facilities (Douglas Point, Gentilly-1 & Nuclear Power Demonstration). 3640-00521-REPT-003, May.</i> <i>Wills, A. 2013. Nuclear Power Demonstration Site: A Description of the Environmental Baseline for Decommissioning. 64-509200-ENA-001. February.</i>
94	MOECC	Section 8.3.3 Surface Water Releases	p. 8-41	Comment: Routine monitoring does not appear to have included testing for non-radiological parameters, nor do release limits appear to have been established for conventional contaminants. Summary data for a single sampling event are provided for non-radiological parameters in discharge from the WAS, which reveal that a number of parameters exceeded the Canadian Counsel of Ministers of the Environment (CCME) Environmental Quality Guidelines, some of them by several orders of magnitude (i.e., Cd, Cu, Pb, PCB). Expectation to Address Comment: Please provide a more complete dataset for non-radiological parameters in effluent from the WAS, which would increase the reliability of the risk assessment with respect to the identification of COPCs.	Resolved As: A scoping campaign was undertaken in 2015 as an initial step in the development of the Effluent Monitoring Program. Through the scoping campaign, iron, lead, mercury, PCBs and dioxins/furans were the non-radiological contaminants identified that required monitoring from the Wells Area Sump as part of the NPD Effluent Monitoring Plan in accordance with N288.5 (CNL 2022). Monitoring of these non-radioactive contaminants commenced in April 2016, when CSA Standard N288.5, was officially implemented. Results of Wells Area Sump monitoring are presented in Annual Compliance Reports that are submitted to the CNSC. The last discharge of liquid effluent from the NPD facility sumps to the Ottawa River occurred in October 2017. Since October 2017, liquids collected within the building sumps are managed by pumping into transport containers followed by shipment to the Chalk River Laboratories Waste Treatment Centre for processing. Although Table 8.3-2 presents non-radiological effluent contaminants which exceed Canadian Council of Ministers of the Environment Environmental Quality Guidelines (CCME EQG), as stated in the EIS, CCME EQG are used for environmental concentrations, and are not directly applicable to effluent releases which are typically subject to dispersion and dilution processes. The project also completed a study using MIKE-3 to model the hydrology of the Ottawa River and represent the near-field, where e.g., ecological receptors could potentially be exposed to concentrations close to the groundwater discharge area in the Ottawa River. The MIKE-3 calculations evaluated the potential impacts of transient operational releases of liquid effluent from the NPD Facility into the Ottawa River (e.g., from the Wells Area Sump). This study included consideration of the assimilative capacity (taking into account bathymetry, flow, temperature, wind, etc.) of the receiving waters to determine the actual discharge concentrations in the surface water environment. Additionally, available water quality data were reviewed for locations upstream of the NPD Site (MOECC 2016 and MOECC 2018), however no data was available for parameters relevant to the NPD Closure Project. This study compares environmental concentrations in the Ottawa River with the MOECC’s Procedure B-1, <i>Water Management Policies, Guidelines and Provincial Water Quality Objectives</i> (1994). This comparison demonstrates that the transient release of liquid effluent from the NPD facility into the Ottawa River is in line with regulatory requirements, as the calculated maximum concentrations of tritium, gross beta, and other effluent parameters are orders of magnitude below these surface water quality guidelines. These water quality objectives ensure protection of both human health and aquatic life, therefore there is no impact within the mixing zone of the NPD process outfall.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					References: <i>Canadian Standards Association (CSA). 2022. CSA Standard N288.5-22. Effluent and Emissions Monitoring Programs at Nuclear Facilities.</i> <i>Canadian Nuclear Laboratories (CNL). 2022. Nuclear Power Demonstration Effluent Monitoring Plan. 64-509200-PLA-001.</i> <i>Ministry of the Environment and Climate Change (MOECC) 2016. Data Catalogue - Industrial wastewater discharges. https://www.ontario.ca/data/industrial-wastewater-discharges. Accessed in March 2018.</i> <i>Ministry of the Environment and Climate Change (MOECC) 2018. Map: Provincial (Stream) Water Quality Monitoring Network. https://www.ontario.ca/environment-and-energy/map-provincial-stream-water-quality-monitoring-network. Accessed in 2018 March.</i> <i>Ontario Ministry of Environment and Energy (MOEE). 1994. Water Management Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy. 1994 July.</i>
95	MOECC	Section 8.3.4 Surface Water Quality	p.8-41 to 8-49	Comment: Several issues were identified with respect to the dataset provided for surface water quality from subsurface drains. - On page 8-31, the EIS indicates that MH-3 has been routinely dry in recent years, while data presented in Table 8.3-4 indicates that dry conditions were encountered in 6 years (2007 - 2012) of the past 23 years (1993 - 2015). Measured discharge volumes do not appear to be available. It is unknown if flow in Drains 1 or 2 have been affected by maintenance activities or other work undertaken at the site in recent years, which may account for the dry conditions and/or apparent restoration of flow in Drain 2. Without quantified flows from each drain, the precautionary approach should be employed in interpreting water quality data (i.e., presume ongoing discharge). - Data for non-radiological parameters in effluent from subsurface drains seems limited. The EIS indicates that data collected in 2014 was compared to Health Canada’s drinking water criteria. Please note that drinking water criteria are not applicable to the assessment of discharge to surface water receivers as, in some cases, guidelines for protection of aquatic life and/or recreational value may be orders of magnitude lower than drinking water criteria for the same parameter. Given that data is apparently very limited, comparison of all available data to relevant criteria is expected. - High tritium concentrations in drains (especially in Drain 1, which is understood to sustain more consistent flows) may suggest that the drain is intercepting and discharging contaminated groundwater. This does not appear to have been	Incorporated: In 2015, a comprehensive characterization campaign of all effluent sources at NPD was undertaken (Audet 2016) as a first step in developing NPD’s Effluent Monitoring Plan in accordance with CSA N288.5. Results were compared to CCME guidelines for the protection of aquatic life, taking into consideration background conditions through guidance from the Ontario Ministry of the Environment (MOE 2011c). The results of this characterization campaign determined the parameters of interest to be formally monitored as part of the Effluent Monitoring Plan. MH-2 has a consistent, observable flow and is monitored as part of the NPD Effluent Monitoring Plan. Monitoring of MH-2 provides an indication of unusual or unforeseen conditions and provides data for trending purposes. MH-2 is monitored for Tritium Oxide (semi-annually), Gross Beta Activity (semi-annually) and a flow measurement (annually). Non-radiological contaminants are not monitored because the results of (Audet 2016) did not identify any non-radiological contaminants of interest in MH-2. Formal effluent monitoring of MH-2 commenced in 2016 April, when CSA Standard N288.5 was officially implemented at NPD. Although Drain 1 appears to discharge high levels of tritium, the values are based on the Lower Detection Limit of the analysis equipment. Because the volume of flow through Drain 1 is high, this results in a high reported discharge of tritium (which is nonetheless <0.01% of the Derived Release Limit for tritium for the NPD site). Monitoring is not required for MH-1 as it is upstream of MH-2 (which is monitored). Observations of Manhole #3 (MH-3) indicate that when water is present, it is stagnant. Investigations in 2022 found low but consistent flow at Drain 2, downstream from MH-3. The major source of flowing water in Drain 2 is thought to be groundwater intercepted by a tile drain adjacent to and underneath the Pressure Relief Pit. The Pressure Relief Pit also collects precipitation which drains by gravity via a sump. As such, sampling at Tile Drain 2 was initiated in 2022. The potential for the subsurface drains and surrounding granular material to be a preferential pathway for migration of contaminants in groundwater discharging to the Ottawa River has been considered as a groundwater pathway in the Postclosure Safety Assessment Technical Supporting Document (PostSA TSD). Also, the NPD Closure Project developed three draft detailed follow up monitoring plans in accordance with CSA N288 standards for effluent, environmental and groundwater monitoring (Gilbert and Kovacs 2018, Kovacs 2018, McKee and Kovacs 2018). These reports were submitted to the CNSC in 2018 October and are listed on the NPD webpage of CNL’s website (available upon request). The groundwater follow-up monitoring plan includes wells

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				sufficiently addressed within the subject proposal, as it relates to the potential for impacts to surface water. Subsurface drains and surrounding granular material may represent a preferential pathway for migration of contaminants in groundwater towards, and discharging to the Ottawa River. (Refer to comments no.26 and no.212 for more details). Expectation to Address Comment: Taking into account the aforementioned issues, please revise Section 8.3.4 of the EIS. Also, consider providing a more robust dataset for the quality and quantity of effluent from subsurface drains, which would permit a more reliable assessment of the potential risks to surface water resources associated with this project.	placed in the area of preferential pathway, i.e., where granular materials are associated with drains and pipes left in place. Change to EIS: The following text has been added to Section 8.3.4.1, after the sentence “Tile Drain No.2 had been routinely dry...” “No maintenance activities or other work had been undertaken at the site which would have caused the dry conditions during 2007 – 2012. Observations of MH-3 typically indicated that when water was present, it was stagnant. Because there was no flow observed, discharge volumes were not measured at MH-3. However, as described in Johnson (2022a), investigations conducted in the fall of 2021 identified low but consistent flow in Tile Drain #2 downgradient of MH-3. The major source of flowing water in this section of Tile Drain #2 is thought to be groundwater intercepted by a tile drain adjacent to and underneath the Pressure Relief Pit. The Pressure Relief Pit also collects precipitation which drains by natural gravity via a sump. The groundwater and precipitation intercepted at the Pressure Relief Pit is directed to a drain line referred to as the Pressure Relief Duct Drain which connects to Tile Drain #2 near the shoreline of the Ottawa River (Johnson, 2022a). In fall of 2021, a new monitoring point was installed in Tile Drain #2 downgradient of MH-3 and of the interception point, near the discharge point to the Ottawa River (see Figure 8.3-7). Effluent monitoring at this location began in 2022. MH-2 has a consistent, observable flow and is monitored as part of the NPD Effluent Monitoring Plan. Monitoring of MH-2 provides an indication of unusual or unforeseen conditions and provides data for trending purposes. It is monitored for Tritium Oxide (semi-annually), Gross Beta Activity (semi-annually) and a flow measurement (annually). Non-radiological contaminants are not monitored because the results of a characterization campaign undertaken in 2015 (Audet 2016) did not identify any non-radiological contaminants of interest. Contaminants from MH-2 typically do not exceed the Health Canada Guidelines for Canadian Drinking Water Quality. However, MH-1, which is upstream of MH-2 in the subsurface drain network and on the south side of the facility (close to the ventilation stack), does consistently contain tritium at levels exceeding 7,000 Bq/L. Tritium and gross beta are measured semi-annually. Formal effluent monitoring of MH-2 commenced in 2016 April, when CSA Standard N288.5 (CSA 2022a) was officially implemented at NPD.” References: <i>Audet, M. 2016. Results of sampling Effluent Streams from CNL’s Prototype Reactor Decommissioning Sites. 3640-509000-021-000. Revision 0. 2016 March 28.</i> <i>Canadian Standards Association (CSA). 2022. CSA Standard N288.5-22. Effluent and Emissions Monitoring Programs at Nuclear Facilities.</i> <i>Canadian Nuclear Laboratories (CNL). 2022. Nuclear Power Demonstration Effluent Monitoring Plan. 64-509200-PLA-001.</i> <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Johnson, D. 2022a. Detailed Decommissioning Plan Nuclear Power Demonstration Waste Facility. 64-508310-DDP-001 Revision 3.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i> <i>Ontario Ministry of the Environment (MOE). 2011c. Rationale for the Development of Soil and Groundwater Standards for use at Contaminated Sites in Ontario, Report PIBS7386e01, 2011 April.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
96	CNSC	Section 8.3.4 Surface Water Quality	p.8-45	Comment: Section 8.3.4.1 states that chemical levels in surface water in the part of the Ottawa River located in the Site and Local Study Areas are not available. If these data have not been obtained, how can follow-up monitoring of the surface water environment be reliably conducted and contrasted during the undertaking and completion of the project in order to demonstrate chemical contaminants are not entering the Ottawa River? Expectations to Address Comment: Given the stipulations in CSA N288.4-10, <i>Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills</i> (Sections 5.2.1 and 5.2.2), please justify why it is unnecessary to have baseline chemical data of the Ottawa River within the Site and Local Study Areas prior to commencement of the project. Acquiring this data would help develop a robust description of the baseline environment in order to reliably demonstrate that the project is not impacting surface water quality in the Ottawa River during follow-up monitoring.	Incorporated: As a first step of follow-up monitoring, CNL is planning baseline monitoring of surface water (the Ottawa River) for radiological and non-radiological parameters that are relevant to the project. Chemical parameters that will be monitored are iron, lead, mercury, PCBs and dioxins/furans. These are the chemical parameters that are relevant to the facility, identified during a comprehensive characterization of effluents in 2015 to support the development of an Effluent Verification Monitoring Plan compliant with CSA N288.5. The baseline monitoring will take place before the project begins, to provide a basis of comparison for future follow-up monitoring. Monitoring will take place upstream from NPD, offshore of the facility and downstream of NPD. Details of proposed monitoring parameters, locations and frequency for the Ottawa River are described in the Draft Environmental Follow-up Monitoring Plan, submitted to the CNSC in 2018 October (McKee and Kovacs 2018) along with a Draft Effluent Follow-up Monitoring Plan (Gilbert and Kovacs 2018) and Draft Groundwater Follow-up monitoring plan (Kovacs 2018). Each plan was developed in accordance with the corresponding CSA standards (N288.4, N288.5 and N288.7). The follow-up monitoring plans are complete documents but include the word "Draft" to reflect the fact that CNL is not finalizing the plans until feedback from interested parties including Indigenous Nations, communities, and organizations is received. The plans will be finalized only after an EA decision is reached, so that any monitoring requirements outlined in the Commission decision may be incorporated into the plans. Change to EIS: Section 12 of the EIS has been revised to include the text below, to reflect how any additional baseline required data will be collected prior to the commencement of the project. Note the text refers to baseline monitoring in a general sense because baseline data will be collected for various environmental components (e.g. sediment, noise, ambient radioactivity etc) not just surface water: “Evaluation criteria were developed for each environmental media, location and parameter identified. These criteria are used as a framework for evaluate the monitoring data and determining the appropriate response, and are based on the following: - Site-specific baseline data (collection of any additional baseline data required will be initiated before commencement of the project); - Environmental concentrations predicted as part of the EIS and TSDs; and, - Relevant guidelines (e.g., CCME Water Quality Guidelines, Health Canada Guidelines for Drinking Water Quality).” References: <i>Canadian Standards Association (CSA). 2019. CSA Standard N288.4-19. Environmental Monitoring Programs at Nuclear Facilities and Uranium Mines and Mills.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Canadian Standards Association (CSA). 2023. CSA Standard N288.7-23. Groundwater Protection and Monitoring Programs for Nuclear Facilities and Uranium Mines and Mills.</i> <i>Canadian Standards Association (CSA). 2022. CSA Standard N288.5-22. Effluent and Emissions Monitoring Programs at Nuclear Facilities.</i> <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i>
97	ECCC	Section 8.3.5 Sediment Quality	p.8-51	Comment: In 2014, a river sediment study near the NPD outfall pipe was conducted. The radiological parameter Cs-137 and a set of Naturally Occurring Radioactive Materials (K-40 and U-238 decay series radionuclides) were reported for about 30 stations, both upstream and downstream of the NPD outfall pipe. In 2016, sediment samples were collected at 16 locations both upstream and downstream of the NPD site. The 2016 samples were collected 15 centimeters below the “ground” surface, and were analyzed for metals. With respect to the 2014 study, it is not clear at what depth below sediment surface the radiological samples were collected. With respect to the 2016 study, there is no information with respect to spatial distribution of the sampling stations for the campaign. It is not possible to identify areas with potentially elevated levels of metals without an understanding of the spatial locations of the stations along with a station-to-station analysis of the data. It also is not clear if the depth of the 2016 samples is appropriate to capture the influence of the NPD site, because no additional information on natural sediment depositional rates was given. Expectation to Address Comment: A more detailed assessment of the adequacy of the baseline sediment data is not possible without the additional information requested as follows: • Provide information on the natural depositional rates in the Ottawa River • Provide a justification for the depth of sediment sampling, in consideration of the historical period that the NPD facility has operated and existed	Incorporated As: Studies conducted in the Ottawa River near the Chalk River Laboratories (CRL) site indicate that typical natural sediment deposition rates, which vary with water depth, range from about 0.5 to 1.5 mm/yr (Rowan 2013). In the 2014 river sediment study (Lee 2014), grab samples were taken using a dredge device which sampled a maximum depth of 10.5 cm. For the 2016 Study (Golder 2017b), grab samples were collected from the top 15 cm of sediment. In 2021, another study was completed (Bond and Carr 2021) where sediment samples were collected from four water column depth bins: 0-5, 5-10, 10-15, and 15-20 m deep. Assuming a deposition rate of 1.5 mm/yr (i.e., the highest Ottawa River sedimentation rate documented in (Rowan 2013), sediment would have accumulated to a depth of 9.3 cm over the past 62 years (since the start of NPD operations in 1962). Although the sedimentation rate documented in (Rowan 2013) may not apply to the Ottawa River near NPD, analysis of the top 10 - 15 cm sediment at NPD (Lee 2014 and Golder 2017b) indicate no adverse impacts from the NPD facility, and the NPD Closure Project does not involve disturbance to sediments. A map that identifies the 2016 sediment sampling locations from (Golder 2017b) has been added to Section 8.3.5 of the EIS (Figure 8.3-11). Note that as part of the study, 16 sediment samples were collected. An arbitrary eight of these were analyzed initially as a scoping effort. From these 8 samples, concentrations of the metals at downstream sampling locations were slightly above the lowest federal or provincial guideline levels but were well below guidelines identified with potential adverse effects on aquatic life. Accordingly, it was decided that the remaining 8 samples did not require analysis. Table 8.3-12 of the EIS shows a summary of sediment analysis results for non-radioactive analytes from Golder 2017b (metals and non-metals). Detailed results per sampling site is located in Table E3 of Golder 2017b. Due to the length of the full results table, a summary table was included in the EIS. Section 8.3.5.1 states that non-radiological contaminant concentrations of all samples were below the CCME Probable Effect Levels. Except for a few samples, the concentration of analyzed contaminants met the OREG153 Table 8 Site Condition Standards for sediment for all property uses and CCME Interim Sediment Quality Guidelines (ISQG). Based on the type, magnitude and distribution of exceedances, it is considered unlikely that the CNL NPD Site has contributed to the elevated levels of select contaminants in the Ottawa River sediment. With respect to radiological sampling parameters, the 2014 study (Lee 2014) was limited in scope. The purpose was to search for and quantify the presence of gamma-emitting isotopes in the surficial sediments, specifically to search for possible radioactive particles (particles containing Cs-137).

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				- Provide a map that identifies the 2016 sediment sampling locations, along with a metals analysis at each of the 16 stations sampled - Demonstrate that radiological sampling parameters were appropriate to those that could potentially be associated with releases from the NPD facility (e.g., fission and activation products, such as Cs-137, Ac-228). Additional sampling may be required.	In 2017, a characterization campaign was undertaken (McVeigh 2018b) which involved analysis of sediment for radiological parameters appropriate for the NPD facility. In this campaign, Ottawa River sediment samples were obtained from a small boat using a Ponar sampler. Eight random samples were retrieved from an area upstream of the NPD outfalls and eight from an area immediately downstream of the NPD outfalls. Results of this study are shown in Table 8.3-9 of the EIS. All radionuclides are well below the Unconditional Clearance Criteria, Schedule 1, SOR2000-207 Nuclear Substances and Radiation Device Regulations. Comparison of upstream and downstream data using the appropriate statistical test (Wilcoxon Mann-Whitney), shows that the sediments immediately downstream of the NPD river outfalls are comparable to the upstream area. This demonstrates that the sediment tritium concentrations at the NPD site are non-impacted and are below the unconditional clearance criteria (SOR 2000-207). The most recent study was completed in 2020 June, CNL undertook sediment sampling in the Ottawa River to better understand baseline conditions in the context of EA follow-up monitoring (Bond and Carr 2021). Sediment was sampled along seven transects, five of which are located partly within the Site/Local Study Area and extend into the Regional Study Area. The remaining two transects (transects 1 and 7) are located within the Regional Study Area and include an upstream reference transect as well as a downstream transect at Deep River. Within each transect, a sediment sample was collected from each of four water column depth bins: 0-5, 5-10, 10-15, and 15-20 m deep. The transect locations are shown in Figure 8.3-10. All radionuclides analyzed for were below the unconditional clearance criteria (SOR 2000-207). The only anthropogenic radionuclide detected in Ottawa River sediments was Cesium-137. Cesium-137 in sediments upstream of CRL is due to atmospheric nuclear weapon tests during the early 1960s. A summary of the results are shown in Table 8.3-10. Change to EIS: A map that identifies the 2016 sediment sampling locations from (Golder 2017b) has been added to Section 8.3.5 of the EIS as Figure 8.3-11. The following text has been added to Section 8.3.5 which summarizes the results of the Golder 2017b sediment study for non-radiological parameters: “Non-radiological contaminant concentrations of all samples were below the CCME Probable Effect Levels. Except for a few samples, the concentration of analyzed contaminants met the O REG 153 Table 8 Site Condition Standards for sediment for all property uses and CCME Interim Sediment Quality Guidelines (ISQG). Based on the type, magnitude and distribution of exceedances, it is considered unlikely that the CNL NPD Site has contributed to the elevated levels of select contaminants in the Ottawa River sediment.” Table 8.3-12 of the EIS shows a summary of results of sediment analysis for non-radioactive analytes from Golder 2017b (metals and non-metals) Table 8.3-9 shows results from (McVeigh 2018b) for sediment sampling and analysis of radiological parameters appropriate for the NPD facility, and Section 8.3.5 describes the results of the study. All radionuclides are well below the Unconditional Clearance Criteria, Schedule 1, SOR2000-207 Nuclear Substances and Radiation Device Regulations. Comparison of upstream and downstream data using the appropriate statistical test (Wilcoxon Mann-Whitney), shows that the sediments immediately downstream of the NPD river outfalls are comparable to the upstream area. This demonstrates that the sediment tritium concentrations at the NPD site are non-impacted and are below the unconditional clearance criteria (SOR 2000-207).

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					A summary of the sediment sampling results completed by Bond and Carr (2021) was added to Section 8.3.5.1 of the EIS, with relevant Figures (8.3-10) and Tables (8.3-10 and 8.3-11). References: <i>Bond, M. and J. Carr. 2021. Baseline Conditions for Ottawa River Sediment, Benthic Invertebrates and Fish Habitat Features near NPD. 64-509246-ENA-001. Revision 0. 2021 May 6.</i> <i>Golder Associates Limited. 2017b. Environmental Site Assessment Report – NPD Closure Project. 64-509410-REPT-006. Revision 0.</i> <i>Lee, D. 2014. Radioactivity in the Bed of the Ottawa River near the Nuclear Power Demonstration Generating Station. 64-509243-REPT-001.</i> <i>McVeigh, A. 2018b. NPD Balance of Site Characterisation Report. 64-509410-REPT-009. Revision 0.</i> <i>Rowan, D. 2013. Sediment Accumulation Rates of Ottawa River Sediments - Determined by Cs-137, Am-241 and Pb-210 Profiles. AECL Report: 175-121270-REPT-004. 2013 August.</i>
98	CNSC	Section 8.3.5 Sediment Quality, Tables 8.3-8 and 8.3-9 Also applicable to the Postclosure Safety Assessment Technical Supporting Document, Table 5-5, p.5-14	p.8-53 to 8-54	Comment: In the Postclosure Safety Assessment TSD (in Table 5-5), a maximum tritium concentration of 2000 Bq/kg is predicted in sediments, 40 years into the Institutional Controls phase. How does this value compare to current tritium concentrations in sediments around the NPD site? Tritium seemingly has not been included in the suite of radionuclides analyzed in Tables 8.3-8 and 8.3-9. Is there tritium data available from sediment samples around the NPD site to describe baseline conditions? Expectations to Address Comment: Please indicate if tritium data is available for the sediment sample locations described in Tables 8.3-8 and 8.3-9. If no tritium data is available, CNL should justify why no analysis of river sediments for tritium were conducted, especially considering it is estimated to be the primary contributor of radiation in river sediment predicted in the post closure TSD.	Incorporated: The sediment analysis results from the 2014 study (Lee) were designed only to search for and quantify the presence of gamma-emitting isotopes in the surficial sediments, specifically to search for possible radioactive particles (particles containing Cs-137). A Phase Two Environmental Site Assessment (Golder 2017b) of the NPD property was completed over 2016 and 2017. In that sampling campaign, Ottawa River sediment samples were obtained from a small boat using a Ponar sampler (McVeigh 2018b). Eight random samples were retrieved from an area upstream of the NPD outfalls and eight from an area immediately downstream of the NPD outfalls. Average upstream tritium concentrations were 0.003 Bqg⁻¹, and average downstream concentrations were 0.002 Bqg⁻¹. For reference, the criterion for tritium in the Unconditional Clearance Criteria (SOR 2000-203) is 100 Bqg⁻¹. Comparison of upstream and downstream data using the appropriate statistical test (Wilcoxon Mann-Whitney), shows that the sediments immediately downstream of the NPD river outfalls are comparable to the upstream area. This demonstrates that the sediment tritium concentrations at the NPD site are non-impacted and are below the unconditional clearance criteria (SOR 2000-207). The results from this study (McVeigh 2018) are shown in Table 8-3.9. A more recent study (Bond and Carr 2021) was completed in 2020 June. CNL undertook sediment sampling in the Ottawa River to better understand baseline conditions in the context of EA follow-up monitoring. Sediment was sampled along seven transects, five of which are located partly within the Site/Local Study Area and extend into the Regional Study Area. The remaining two transects are located within the Regional Study Area and include an upstream reference transect as well as a downstream transect at Deep River. Within each transect, a sediment sample was collected from each of four water column depth bins: 0-5, 5-10, 10-15, and 15-20 m deep. Tritium was analyzed in the samples collected. All of the samples collected observed results below the minimum detection limit for tritium, and therefore are below the Unconditional Clearance Criteria (SOR 2000-203). Change to EIS: Section 8.3.5 of the EIS has been updated to include additional baseline sediment data from the 2016/2017 Phase Two ESA campaign and 2020 Bond and Carr study.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Table numbers have changed where Table 8-3.8 show sediment sampling locations and Table 8.3-9 show results from the 2018 McVeigh study. References: <i>Bond, M. and J. Carr. 2021. Baseline Conditions for Ottawa River Sediment, Benthic Invertebrates and Fish Habitat Features near NPD. 64-509246-ENA-001. Revision 0. 2021 May 06.</i> <i>Golder Associates Limited. 2017b. Environmental Site Assessment Report – NPD Closure Project. 64-509410-REPT-006. Revision 0.</i> <i>Lee, D. 2014. Radioactivity in the Bed of the Ottawa River near the Nuclear Power Demonstration Generating Station. 64-509243-REPT-001.</i> <i>McVeigh, A. 2018b. NPD Balance of Site Characterisation Report. 64-509410-REPT-009. Revision 0.</i> <i>Unconditional Clearance Criteria, Schedule 1, SOR2000-203 Nuclear Substances and Radiation Device Regulations</i>
99	CNSC	Section 8.3.5 Sediment Quality, Tables 8.3-8 and 8.3-9	p.8-53 to 8-54	Comment: Tables 8.3-8 and 8.3-9 present results for a subset of sample locations shown in Figures 8.3-10 and 8.3-11. No explanation is provided for why 8 sampling locations were selected to conduct a 24-hour count analysis, while 22 sampling locations were selected to conduct a 4-hour count analysis. For some locations, no results are presented in Tables 8.3-8 and 8.3-9 (e.g. P-31, P-32, P-33, etc.). Expectation to Address Comment: Please explain the distribution of results in Tables 8.3-8 and 8.3-9, and why not all locations are associated with sample results in these tables.	Incorporated: Section 8.3.5 has been changed to focus on more recent sediment sampling studies such as McVeigh 2018 and Bond and Carr 2021. Results from Lee 2014 and no longer summarized in this section. Nevertheless, with respect to why some samples were counted for 4 hours and some were counted for 24 hours, the sediment survey (Lee 2014) was conducted with the assumption that the sediments in a specific zone directly downstream of the process outflow would have a greater concentration of potential radionuclides. The shape of this zone was based on studies of the contaminated footprint at CRL. (Lee et al. 2009; Lee and Hartwig 2010). CNL selected the samples located within the zone of expected elevated radionuclide concentrations for the 24 hr count time to yield the lowest MDA (Minimum Detectable Activity) values and the best counting statistics for those samples found in the area of highest risk of encountering gamma emitters. In addition to the sediment grab samples being collected, a towed gamma probe survey was also conducted. The survey results and gamma spectrum results showed an essentially homogeneous (background) distribution of gamma readings. Thus there was no observable trend in radiological elevated conditions.” The results from this study (Lee 2014) are no longer included in Section 8.3.5, since results from more recent studies (McVeigh 2018 & Bond and Carr 2021) are shown instead. Change to EIS: Section 8.3.5 of the EIS has been updated to include additional baseline sediment data from the 2016/2017 Phase Two ESA campaign and 2020 Bond and Carr study. Table numbers have changed where Table 8-3.8 show sediment sampling locations and Table 8.3-9 show results from the 2018 McVeigh study. References: <i>Bond, M. and J. Carr. 2021. Baseline Conditions for Ottawa River Sediment, Benthic Invertebrates and Fish Habitat Features near NPD. 64-509246-ENA-001. Revision 0. 2021 May 06.</i> <i>Lee, D.R.2009, D.S. Hartwig, and J. Roche Sediments of the Ottawa River near CRL: Gamma Probe Survey and Inventory of Radioactivity. AECL Report. 175-121270-REPT-001, Revision 1.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Lee, D.R., and D.S. Hartwig. 2010. Seasonal and Spatial Variations in River Temperature in the Ottawa River in the Region of the NRU Process Cooling Water Discharge. Memo EnvP-121241-021-000.</i> <i>Lee, D.R 2014. Radioactivity in the Bed of the Ottawa River near the Nuclear Power Demonstration Generating Station. 64-509243-REPT-001.</i> <i>McVeigh, A. 2018b. NPD Balance of Site Characterisation Report. 64-509410-REPT-009. Revision 0.</i>
100	Health Canada, MOECC	Section 8.3.5 Sediment Quality	p.8-55	Comment: Several issues were identified with respect to the analysis of non-radiological parameters in sediment. ☐ No differentiation is made between sediment quality upstream and downstream of the facility outfalls. ☐ When collecting samples in support of establishing natural background conditions, samples should be collected from an area with similar environmental conditions located away from potential anthropogenic contamination. However, no information is provided with respect to the selection of sampling sites (i.e., water depth or current, depositional areas) or substrate characteristics (i.e. grain size, organic content, etc.). ☐ Upon examination of individual sample results, it is noted that, while there are no exceedances of applicable standards upstream of the NPD site, some metals exceed guideline values at downstream stations (i.e., exceedances of standards for nickel, copper, arsenic and cadmium). This may suggest some influence from the site (i.e., discharge of effluent from WAS or subsurface drains with elevated concentrations of metals, or seepage of impacted groundwater to the river). Expectation to Address Comment: Please provide a more detailed assessment to better inform decisions on acceptable release criteria and to permit more reliable monitoring for potential impacts. Establish acceptable release criteria to prevent further deterioration of sediment quality for parameters exceeding applicable guidelines at downstream stations. In addition, demonstrate that the sample locations have not been impacted by anthropogenic sources and are reflective of natural background conditions.	Incorporated: A map from the Phase II Environmental Site Assessment Report (Golder 2017b) has been added to Section 8.3.5 (Figure 8.3-11) of the EIS, showing sediment sampling locations immediately upstream (samples SA-010, SA-012 and SA-013) and downstream (samples SA-001, SA-002, SA-003, SA-004 and SA-008) of the NPD facility. A Table (Table 8.3-8) has also been added to Section 8.3.5 of the EIS showing depth of water and sediment description at these sampling points. Sediments in downstream areas had slightly higher concentrations of some metals (arsenic, copper, cadmium, chromium and nickel) compared to upstream areas but concentrations were only marginally higher than in upstream sampling locations. Concentrations of the metals at downstream sampling locations were slightly above the lowest federal or provincial guideline levels, but were well below guidelines identified with potential adverse effects on aquatic life as summarized below. The acronyms used in the text below are: CCME PEL: Canadian Council of Ministers of the Environment, Canadian Sediment Quality Guidelines for the Protection of Aquatic Life - Probable Effects Levels - freshwater (CCME 2001) MOECC PSQG SEL: Ministry of the Environment and Climate Change (now Ministry of the Environment, Conservations and Parks) Provincial Sediment Quality Guidelines Severe Effect Level (MOE 2008) MOECC PSQG LEL: Ministry of the Environment and Climate Change (now Ministry of the Environment, Conservations and Parks) Provincial Sediment Quality Guidelines Lowest Effect Level (MOE 2008) Reg 153: Ontario Regulation 153/04 - Records of Site Condition - Part XV.1 of the Environmental Protection Act (MOE 2011b) CCME ISQG: Canadian Council of Ministers of the Environment Interim Sediment Quality Guidelines (CCME 2001) CSQGs: Canadian Sediment Quality Guidelines (CCME 2001) Arsenic: the highest concentration measured was 10 µg/g at SA-002 (downstream of NPD) with other downstream concentrations ranging from 7.4 µg/g to 9.1 µg/g. By comparison the CCME PEL for arsenic is 17 µg/g. The PEL is the level at which adverse effects on some sensitive species could occur. Upstream ambient concentrations ranged up to 3.5 µg/g. Copper: exceeded the MOECC PSQG LEL/Reg 153 Table 8 guideline of 16 µg/g at three downstream locations downstream, ranging from 17 µg/g (just above the guideline) to a high of 21 µg/g at SA-008. The maximum value is below the CCME ISQG for copper of 35.7 µg/g and well below the PEL of 197 µg/g. Upstream ambient concentrations ranged from 12 to 15 µg/g.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Cadmium: the highest concentration measured downstream was 0.61 µg/g compared to the CCME ISQG and MOECC PSQG LEL of 0.6 µg/g. The measured concentration is within the laboratory measurement error and this value is not considered to be significant. the average upstream concentration was 0.36 µg/g Chromium: a single exceedance of the MOECC PSQG LEL for chromium (16 µg/g) was recorded in downstream location SA-008. The concentration of 28 µg/g measured at SA-008 was below the CCME ISQG of 37.3 µg/g and is well below both the MOECC PSQG SEL of 120 µg/g and the CCME PEL of 90 µg/g. Upstream Cr concentrations ranged between 21 µg/g and 23 µg/g. Nickel: Ni exceeded the MOECC PSQG LEL of 16 µg/g at three of the downstream locations (SA-001, SA-002 and SA-008), ranging from 17 to 20 µg/g. Upstream concentrations were 16 µg/g. While the CCME has not provided CSQGs for Ni, the MOECC PSQGs provide an SEL of 75 µg/g. The highest measured concentration downstream was well below this potential effect concentration. Given that past releases (including past discharges of liquid effluent from the facility sumps into the Ottawa River) have not had a measurable adverse effect on sediment quality immediately downstream of the facility, developing release criteria to protect sediment quality is not recommended. A more recent study (Bond and Carr 2021) occurred in 2020 June, where CNL undertook sediment sampling in the Ottawa River to better understand baseline conditions in the context of EA follow-up monitoring. Sediment was sampled along seven transects, five of which are located partly within the Site/Local Study Area and extend into the Regional Study Area. The remaining two transects are located within the Regional Study Area and include an upstream reference transect as well as a downstream transect at Deep River. Within each transect, a sediment sample was collected from each of four water column depth bins: 0-5,5-10, 10-15, and 15-20 m deep. The results comparing the upstream and downstream results from this study are shown in Table 8.3-14 (radiological results) and Table 8.3-15 (non-radiological results). Simiarly to the results observed in McVeigh (2018), there were slightly elevated amounts of metals downstream of the facility, when compared to upstream. Regarding the comment to "demonstrate that the sample locations have not been impacted by anthropogenic sources and are reflective of natural background conditions.", the purpose of the Environmental Site Assessment (Golder 2017b) is to characterize the current baseline environmental conditions, as required in Section B.2 of the CNSC REGDOC-2.9.1, <i>Environmental Protection: Environmental Principals, Assessments and Protection Measures</i>, and not to demonstrate that the sample locations have not been impacted by anthropogenic sources. Change to EIS: A map from the Phase II Environmental Site Assessment Report (Golder 2017b) has been added to Section 8.3.5 (Sediment Quality) of the EIS, showing sediment sampling locations immediately upstream (samples SA-010, SA-012 and SA-013) and downstream (samples SA-001, SA-002, SA-003, SA-004 and SA-008) of the NPD facility. A table has also been added to Section 8.3.5 of the EIS showing depth of water and sediment description at these sampling points. Section 8.3.5 also includes a description of the sediment sampling results as provided in this disposition. Section 8.3.5 has also been updated to include a more recent sediment study (Bond and Carr 2021). References: <i>Bond, M. and J. Carr. 2021. Baseline Conditions for Ottawa River Sediment, Benthic Invertebrates and Fish Habitat Features near NPD. 64-509246-ENA-001. Revision 0. 2021 May 06.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Canadian Council of Ministers of the Environment (CCME). 2001. Canadian sediment quality guidelines for the protection of aquatic life, online. Updated 2012.</i> <i>Golder Associates Limited. 2017b. Environmental Site Assessment Report – NPD Closure Project. 64-509410-REPT-006. Revision 0.</i> <i>Ontario Ministry of the Environment (MOE). 2008. Guidelines for Identifying, Assessing and Managing Contaminated Sediments in Ontario May PIBS 6658e.</i> <i>Ontario Ministry of the Environment (MOE). 2011. Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act. 2011 July 01. https://www.ontario.ca/page/soil-ground-water-and-sediment-standards-use-under-part-xv1-environmental-protection-act</i>
101	Health Canada	Section 8.3.5 Sediment Quality	p.8-55 to 8-56	Comment: The location of background samples for non-radiological concentrations in sediment are purportedly shown on a map in Ethier and Hart 2013 and Golder 2017, without providing a summary of the results, conclusions and applicability to the NPD site. Expectation to Address Comment: Please include a figure in the EIS that clearly delineates sampling and reference locations, and demonstrate their appropriateness for this assessment.	Incorporated: The Ethier and Hart reference has been removed and replaced with the correct reference: <i>Silke R. and Wills A. 2012. CRL Ottawa River Sediment Remediation - Contaminants of Potential Concern (COPCs) Screening Level Review, 175-121250-REPT-005, November.</i> A map (adapted from Silke and Wills 2012) has been added to Section 8.3.5.2 of the EIS, showing the general areas of sediment sampling in the Ottawa River that represent background conditions. The results of Silke and Wills (2012) show that certain metals in Ottawa River sediment are elevated but not due to CNL operations. These metals are arsenic, cadmium, chromium, copper, lead, manganese, nickel, zinc and mercury. Sampling results were compared to federal benchmarks (CCME 2002) for arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), nickel (Ni), zinc (Zn) and mercury (Hg) or provincial benchmarks (MOE 2008) for manganese (Mn). A more recent study (Bond and Carr 2021) also assessed sediment in the Ottawa River and analyzed samples for metal parameters. The results observed in this study were similar to that of Silke and Wills (2012). Results from the metals analysis compaing upstream and downstream results are shown in Table 8.3-15. Please note that for the purposes of the EIS, the results were generalized to provide an overview of background sediment characteristics in the Regional Study Area to fulfill the requirements of Section B.2 of the CNSC’s REGDOC-2.9.1 (Environmental Protection: Environmental Principles, Assessments and Protection Measures). Change to EIS: The text in the “Non-Radiological” Section of 8.3.5.2 has been replaced with the following text: “Chalk River Laboratories has undertaken extensive sediment sampling campaigns in the Ottawa River, in particular Silke and Wills (2012) and Bond and Carr (2021). Silke and Wills (2012) included sediment sampling at background areas (as shown on Figure 8.3-12) and demonstrated that certain metals in Ottawa River sediment are elevated but not due to CNL operations. These metals are arsenic, cadmium, chromium, copper, lead, manganese, nickel, zinc and mercury. Sampling results were compared to federal guidelines (CCME 2001) for arsenic, cadmium, chromium, copper, lead, nickel, zinc and mercury or provincial benchmarks (MOE 2008) for manganese.” A map adapted from Silke and Wills (2012) has been added to the “Non-Radiological” Section of 8.3.5.2, showing the general areas of background sediment sampling.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					References <i>Bond, M. and J. Carr. 2021. Baseline Conditions for Ottawa River Sediment, Benthic Invertebrates and Fish Habitat Features near NPD. 64-509246-ENA-001. Revision 0. 2021 May 06.</i> <i>Canadian Council of Ministers of the Environment (CCME). 2002. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life: Summary Tables. In: Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg. Updated 2002. http://ceqg-rcqe.ccme.ca/en/index.html#void</i> <i>Ontario Ministry of the Environment (MOE). 2008. Guidelines for Identifying, Assessing and Managing Contaminated Sediments in Ontario: An Integrated Approach, PIBS 6658e.</i> <i>Silke R. and Wills A. 2012. CRL Ottawa River Sediment Remediation - Contaminants of Potential Concern (COPCs) Screening Level Review, 175-121250-REPT-005, Revision 0.</i>
102	Health Canada	Section 8.3.5 Sediment Quality	p.8-56	Comment: It is not clear what is meant by the following passage: “there were reported exceedances of several metals in both reference sites and sites affected by CRL operations. Due to the high levels in unaffected sites, these exceedances were considered to be baseline conditions.” Expectation to Address Comment: Please clarify whether the concentrations were similar at both reference sites and sites affected by CRL operations to justify the conclusion that exceedances were due to background conditions rather than existing contamination from CRL activities.	Incorporated: To clarify this section, the text in the “Non-Radiological” Section of 8.3.5.2 have been replaced with these words: “Chalk River Laboratories has undertaken extensive sediment sampling campaigns in the Ottawa River, in particular Silke and Wills (2012) and Bond and Carr (2021). Silke and Wills (2012) included sediment sampling at background areas (as shown on Figure 8.3-12) and demonstrated that certain metals in Ottawa River sediment are elevated but not due to CNL operations. These metals are arsenic, cadmium, chromium, copper, lead, manganese, nickel, zinc and mercury. Sampling results were compared to federal guidelines (CCME 2001) for arsenic, cadmium, chromium, copper, lead, nickel, zinc and mercury or provincial benchmarks (MOE 2008) for manganese.” A map adapted from Silke and Wills (2012) has been added to the “Non-Radiological” Section of 8.3.5.2, showing the general areas of background sediment locations. Furthermore, a more recent study (Bond and Carr 2021) occurred in 2020 June, where CNL undertook sediment sampling in the Ottawa River to better understand baseline conditions in the context of EA follow-up monitoring. Sediment was sampled along seven transects, five of which are located partly within the Site/Local Study Area and extend into the Regional Study Area. The remaining two transects are located within the Regional Study Area and include an upstream reference transect as well as a downstream transect at Deep River. Within each transect, a sediment sample was collected from each of four water column depth bins: 0-5,5-10, 10-15, and 15-20 m deep. The results observed in this study were similar to that of Silke and Wills (2012). Results from the metals analysis compaing upstream and downstream results are shown in Table 8.3-15. Please note that the sediment quality in the vicinity of the CRL site will not be summarized in the EIS as it is not relevant to the NPD Closure Project. The purpose of Section 8.3.5.2 is to provide background sediment characteristics in the Regional Study Area to fulfill the requirements of Section B.2 of the CNSC’s REGDOC-2.9.1 (Environmental Protection: Environmental Principles, Assessments and Protection Measures). Change to EIS: The text in the “Non-Radiological” Section of 8.3.5.2 has been replaced with the following text: “Chalk River Laboratories has undertaken extensive sediment sampling campaigns in the Ottawa River, in particular Silke and Wills (2012) and Bond and Carr (2021). Silke and Wills (2012) included sediment sampling at background areas (as shown on Figure 8.3-12) and demonstrated that certain metals in Ottawa River sediment are elevated but not due to CNL operations. These metals

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					are arsenic, cadmium, chromium, copper, lead, manganese, nickel, zinc and mercury. Sampling results were compared to federal guidelines (CCME 2001) for arsenic, cadmium, chromium, copper, lead, nickel, zinc and mercury or provincial benchmarks (MOE 2008) for manganese.” A map adapted from Silke and Wills (2012) has been added to the “Non-Radiological” section of 8.3.5.2, showing the general areas of background sediment locations. The Ottawa River sediment sampling study (Bond and Carr 2021) completed in 2020 June was also added to Section 8.3.5. References <i>Bond, M. and J. Carr. 2021. Baseline Conditions for Ottawa River Sediment, Benthic Invertebrates and Fish Habitat Features near NPD. 64-509246-ENA-001. Revision 0. 2021 May 06.</i> <i>Canadian Council of Ministers of the Environment (CCME). 2002. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life: Summary Tables. In: Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg. Updated 2002. http://ceqg-rcqe.ccme.ca/en/index.html#void</i> <i>Ontario Ministry of the Environment (MOE). 2008. Guidelines for Identifying, Assessing and Managing Contaminated Sediments in Ontario: An Integrated Approach, https://www.ontario.ca/document/guidelines-identifying-assessing-and-managing-contaminated-sediments-ontario</i> <i>Silke R. and Wills A. 2012. CRL Ottawa River Sediment Remediation - Contaminants of Potential Concern (COPCs) Screening Level Review, 175-121250-REPT-005, November.</i>
103	CNSC	Section 8.5.2 Geology	p.8-63	Comment: CNL states that the potential for liquefaction has not been assessed because the foundation of the NPDWF is well within the bedrock. Although the liquefaction of the overburden adjacent to the NPD foundation might not affect the structural integrity of the NPDWF, as the soils do not support the structure, it might compromise the integrity of the engineered barrier overlying the concrete cap depending on the barrier design (e.g., if part of the engineered barrier is overlying the overburden) and have implications on the safety of the facility. Expectation to Address Comment: Please determine if the liquefaction of the overburden would compromise the integrity of the engineered barrier. If the impact is likely, the liquefaction of the overburden should be assessed and its implication to the safety of the facility should be evaluated.	Resolved as: One of the main functions of the engineered cover to be placed over the closed NPD facility is to reduce the ingress of rain and meltwater into the facility. This role is important for approximately 100 years post-closure, until tritium concentrations in the facility have decayed sufficiently that tritium is not the primary contaminant of concern. The proposed Institutional Control period will extend for at least 100 years post-closure during which time surveillance will be performed (Taylor 2019), so any failure of the engineered cover during this time (liquefaction induced or otherwise) will be detected and repaired. After 100 years post-closure, failure of the engineered cover from any initiating event will not impact the performance of the facility. An analysis was undertaken (Arcadis, 2021b) to determine the impacts to stability of the north slope at NPDWF from seismic events of different magnitudes. The study concluded that the slope was stable during a 1:2,500 year earthquake, which is the design basis earthquake for the engineered cover, and thus the overburden would not liquefy under that event. In a 1:10,000 year event, which is the design basis event for the NPDDF, some local failures were expected at the toe of the north slope, in the saturated zone of the fluvial sand deposits at the base of the slope. These events were not considered to lead to further failures of the overall slope, and thus would not themselves have an undermining impact on the engineered cover. However, this event is well beyond the design basis for the engineered cover, so failure of the cover would be expected even if the overburden did not liquefy. If such an event were to occur in the Institutional Control period, an assessment would be undertaken to determine required repairs, and those identified repairs would then be conducted. Change to EIS: Section 9.14.7 has been revised to include: “An analysis was undertaken (Arcadis, 2021b) to determine impacts to the engineered cover resulting from seismic action on the slope north of NPD, for two seismic events. For a 1:2,500 year event, the slope is stable and thus no

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					impacts are anticipated to the engineered cover from liquefaction. For a 1:10,000 year event, failure of the cover itself is expected as this event is significantly beyond the design basis for the cover. However, there is only local-scale liquefaction failures anticipated for the north slope, and thus would not lead to liquefaction of the overburden surrounding the facility. Should an event of this magnitude occur during the proposed Period of Institutional Control, an assessment would be undertaken to determine required repairs to the overall NPDDF including the engineered cover, and those identified repairs would then be conducted.” Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound. References: <i>Arcadis. 2021b. Slope Stability Assessment, Nuclear Power Demonstration Waste Facility, 64-509410-REPT-016, Revision 0.</i> <i>Taylor, A. 2019, Surveillance Plan for Institutional Control Phase – NPD Disposal Facility, 64-508640-PLA-001 Revision 0.</i>
104	CNSC	Section 8.5.2 Geology Also applicable to the Postclosure Safety Assessment Technical Supporting Document	p.8-63 to 8-65	Comment: The location of the project within the Ottawa-Bonnechere graben – the structure of regional importance with respect to active seismicity in this part of the world – is not proportionate with the very limited baseline information provided to support the EIS. This insufficiency of information affects CNSC staff’s ability to evaluate the safety assessment scenarios and long-term safety case for the proposed project. The existing geological environment is characterized over only a few pages in the main EIS, providing an extremely limited overview of the geosphere. This information is required to assess a project of this scope and scale, which proposes to safely isolate and contain the radioactive source material for many tens of thousands of years. There are no scientific or technical references provided for the regional or site geology that refer to the published peer-reviewed literature. Section 8.5.2 refers to King (2017) and McCrank (2016). King (2017) is a historical site assessment made for the NPD site; McCrank is a geological model prepared for the CRL site, and is not specific to the NPD site. The scientific literature appears not to have been consulted. There appears to have been almost no site-specific characterization of the geological and hydrogeological environment, to verify and constrain statements made throughout the EIS and supporting documents.	Incorporated As: The NPD Closure Project has conducted a significant amount of additional field work to ensure sufficient information is available to describe the baseline geological conditions consistent with the requirements of CNSC’s REGDOC 2.9.1. This includes: - Completion of additional geological site characterization - Preparation of a Geosynthesis Report (consistent with REGDOC 2.9.1) - Revisions to the Groundwater Model to incorporate the new geological site characterization data. The EIS has been updated to include information from the Geosynthesis report (Geosynthesis TSD), including: - Physiography; - regional and local structural geology; - elevation (topography); - surficial geology; - bedrock geology; - bedrock structures; - mineralogy; - petrology; - lithogeochemistry; - economic geology; - seismicity; and

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Information is either not provided (e.g., documentation of the structural geology at local and regional scales, geological setting and history of the region, tectonic setting, three-dimensional geological framework model) or limited (e.g., characterization of the seismic hazard of the site [linked to regional geological structures and the tectonic setting, potential for fault / shear zone reactivation], characterization of overburden materials, such as their physical, hydrogeological, mechanical, and geochemical properties). This will impact both the environmental effect and safety assessments. For instance, the existence of large-scale discontinuities at or near the facility might constitute preferential groundwater flow and contaminant migration pathways, impacting the safety of the facility. Expectation to Address Comment: Please provide a synthesis of the complete geosphere characteristics that are relevant for this project to support the EIS and the safety assessment, and as an important component of the overall safety case. Please review and refer to the scientific literature.	slope stability & liquefaction potential. The latest Iteration of the Postclosure Safety Assessment Technical Supporting Document (PostSA TSD) has utilized the site-specific geological characterization data obtained from the additional field work carried out at the NPD site as well as the findings described in the Geosynthesis Report (Geosynthesis TSD). Change to EIS: The NPD Closure Project has updated Sections 8.5.2 and 8.12.2 in the EIS to include a summary of the baseline geological information as described in the Geosynthesis Report. References: <i>Geosynthesis TSD:</i> Raven, K., Sterling, S. and Calder, N. 2022. 2021 Update to Geosynthesis Nuclear Power Demonstration Closure Project Rolphton, Ontario. 64-509410-REPT-010. Revision 2. Prepared by Arcadis and Geofirma for CNL. <i>PostSA TSD:</i> Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.
105	CNSC	Section 8.5.2 Geology	p.8-65	Comment: The description of the existing geological environment is not consistent with CNSC’s REGDOC-2.9.1. Bedrock geology is only briefly described in a few hundred words on page 8-65 (Section 8.5.2.2 Regional study area). No maps were provided (the bedrock geology map of Ontario and the Wikipedia map provided in Appendix B of the Postclosure Safety Assessment TSDare insufficient for this project). Though reference is made to a descriptive geological site model that was completed for the CRL site, this model is not provided in the submission – and would likely not represent the conditions at the NPD site. Section 8.5.2 appears to be the section that will provide the information to meet the requirement for baseline geological information in the EIS, as outlined in CNSC’s REGDOC 2.9.1 (Section B.4). This information is required for CNSC’s evaluation of the EIS and the VCs (refer to Comment no.68). The EIS should include a geological model that incorporates the site characteristics (e.g., overburden characteristics, bedrock characteristics), and that explicitly states uncertainties in the model, as well as any need for further characterization field work that would be required to reduce those uncertainties. Expectation to Address Comment:	Incorporated: The NPD Closure Project has conducted a significant amount of additional field work to ensure sufficient information is available to describe the baseline geological consistent with the requirements of CNSC’s REGDOC 2.9.1. This includes: - Completion of additional geological site characterization; - Preparation of a Geosynthesis Report (consistent with REGDOC 2.9.1); and - Revisions to the Groundwater Model to incorporate the new geological site characterization data. The EIS has been updated to include information to from the Geosynthesis report, including: - Physiography; - regional and local structural geology; - elevation (topography); - surficial geology; - bedrock geology; - bedrock structures; - mineralogy; - petrology; - lithogeochemistry; - economic geology;

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Please provide a full description of the geosphere to support the EIS and fulfill the requirement for baseline geological information of the existing environment. Consistency should be ensured with CNSC’s REGDOC-2.9.1. This information will support assessments of the NPD site’s future evolution, over the extended safety assessment timeframe.	• seismicity; and • slope stability & liquefaction potential. Change to EIS: The NPD Closure Project has updated Sections 8.5.2 and 8.12.2 in the EIS to include a summary of the baseline geological information as described in the Geosynthesis Report. References: <i>Geosynthesis TSD: Raven, K., Sterling, S. and Calder, N. 2022. 2021 Update to Geosynthesis Nuclear Power Demonstration Closure Project Rolphoton, Ontario. 64-509410-REPT-010. Revision 2. Prepared by Arcadis and Geofirma for CNL.</i>
106	ECCC	Section 8.5.3 Soil Quality Also applicable to the Baseline Report (Wills 2013), Section 5.2.5 Soil, Tables 5-26 to 5-28	p.8-65	Comment: The only reported soil baseline data for radionuclides in the vicinity of the NPD site includes: ☐ A monitoring record of tritiated water (HTO) in soil at 8 sampling stations around the NPD site from 1988-2015 ☐ A 1996 sampling campaign for gamma emitting radionuclides in soil The 1996 data reported naturally occurring radionuclides, Cs-137 and Ac-228, as well as gross alpha and gross beta, which comprise a reasonable set of relevant radionuclides for the NPD facility. However, since 1996, HTO has been the only radiological constituent reported in the EIS for soil. Also, for both sampling programs, no maps were provided to show the locations that were sampled. This made it difficult to interpret the soil data, and to identify if the sampling programs provide adequate baseline information. Regarding baseline non-radiological soil surveys, a few soil sampling campaigns took place between 1989 and 2008 at the NPD site. It is noteworthy that the 1990 sampling campaign also analyzed for metals, oil, grease and PCBs. Tables 5-26 to 5-28 of the Baseline Report (Wills 2013) show the results from borehole samples, but no information is given related to the depths of the boreholes or at what depth the samples were taken. Also, no map is provided in this document to show where the sampling stations are. Figure 8.5-4 of the main EIS seems to include soil sampling station names that correspond to the stations that are reported in the Baseline Report, but this has not been clarified. Even so, Test pit site TP-N, which shows elevated levels of some metals, PCB’s and Phenols, is not visible on Figure 8.5-4. Although almost all of the hydrocarbon / organics data reported seem to be below detection limits, there are some parameters (e.g.,	Incorporated: A Phase Two Environmental Site Assessment (Phase Two ESA) of the NPD property was completed and documented in 2016 and 2017. At the time of preparation of the draft EIS, data for only metals in the soils and sediment were available. Since then, more detailed information is available on the baseline soil quality. The Phase Two ESA was undertaken with the general objective of determining the environmental condition of the NPD site in terms of Contaminants of Potential Concern (COPCs), both radiological and chemical parameters, relative to both federal and provincial environmental standards for more sensitive land uses (i.e., Residential/Parks/Institutional Property). CNL applied O.Reg 153/04 for the purposes of the Phase Two ESA as best practice/due diligence. Furthermore, the characterization has been completed to the appropriate requirements set forth in CSA Z769 (Phase II Environmental Site Assessment) as well as CSA N292.5-11 (Guideline for the exemption or clearance from regulatory control of materials that contain, or potentially contain, nuclear substances). The comprehensive Phase Two ESA included field sampling of soil, sediment and groundwater and analysis for all COPCs at target locations across the NPD site. To ensure the requirements of CSA N292.5-11 were met, a statistical rationale was used for the selection of sample locations based on a 95 percent upper confidence level. Further the entire site was subdivided into characterization units and the density of sampling was based on risk of historic impact. In total, over 400 soil samples were collected and analyzed for radiological and conventional parameters. Soil sample depths varied by area depending on risk of historic impact but were generally 0 to 0.15 meters below ground surface and extending up to 0.30 meters where subsurface sources may be present. Soil boreholes were extended into Landfill 1 to the same depth of waste fill for subsurface soil assessment. The Phase Two ESA also included the assessment of 24 groundwater samples collected from monitoring wells and sediment quality at 16 locations in the Ottawa River upstream, adjacent to and downstream of the NPD site. Samples were submitted for analysis of both radiological and chemical parameters. The selection of parameters for environmental media was based on a systematic process which includes historical reviews of previous campaigns, identification of potential sources of contamination and conceptual models. As a result, all soil samples were submitted for one or more selected chemical COPCs where indications of chemical COPC field impact were present. Soil samples in the 2016 and 2017 ESA campaign were submitted for one or more of the following: metals, Petroleum Hydrocarbons (PHCs), Polycyclic Aromatic Hydrocarbons (PAHs), Volatile Organic Compounds (VOCs), gamma-emitting fission and activation products, tritium, carbon-14, strontium-90 and isotopic plutonium. The NPD Closure Project assessed and prepared the Phase Two ESA Report (Golder 2017b) for the chemical COPCs in accordance with O.Reg 153/04 using both Ministry of Environmental and Climate Change (MOECC) standards and Canadian Council of Ministers of the Environment (CCME) environmental quality guidelines. CNL prepared a

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				2,4,6 Trichlorophenol) for which the detection limits are higher than the guidelines for Residential / Parkland (0.05ug/g vs 0.5ug/g). Furthermore, it would have been useful to use the 2016 campaign to confirm previous findings regarding hydrocarbon levels and identify if any residual contamination exists. A more recent soil sampling campaign for metals was reported to have been conducted in 2016. Sampling was conducted at 96 locations throughout the NPD exclusion area; however, none of those sites are identified on a map. It is not possible to interpret the monitoring data without a spatial understanding of the sampling locations. Expectation to Address Comment: A more detailed assessment of the adequacy of the baseline soil data is not possible without the additional information requested as follows: • Provide maps that clearly identify all soil sampling locations associated with the 1990 and 2016 sampling campaigns • Identify any monitoring results for which the detection limit is greater than the applicable guideline (e.g., some instances were noted in the 1990 campaign) • Provide the depths of the borehole samples that were collected in the 1990 soil sampling campaign • If available, hydrocarbon and organics data should be reported for the 2016 sampling campaign • In addition to the recent HTO data, provide current soil radiological information that includes other fission and activation products	Site Clearance Report (McVeigh 2018b) for the radiological COPCs in accordance with CSA N292.5-11 using the Nuclear Substances and Radiation Devices Regulations (SOR-2000-207). A summary of the soil conditions at the NPD site based on the findings of the 2016/2017 Phase Two ESA is as follows: • PAH impacts in two soil samples in close proximity to the main building. This is within an area which will become part of proposed waste disposal facility and covered with an engineered cover. • Along the shoreline of the Ottawa River a pile of debris was found during the Phase II ESA work. The majority of debris was cleared in Spring 2018 to the extent practical. The soil around the debris was found to have a phenanthrene concentration of 0.091 ug/g which was noted as an exceedance in Golder 2017b. However, the exceedance was identified based on a CCME Soil Quality Guideline for the Protection of Freshwater Life of 0.046 ug/g. (CCME 2010). This same guidance states that “if impact to surface water is not a concern, it is recommended to revert to the 1997 provisional SQGE for naphthalene and the 1991 Interim Soil Quality Criteria for phenanthrene”. These interim Soil Quality Guidelines show a benchmark value for phenanthrene of 43 ug/g for Soil and food ingestion (for Agricultural and Residential/Parkland use). Similarly, guidance from the Ontario Ministry of the Environment show standard values for phenanthrene in soil as 0.19 µg/g (Agricultural or other property use) and 0.69 µg/g (Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use). Since the area in question has phenanthrene values less than CCME Interim Soil Quality Criteria and Provincial soil standards, it does not require soil remediation. At two sites used historically for unauthorized dumping and vehicle maintenance, exceedances of metals (arsenic, copper, vanadium and zinc) and hydrocarbons were found. These two sites are located in close proximity of each other, in a forested area approximately 300 m south of the Main Building. The sites were likely used during the construction of NPD. The impacted soil was relocated next to the main building in 2018 spring (i.e. an area which will become part of proposed waste disposal facility and covered with an engineered cover). The contamination at these locations is shallow (less than 0.5 m meters below ground surface) and localized remediation has been completed and soil waste appropriately managed through CNL’s Waste Management Program. The assessment of the radiological results demonstrates that the soil conditions at the NPD site are non-impacted and measured radiological concentrations are below the unconditional clearance criteria (SOR-2000-207). Change to EIS: Section 8.5.3 of the EIS has been updated to include additional baseline soil data from the Phase II ESA (2017) and Balance of Site Characterization (2018) reports, and additional information from MacLarentech (1990). Specifically, the NPD Closure Project notes the following: • The EIS has been updated to include maps that identify soil sampling locations for both sampling campaigns; • Please note that there are no instances where the detection limit exceeded the applicable guidelines, in either MacLarentech (1990) or the Phase 2 ESA (2017); • A statement including the depths of the borehole samples from MacLarentech (1990) is now included in EIS Section 8.5.3; • The hydrocarbon and organic data from the Phase 2 ESA (2017) have been added to the EIS; and

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Additional radionuclide data has been added to Section 8.5.3 of the EIS from the Balance of Site Characterization report (2018). References: <i>Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. 2010. http://ceqg-rcqe.ccme.ca/download/en/320/.</i> <i>Canadian Standards Association (CSA). 2011. Guideline for the exemption or clearance from regulatory control of materials that contain, or potentially contain, nuclear substances. N292.5-11 (reaffirmed in 2021).</i> <i>Golder Associates Limited. 2017b. Environmental Site Assessment Report – NPD Closure Project. 64-509410-REPT-006. Revision 0.</i> <i>MacLarentech Inc. 1990. Rolphton NPD Waste Management Facility Site Characterisation and Facility Evaluation. Project No. 703725. Prepared for CNL. February.</i> <i>McVeigh, A. 2018b. NPD Balance of Site Characterisation Report. 64-509410-REPT-009. Revision 0.</i> <i>Ontario Ministry of the Environment, Soil, ground water and sediment standards for use under Part XV.1 of the Environmental Protection Act, 2011. https://www.ontario.ca/page/soil-ground-water-and-sediment-standards-use-under-part-xv1-environmental-protection-act#section-1</i>
107	Government of Quebec	Section 8.5.5 Hydrogeology	.8-76	Comment: Section 8.5.5 states: “Groundwater seepage into the facility is directed to the lowest point at the WAS and is less than 10 m3/a in the last 5 years.” In the long-term, this rate represents a significant amount of water. What are the concentrations of radioactive elements in this water? Expectation to Address Comment: Please address the above question and concern.	Resolved As: Concentrations of the radioactive parameters in the Wells Area Sump (WAS) are presented in Section 8.3.3 of the EIS. The baseline groundwater seepage does not necessarily reflect the seepage once the facility has been grouted. Resaturation modelling was completed using a two-phase flow code, simulating the transport of water and gas through porous medium (Sgro, 2023). While the facility is resaturating, groundwater flows are directed towards the interior of the facility. The time at which the total flow into the facility switches to flow leaving the facility is used to determine the time of resaturation. Once the facility is filled with grout, the length of time for facility resaturation is estimated to be approximately 85 years. Releases of radioactive elements in the groundwater are presented in Section 5.1.2.1 of the Postclosure Safety Assessment TSD. Following closure of the facility by grouting, concentrations in the surrounding groundwater are dominated by tritium, peaking at around 3,000 Bq/L in the bedrock at approximately 1 year after closure. In the overburden, groundwater tritium peak concentrations are comparatively lower, at approximately 0.04 Bq/L, due to higher flow rates in the overburden relative to bedrock (immediately outside the facility). By approximately 100 years, concentrations are less than 10 Bq/L. Current drinking water guideline for tritium is 7,000 Bq/L (Health Canada 2017). During post Institutional Control Phase the total radioactivity concentrations in groundwater is <10 Bq/L. References: <i>Sgro, N. 2023. 2023 Resaturation Modelling for the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-005 Revision 3.0. February 28, 2024. Prepared by Arcadis and Geofirma for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Health Canada (HC). 2017. Guidelines for Canadian Drinking Water Quality Summary Table Prepared by the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment. February.</i>
108	Government of Quebec	Section 8.5.5 Hydrogeology	p.8-77	Comment: Section 8.5.5 states: “The process effluent drain is in service and is valved out inside the building. The access to the area is controlled to authorized personnel only. This drain is used for batch discharges from the WAS...” Given that the base of the WAS is well below the drains, how will batch discharges be performed? Will the link between the WAS and the drains be blocked or filled with cement? Are these the drains that follow the pipes to the river or the drains surrounding the building? Expectation to Address Comment: Please clarify how CNL plans on performing batch discharges and explain the current and future status of the drain(s) mentioned in Section 8.5.5.	Resolved As: Section 8 of the EIS is titled “Description of the Existing Environment” and describes the existing facility and operations as they were when the EIS was written. Canadian Nuclear Laboratories has revised the methodology for managing the water collected in the Wells Area Sump (WAS). Instead of discharge to the Ottawa River following acceptable sample analysis and approval, the contents are now sampled, pumped into containers and transported to the Chalk River Laboratories site for processing, thereby eliminating direct effluent from the Nuclear Power Demonstration WAS. The pump and piping for transferring the liquid from the WAS to transport containers is completely independent from the historic pump and piping used to transfer the WAS contents to the Ottawa River. Prior to grouting the facility, all pipe penetration through the foundation wall, including the process effluent drain, will be severed inside the facility followed by installation of an engineered closure plug at least the thickness of the existing foundation walls. The associated equipment within the facility will then be grouted in place. The process piping between the facility and the river, including the historic effluent discharge line, will be filled with grout. The process effluent drain described above is different from the tile drains surrounding the building at approximately bedrock level. These tile drains, as described in Section 8.5.5.1 have the purpose of collecting and removing groundwater from around and under the building, and they have separate discharge points at the river. The plan for the future is to leave these tile drains in place. Change to EIS: The following statement has been added to Section 4.3.1.6 of the EIS. “The process piping between the facility and the river will be filled with grout, this does not include the external tile drain system used to divert ground water from the building.” Section 8.3.3 has also been updated to reflect CNL’s change in strategy for managing liquid effluent from the Wells Area Sump. Instead of discharging liquid effluent from facility sumps to the Ottawa River it is now transferred to the Waste Treatment Centre on the Chalk River.
109	CNSC	Section 8.6.5 Regional Provincial Parks and Protected Areas, Figure 8.7-1	p.8-106	Comment: Seven provincial parks and protected areas are located within the Regional Study Area, shown on Figure 8.6-1 (p.8-84). To help the reader better understand the existing terrestrial environment surrounding the NPD site and how the project could affect terrestrial VCs, provincial parks and protected areas should be depicted on Figure 8.6-1. Expectation to Address Comment: Please revise accordingly or provide an explanation for why these environmental sensitive areas are not visible on Figure 8.6-1.	Incorporated: The NPD Closure Project has revised Figure 8.6-1 to include the provincial parks and protected areas in the terrestrial environment Regional Study Area. Figure 3.1-2 has also been revised. Change to EIS: Figure 3.1-2 and Figure 8.6-1 of the EIS have been revised to include the provincial parks and protected areas in the terrestrial environment Regional Study Area.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
110	CNSC	Section 8.9.2 Traditional Land Use	p.8-133	Comment: Section 8.9.2 states that “[t]he project occurs within the general area of the Algonquins of Ontario Settlement Boundary.” It should be noted that the NPD site is also located within the known traditional territory of the Métis Nation of Ontario (MNO). Expectation to Address Comment: Please confirm whether or not CNL has undertaken research on Métis traditional land use, as per REGDOC-3.2.2, which advocates considering traditional territories and traditional uses of land. CNL should review the MNO’s research on the Métis’ traditional land use in and around the Mattawa and Ottawa rivers. This research can be found here: http://www.Métisnation.org/news-media/news/historic-research-report-on-métis-community-in-mattawanipissing-region-released/.	Resolved As: CNL has undertaken research on Métis traditional land use, as per REGDOC-3.2.2, which advocates considering traditional territories and traditional uses of land. CNL’s research has included existing studies, direct engagement with the Métis Nation of Ontario (MNO) and the funding of an MNO Traditional Knowledge and Land Use Study (TKLUS) to fill gaps in available Métis-specific knowledge, as requested by the MNO. The MNO stated the importance of completing the TKLUS to obtain Métis traditional land use information (as well as to collect other information related to Métis traditional knowledge and land use). This study, which was jointly funded by the CNSC and CNL, was completed and shared with CNL in February 2019. The TKLUS references and includes the information that was seen as applicable from the research report referenced in the comment. CNL has incorporated the findings of this new study, including information on Métis traditional land use, into the EIS. Specifically, Section 8.9 of the EIS, titled Traditional Land and Resource Use, details the findings of research into traditional land use information, including TKLUS information directly received from the MNO. For instance, Section 8.9.2.2 of the EIS details hunting information from the MNO TKLUS, Section 8.9.2.3 details fishing information from the MNO TKLUS, Section 8.9.2.4 details gathering information from the MNO TKLUS, and Section 8.9.3 details information on cultural resources and ceremonies from the MNO TKLUS. In accordance with <i>CEAA</i>, 2012, CNL applied the information from the MNO TKLUS to the assessment of effects. This can be found in Section 9.9 Traditional Land and Resource Use, which details the Traditional Land and Resource Use VCs that were selected based on consideration of a number of factors, including the: • Knowledge of Indigenous traditional land and resource use practices that interact with the environment; • Aboriginal and / or treaty rights; • Engagement (which included receiving information directly from the MNO, in particular the MNO TKLUS); and, • Consideration of other EAs.
111	CNSC	Section 8.9.2 Traditional Land Use	p.8-134	Comment: Section 8.9.2 identifies that the Regional Study Area intersects with two designated Trapline Areas (PE026 and PE027) and states that “[i]t is possible but not yet determined whether there are Aboriginal people holding these traplines.” Expectation to Address Comment: Please clarify whether CNL has been in contact with those who have trapping rights / licence for traplines PE026 and PE027. Explain if there is active hunting or trapping in these adjacent traplines, as well as on adjacent private (patent) lands, more specifically if they are being used by any of the identified Aboriginal groups, in accordance with guidance provided in REGDOC-3.2.2 and CNSC’s <i>Generic EIS Guidelines</i>.	Resolved As: To date, no Indigenous person, Nation, community or organization, has identified to CNL that PE026 or PE027 traplines belong to them. CNL has made requests for traditional use information in letters, presentations, and through direct discussions. The Ministry of Natural Resources and Forestry (MNRF) will not reveal to CNL whether the holders of these two traplines identify themselves as Indigenous or not due to privacy concerns. Therefore, CNL took the precautionary approach of indicating that these traplines may be held by Indigenous peoples. There is no information in the Métis Nation of Ontario (MNO) Traditional Knowledge and Land Use Studies (TKLUS) or in engagements with the MNO (spring and fall 2019) that indicate that these traplines belong to MNO members. The Algonquins of Ontario’s (AOO) consultant undertaking their Algonquin Knowledge and Land Use Study (AKLUS) indicated that they would explore if the nearby and adjacent traplines might be held by Algonquin representatives. With respect to the CNSC’s point: “Explain if there is active hunting or trapping in these adjacent traplines, as well as on adjacent private (patent) lands, more specifically if they are being used by any of the identified Aboriginal groups, in accordance with guidance provided in REGDOC-3.2.2 and CNSC’s <i>Generic EIS Guidelines</i>.”

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Trapping and hunting are two separately licensed activities in Ontario and the possession of a trapline does not include any additional hunting rights. CNL has assumed that trapping is occurring on provincial land in the OVF (and the nearby Algonquin Park Forest) by registered Algonquins who are members of one of the ten AOO communities. Evidence from the AOO AKLUS confirms this. While most of the trapping documented in the AKLUS is occurring several kilometers south and west of the NPD site, trapping was identified as close as immediately southwest of both Rolphton and Rapides--des--Joachims (SVS, AOO, 2020). Trapping or snaring was also identified in the Algonquins of Pikwàkanagàn First Nation (AOPFN) AKLUS study area, in Algonquin Park, significantly southwest of the NPD site (SVS, AOPFN, 2020). In the MNO TKLUS, it was identified that trapping has been a foundational element of Métis way of life and land use since the genesis of the Métis. Of the 11 participants in the MNO TKLUS, 7 individuals reported participating in trapping although none had trapped within the 50 km Study Area. Hunting occurs on Crown land in Ontario and Crown land surrounds the NPD site. Therefore, hunting can be undertaken by First Nations and Métis peoples and the general public on the adjacent crown land. CNL has assumed that hunting does occur around the NPD property by Indigenous peoples. There is no traditional harvesting occurring within the Site Study Area (SSA) due to the restricted access to the NPD site, except that it is possible for harvesters to hunt for waterfowl on the Kichi-Sibi (Ottawa River) immediately adjacent to the site. Hunting for waterfowl in Ontario commonly occurs along waterways, and there are no restrictions preventing an individual from hunting along the Kichi-Sibi (Ottawa River). Therefore, it seems reasonable that Indigenous peoples from any and all of the Indigenous Nations, communities and organizations may hunt waterfowl along the Kichi-Sibi (Ottawa River). The Local Study Area (LSA) is largely comprised of Federal lands owned by Atomic Energy of Canada Limited (AECL) with some lands in private tenure. It is possible that there is harvesting occurring on adjacent private property (hunting on private land is subject to landowner permission). The AOO AKLUS did not identify any hunting in the site study area but as it represents a small sample it is possible that AOO members might hunt in the LSA. The AOPFN AKLUS identifies hunting in very close proximity to the NPD site. While it is not possible for hunting to occur within the SSA (except for waterfowl hunting on the Ottawa River), it is possible that hunting is occurring in the LSA or adjacent to it. Hunting or trapping on private land (patent) is allowed but requires landowner permission in Ontario. It is possible that First Nations and Métis people might hunt on the adjacent patent land but given the abundance of crown land in the region around NPD, and the small area of private land, it is unlikely that this occurs. On the Quebec side of the Kichi-Sibi (Ottawa River), the area is fairly remote (<i>i.e.</i>, limited road infrastructure and not easy to get access to) but could be used for traditional hunting. In response, CNL will continue to take steps to attempt to confirm whether the individuals holding these traplines identify as Indigenous by continuing to ask the leadership of the AOO, AOPFN, the MNO, Kebaowek First Nation (KFN) and Kitigian Zibi Anishinabeg (KZA) whether individuals identifying as First Nations or Métis have the trapping rights / license for these traplines. However, as discussed with the CNSC in February 2018, CNL would like to recognize that there may be privacy or confidentiality issues in obtaining information on the Indigenous status of individuals. As outlined in the <i>Generic EIS Guidelines</i> (3.3.4), certain information should not be included in an EIS for reasons of privacy or confidentiality.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Change to EIS: Section 8.9.2.3.2 of the EIS that has been updated to reflect CNL’s efforts up until 2024 March (2024 May and 2024 June for KZA and KFN, respectively), have neither confirmed or refuted that the individuals holding these traplines identify as Indigenous, although it is possible that Indigenous trappers could be identified through ongoing engagement. In the absence of specific confirmation and based on findings of the TKLUS and AKLUS studies, CNL’s assessment assumes that trapping by Indigenous peoples is occurring in the RSA. CNL has integrated the MNO TKLUS findings, AOO and AOPFN AKLUS findings and concerns into the EIS. Specifically, CNL expanded the description of traditional uses in Section 8.9 of the EIS. Change to IER: Section 6.1.2.2.1.2 of the IER has been updated to reflect that CNL will continue to engage with Indigenous Nations, communities, and organizations and attempt to confirm whether the individuals holding these traplines identify as Indigenous. References: <i>Canadian Nuclear Safety Commission (CNSC). 2016a. Generic Guidelines for the Preparation of an Environmental Impact Statement, May. 64-NOCN-16-0002-E.</i> <i>KnowHistory. 2019. Chalk River TKLUS Report. 2019 February 28.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Ontario (AOO). 2020 December 15.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Pikwàkanagàn First Nation (AOPFN).2020 September 24.</i>
112	CNSC	Section 8.9.2 Traditional Land Use	p.8-135	Comment: Section 8.9.2 states that “[t]he Regional Study Area includes provincial, federal and private lands where hunting may also be occurring. It is unknown whether hunting on these private lands is being undertaken by Aboriginal peoples.” Expectation to Address Comment: As per REGDOC-3.2.2 and CNSC’s <i>Generic EIS Guidelines</i>, please clarify whether First Nation or Métis groups hunt on these lands, and if so, what engagement activities has been conducted with the identified groups to address their concerns.	Incorporated: The completion of the Métis Nation of Ontario (MNO) Traditional Knowledge and Land Use Study (TKLUS) has demonstrated that there has been at least one MNO harvester who has hunted small game within the Regional Study Area (RSA) of the NPD site. This can be observed on Figure 3 of that study and shows small game harvesting along the transmission corridor originating from Rapids-des-Joachim Generating Station. While no other hunting is shown with the RSA, more hunting is identified in the area around Deux-Rivieres. The MNO TKLUS sample size (n=11) was small and therefore should not be considered as representative of all MNO harvesters. Therefore, there may be more use than what is shown in that report. Algonquin harvest in this management unit is known, as targets for moose and deer have been identified (AOO 2017b, AOPFN, SVS, 2020). The Algonquins of Ontario (AOO) Algonquin Knowledge and Land Use Study (AKLUS) identified one record of harvest within the RSA south of Rolphton and the Trans-Canada Highway. As the AOO AKLUS is just a sample of uses by AOO members, hunting may be more extensive than what the study indicated. The AOO AKLUS documents more significant wildlife harvesting or hunting to the south of the NPD site within Algonquin Park. The Algonquins of Pikwàkanagàn First Nation (AOPFN) AKLUS does identify multiple incidents of hunting within the RSA. As the AOPFN AKLUS is just a sample of uses by AOPFN members, hunting may be more extensive than what the study indicated. The AOPFN AKLUS also documents significant hunting beyond the EIS RSA but within the AOPFN AKLUS RSA. In fact, most of the area is hunted. Most of this hunting is located on the Ontario side of the Kichi-Sibi (Ottawa River) and therefore west and south of the NPD site.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					To date, there has been no confirmation from any of the other Indigenous Nations, communities, and organizations engaging with Canadian Nuclear Laboratories (CNL) (including both Métis and First Nation communities) that any of their members are hunting within the RSA. However, the EIS conservatively assumes that Indigenous peoples continue to practice traditional activities, such as hunting and/or fishing within the area: “The project occurs within the general area of the Algonquins of Ontario Settlement Boundary. The area that is the subject of the Algonquin Land Claim in Ontario includes the National Capital Region, all of Renfrew County and most of Algonquin Park. As such, it is assumed that Algonquin of Ontario citizens continue to practice traditional land use activities throughout this region.” (Section 8.9.2 of the EIS). In general discussions between CNL and the MNO, a point has been raised about perceptions of avoidance of certain sites for harvesting because of concerns of contamination or health. This avoidance behavior was also identified in the MNO TKLUS. The AOPFN also raised a similar concern in their comments to CNL on the 2020 March draft EIS. CNL is of the opinion that its activities will not impair hunting on adjacent lands but has discussed and will continue to discuss this issue in greater detail with the MNO, AOPFN and any other Indigenous Nations, communities, and organizations. CNL has entered into two Memorandums of Understanding (MOU), three Contribution Agreements, one Long-Term Relationship Agreement (LTRA), and one Framework Agreement. CNL has signed MOUs with the AOO and the MNO, the Contribution Agreements have been signed with AOPFN, Curve Lake First Nation (CLFN) and Hiawatha First Nation (HFN), the LTRA has been established with AOPFN, and the Framework Agreement was signed with Kebaowek First Nation (KFN). These agreements are the building blocks of a mutually beneficial relationship between CNL and the individual communities. Based on these agreements parties will work collaboratively to meet the needs of the Indigenous Nations, communities and organizations as well as CNL’s project requirements. CNL continues to engage with Indigenous Nations, communities, and organizations regarding any potential hunting and trapping activities within the framework of these agreements and these engagements and how the TKLUS and AKLUS inform the project have been described in the EIS. Engagement activities with Indigenous Nations, communities, and organizations have included sharing information on Valued Components (VCs) and a specific VCs workshop with the MNO. CNL also received a letter from the AOO in July 2020 providing a preliminary list of valued species. In late 2022 and 2023, CNL and the AOO developed a simplified table incorporating all VCs from the AOO AKLUS mapping their inclusion in CNL’s EIS to assist AOO members confirming that all their identified VCs are considered in CNL’s assessment. CNL shared this table with the AOO in 2023 June. CNL includes a record of engagement activities including the topics of discussion at engagements in Appendix C of the EIS. CNL has also created Tables of Interests and Concerns also in Appendix C (of the EIS), one for each community or organization. These tables include lists of interests, concerns, and/or feedback which were raised by each Indigenous Nation, community or organization, as well as how CNL addressed these, verification with the applicable Indigenous Nation, community, or organization that the interest / concern is resolved and next steps. CNL includes a dedicated subsection (Section 6.3) in the Indigenous Engagement Section of the EIS to discuss VCs identified by Indigenous Nations, communities, and organizations. For communities who have shared traditional knowledge and land use studies, CNL has included tables that map species of interest to representative species in the Ecological Risk Assessment (EcoRA). Based on these studies, CNL has added some new species to its assessment including moose, fox, otter, mink, short-tailed weasel, berries, and mushrooms. In summary, the EIS assumes, and traditional knowledge and land use studies have confirmed, that hunting by Indigenous peoples on Crown land within the RSA is occurring.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Change to EIS: Section 6.2.4 and Appendix C have been updated with all Indigenous engagements up to 2024 March (2024 May and 2024 June for Kitigan Zibi Anishinabeg First Nation (KZA) and KFN, respectively). Sections 6.2.4 and 8.9.2.4 have also been updated to reflect the above response. Note: The order of EIS sections has been changed in the 2024 EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples. Change to IER: Section 4.4 and Appendices J through BB have been updated with all Indigenous engagements up to 2024 March (2024 May and 2024 June for KZA and KFN, respectively). Sections 4, 5 and 6.1.2.2.2 have incorporated the content of CNL’s responses above to the IER. References: <i>IER TSD: Chennette.R. 2024. Nuclear Power Demonstration (NPD) Indigenous Engagement Report. 64-513130-REPT-001. Revision 5.</i> <i>KnowHistory. 2019. Chalk River TKLUS Report. 2019 February 28.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Ontario (AOO). 2020 December 15.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Pikwàkanagàn First Nation (AOPFN). 2020 September 24.</i>
113	CNSC	Section 8.9.2 Traditional Land Use	p.8-137	Comment: Section 8.9.2 states that “[i]t is likely that there is fishing by Aboriginal people on the Ottawa River in the vicinity of the NPD site.” The Ottawa River is highly valued by local First Nation or Métis groups, and it is likely that there is fishing by Aboriginal peoples in the regions around the NPD site. Expectation to Address Comment: As per CNSC’s <i>Generic EIS Guidelines</i> (Sections 2.4, 3.3.2 and 5.2.1), please clarify the following with respect to fishing by Aboriginal peoples near the NPD site: ☐ Which potentially affected First Nation or Métis groups are referred to on p.8-137 ☐ If those groups are included within CNL’s list of identified Aboriginal groups ☐ How CNL has adequately engaged with those groups regarding potential impacts to VCs of interest to Aboriginal peoples, including fish resources in the Ottawa River	Incorporated: In engagement sessions so far with the Algonquins of Pikwàkanagàn First Nation (AOPFN), Métis Nation of Ontario (MNO), the Algonquins of Ontario (AOO), the Algonquin Anishinabeg Nation Tribal Council (AANTC), Kebaowek First Nation (KFN) and the Kitigan Zibi Anishinabeg (KZA), Canadian Nuclear Laboratories (CNL) stated its assumptions that CNL has assumed fishing is occurring by Indigenous peoples on the Kichi-Sìbì (Ottawa River). To date, no one from any of these communities has suggested anything different. As the Canadian Nuclear Safety Commission (CNSC) is aware, the Aboriginal and Treaty Rights Information System (ATRIS) and the CNSC have identified some Indigenous Nations, communities and organizations that are to be consulted with that are not geographically located in close proximity to the NPD site. Therefore, for some of the Nations, communities and organizations that are situated great distances from the NPD site, it seems unreasonable for their leadership to know whether they may or may not have members practicing traditional activities near the NPD site. By identifying that traditional activities such as fishing likely occur on the adjacent Kichi-Sìbì (Ottawa River) and that hunting most likely occurs on the nearest Crown land, CNL has exercised a precautionary approach of where these activities might occur in relation to the NPD site. Furthermore, engagement to date has suggested that these assumptions are correct. Therefore, with respect to the three questions: BULLET 1: Which potentially affected First Nation or Métis groups are referred to on p.8-137? CNL is assuming that the closest First Nations in proximity to the NPD site, such as the AOO, AOPFN, KZA and Métis, are likely fishing on the Kichi-Sìbì (Ottawa River) and perhaps in close proximity to the NPD site. To put this

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					in the correct context, it is likely that there are hundreds of waterbodies and thousands of fishing locations within the traditional territories of these Nations, communities and organizations, and therefore, it seems unreasonable for their leadership to know all the specific locations where all of their members or citizens fish. However, at the same time, given the significance of the Kichi-Sibi (Ottawa River), it seems reasonable that there are members and citizens from these Nations, communities and organizations that do fish in the Kichi-Sibi (Ottawa River), and that fishing does occur near the NPD site. The MNO Traditional Knowledge and Land Use Study (TKLUS) (KnowHistory 2019) has identified fishing occurring as close as 10 kilometers upstream of the NPD site. As previously indicated, the MNO TKLUS involved a small sample size and therefore may not be indicative of overall use by MNO citizens. As such, there may be more frequent and closer use in proximity to the NPD site. CNL has also received an Algonquin Knowledge and Land Use Study (AKLUS) from both AOO and AOPFN. The AOO AKLUS identified that fishing occurs all along the Kichi-Sibi (Ottawa River) within the study area (the study area with respect to the Ottawa River is 25 kilometers upstream but 30 kilometers downstream) of the AKLUS including within the Regional Study Area (RSA) for the NPD Project. The AOPFN AKLUS identified fishing in the RSA (SVS, AOPFN, 2020), likely on the Kichi-Sibi (Ottawa River). While the number of personal fishing areas identified by AOPFN members within the AKLUS was very limited, this likely under-represents AOPFN fishing use on the Kichi-Sibi (Ottawa River). In the August 2021 AOPFN Diet and Harvest Study Report (Fediuk, et. Al., 2021), eighteen percent of AOPFN survey respondents fished within a zone containing the NPD site, including the Kichi-Sibi (Ottawa River). While there are other waterbodies in this zone, it seems likely that some of this fishing was in the Kichi-Sibi (Ottawa River). The AOPFN Diet and Harvest Study also notes that the area surrounding CNL sites is harvested less in part because of concerns associated with the proximity of nuclear facilities. The EIS assessment demonstrates that NPD Closure Project activities have no undue effects on terrestrial or aquatic VCs, and CNL has discussed and will continue to discuss this issue in greater detail with the AOPFN and any other Indigenous Nations, communities, and organizations. Wolf Lake First Nation (WLFN) sent CNL comments on the NPD Closure Project EIS in March 2023. WLFN raised a number of comments related to fishing on the Ottawa River in the vicinity of the NPD site in their review of the 2021 draft EIS, including: • Quebec’s side of the Ottawa River is used by WLFN citizens for traditional fishing activities. • Fish are a significant staple resource for WLFN citizens, utilizing a variety of species for either food, medicine or ceremonial purposes. Fish are also respected and connected to WLFN as part of their cultural systems and beliefs. There are many fish species listed within the EIS that are particularly significant to WLFN. • Concerns that extensive changes to the landscape have resulted in obliterated fish habitats and depleted fish stocks. • Fish represent the expression of WLFN’s rights and their ability to exercise their Aboriginal rights to fish. • Concerns of cumulative effects related to fish (bioaccumulation), leading to uncertainties, fear, and avoidance of the area. CNL responded to WLFN EIS comments and recommendations in June 2023. Despite multiple attempts by CNL to coordinate a meeting to discuss the WLFN feedback, CNL has received very limited response from WLFN, and no meetings have been possible.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					The Environmental Assessment (EA) is a public process and CNL will address and consider any feedback from any Indigenous Nations, communities, and organizations interested in the project, especially with respect to potential impacts to traditional rights. BULLET 2: If those groups are included within CNL’s list of identified Aboriginal groups. The Indigenous Nations, communities and organizations, which were identified through use of the Aboriginal and Treaty Rights Information System (ATRIS) and mirror the Indigenous Nations, communities, and organizations identified by CNSC for the project, includes the closest Indigenous Nations, communities and organizations in proximity to the NPD site. BULLET 3: How CNL has adequately engaged with those groups regarding potential impacts to VCs of interest to Aboriginal peoples, including fish resources in the Ottawa River? CNL obtained input on fish species from Indigenous Nations, communities, and organizations through engagement activities, including discussions at meetings, through correspondence and through Traditional Knowledge and Land Use Studies. To see the resulting VCs, please see Section 6.3 of the EIS that is specific to Indigenous Engagement on the VCs. Tables 6.3-1, 6.3-2, 6.3-3, 6.3-4 and 6.3-5 in the NPD Closure Project EIS were prepared to demonstrate how Indigenous input, particularly from the AOO (Table 6.3-2), the MNO (Table 6.3-3), AOPFN (Table 6.3-4) and Williams Treaties First Nations (WTFN) (Table 6.3-5) influenced and/or was consistent with the VCs that CNL selected. The following fish species of value were identified by the MNO: bass, Northern pike/jackfish, trout, walleye and sturgeon. This was discussed with the MNO at a working session in April 2019, and MNO Committee members indicated that they were satisfied with the explanation that all fish species are assessed through the general categories of benthic and pelagic fish. The following fish species of value were identified by the AOO: lake trout, northern pike, walleye, sauger, smallmouth bass and muskellunge. AOPFN identified the following as fish species of importance: bait fish, bass, brook trout, burbot, catfish, chub, eel, jackfish/northern pike, lake sturgeon, lake trout, lake whitefish, mud pout, muskellunge, pickerel/walleye, speckled trout, sucker, sunfish and yellow perch. CNL has gathered Indigenous traditional knowledge from communities to inform the Indigenous Engagement Report (IER) and EIS and aid in the identification of the Traditional Land and Resource Use VCs. The information on traditional land use activities by Indigenous peoples has been drawn from: existing studies and reports; Indigenous Nation, community and organization websites; the MNO Traditional Knowledge and Land Use Study; the AOPFN and the AOO AKLUS; KZA and KFN procedural directive submissions for the NSDF hearing; formal and informal engagement activities; and general knowledge of the region. With respect to VCs, the VCs for the NPD EIS were presented by CNL in project engagements to the AOO (including AOPFN members), the MNO and KZA. The AOO, AOPFN, MNO, KFN, KZA and WLFN have all expressed interest in the VCs used in the NPD EIS. See Appendices J through BB of the IER TSD for specific engagements that included discussion of VCs, specific concerns and CNL’s response. As examples: • CNL and the CNSC provided capacity funding to the MNO to conduct a Valued Components (VC) workshop. The results of this workshop are appended to the MNO Traditional Knowledge and Land Use Study (TKLUS). CNL and MNO have spent significant resources discussing MNO feedback and considerations on the VCs, as demonstrated through the engagements outlined with the MNO in the IER TSD Appendix L and the EIS. • CNL and the AOO discussed VCs during six dedicated Working Group meetings. Late in 2022, the AOO Working Group developed a simplified table incorporating all VCs from the AOO AKLUS mapping their inclusion in CNL’s EIS to assist AOO members confirming that all their identified VCs are considered in CNL’s assessment. The VC summary table explained how AOO identified VCs are included, assessed and

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					protected through CNL’s proposed project. In June 2023, CNL shared the complete VC summary table with the AOO. In 2022 and 2023, KZA and KFN renewed their interest in the NPD Closure Project. During engagement activities and through formal and informal engagement activities to date, KZA and KFN both expressed interest in the protection of the Kichi-Sibi (Ottawa River). The feedback received did not directly relate to fishing, however if additional areas of interests and concerns are identified through engagement, CNL will capture the feedback in the IER. Section 5 of the IER includes Indigenous VCs in Tables 5.2 through 5.5 showing how Indigenous VCs are represented by the species evaluated in the Ecological Risk Assessment (EcoRA). As a result of feedback provided by Indigenous Nations, communities and organizations, new Ecological Profiles have been added for moose, fox, otter, mink, short-tailed weasel. CNL also includes Table 5.1 that summarizes the key interests and concerns related to VCs (not strictly species) that were expressed during engagement activities with Indigenous Nations, communities, and organizations. Table 5.1 identifies where VC-related feedback has resulted in the addition of a new VC. Where the table indicates that no new VCs have been added, this affirms that direct, representative, or related VCs that encompass the value or interest of the Indigenous Nations, communities or organizations were already included in the assessment. Through continued engagement, CNL has put forward several commitments related to this topic that CNL hopes will resolve outstanding concerns on the topic potential impacts to VCs of interest to Indigenous peoples, including fish resources in the Ottawa River. CNL has committed to AOPFN to supporting a comprehensive and site-wide inventory, followed by collaborative review to ensure that mitigations are in place to protect terrestrial and aquatic biota that are important to AOPFN. This includes NPD site-specific Guardian monitoring activities, incorporating traditional knowledge and AOPFN VCs, and co-development of additional mitigation measures to include within the NPD Closure Project Environmental Protection Plan to ensure that items of value to AOPFN are protected. CNL will provide capacity to the AOO to undertake a socio-economic study with results captured in a subsequent revision of the IER. Through the study recommendations, CNL and AOO will develop together opportunities to improve CNL’s monitoring and mitigations to ensure traditional knowledge is incorporated and that interdependencies between ecological, socio-economic, community and cultural health are recognized. CNL’s ongoing engagement with Indigenous Nations, communities, and organizations particularly with respect to VCs will be captured in the IER, which will be submitted to the CNSC as supplemental documentation prior to the Commission Hearing. Change to EIS: Section 6.2.4 and Appendix C have been updated with all Indigenous engagements up to 2024 March (2024 May and 2024 June for KZA and KFN, respectively). Sections 6 and 8.9.2.5 have also been updated to reflect the above response. Note: The order of EIS sections has been changed in the 2024 EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples. Change to IER: Section 4.4 and Appendices J through BB have been updated with all Indigenous engagements up to 2024 March (2024 May and 2024 June for KZA and KFN, respectively). Section 4, 5 and 6.1.2.2.3 have incorporated the content of CNL’s responses above to the IER.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					References: <i>Fediuk, Karen, Ginger Gibson, and Firelight Research Inc. Diet and Harvest Study. Confidential Report Specific to Canadian Nuclear Laboratories Nuclear Power Demonstration Decommissioning Project. Submitted to the Algonquins of Pikwàkanagàn First Nation. 2021 August 10.</i> IER TSD: <i>Chennette, R. 2024. Nuclear Power Demonstration (NPD) Indigenous Engagement Report. 64-513130-REPT-001. Revision 5.</i> <i>KnowHistory. 2019. Chalk River TKLUS Report. 2019 February 28.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Ontario (AOO). 2020 December 15.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Pikwàkanagàn First Nation (AOPFN). 2020 September 24.</i>
114	CNSC	Section 8.9.2 Traditional Land Use	p.8-138	Comment: Section 8.9.2 states that “[i]t is possible that there may be some gathering activities in the Local Study Area within private lands adjacent to the Federal lands... Aboriginal people also likely gather plan materials and other resources on provincial land in the Regional Study Area.” Expectation to Address Comment: As per CNSC’s <i>Generic EIS Guidelines</i>, please clarify the following with respect to gathering by Aboriginal peoples near the NPD site: ☐ Which potentially affected First Nation or Métis groups are referred to on p.8-138 ☐ If those groups are included within CNL’s list of identified Aboriginal groups ☐ How CNL has adequately engaged with those groups regarding potential impacts to VCs of interest to Aboriginal peoples, including gathering activities with the Ottawa Valley	Incorporated: Canadian Nuclear Laboratories (CNL) has taken a conservative approach and is assuming any and/or all of the identified First Nations and Métis could be conducting gathering activities in the Local Study Areas (LSAs). “...traditional land and resource use is assumed wherever there are publicly accessible lands (e.g., Ontario Crown land), which is a conservative approach to the assessment and also reflects the dynamic practice of traditional land and resource use by Indigenous peoples in time and space.” (Section 8.9.2.1 of the Environmental Impact Statement (EIS)). In engagement sessions with the Métis Nation of Ontario (MNO), the Algonquins of Ontario (AOO), the Algonquins of Pikwàkanagàn First Nation (AOPFN), the Algonquin Anishinabeg Nation Tribal Council (AANTC), the Williams Treaties First Nations (WTFN), Kebaowek First Nation (KFN) and Kitigan Zibi Anishinabeg (KZA) First Nation, CNL stated its assumptions that gathering likely occurs on Crown land around NPD by Indigenous peoples. This assumption has been confirmed by the following Indigenous Knowledge studies, developed for the Project and incorporated into the EIS: The MNO Traditional Knowledge and Land Use Study (TKLUS) (KnowHistory 2019) identifies gathering activities occurring in close proximity to the NPD site. Specifically, Figure 6 in the study identifies gathering occurring adjacent to the Trans-Canada Highway corridor. While this appears to have been just one individual, the MNO TKLUS involved only a small sample size and therefore may not be indicative of overall use by MNO citizens. As such, there may be more significant harvesting of plant material near the NPD site. The AOPFN Diet and Harvest Study found that AOPFN survey respondents collect fifteen different kinds of berries and nuts, twenty-six kinds of other plant foods, three kinds of mushrooms and three kinds of plants for medicines throughout AOPFN traditional territory (Fediuk, et. al., 2021). According to the AOPFN Diet and Harvest Study, close to a third of respondents reported collecting plants. While the primary areas for collecting plants were identified in Algonquin Park and south of Algonquin Park, the area between North Bay and Pembroke on the south side of the Ottawa River (the area containing the NPD site) was used by some plant harvesters (Fediuk, et. al., 2021). The AOO AKLUS identified plant and natural material gathering areas and documented their importance with respect to them not only as food items but also their importance as medicines and for ceremony. The plants collected included the following: balsam fir, blueberries, cranberries, raspberries, blackberries, strawberries, reindeer lichen, thorn apple, sumac, pine, pearly everlasting, sumac, sphagnum moss, wintergreen, etc. (SVS, AOO, 2020).

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					The harvesting of plants by AOPFN is recognized as a benefit not only in terms of the provision of food but also for medicinal purposes. As well, many of the plants are important for cultural use for ceremonies. The AOPFN AKLUS report notes that it is evident that there are Algonquin species of importance surrounding the proposed project (SVS, AOPFN, 2020). Both the AOO AKLUS and AOPFN AKLUS documented gathering within the 25 kilometer AKLUS study areas. By identifying that traditional activities, such as gathering, likely occur on the nearest Crown land, CNL has exercised a precautionary approach of where these activities might occur in relation to the NPD site. Furthermore, engagement to date has suggested that these assumptions are correct. Therefore, with respect to the three questions: BULLET 1: Which potentially affected First Nation or Métis groups are referred to on p. 8-138? CNL is assuming that the closest Indigenous Nations, organizations and communities in proximity to the NPD site, such as the AOO, AOPFN, KFN, KZA, and MNO, are likely gathering in the region. However, it is less clear which other Indigenous Nations, communities, and organizations may also be using the Crown land in the region. As other Indigenous Nations, communities or organizations are generally located hundreds of kilometers from the NPD site, it seems unlikely that many, if any, of their members gather plants near the NPD site. Moreover, it seems highly unlikely that their leadership will know if their members gather near the NPD site when they will have thousands of other gathering locations closer to their home community. Still, the Environmental Assessment (EA) is a public process, and CNL would address and consider any feedback from any Indigenous Nation, community, and organization interested in the project, especially with respect to potential impact on traditional Indigenous rights, such as gathering. BULLET 2: If those groups are included within CNL’s list of identified Aboriginal groups? The Indigenous Nations, communities, and organizations were identified through use of the Aboriginal and Treaty Rights Information System (ATRIS) and mirror the Indigenous Nations, communities and organizations identified by CNSC for the project, which include the First Nations and Métis in closest proximity to the NPD site. BULLET 3: How CNL has adequately engaged with those groups regarding potential impacts to VCs of interest to Aboriginal peoples, including gathering activities within the Ottawa Valley? Engagement activities with Indigenous Nations, communities, and organizations have included sharing information on Valued Components (VC), including a specific VCs workshop with the MNO and six Working Group meetings focused on VCs with the AOO. CNL includes a record of engagement activities with each Indigenous Nation, community and organization, including the topics of discussion at engagements, in Appendix C of the EIS. CNL has also created Tables of Interests and Concerns in Appendix C of the EIS, one for each Nation, community or organization. These tables summarize interests, concerns, and/or feedback which were raised by each Indigenous Nation, community or organization, as well as how CNL addressed these, verification with the applicable Indigenous Nation, community and organization on the interest / concern, and next steps. CNL includes a dedicated subsection (Section 6.3) in the Indigenous Engagement Section of the EIS to discuss Valued Components identified by Indigenous Nations, communities, and organizations. For those who have shared Traditional Knowledge and Land Use Studies, CNL has included tables that map species of interest to representative species in the Ecological Risk Assessment (EcoRA). Based on these studies, CNL has added some new species to its assessment including moose, fox, otter, mink, short-tailed weasel, berries and mushrooms.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					CNL’s ongoing engagement with Indigenous Nations, particularly with respect to VCs will be captured in a revised Indigenous Engagement Report (IER), which will be submitted to the CNSC as supplemental documentation prior to the Commission Hearing. Change to EIS: Section 6.2.4 and Appendix C have been updated with all Indigenous engagements up to 2024 March (2024 May and 2024 June for KZA and KFN, respectively). Sections 6 and 8.9.2.6 have also been updated to reflect the above response. Note: The order of EIS sections has been changed in the 2024 EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples. Change to IER: Section 4.4 and Appendix J through BB have been updated with all Indigenous engagements up to 2024 March (2024 May and 2024 June for KZA and KFN, respectively). Sections 4, 5 and 6.1.2.2.5 have incorporated the content of CNL’s responses above to the IER. References: <i>Fediuk, Karen, Ginger Gibson, and Firelight Research Inc. Diet and Harvest Study. Confidential Report Specific to Canadian Nuclear Laboratories Nuclear Power Demonstration Decommissioning Project. Submitted to the Algonquins of Pikwàkanagàn First Nation. 2021 August 10.</i> <i>IER TSD: Chennette, R. 2024. Nuclear Power Demonstration (NPD) Indigenous Engagement Report. 64-513130-REPT-001. Revision 5.</i> <i>KnowHistory. 2019. Chalk River TKLUS Report. 2019 February 28.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Ontario (AOO). 2020 December 15.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Pikwàkanagàn First Nation (AOPFN). 2020 September 24.</i>
115	CNSC	Section 8.9.3 Cultural Resources and Ceremonies	p.8-138 to 8-139	Comment: As per CNSC’s <i>Generic EIS Guidelines</i>, CNL is expected to work with First Nation and Métis groups to identify and mitigate potential environmental effects to a structure, site or thing that is of archeological significance. Expectation to Address Comment: Please include an update on the level of community interest expressed with regards to any of the archaeological sites and artifacts identified on the NPD site. Also, indicate how CNL has engaged with identified First Nation and Métis groups, the level of interest they have expressed with regards to the archaeological finds, and how CNL will work with any interested groups and	Resolved As: In 2016, the Algonquins of Ontario (AOO) expressed interest in potential archaeological impacts at the NPD site. CNL engaged an archaeologist to conduct an Archeological Assessment that was provided as a Technical Supporting Document (TSD) to the draft Environmental Impact Statement (EIS). In this report, the archaeologist described how NPD Closure Project activities are contained within a footprint that was previously disturbed. As such, the decommissioning activities were determined to have no archaeological potential. The Archeological Assessment TSD states that there may be archeological resources on the rest of the site which will not be impacted by the NPD Closure Project. The AOO, Algonquins of Pikwàkanagàn First Nation (AOPFN), Curve Lake First Nation (CLFN) and the Métis Nation of Ontario (MNO) have expressed interest in archaeological activities at NPD in their respective responses to the Project Description and the draft EIS. Indigenous interest with respect to potential archeological sites and finds at the NPD site is highlighted in Sections 6.2.4.2.3, 6.2.4.3.3, 6.2.4.4.3, 6.2.4.10.3 for AOO, AOPFN, MNO and CLFN, respectively. CNL will continue to work with any interested Indigenous Nations, communities, and

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				communities on preserving and managing the structures, sites or things that are of archeological significance.	organizations and will record these engagements in the Indigenous Engagement Report (IER), which will be submitted to the CNSC as supplemental documentation prior to the Commission Hearing. AOPFN requested a commitment from CNL to develop a “Chance Find” procedure to protect and preserve any artefacts that may be encountered on the CNL site (Section 6.2.4.3.3 of the EIS). CNL has agreed to co-develop and implement this plan with AOPFN to ensure artefact discoveries are correctly communicated and managed. Change to EIS: Sections 6.2.4 and 8.9.3 have been updated to reflect continuing engagement with respect to archaeological information. Feedback with respect to archaeological information and this area of interest is also recorded in the Tables of Interests and Concerns (Appendix C) one for each Nation, community or organization. Note: The order of EIS sections has been changed in the 2024 EIS with Indigenous engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples. Change to IER: Section 4.4 has been updated with new feedback with respect to archeological information and this area of interest is also recorded in the Tables of Interests and Concerns in Appendices J through BB one for each Indigenous Nation, community or organization. References: <i>Archaeology TSD:</i> Swayze, K. 2016. <i>Stage 1 Archaeological Assessment of the Nuclear Power Demonstration (NPD) Property I Part or Lots 41-45 & Town Plot, Range A & B Rolph Twp. (Geo), Township of Laurentian Hills, Renfrew County., 64-509200-ASD-003. Revision 0.</i> <i>IER TSD:</i> Chennette, R. 2024. <i>Nuclear Power Demonstration (NPD) Indigenous Engagement Report. 64-513130-REPT-001. Revision 5.</i>
116	CNSC	Section 8.9.3 Cultural Resources and Ceremonies	p.8-139	Comment: Section 8.9.3 states that “CNL acknowledges that there are proposed Algonquin land claim settlement lands located near the NPD site (near Tee Lake) that likely are of significance to certain members of the Algonquins of Ontario.” Expectation to Address Comment: Please indicate whether CNL has engaged with the Algonquins of Ontario to confirm the significance of these lands, and if there are any potential cultural ceremonies associated with the Regional Study Area in accordance with CNSC’s <i>Generic EIS Guidelines</i>.	Resolved As: Canadian Nuclear Laboratories (CNL) proactively researched and identified Algonquin settlement lands as part of its research for the Environmental Impact Statement (EIS). As the Canadian Nuclear Safety Commission (CNSC) may be aware, the settlement lands are identified on the Algonquins of Ontario (AOO) website but there is no information provided as to the particular significance of the specific land parcels. Given that these lands were identified as part of the settlement lands in the Agreement-in-Principle, it stands to reason that they are of some significance to the AOO. CNL’s statement in Section 8.9.3 was merely being cautionary; there was no evidence to suggest cultural ceremonies occur there. In its first meeting with AOO leadership, CNL identified that the NPD site was near these settlement lands to allow the AOO an opportunity to see if there were any specific concerns or issues. At that meeting, the AOO did not express the reasons why those specific land parcels were selected. In general, there are multiple and varying reasons why different land parcels were selected and different Algonquin communities have different interests in different parcels. Because these lands were selected it was assumed that they are of significance to the AOO, but it may not be possible to determine why. It may not be reasonable for CNL to determine the significance of these lands as the Algonquins may simply not want that information known, or it’s possible that the AOO staff and consultants that CNL is engaging with simply do not know this level of detail. The AOO AKLUS received in December 2020 did note a cultural site near the Swisha Dam. This site is not on CNL-operated property but is within the Regional Study Area (RSA). In the AOO AKLUS, there was some concern

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					expressed about the NPD Closure Project and access to cultural sites. There are currently no known cultural sites on the NPD property, however CNL is open and willing to facilitate access to the site for Indigenous peoples to evaluate the lands. Section 8.9.2.2 of the EIS includes a description of the AOO Settlement Lands within the RSA. Section 8.9.3.2 indicates that: “CNL acknowledges that there are proposed Algonquin land claim settlement lands located near the NPD site (near Tee Lake) that likely are of significance to certain members of the Algonquins of Ontario. There may be cultural ceremonies associated with this area, which is situated south of the NPD property.” The NPD Closure Project is of the opinion that that statement is accurate and precautionary. Change to EIS: Findings of the AOO AKLUS of a cultural site near the Swisha Dam have been included in Section 8.9.3.2. References: <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Ontario (AOO). 2020 December 15.</i>
117	CNSC	Section 8.11.2 Seismicity	p.8-157	Comment: The characterization of seismic hazard of the site is insufficient. Similarly, the characterization of regional seismic sources (and regionally important geological structures), presentation of regional geological setting and history, and tectonic setting is limited. The NPD site lies within the Ottawa-Bonnechere Graben, within the Western Quebec Seismic Zone (WQSZ), a zone with moderate seismic hazard. References to the earthquake events of the WQSZ are incomplete. No seismic hazard assessment was conducted in accordance with the defined assessment timeframe since the probability of a major earthquake increases with time – and with respect to long-term safety for this project, that time is 50,000 years. The two paragraphs devoted to describing seismic events require further development and supporting documentation. A seismic hazard assessment should be conducted and supported by documentation of the geological environment, including documentation of regional seismic sources, their related geological structures, and tectonic setting. Information on paleoearthquakes, such as in Doig (1991) and Aylsworth et al. (2000) among many others, should be cited to support the assessment, as appropriate. Expectation to Address Comment: Please conduct a seismic hazard assessment of the site corresponding to the defined timeframe and assess its impact on the NPD facility. References:	Resolved As: The NPD Closure Project has prepared the Underground Structure Seismic Assessment (Zhang 2021) to assess the impact on the NPD Disposal Facility based on a 1/10,000 year event, which is consistent with the assessment timeframe of the normal evolution. The 1/10,000 year event is considered as the design basis event (DBE) and is consistent with the requirements of CSA N289.1 (CSA 2018b). The updated Assessment also includes a 1/50,000 year event as an abnormal scenario, with peak ground accelerations (PGA) extrapolated from higher frequency events using a conservative log extrapolation developed by the Canadian Geologic Survey. CNL recognizes that there may be some confusion between the two time periods of “design life” of the NPD components and the “assessment timeframe” of the analyses. CNL would like to provide the following clarification: - From the International Atomic Energy Agency (IAEA) Safety Glossary, the design life is the period of time during which a facility or component is expected to perform according to the technical specifications to which it was produced. For the NPDDF there are no design life requirements necessary for the waste form, reactor vault concrete walls, reactor building concrete wall, and grout filling the underground building structure. Only the concrete cap and engineered cover have a design life which is specified to be 100 years. As such the seismic performance of the concrete cap and cover have been assessed using an earthquake with a 2% probability of exceedance in 50 years. This is considered to be a significantly large enough earthquake that can be expected to occur during the design life of the concrete cap and barrier. - From REGDOC 2.11.1, “The assessment of future impacts of radioactive waste on the health and safety of persons and the environment encompasses the period of time during which the maximum impact is predicted to occur.” The period of time during which the maximum impact is predicted to occur is referred to as the assessment timeframe and for the NPDDF, CNL is proposing an assessment timeframe of 10,000 years. The assessment timeframe is also expected to encompass the design life of the facility; thus, it also contemplates beyond design basis events. For the NPDDF the maximum impact during the normal evolution scenario is predicted to occur 1100 years after closure. As described in Appendix A of the Postclosure Safety Assessment Technical Support Document (PostSA TSD), the NPD Closure Project has selected 10,000 years as the assessment timeframe. This timeframe aligns with the criteria set out in Section 7.4 of REGDOC 2.11.1 Volume III, Assessing the Long-term Safety of Radioactive Waste Management. CNL has conservatively chosen a 1 in 10,000 year earthquake as the Design Basis Earthquake (DBE)

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Doig, R. 1991. <i>Effects of strong seismic shaking in lake sediments, and earthquake recurrence interval, Témiscaming, Quebec</i>. Canadian Journal of Earth Sciences 28, 1349-1352. Aylsworth, J.M., D.E. Lawrence and J. Guertin. 2000. <i>Did two massive earthquakes in the Holocene induce widespread landsliding and near-surface deformation in part of the Ottawa Valley, Canada?</i> Geology 28, 903-906.	and has a return period approximately 10 times longer than the structural lifetime of the facility and is thus considered to be a maximum credible event within the 1,000 year structural lifetime of the NPDDF. This is the earthquake in the CSA N289.1 standard that is to be applied to the design of an operating nuclear power plant. The adoption of this size of earthquake is considered conservative because the inventory of radioactive material in the NPDDF is significantly less than the radioactive inventory of a nuclear power plant; thus, the consequence of exceeding the DBE at the NPDDF site during the 1,000 year structural lifetime of the facility is much less than the consequence of exceeding a DBE at an operating power reactor if the safety and containment systems do not mitigate the event as designed. The DBE is commensurate with the design life and the risk associated with the concrete cap and cover. Within the PostSA, CNL demonstrates that there are no impacts to human health and the environment if more severe events than a design basis seismic event were to occur. The PostSA is a bounding safety assessment adequately supporting the EIS. Change to EIS: Section 8.12.2 have been updated to include additional background seismic information for the site study and regional area, as described in the Underground Structure Seismic Assessment (Athuda-Arachchige, 2015). Section 9.14.7 has been updated to discuss the impacts on the disposal facility from various potential seismic events, as described in the Underground Structure Seismic Assessment (Zhang, 2021). References: <i>Athauda-Arachchige, H. 2015. Safety Analysis Report for the Nuclear Power Demonstration Waste Management Facility. 64-03610-SAR-001. Revision 3.</i> <i>Canadian Nuclear Safety Commission (CNSC) 2021a, REGDOC 2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. Version 2.</i> <i>Canadian Standards Association (CSA). 2018b. General Requirements for Seismic Design and Qualification of Nuclear Power Plants. N289.1-2018.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> <i>Zhang, Y. 2021. NPD Underground Structure Seismic Assessment, 64-20000-ASD-001. Revision 2.</i>
118	ECCC	Section 8.11.4 Floods Also applicable to Section 9.13.2 Climate Change and Section 9.13.6 Flood Also applicable to the Decommissioning Safety	p.8-161 to 8-164	Comment: CNL indicates that construction will occur over the period 2019-2020 and the “Effects of the Environment on the Project” are considered for two future time periods: - Decommissioning Execution phase – Decommissioning Safety Assessment TSD (2020-2120) - Post-Institutional Controls phase – Postclosure Safety Assessment TSD (2120+) CNL defines baseline floods for the study area in Section 8.11.4 of the main EIS. They indicate that flooding could occur due to: (i) flooding of the Ottawa River, (ii) heavy precipitation, or (iii) failure of upstream dams. Many of the values described in this section appear to be based on the observational climate record	Incorporated: The NPD Closure Project has prepared a discussion on potential climate change effects on precipitation at the NPD site. The discussion, which will be added to the EIS, includes text and figures (with legends) indicating that annual precipitation is projected to increase by about 10% of the current climate normals annual precipitation of 852 mm until 2100. Regarding surface water management systems as part of the long-term performance, the engineered cover is designed to convey storm water (i.e. clean precipitation) to ditches on the south, east and western perimeters of the mound which then connect to the existing ditch systems. The ditch systems would enable infiltration of storm water. Resolved As: Given the large elevation of the facility above the river, there is no potential for significant flooding of the NPD site by the river. The increase in river elevation as a result of the increased precipitation due to climate change is

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		Assessment Technical Supporting Document, Section 4.3 (p.4-9) and Section 9.6.3 (p.9-65 to 9-69)		(e.g., major floods in Ontario 1990-2015, heavy rainfall, PMP and 100-year snowpack). The scientific literature points to an increased probability and intensity of extreme heavy precipitation events in the future with continued climate change. In addition to the projected changes in precipitation with climate change, the number of exceedances of many fixed design values, for example the capacity of stormwater management structures, will likely increase over the longer time period (e.g., into the Post-Institutional Controls phase). No estimates of how the observation-based values used to estimate flood risks (e.g., heavy rainfall, PMP and 100 year snowpack from observations) may change with future climate change have been provided in the EIS documentation (e.g., Sections 9.13.2 and 9.13.6 of the draft EIS, and Section 9.6.3 of the Decommissioning Safety Assessment TSD). Expectation to Address Comment: Please evaluate the effects of climate change upon precipitation, and its resultant effect upon potential flooding of the NPD site, as well as the potential for this flooding to cause adverse effects.	considered to be negligible. Various disruptive scenarios in the DecomSA and PostSA consider transient flooding as a result of the failure of the upstream dams. Change to EIS: Section 4.3.1 has been updated with a description of the engineered cover components. Section 8.12.4.3 of the EIS has been updated to include the updated discussion on climate change effects on precipitation. Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound. References: <i>DecomSA TSD: Garisto, N., Kovacs, R., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i> <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
9. Assessment and Mitigation of Environmental Effect					
119	Government of Quebec	Section 9.1 Effects Assessment Approach	N/A	Comments: Figure 1 in the Helbrecht (2002) article shows that short-term radioactive contamination is dominated by the rapid release (15 years) of chlorine-36 contained in the concrete of the reactor vault. The reason for this behaviour is that chlorine ions travel freely in the concrete. The emission peak is only a factor of 2 below the standard imposed by the CNSC (at the time the article was being written). A second peak appears around 1,000 years for the same source. Towards the end of the proposed Institutional Controls period (100 years), strontium-90 is released instantaneously, which is the main source of radioactivity. After 1,000 years, the radioactivity is initially dominated by the diffusion of chlorine-36 contained in aluminium parts. A second radioactive peak arrives at around 10,000 years and is caused by the release of carbon-14 in aluminium parts. The release of chlorine-36 from zircaloy parts is also observed at this time. Figure 2 in the same article shows the behaviour of the released radioactivity as a function of the adopted decommissioning strategy. It is noted that the options to minimize radiological risk in the short-term (<100 years) consist in removing the radioactive components, adding a layer of clay to inhibit the mobility of	Resolved As: The NPD Closure Project performed a new performance assessment for the in-situ disposal of NPD to support the EIS, the Post Closure Safety Assessment Technical Supporting Document (PostSA TSD). The total radiation dose to human receptors, as a function of time, is presented in Figure 5-17 of the PostSA TSD. The highest dose of 8E-5 mSv y⁻¹ is received by an infant of the Site Resident group. The dose is dominated by ingestion of food from vegetables grown in the Garden, in which Cl-36 has accumulated. The dose is more than 1,000 times lower than the dose criterion of 0.25 mSv y⁻¹ and occurs 12,000 y after closure of the Facility (the dose rate value at 10,000 y is the same to one significant figure). The peak dose to the Hunter exposure group occurs earlier, after 1,500 y, and is 4E-7 mSv y⁻¹. This is due to ingestion of C-14 in animal products. The Indigenous Algonquins of Pikwàkanagàn First Nation (AOPFN) exposure group have habits based on surveys of traditional practices. Their peak dose occurs equally via ingestion of plants and fish. C-14 is the dominant radionuclide and the peak total dose is 7E-06 mSv y⁻¹. Finally, the peak dose to the Offsite Receptor, living in Deep River, is only 1E-8 mSv y⁻¹ from ingestion of water containing tritium shortly after the closure of the facility (7 y, as institutional controls cannot be applied at offsite locations). For all exposure groups, the doses represent very low levels of radiation exposure and reflect the very low environmental concentrations. These are very low levels of exposure and reflect the very low environmental concentrations. Initially, tritium is dominant, up to 100 y, but during this period institutional controls could prevent exposure. Lengthening the Institutional Control period would reduce the medium term risks associated with human intrusion but would not have an impact on the longer term risks. The removal of the calandria from the Reactor Vault prior to the closure of NPD has been modelled in the 2nd Iteration of the PostSA TSD. This was performed to show the impact a reduced inventory would have on the environment due to removal of radioactive components.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				radioisotopes, and hydraulically isolate the site or imposing institutional controls. If all these approaches are effective in reducing the short-term risk, only the removal of radioactive components would allow the NPD site to be safely abandoned. This seems to be the only method that complies with nuclear waste management best practices. Expectation to Address Comment: Please address the above analysis of Helbrecht (2002) in light of the proposed project as part of the alternative means assessment. Reference: Helbrecht, R.A. 2002. <i>Summary of feasibility studies on in situ disposal as a decommissioning option for nuclear facilities</i> (IAEA-TECDOC--1273). International Atomic Energy Agency.	The results show that the initial releases of contaminants from the Reactor Vault are reasonably similar, as these relate to radionuclides present as surface contamination, or in the concrete walls of the vault, both of which are assumed to remain. The dominant radionuclides consistently include tritium and Ag-108m on timescales of hundreds to a few thousand years and Ni-59 on timescales of more than 10,000 y after closure. In the very long term Zr-93 and its daughter Nb-93m become important in soil and sediment. The peak rate of release is 20 GBq y⁻¹ after 40 y, dominated by tritium (PostSA TSD). There is only a notable difference from the Normal Evolution Case in the longer-term releases (several thousand years) relating to the corrosion-controlled release of activation product radionuclides such as Ni-59 and Zr-93 from steels and Zircaloy which are not present in significant quantities if the Calandria is removed. The rate of release of radionuclides that dominate doses in the Normal Evolution scenario (e.g. Ag-108m, Cl-36, Ni-59) is much reduced, in line with the reduction of their inventory. The reduction in the rate of release of key radionuclides from the Reactor Vault is propagated through to the release from the geosphere to the surface environment. Environmental concentrations are similar in the first few hundred years, but decrease after the end of the first stage of cement chemical degradation, around 1,000 y, mainly due to the reduction in the Ag-108m inventory. This results in radiation doses that are reduced substantially to humans and reflect the reduction in the inventory of the Facility. The removal of radioactive components to reduce short term risk as modelled by Helbrecht is offset by the significantly increased worker doses required to perform the extra work. This is illustrated by comparison of the worker doses estimated in the Detailed Decommissioning Plan (DDP) for NPD (Johnson 2022a) with the dose estimate for complete removal of the facility, (McVeigh 2018c). Johnson 2022a estimates the collective occupational radiation dose for in-situ disposal as 14 person mSv. McVeigh 2018c analysed the collective doses for complete removal of the facility to be 761 person mSv which is approximately 50 times the current DDP dose estimate for in-situ disposal. This alternative clearly does not meet the As Low As Reasonably Achievable principle and as the project is able to demonstrate that the proposed grouting option is able to easily meet the dose acceptance criteria both in the short term and the long term then there is no impetus to perform the suggested alternatives. References: <i>Johnson, D 2022a. Detailed Decommissioning Plan for Nuclear Power Demonstration Waste Facility. 64-508310-DDP-001. Revision 3.</i> <i>McVeigh, A. 2018c. Alternate Decommissioning Dose Estimate for the NPD Waste Facility Closure Project, 64-508740-021-000, 2018 January 30.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
120	ECCC	Section 9.1 Effects Assessment Approach	p.9-1	Comment: Section 9.1.1. (Background) states that “[d]isruptive event scenarios are designed to address uncertainties that have arisen during the definition of scenarios and conceptual models. Each is a variant on the normal evolution scenario (NES) and is described with scenario-specific assumptions.” Considering the sensitivity of the project to water infiltration and its proximity to a major river, another scenario that should be evaluated is long-term flooding of the monolith by the Ottawa River.	Clarification: The potential of flooding is considered in FEPs 1.3.7 and 1.4.9 (Postclosure Safety Assessment PostSA Appendix C, Features, Events and Processes). Here, it is noted that only the most extreme flooding scenario that has been identified might just potentially reach the ground level elevation of the NPD Waste Facility (NPDWF) (129 masl) (masl = meters above sea level). This scenario, documented by Ontario Power generation (OPG) in 1999, contemplated a catastrophic failure of multiple upstream dams on the Ottawa River, as a result of an extreme storm in the north and associated surge. The maximum flood level at the NPDWF location in these circumstances was 132.2 masl, compared to the facility’s elevation at 129 masl. The circumstances of the scenario are such that the flood would be transient.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Expectation to Address Comment: Please consider, in this scenario, including the possibility of waters not receding for decades or longer. This scenario should evaluate the impacts from, and on, surface water due to physical, chemical, biological and other limnological processes that may occur under conditions of long-term flooding.	These FEPs were recognised and further considered in the scenario development stage (PostSA Appendix D). The purpose of this stage is to identify significant scenarios; the emphasis is on considering those with potentially significant implications for the safety performance of the disposal system. In relation to flooding, the following point was made (PostSA Section D4.8). <i>“The effect of a sudden increase in flows through the overburden will be to dilute and decrease the concentration of contaminants in groundwater. Such a situation is not of interest from the perspective of the PostSA as it will result in a reduction in the environmental concentrations of contaminants compared with the Normal Evolution Scenario. Of more interest is the possibility that the flood could potentially expose contaminated rock to the surface environment. Direct exposure of someone living on the site after the flood could consequently give rise to higher doses than the Normal Evolution Scenario, in which contamination is not discharged to the surface environment until it reaches the river, where it is diluted.”</i> On this basis, the PostSA TSD adopted a conservative disruptive event scenario that evaluated the consequences of erosion of the overburden by the floodwaters, leading to potential direct exposure to contaminated groundwater and contaminated rock once the water had receded. This situation is conservative because it involves a reduced amount of dilution and shielding than the Normal Evolution Scenario. The scenario results are presented in Section 5.3.2 of the Main Report and show that this scenario could indeed lead to much higher concentrations at the surface (a factor of about 50). Very conservatively, it was also assumed that the denuded area was used to grow food, providing a direct exposure pathway to the much-increased concentrations of radionuclides. This scenario therefore considers the complete removal of the geosphere as a “barrier” to radionuclides released from the facility. The flooding scenario suggested in the review comment was not examined for a number of reasons. • The conditions necessary for water to reach the level of the NPDWF are reported to only be met during a surge caused by multiple dam failures and an extreme storm. This would not persist for decades or longer as there would be insufficient water supply to sustain the increased level. So, an extended “flooded” situation does not appear to be physically credible. • Upon flooding, the majority of the NPDDF would not experience a significant change in condition, as it is already fully saturated and lying below the water table. This is the part of the facility containing 90% of the inventory. The only difference would be that groundwater might migrate to the river water by a different route. However, as the PostSA TSD has demonstrated elsewhere, the geosphere is not a major barrier. The main barriers are the waste form, grout and NPD structure which, embedded in the bedrock, would be unaffected by the flooding. The only substantial change to the system would be that groundwater would be released into a river with a greater flow rate in the short term, which would afford greater dilution and thus reduce concentrations. • Only about 7% of the inventory lies in unsaturated rooms that could become flooded if the catastrophic flood occurred. This is largely material in the turbine room. The consequences of flooding these rooms would be that, rather than the contaminants being leached downwards, in a relatively small volume of water (as a result of infiltrating rain and snowmelt, probably less than 1 m³ per m² per year once the engineered cover has completed degraded) the contaminants could be released directly to floodwater, as the wastes decay and corrode. The rate of flow of the floodwater is not known but would presumably be greater than the current Ottawa River flow rate. The Models and Data report (Appendix E, section E3.6.1) notes that this is between 336 m³ s⁻¹ and 1560 m³ s⁻¹, i.e. at least 1x10¹⁰ m³ per year. The released contaminants would therefore be subject to immediate dilution in a very large volume of water. These considerations led to the conclusion that flooding of the NPDWF would not result in an increase in the potential exposures from contaminants within it, because: the flooding would be temporary, the release to the environment of the majority of the contaminants not be significantly changed, and for those contaminants in the

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					unsaturated region, the change would only result in immediate dilution with very large amounts of water. For these same reasons, it was concluded that the most likely consequence of flooding would be a reduction in radiological consequences. References: <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
121	CNSC	Section 9.1 Effects Assessment Approach, Figure 9.1-2	p.9-4	Comment: The effects of seismicity on the NPD facility are not considered in the Normal Evolution Scenarios, but they are in the Disruptive Event Scenarios (DES). This is acceptable only if the facility is designed to resist a Design Basis Earthquake (DBE), which must be selected taking into consideration the assessment timeframe (50,000 years). The impact of a seismic event beyond a DBE can be considered and assessed within a DES. Expectation to Address Comment: Please add a link between the “Normal Evolution Scenarios” and the “Effects of the Environment on the Project” in Figure 9.1-2. Clearly define a DBE that is commensurate with the assessment timeframe and provide evidence that the NPD facility can resist the DBE. Also, please include the impacts associated with a seismic event beyond a DBE as part as the DES.	Resolved As: The Postclosure Safety Assessment Technical Support Document (PostSA TSD) has been revised to include the effects of seismicity in the Normal Evolution. The NPD Closure Project has prepared an Underground Structure Seismic Assessment (Zhang 2021) to include a 1/10,000 year event as the design basis event (DBE), consistent with the requirements of CSA N289.1 (CSA 2018b). The updated Assessment also includes a 1/50,000 year event as an abnormal scenario, with peak ground accelerations (PGA) extrapolated from higher frequency events using a conservative log: log extrapolation developed by the Canadian Geologic Survey. The NPD Closure Project has selected 10,000 years as the assessment timeframe for the normal evolution. This timeframe aligns with the criteria set out in Section 7.4 of REGDOC 2.11.1 Volume III, Assessing the Long-term Safety of Radioactive Waste Management (CNSC 2021a). Details on the determination of the assessment timeframe can be found in Appendix A of the PostSA TSD. The timeframe for closure is less than 10 years and the timeframe for institutional controls is assumed to be at least 100 years. In addition to this NPD has had at least 30 years of storage with surveillance, during which time the long term performance of the facility structures forming the engineered barriers has been studied. This provides similar experience as would be obtained during the operation of a waste disposal facility prior to closure. This relatively short time period does not contribute any significant additional time to the assessment timeframe of 10,000 years. Criterion #2 is therefore met. Seismic effects are assessed through a set of conservative disruptive event scenarios occurring within the 10,000 year assessment timeframe, including accelerated engineered barrier degradation, localized fast pathways, human intrusion (exploratory drilling), and the inclusion of a fracture model. The PostSA considers these scenarios where the NPD Disposal Facility (NPDDF) is degraded, and doses following events in this degraded state are well below regulatory requirements. Based on the anticipated lifetime of the NPDDF concrete structure, which is estimated to be in the 1,000 year range, and the assessment timeframe of 10,000 years a DBE of 1 in 10,000 years and a beyond design basis event (BDBE) of 1 in 50,000 years have been selected. The DBE has a return period approximately 10 times longer than the structural lifetime of the facility and is thus considered to be a maximum credible event within this timescale. The 1 in 50,000 year earthquake is used to test the robustness of the facility under an extreme event. Criterion #5 is therefore met. Rather than determining the importance of regional seismic events, the PostSA methodology was to determine their impact, if they were to occur. This approach makes the probability of such an event unimportant. The PostSA concludes that doses from both the 1 in 10,000 year DBE and the 1 in 50,000 year event are well below acceptance criteria, so it is appropriate to have no link between the “Normal Evolution Scenarios” and the “Effects of the Environment on the Project” in Figure 9.1-2. The EIS concludes no residual effects for any of the scenarios analyzed, so the existing wording covers the impacts from a seismic event beyond a DBE as part of a Disruptive Event Scenario.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Change to EIS: Table 9.14-2 has been updated to identify the 1/10,000 year event as the DBE, and the 1/50,000 year event as the BDBE. References: <i>Canadian Nuclear Safety Commission (CNSC) 2021a, REGDOC 2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. Version 2.</i> <i>Canadian Standards Association (CSA). 2018b. General Requirements for Seismic Design and Qualification of Nuclear Power Plants. N289.1-2018.</i> PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. <i>Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> Zhang, Y. 2021. <i>NPD Underground Structure Seismic Assessment, 64-20000-ASD-001. Revision 2.</i>
122	CNSC	Section 9.1 Effects Assessment Approach, p.9-4	p.9-4	Comment: Section 9.1.1.1 (Supporting Documents) states that the radiological exposure of workers during the Institutional Controls phase is not expected to be any greater than the current ambient dose rates (< 0.0005 mSv/hour). A conservative dose estimate over a defined time period (e.g., annual) is not provided in the EIS. Furthermore, the basis for the dose estimate information could not be found in the Decommissioning Safety Assessment TSD or in the Postclosure Safety Assessment Report TSD. Expectation to Address Comment: Please provide the basis supporting the conservative dose estimate to workers during the Institutional Controls phase for care and maintenance work activities.	Resolved As: Radiation exposure to workers during the period of Institutional Control is not anticipated to exceed the current ambient dose rate of 0.0005 mSv^h⁻¹ exposure level. This dose rate is based on a gamma radiation survey of the current Licensed Area within the security fence but external to the Facility structure and the anticipated final radiological zoning of the licensed area, post-closure. The area is currently designated as a Radiological Zone 1, i.e. an area where the dose received by an individual will not exceed 1 mSv^y⁻¹, i.e. a maximum dose rate of 0.0005mSv^h⁻¹. The assumption is that 2000 hrs represents maximum occupancy for a worker. The level of radiation hazard and hence the radiological zone is not anticipated to increase post-closure. Radiological Zoning is in accordance with Canadian Nuclear Laboratories (CNL) Radiation Protection manual, (CNL 2021d). Change to EIS: This sentence appears in Sections 9.8.3.3 and 9.10.2.3.3; “The radiation dose to workers performing duties associated with Institutional Controls, within the Licensed Area will be negligible based on the anticipated radiological zoning (Radiological Zone 1).” References: <i>Canadian Nuclear Laboratories (CNL). 2021d. Radiological Areas and Zones, 900-508740-MCP-027.</i>
123	ECCC	Section 9.2.3 Identification of Residual Effects (Atmospheric Environment), Table 9.2-3	p.9-18	Comment: The proposed mitigation measures and monitoring for effects on air quality and GHG emissions from construction equipment and vehicles are based on qualitative analysis and estimates (e.g., visual inspections for dust or estimation of combustible gases). The main EIS has provided some information, but lacks critical details such as: • Frequency of site inspections and vehicle maintenance • Type of engine technology for vehicles and off-road equipment • Control efficiencies associated with the application of specific mitigations	Resolved As: a) With respect to mitigation measures: the EIS presents mitigation measures (and follow-up monitoring activities) at a high-level, commensurate with the conceptual level of project information provided in an EIS (which is a planning-level document). Proposed mitigation measures to protect the Atmospheric Environment are outlined in Section 9.2.3.2 of the EIS. Industry best management practices, such as those identified in CNL’s Management of Land, Habitat and Wildlife Standard (Hawkins, 2024), CNL’s Radiation Protection Program, Cheminfo Services Inc. (2005) Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities, will be employed, including the following: • regular maintenance of machinery to efficiently reduce emissions; • water misting for dust suppression to reduce resuspension; • temporary local ventilation with HEPA filtration, as required; • haulage trucks covered to minimize dust emissions;

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				• Thresholds for corrective management actions (e.g., what other adaptive measures or mitigation will be in place to reduce the impact further in case particulate matter levels approach/exceed criteria) • Description of the monitoring program that will facilitate timely management actions • Record keeping to demonstrate adoption of actions Proposed monitoring should include the collection of real time data, and this should be included as a trigger to implement proposed mitigation measures. The proposed monitoring program and mitigation needs to be described in greater detail and integrated so that there is a clear understanding of what mitigations will be implemented in response to monitored levels of contaminants, and the potential effectiveness of those mitigations to achieve air quality objectives. This will ensure that effective mitigation measures are being undertaken and that air quality effects will be consistent with EIS predictions. ECCC is aware of construction equipment and vehicles available that meet the newest emission standards. These could help to mitigate effects on air quality from these sources. Expectation to Address Comment: Please provide a table of mitigation measures including: type of vehicle and construction equipment, the control efficiency (with references), and frequency of implementation of each mitigation assumed in the development of the air quality modeling. Indicate if vehicles or construction equipment meet current emission standards. If not, please provide a rationale. Also, please provide more specific details about the air quality monitoring parameters, methods, sampling locations, applicable standards, monitoring frequencies and duration. The follow-up monitoring program for air quality should be based on real time data, and clearly outline specific thresholds and the additional proposed mitigation actions that they are proposed to trigger. Should high levels of dust occur, real time monitoring for dust and particulate matter should be considered for the demolition and concrete batching activities (with analysis of metals such as lead and mercury) to verify the effectiveness of mitigation measures and implement adaptive management, as necessary.	• minimization of dust generation through planning and site layout; • dust suppression (e.g., wet methodologies) during demolition and material sizing activities; • cover storage piles (stockpiles) when not in use, prior to workers leaving the site, and during heavy rainstorms; • compaction of disturbed soil after completion of activities; • minimization of drop heights of materials; • barriers to prevent dispersion of materials; • safe work practices for loading debris; • avoidance of prolonged storage of debris; • proper techniques for the use and handling of chemicals; • limit idling of vehicles/equipment on-site to minimize emissions (Lambert 2022); and, • post speed limits on-site (see Section 9.6.3.2 of the EIS) to minimize dust emissions. See discussion of monitoring plans below. b) With respect to the air quality monitoring program: The EIS presents a framework for the proposed follow-up monitoring program in alignment with the requirements in the <i>Generic Guidelines for the Preparation of an EIS</i>. The NPD Closure Project has prepared draft Follow-up Monitoring Plans in accordance with relevant CSA N288 standards, including N288.4 (environmental monitoring), and N288.5 (effluent monitoring). The draft Follow-up Monitoring Program provides details on monitoring parameters, locations and frequency as well as thresholds for corrective management actions. Within the effluent monitoring plan (Gilbert and Kovacs 2018) Table 7-31 and Table 7-32 provide monitoring parameters, locations and frequency and Table 7-3 includes triggers for further action. Within the environmental monitoring plan (McKee and Kovacs 2018) Table 7-19 and Table 7-20 provide monitoring parameters, locations and frequency and Table 7-2 includes triggers for further action. c) With respect to vehicles and construction equipment meeting current emission standards, the NPD Closure Project confirmed that the relevant ECCC emission standards are: Off-Road Compression-Ignition Engine Emission Regulations (the ORCIEER) under Canadian Environmental Protection Act, 1999 (the Act), introduced standards to reduce smog-forming emissions applicable to 2006 and later model year diesel engines such as those found in agriculture and construction machinery. The On-Road Vehicle and Engine Emissions Regulations (the ORVEER) applicable to 2004 and later model years, Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations applicable to 2011 and later model years and the Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations (the HDVEGHGER) applicable to 2014 and later model years, under the Canadian Environmental Protection Act, 1999 (the Act), establish emission standards that are aligned with those of the U.S. Environmental Protection Agency (EPA) to reduce smog-forming emissions from on-road heavy-duty and light duty vehicles and engines and greenhouse gas emissions from on-road heavy-duty vehicles and engines, including heavy trucks. These emission standards are applicable to the importation and manufacture of vehicles within Canada. The grout and demolition contractor who is eventually selected may have some vehicles with model years that are recent enough to meet these emission standards. Given the contractors are most likely provincially regulated, there may be provincial requirements they have to meet as well (e.g. DriveClean, etc.). If the contractor has vehicles or equipment prior to effective date of the above regulations, as described in the NPD Closure Project’s Greenhouse Gases (GHG) TSD, the emissions from the project are a small fraction of the provincial totals. The project’s GHG emissions (direct and life-cycle combined) are negligible in comparison to

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Ontario’s total GHG emissions (i.e., less than 0.005%) and are approximately 0.3% of the Ontario total for cement production. Even if the emission rates were to increase substantially, e.g., by 50-100 percent, the GHG emissions associated with the project are not expected to contribute a substantial fraction of the provincial emissions. References: <i>Cheminfo Services Inc. (Cheminfo). 2005. Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities. Construction and Demolition Multi-stakeholder Working Group Report to Environment Canada, Transboundary Issues Branch. 49 p.</i> GHG TSD: <i>Garisto, N., Kirkaldy, J., Dodsworth, L., Cooper, F., Music, S. 2020. Greenhouse Gas Emissions Report. 64-509200-ASD-001 Revision 1. Prepared by Arcadis for CNL.</i> <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Lambert, K. 2022. Management and Monitoring of Effluents and Emissions. 900-509200-STD-009 Revision 1.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i> <i>Hawkins, E. 2024. Management of Land, Habitat and Wildlife. 900-509200-STD-006, Revision 1.</i>
124	Health Canada	Section 9.2.3 Identification of Residual Effects (Atmospheric Environment) Also applicable to Section 8.2.5 Ambient Noise	p.9-19	Comment: Section 9.2.3 states: "the effects of noise in the Site and Local Study Area are assessed qualitatively. Due to the nature of the work, quantity and nature of equipment on site, and proximity to Highway 17, no noise effects are expected." This statement has not been sufficiently supported in the EIS. Decommissioning activities have the potential to be louder and more annoying (e.g., due to tonality and frequency) than historic traffic or generator use described in the EIS. Humans may perceive and respond to changes in sound characteristics other than loudness. Examples of these characteristics include frequency, sound modulation, impulsiveness and tonality (e.g., sizing of material such as cutting steel beams, use of pavement breaker, or crushing masonry for fitting into void areas). In addition, it is reasonable to assume that off-site employee traffic would be ongoing / concurrent with operation of equipment and should therefore also be included in the noise assessment. Expectation to Address Comment: • Please include a discussion on changes in sound characteristics other than loudness to support the use of a qualitative assessment of noise. If these sound characteristics are not relevant to the project, this statement should be made. Please refer to Health Canada’s <i>Guidance for Evaluating</i>	Resolved As: The NPD Closure Project has not evaluated changes in sound characteristics associated with the project due to the rural location of the project. The NPD property has a significant forest buffer around the areas where on-site traffic and demolition/grouting activities would take place (see EIS Figure 3.1-3). As stated in Section 3.1 of the EIS, the NPD site is in a remote area, with relatively low population density. For this project, the closest sensitive receptors are rural residences located to the southeast and southwest of the NPD Site near Highway 17. Owing to the close proximity of the sensitive receptors to Highway 17, the highway traffic noise is expected to be dominant and continuous at these locations for most hours of the day. (Highway 17 (the Trans-Canada Highway) has a high volume of transport truck traffic during both daytime and nighttime). Due to the short duration of the Decommissioning Execution phase (1-2 yr) and forest buffer around the around the areas where on-site traffic and demolition / grouting activities would take place, CNL determined that a quantitative noise assessment is not warranted. With respect to noise monitoring, the EIS provides a high-level framework for the proposed follow-up monitoring program in alignment with the requirements in the <i>Generic Guidelines for the Preparation of an EIS</i>. Separate from the EIS, CNL prepared draft detailed follow-up monitoring plans in accordance with relevant CSA N288 standards, including N288.4 (environmental monitoring). Noise monitoring is described in the Environmental Follow-up Monitoring Plan, which includes noise monitoring locations and evaluation criteria for noise (for worker and public), taken from Health Canada’s <i>Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise</i>.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				<i>Human Health Impacts in Environmental Assessment: Noise</i> , available here: https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidance-evaluating-human-health-impacts-noise.html Please include all relevant noise sources in the noise assessment.	
125	Health Canada	Section 9.2.3 Identification of Residual Effects (Atmospheric Environment)	p.9-19	Comment: In the following statement, the term “exceptional circumstances” is not clearly defined: “Operation of batch mixing plant restricted to between 7 am and 7 pm only to be allowed outside this period in exceptional circumstances.” Expectation to Address Comment: Please expand and clarify what is intended by the term “exceptional circumstance”.	Incorporated: The intent of the exceptional circumstance was to allow for a scenario where a critical pour of grout was in progress that was delayed for some reason and needed to be completed to ensure the safety of the structure or integrity of the pour. Change to EIS: The following text has been added to Section 9.2.3.2 (first bullet under noise mitigation measures): “Operation of batch mixing plant restricted to between 7 am to 7 pm only to be allowed outside this period in exceptional circumstances; (e.g., to complete a critical grout fill step that cannot be interrupted to ensure the safety of the structure or integrity of the grout).”
126	Health Canada	Section 9.2.5 Monitoring and Follow-up (Atmospheric Environment), Table 9.2-4 Also applicable to Section 12 Follow-up Program	p.9-26 to 9-27	Comment: Investigative action and monitoring are not mitigation measures on their own. It is unclear which monitoring activities are part of an ongoing monitoring program for the NPD Closure Project, and which are part of existing CRL and NPD “SwS” monitoring programs. Expectation to Address Comment: Please provide additional details about the proposed monitoring program. Clarify what mitigation or follow-up action may be implemented following investigative action. Mitigation measures should include a communications plan that specifies how potential receptors will be notified in the event of contaminant release due to disruptive events and/or unexpected exceedances identified during monitoring.	Incorporated: The 2017 EIS presented a framework for the proposed follow-up monitoring program in alignment with the requirements in the <i>Generic Guidelines for the Preparation of an EIS</i> . Separately from the EIS, the NPD Closure Project has prepared a follow-up monitoring program, which have been developed in accordance with CSA Standards N288.4-19 (Environmental Monitoring, McKee and Kovacs 2018), N288.5-22 (Effluent Monitoring, Gilbert and Kovacs 2018), and N288.7-23 (Groundwater Monitoring, Kovacs 2018). The follow-up monitoring plans were submitted to the CNSC in 2018 October. The CNSC, as the regulatory authority for the designated project, will also coordinate the review of the follow-up monitoring program with other interested federal and provincial agencies. The follow up monitoring program is in draft, as CNL is seeking input on the plans from Indigenous Nations, communities, and organizations, as well as the public and other stakeholders. The final follow-up monitoring program will be required to meet any objectives and activities prescribed in the EA Report (to be prepared by the CNSC). The NPD Closure Project has revised the EIS to include details from the monitoring plans, such as monitoring locations, parameters, frequency, as well as criteria and methods for evaluating data and addressing exceedance. The EIS also includes more procedural information related to the monitoring plans, such as information management and reporting, quality assurance and quality control, and sampling and analysis. With respect to notification during upset conditions, using CNL’s current environmental monitoring program framework, non-conformance management processes are in place for the formal evaluation and reporting of potential performance issues as indicated by the application of performance criteria. The mitigation or follow-up action would be dependent on the nature and severity of the exceedance but could range from collection of additional monitoring data to adjusting mitigation measures to be more effective to halting project activities. All proposed follow-up actions undergo management screening and potentially even reporting to the CNSC, if significant enough. CNL is committed to organizational transparency, ensuring that Indigenous peoples, the general public, local communities, elected and appointed government officials and other industry stakeholders are properly informed

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					about activities carried out at CNL sites. CNL’s Public Information Program includes specific communications to stakeholders, public access to information related to routine activities, radiological and non-radiological emissions, and non-routine items or events at the different sites managed by CNL. Accordingly, CNL will notify local communities and Indigenous Nations, communities, and organizations in the event of a contaminant release due to disruptive events and/or unexpected exceedances identified during monitoring. Change to EIS: Section 9.2.5, Table 9.2-5 and Section 12 of the EIS have been revised to include details from the monitoring plans, such as monitoring locations, parameters, frequency, as well as criteria and methods for evaluating data and addressing exceedance. The EIS also includes more procedural information related to the monitoring plans, such as information management and reporting, quality assurance and quality control, and sampling and analysis. References: <i>Canadian Nuclear Safety Commission (CNSC). 2018c. REGDOC-3.2.1, Public Information and Disclosure.</i> <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i>
127	CNSC	Section 9.2.5 Monitoring and Follow-up (Atmospheric Environment)	p.9-28 to 9-29	Comment: The EIS outlines non-periodic event-based monitoring for non-radiological and radiological parameters of concern in air. It has been indicated that this monitoring may be done either through measurement or estimation methods. No justification has been provided for why routine environmental monitoring for the atmospheric environment during the Decommissioning Execution phase is not warranted to confirm the predictions of the EIS. Expectations to Address Comment: Please provide justification regarding why routine environmental monitoring during the Decommissioning Execution phase is not warranted.	Resolved As: The 2017 draft EIS presented an early framework for follow-up monitoring. Section 9.2.5 in the 2017 EIS outlined non-periodic event-based monitoring for non-radiological and radiological parameters of concern in air, i.e. monitoring “For each new activity or modification of an existing activity”. This text is no longer in the EIS because this early framework was replaced with more detail from the draft follow-up monitoring plans which were developed after the 2017 draft EIS was submitted. Routine monitoring for the atmospheric environment is now specified. For example, in Table 9.2-4 of the 2017 draft EIS, event-based monitoring of air quality (radiological and non-radiological parameters) was specified for project activities like grouting and demolition. In the EIS, Table 9.2-5 specifies monitoring of air quality on a continuous basis during grouting and demolition activities. Both the draft Effluent Follow-Up Monitoring Plan and the draft Environmental Follow-Up Monitoring Plan identify routine monitoring of the atmospheric environment during the Decommissioning Execution phase with details summarized in the EIS. EIS Table 12.3-2 has the summary of effluent monitoring during the Decommissioning Execution phase including effluent stream, parameters of interest, and monitoring frequency. The effluent streams that will be monitored are ventilation exhaust (including portable ventilation), release of surface contamination during demolition, displacement of air during grouting of below grade structures, halocarbon release, solvent use, dust emissions, noise emissions, and diesel emissions. The effluent streams and monitoring frequencies are discussed in more detail in Section 7.4 and 7.6.1 respectively of the draft Effluent Follow-Up Monitoring Plan. EIS Table 12.3-4 has the summary of air quality and noise monitoring during the Decommissioning Execution phase including sampling locations, parameters, and monitoring frequency. The parameters to be monitored and monitoring

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					frequencies with justification are discussed in more detail in Table 7-7 and Section 7.4 respectively of the draft Environmental Follow-Up Monitoring Plan. References: <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i>
128	ECCC	9.3.3 Identification of Residual Effects (Surface Water Environment) Also applicable to Sections 9.3.5 and 9.3.6 and Tables 9.3-2 and 9.3-4	p.9-31	Comment: Section 9.3.3 states: “Monitoring activities, such as inspection of site drainage properties and analyzing discharges for parameters of concern, will verify the accuracy of the EA predictions and effectiveness of measures implemented to mitigate potential adverse environmental effects.” The primary method of mitigation to prevent release of contaminants and radionuclides to the environment that the proposed project relies upon is the grouting of the NPD building. Considering that the grouting will eventually degrade, and considering that this will occur in the post-closure phase when there will be no institutional oversight or control, it is expected that no additional mitigation measures could be applied at that point. Since there is a high degree of uncertainty as to what the environmental effects might be as the grout degrades through time – either in a normal scenario or one where a release of radionuclides is earlier, faster or larger – additional mitigation measures should be incorporated into the project design to provide a greater margin of safety. The “defense in depth” concept, which requires multiple layers of defense to prevent harmful environmental outcomes, should be a fundamental principle incorporated into the design of the project, particularly since there will be no opportunities for human intervention after the Institutional Controls period. Expectation to Address Comment: Please consider evaluating additional mitigation measures that can be incorporated into the project design to provide a greater margin of safety and address uncertainty related to potential adverse environmental effects that may result should the grout degrade over time. Also, consider proposing action levels that will trigger additional mitigations during the Institutional Controls phase.	Resolved As: Additional mitigation measures were examined in previous iterations of the Postclosure Safety Assessment Technical Support Document (PostSA TSD) as “alternative strategies” (Arcadis and Quintessa 2017). The original decommissioning design at the outset of this evaluation was to leave the reactor vault ungrouted. The alternative strategies examined included: reactor vault backfill with grout, reactor vault backfill with bentonite, removal of calandria and a barrier wall up-gradient of the facility. The most practical alternative strategy, or mitigation measure, that added a larger safety margin to the resultant public dose was to fill the reactor vault with grout. Thus, the exploration of alternative strategies resulted in a change of decommissioning design to grout the reactor vault. The environmental performance of the facility is not solely reliant on the grout. Defence in depth is provided by additional barriers restricting radionuclide / contaminant release from the NPD facility include: - Waste form: the majority of the radioactivity is embedded within carbon steel, stainless steel and zirconium alloy that will corrode very slowly in the alkaline environment of the decommissioned NPD facility - this is the primary barrier to minimizing release of radioactivity. The main non-radioactive contaminant, lead will again corrode gradually and its release in the PostSA TSD is limited by lead solubility in the alkaline environment. The bulk of the lead is contained within steel that further restricts its corrosion in an alkaline environment. Also, the grout sorbs contaminants within it, delaying their release from the facility. - The thick concrete walls of the reactor vault and structure inhibit movements of radionuclides and other contaminants from the NPD facility into the surrounding environment. The long term performance of the existing concrete and planned grout formulation, may have some uncertainties, in particular the rate of physical degradation, and pH change, within the concrete are important considerations for the post-closure scenarios. To address these uncertainties the latest Iteration of the PostSA TSD has performed several defense-in-depth calculations that model the ‘no grout’ case, a “no existing concrete foundation” case and the ‘increased corrosion rates’ case, and the subsequent consequences on the long term performance of the facility. The modelling of these cases shows an increase in the resulting doses but they are still well below the acceptance criteria demonstrating that each of the individual barriers are able to isolate and contain the waste within the facility. In terms of monitoring, Chapter 12 of the EIS presents a high-level framework for proposed follow-up monitoring. Separately from the EIS, CNL has prepared a draft follow-up monitoring program (for effluent, environmental and groundwater monitoring) which describe details of monitoring including parameters, frequency and location as well as trigger levels for further action if unexpected monitoring results are seen (Gilbert and Kovacs 2018, Kovacs 2018, McKee and Kovacs 2018). The program was prepared in accordance with the systematic informed planning process outlined in CSA Standards N288.4-19 (environmental monitoring), N288.5-22 (effluent monitoring), and N288.7-23 (groundwater monitoring).

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					The plans are currently draft since CNL is seeking input from Indigenous Nations, communities, and organizations, the public and stakeholders. The plans will only be finalized after an EA decision is reached because any additional monitoring requirements specified by the CNSC Commission will be incorporated into the plans. The primary monitoring to verify facility performance is groundwater monitoring, which will take place both upgradient and downgradient of the facility. The groundwater monitoring plan elaborates on the actions to take if unexpected groundwater monitoring results are seen. Examples are investigative actions to confirm exceedances and increasing monitoring locations. Potential mitigation measures that could be implemented if monitoring results indicate a decline in environmental performance include upgradient groundwater diversion, a pump-and-treat system for contaminated groundwater, or installation of a bentonite wall. The specific mitigation measure to be implemented would depend on the scenario. References: <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
129	Government of Quebec	Section 9.3.3 Identification of Residual Effects (Surface Water Environment), Table 9.3-2	p.9-31 to 9.32	Comment: Table 9.3-2 notes that starting at Step 3 (Removal of Above Grade Structure), precipitation will infiltrate the facility. How will precipitation water be managed once the roof of the facility is demolished? Will radioactive material be grouted before the roof is demolished? Expectation to Address Comment: Please respond to the above questions regarding water infiltration during the Decommissioning Execution phase of the project.	Resolved As: The current plan is to remove standing water prior to grouting in any room. Additionally, the entire nuclear area will be grouted prior to removing the roof, largely minimizing the potential for precipitation entering radiologically contaminated rooms. The room(s) that the superstructure will be placed into is in the non-nuclear area, therefore precipitation contact with contamination is greatly minimized.
130	ECCC, MOECC	Section 9.3.3 Identification of Residual Effects (Surface Water Environment)	p.9-33	Comment: Proposed mitigation measures for the surface water environment are reportedly based on MOECC’s <i>Guidelines for Evaluating Construction Activities Impacting on Water Resources</i>. CNL seems to have applied an out-of-date version of these guidelines; a newer version is available at: https://www.ontario.ca/page/b-6-guidelines-evaluating-construction-activities-impacting-water-resources. Also, very limited information is provided on specific mitigation measures proposed. As such, it is difficult to determine whether or	Incorporated: The revised EIS has a corrected reference to the most recent revision (1995) of the MOECC’s <i>Guidelines for Evaluating Construction Activities Impacting on Water Resources</i>. The mitigation measures listed in Section 9.3.3.2 for surface water (summarized from the 1984 MOECC guidelines) were compared with the MOECC 1995 guidelines and are still appropriate. The list of mitigation measures provided in Section 9.3.3.2 of the EIS has been updated to clarify that during the Decommissioning Execution phase, silt fencing will be placed in the area to be used for stockpiles of raw material for grout (i.e. sand) to prevent runoff into the Ottawa River. During construction of the concrete cap and engineered cover, silt fencing will also be placed in the construction area to prevent runoff into the Ottawa River.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				not mitigation measures are appropriate and/or sufficient, even at the conceptual scale. Furthermore, given the apparent limited knowledge of surface water and effluent quality, uncertainty related to water quality should be further acknowledged in this section of the EIS. Expectations to Address Comment: Please provide a complete list of proposed measures to mitigate potential impacts to the surface water environment, as well as additional information to identify and describe proposed surface water management facilities (e.g., ditching, stormwater management ponds, etc.) and their location. In addition, please update the text to reflect the most current version of the MOECC Guidelines.	Once completed, the cover system is designed to convey storm water to ditches on the nominal south, east and western perimeters of the mound which then connect to the existing ditch systems. The ditch systems would enable infiltration of storm water. Please note that the EIS reflects the conceptual stage of project design, so as stated in Section 9.3.3.2, as the project approaches detailed work planning, details of the mitigation measures will be refined such as specific locations for silt fencing. Change to EIS: - The list of mitigation measures provided in the first part Section 9.3.3.2 of the EIS have been updated to the following text: - impedance of rainwater inflow into the facility with construction of the concrete cap and monolith; - sediment and erosion controls consistent with CNL’s Environmental Protection Standard on Management of Land, Habitat and Wildlife (Hawkins 2024) for example “Drainage ditches for surface water drainage shall be properly maintained during construction, incorporating appropriate sediment retention measures such as silt curtains and straw bales.” During the Decommissioning Execution phase, silt fencing will be placed in the area to be used for stockpiles of raw material for grout (i.e. sand) to prevent runoff into the Ottawa River; - dust suppression measures outlined in Section 9.2.3.2; - road maintenance activities should follow the guidelines included in the Synthesis of Best Practices Road Salt Management (Hawkins 2024) namely minimizing the use of road salt while continuing to maintain the safety of operations and personnel; - utilization of spill kits and secondary containment of storage tanks (e.g., for fuel oil) to contain any releases from spillage or tank rupture (Hawkins 2024); - use of secondary containment for any hazardous liquids stored on-site; - impedance of rainwater inflow into the facility with construction of the engineered cover and monolith; - once completed, the cover system is designed to convey storm water to ditches on the nominal south, east and western perimeters of the engineered cover which then connect to the existing ditch systems. The ditch systems would enable infiltration of storm water; and - reuse of water from the wash out pit for the batch mixing plant (to the extent practicable); retention and emplacement of settled sediment in the facility. Any liquids generated by the NPD Closure Project will be handled as a non-routine discharge following approved CNL Environmental Protection processes (Matasich 2021), which outlines appropriate disposition routes depending on the analysis results. The key aspect is that no un-assessed liquid effluent releases will occur as part of the decommissioning work. - The list of surface water mitigations in Table 10.3-1 has also been updated with the above list of updated mitigation measures. - Section 9.3.3.2 of the EIS contains a corrected reference to the 1995 MOECC Guidance: “For perspective on industry practices related to waterborne emissions, the Ontario Ministry of the Environment (MOE) Guidelines for Evaluating Construction Activities Impacting on Water Resources (MOE 1995) suggest mitigation measures that include the following:” - The reference section has been revised to replace older references with newer references:

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Ontario Ministry of the Environment (MOE). 1984. <i>Guidelines for Evaluating Construction Activities Impacting on Water Resources</i>. https://www.ontario.ca/page/b-6-guidelines-evaluatingconstruction-activities-impacting-water-resources#section-3 Date Accessed: 2016 Septemer 15. Has been replaced with: Ontario Ministry of the Environment and Energy (MOEE), 1995. <i>B-6 Guidelines for Evaluating Construction Activities Impacting on Water Resources</i>. https://www.ontario.ca/page/b-6-guidelines-evaluatingconstruction-activities-impacting-water-resources. Date Accessed: 2020 February 06. Morin, A. 2015. Management of Land and Habitat. CW-509200-PRO-588. Prepared for CNL. January. Has been replaced with: Hawkins, E., 2024. Management of Land, Habitat and Wildlife 900-509200-STD-006, Revision 1, January. Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound.
131	MOECC	Section 9.3.3 Identification of Residual Effects (Surface Water Environment)	p. 9-34	Comment: Water quality in the Ottawa River upstream of the facility has been characterized; however, surface water quality data for the area in the immediate vicinity of the NPDWF (i.e., Site and Local Study Areas) is not available. Radiological data upstream and downstream of the site is provided within supplementary documentation. Non-radiological data is generally lacking. The EIS does not comment on the applicability of upstream data for the purpose of assessing suitability of proposed discharge criteria. Supplementary documentation indicates that water and sediment sampling was completed in 2002, but that data should be interpreted with caution as no report was produced or data provided. Expectations to Address Comment: Please evaluate the applicability of available water quality data from upstream locations with respect to the assimilative capacity of the receiving area of the Ottawa River for discharges associated with this proposal (radiological and non-radiological), and with the ability to identify impacts to surface water through monitoring. Also, consider anticipated water quality for any project-related releases to surface water.	Incorporated: Monitoring results for radioactivity in the Ottawa River at Rolphton (upstream of NPD) and Deep River (downstream of NPD) over the past several years has been added to Section 8.3.4 of the EIS, along with a map of monitoring locations. The observed concentrations are at natural background levels, and far below the screening levels for radioactivity in drinking water specified by Health Canada (0.5 Bq/L for gross alpha and 1.0 Bq/L for gross beta) CNL does not currently monitor for non-radioactive parameters in the Ottawa River in the vicinity of NPD. However, as part of its Independent Environmental Monitoring Program (IEMP), the CNSC analyzed surface water upstream, adjacent to and downstream of the NPD facility in the summer of 2018. The analysis included both radioactive parameters (tritium and cesium-137) and non-radioactive parameters (Copper, Lead, Mercury and Cadmium). All results were below applicable benchmark values and CNSC screening levels. The Independent Environmental Monitoring Program (IEMP) results for 2018 confirm that the public and the environment around the NPDWF are protected and that there are no expected health impacts. The results of the independent monitoring are available on the CNSC website: http://nuclearsafety.gc.ca/eng/resources/maps-of-nuclear-facilities/iemp/cnl-nuclear-power-demonstration-waste-facility.cfm With respect to the assimilative capacity of the receiving area of the Ottawa River for discharges associated with the project, 3-D near-field hydrodynamic modeling for the predicted surface water releases from the project were completed. This modelling was summarized in a report entitled “Scoping Assessment of the NPD Closure Project Steady State Release Dilution in the Ottawa River” (Arcadis 2018). Results of the calculated peak concentrations are well below the no-effect concentration and surface water quality guidelines. The results of this scoping assessment were also used to select Ottawa River monitoring locations for follow-up monitoring for the NPD Closure Project.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Follow-up monitoring of the Ottawa River is described in the Draft Environmental Follow-up Monitoring Program (Gilbert and Kovacs 2018, Kovacs 2018, McKee and Kovacs 2018), which is one of three draft follow-up monitoring reports (the other two being draft effluent and groundwater monitoring reports) which were submitted to the Canadian Nuclear Safety Commission (CNSC) in 2018 October. Please note that the three plans are complete reports but are titled “Draft” because the NPD Closure Project is seeking input from Indigenous Nations, communities, and organizations, the public and stakeholders. These plans will be finalized after an EA decision is reached, so that any additional monitoring activities specified in the Commission decision can be incorporated. Follow-up monitoring of the Ottawa River will commence prior to the commencement of work, to establish a baseline before the project begins. Both radioactive and non-radioactive parameters relevant to the NPD Closure Project will be monitored in the Ottawa River upstream, adjacent to and downstream of the NPD site. Change to EIS: Radioactivity monitored in the Ottawa River at Rolphton (upstream of NPD) and Deep River (downstream of NPD) over the past several years has been added to Section 8.3.4 of the EIS. The following text has also been added to section 8.3.4 “Gross alpha and beta results of monitoring of radioactivity in the Ottawa River upstream (Rolphton) and downstream (Deep River) of NPDWF from 2013 to 2018 are shown in Table 8.3-8, and the sampling locations are shown in Figure 8.3-9. The observed concentrations are at natural background levels, and far below the screening levels for radioactivity in drinking water specified by Health Canada (0.5 Bq/L for gross alpha and 1.0 Bq/L for gross beta).” The following text has been added to Section 8.3.4.1 of the EIS: “In addition to CNL’s on-site water quality monitoring described above, the CNSC leads an Independent Environmental Monitoring Program (IEMP) designed to verify that the public and the environment around licensed nuclear facilities are protected. As part of its 2018 IEMP, the CNSC analyzed selected radiological parameters (tritium and Cesium-137) and non-radiological parameters (Copper, Lead, Mercury and Cadmium) in the Ottawa River adjacent to the NPD facility. All results were below applicable benchmark values and CNSC screening levels, indicating no expected impacts on the public or the environment based on the 2018 results available at: http://nuclearsafety.gc.ca/eng/resources/maps-of-nuclear-facilities/iemp/cnl-nuclear-power-demonstration-waste-facility.cfm.” The following text has been added to Section 8.3.4.2 of the EIS: “As part of its 2018 IEMP activity, the CNSC analyzed surface water upstream, adjacent to and downstream of the NPD facility in the summer of 2018. The analysis included both radioactive parameters (tritium and cesium-137) and non-radioactive parameters (Copper, Lead, Mercury and Cadmium). All results were below applicable benchmark values and CNSC screening levels. The IEMP results for 2018 confirm that the public and the environment around the NPDWF are protected and that there are no expected health impacts. The results of the independent monitoring are available on the CNSC website: http://nuclearsafety.gc.ca/eng/resources/maps-of-nuclear-facilities/iemp/cnl-nuclear-power-demonstration-waste-facility.cfm ”

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Section 8.3.4.2 has been updated to include this text: “A recent study of near-field surface water releases has evaluated the potential impacts of transient operational releases of liquid effluent from the NPD Facility on the Ottawa River. This study calculated the maximum concentrations in the Ottawa River that could be due to such releases and compared these to environmental-quality guidelines (Garisto et al. 2018). This assessment demonstrates that the transient release of liquid effluent from the NPD facility into the Ottawa River is in line with regulatory requirements, as the calculated maximum concentrations of chemical contaminants (e.g., lead, mercury, PCBs) are at least four orders of magnitude below the provincial and federal surface water quality guidelines.” References: <i>Garisto, N.C., R. Dewey and J. Gilbert 2018, Scoping Assessment of the NPD Closure Project Steady State Release Dilution in the Ottawa River Prepared by Arcadis for CNL (submitted as 64-CNNO-18-0013-E) 64-509200-TD-002 Revision. 0.</i> <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i>
132	ECCC	Section 9.3.3 Identification of Residual Effects (Surface Water Environment) Also applicable to Section 9.6.3 (Table 9.6-2) Also applicable to the Decommissioning Safety Assessment, Technical Supporting Document (Table 7-3) and Section 8.4.1 (p.8-12)	p.9-37	Comment: CNL has not identified the preferred location for the batch mixing plant. Based on several statements made in the EIS documentation (e.g., in Sections 9.3.3.4 and 9.6.3.4 of the main EIS, and Table 7-3 of the Decommissioning Safety Assessment TSD), it is understood that some of the proposed locations for project infrastructure could impact species at risk or their habitat. It is also understood that the potential batch mixing plant location at the west side of the main building is also the location of Monarch butterfly habitat. If so, Monarch butterfly habitat may be overprinted during the decommissioning phase. The Monarch butterfly is known to be present in the Site Study Area. No habitat-related effects are predicted by CNL, as they are proposing to conduct site sweeps, and no clearing of milkweed is proposed to take place during the early life stages. Milkweed will not be removed outside of the Site Study Area. Depending on where the batch mixing plant is located, there may be an impact on Monarch butterflies due to loss of milkweed from that site. A process is currently underway to reclassify Monarch from “Special Concern” to “Endangered” under SARA. Additionally, the location at the west side of the main building is horizontally closer to habitat for Chimney Swifts, and the ground is at a higher vertical elevation than the ground at the chimney location. This means that the batch mixing plant will be closer to	Incorporated: When locating the preferred area for the Batch mixing plant, the project planning team identified key attributes for selecting the location based on the following: • Operational experience of a cement company to confirm size and capacity requirements of a portable mixing unit. • Confirmation of an area suitably sized to stock pile grout materials, house a portable batch plant, stage the wash out pit; all of which are ideally located on existing concrete pads or paved areas to minimize dust creation. • Confirmation of roads which can accommodate transportation paths capable of handling heavy deliveries while being located away from office pedestrian traffic, and which are constructed of tarmac to minimize dust creation. • Confirmation of roads which can accommodate the delivery of processed grout to the work area in a “one way” direction while being located away from office pedestrian traffic, and which are constructed of tarmac to minimize dust creation. • Confirmation of an area located as far away, to the greatest extent reasonable, from the Chimney Swift Roost located in the building ventilation stack. • Increased distance from surface water (i.e. Ottawa River) and established away from slopes / gradients that would result in run-off flowing directly into surface water. Upon completion of the study to locate suitable options for the batch mixing plant operation, a memo (Phillips 2020) which outlines the rationale for siting the batch mixing plant location and a reference map (Figure 1, below) was prepared to document the preferred location (former parking lot location, about 200m from the base of the Ventilation Stack and Ottawa River). Figure 1: Batch Plant Location

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				the chimney opening, and this could potentially impact the amount of dust, noise or disturbance for the Chimney Swifts. Since potential environmental effects may depend on the siting of these project components and activities, it will be important to identify the location of all project components and activities once known. Bearing in mind CNL’s commitments to minimize disturbance to species at risk (e.g., Chimney Swift), CNL should site the various project components / activities in a manner that minimizes these disturbances. Similarly, the siting of Project components / activities should also have consideration for potential effects upon surface water quality. Expectation to Address Comment: Please provide a map(s) containing detailed project site information for the decommissioning phase, including locations of the batch mixing plant, staging areas, raw material storage areas, on-site trucking routes, etc. Please describe the methodology applied to determine the final site plan. In addition, please compare the alternatives, including potential impacts on surface water quality, species at risk (including habitats), and other VCs, and identify applicable mitigation measures and anticipated residual effects, as appropriate. With respect to Monarch butterflies, please provide more information on how much milkweed will be cleared in the Site Study Area and re-assess potential effects of habitat loss to Monarch butterflies, and if there is an effect, propose mitigation and monitoring.	 The project selected this area as the preferred location for the batch plant and aggregate stock piles. This location has the most useable area without the requirement for detailed preparation work. This area is located the farthest of all three areas from the ventilation stack so will have a negligible effect on the Chimney Swift population from dust and noise, and has attributes that are beneficial for water management. The area has established roadways to allow for the safest delivery routes while maintaining a suitable distance from workers on the projects who are not directly tied to batch plant operations. An area of approximately 1.2 hectare currently containing a low density of Milkweed will have to be cleared for this project, in order to prevent impacts to monarch butterflies during the operation of the batch plant. The Milkweed is also present on an area where asphalt remains from previous operations of the site. The milkweed to be removed represents approximately 30% of the milkweed observed in disturbed areas and along roadways on the NPD site. Milkweed is present elsewhere at NPD in smaller areas as well as along the Highway 17. Although the Monarch butterfly larvae feed solely on Milkweed plants, the Monarch also rely heavily on a variety of wildflowers as a nectar source. These nectar sources are vital to Monarch survival and are particularly important during the fall migration. No net habitat-related effects are expected, as CNL will conduct site sweeps, and removal of the milkweed will occur only during a period of time when the host plant is not known to be occupied by any life stages of the species; removal will occur between October 01 and April 30. As outlined in Table 2 of the Management Plan (ECCC 2016), the conversion of breeding and nectaring habitat is identified as a threat with a Medium-Low level of concern. The removal of the low density of Milkweed, won’t have a direct impact on Monarch individuals due to the timing of the removal and since Milkweed is present elsewhere at or around the NPD site, the temporary removal of Milkweed from the one hectare is not likely to have an impact on the reproductive success of the Monarch individuals at NPD. Nectaring sites are available throughout the NPD site and will be maintained for the duration of the NPD Closure Project. To do this, vegetation removal by way of

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					mowing or brushing of nectaring plants along the side of the roads and rights-of-way will be maintained during the period of time the Monarch is present in the area (May 01 to September 30). At the end of the NPD Closure Project, the milkweed impacted area will be remediated by planting Milkweed seeds. Surveys will be conducted for a period of 3 years and information on Milkweed establishment and Monarch larvae and chrysalis occupancy will be monitored. This batch plant location is the only suitable location due to technical and safety constraints as noted for the other two options. Accordingly, the EIS evaluates the environmental impact of this location of the batch plant and not other potential batch plant locations. The evaluation of residual effects is not undertaken for each project component, rather it's undertaken for each environmental component and considers the combined impact of all project activities on each environmental component. For example the evaluation of residual effects from the batch plant (along with other project activities) are considered in: • Section 9.2.3 (Atmospheric Environment - Residual effects); • Section 9.3.3.1 (Surface Water Environment - Residual effects); • Section 9.4.3.1 (Aquatic Environment - Residual effects); and • Section 9.6.3.1 (Terrestrial Environment - Residual effects). Note that habitat and exposure effects are discussed in this section. No residual effects from the installation and operation of the batch plant were identified for any of the above environmental components. Change to EIS: Section 4.3.1.2 Grout and Concrete Batch Mixing Plant: This section includes a description of the preferred location of the batch plant wand that milkweed removal will take place in this area. Section 8.6.2.1 Forest/Vegetation communities (Site/Local Study Area): This section includes a map of milkweed observed on the NPD site (in disturbed areas and along roadways). Section 9.3.3.4 (Prediction Confidence and Uncertainty): Information supporting the location for the batch plant have been added to this section. Section 9.6.3.2 (Proposed Mitigation Measures): Mitigation measures specific to milkweed have been added to this section: • Vegetation removal by way of mowing or brushing of nectaring plants along the side of the roads and rights-of-way will be avoided during the period of time the monarch is present in the area (May 01 to September 30). • During final site restoration, the 1.2 hectare area will be seeded with milkweed. Section 9.6.3.3 Effects After Mitigation: this section includes an assessment of the effects to milkweed/monarch butterfly from the temporary removal of milkweed from the batch plant location. Section 9.6.5, and Table 9.6-6: A summary of follow up monitoring activities for milkweed have been added (Surveys will be conducted for a period of 3 years and information on milkweed establishment and Monarch larvae and chrysalis occupancy will be monitored).

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Table 10.3-1 Summary of Mitigation Measures: Mitigation measures specific to milkweed have been added: • removal of milkweed will occur only during a period of time when the host plant is not known to be occupied by any life stages of the species; removal will occur between October 01 and April 30; • no removal of milkweed outside of the Site Study Area; • Vegetation removal by way of mowing or brushing of nectaring plants along the side of the roads and rights-of-way will be avoided during the period of time the monarch is present in the area (May 01 to September 30); and • During final site restoration, the 1.2 hectare area will be seeded with milkweed. References: <i>Environment and Climate Change Canada. 2016c. Management Plan for the Monarch (Danaus plexippus) in Canada. Species at Risk Act Management Plan Series. Environment and Climate Change Canada, Ottawa.</i> <i>Phillips, B. 2020. Memo: Batch Plant Siting Locations. 64-15700-021-000. 2020 November 23.</i>
133	MOECC	Section 9.3.3 Identification of Residual Effects (Surface Water Environment), Table 9.3-3	p.9-38	Comment: During the Institutional Controls and Post-Institutional Controls phases, there is potential for residual effects to arise primarily from groundwater flow into the eventually degraded grouted structure, and eventually to the Ottawa River, with potential impacts to surface water, river and shoreline sediment. Such discharge, should it occur, would have the potential to impact both surface water and sediment; however, due to the sparsity of water quality information, the potential severity of that impact is unclear. Expectation to Address Comment: Please include the potential for interception of contaminated groundwater, with discharge to the Ottawa River by way of the preferential pathways associated with infrastructure capped and left in place (i.e., drains and inlet / outlet pipes) in the assessment of potential impacts to surface water.	Incorporated: Preferential pathways associated with existing infrastructure (such as the drains and inlet / outlet pipes, as shown in historical photos taken during construction) were already considered in the assessment and modeling of the 2017 EIS submission package and its documents. Preferential pathways such as these continue to be included in updated (2024) assessment and modelling documents. The Groundwater Modeling Report (Calder 2024b) accounts for the presence and influence of the tile drains surrounding the facility. Their implementation in the model is discussed in Section 3.2 of the report. The pipe trench contains fill, and as consequence, has the properties of fill. Property assignments are shown in the plan view to help emphasize this. The fill within the groundwater model is described in Section 3.1.3.5, and property values provided in Table 3-1, of the Groundwater Modelling Report (Calder 2024b). The Groundwater Modeling report results also include simulations of particle tracks around the NPD building (Section 4.3). These particle track simulations show that preferential pathways (pathways with short travel times in the order of 15 years or less) will flow through areas with high permeability fill, particularly the pipe trench. The 2024 Near-Field Groundwater Modelling Report (Calder 2024c) directly examines groundwater flow between different compartments of the facility. It also includes transport calculations to improve the understanding of transport between rooms and the eventual discharge from the facility (e.g. through the tile drains and other pathways). The groundwater modelling results are carried forward into the assessment in the 4th Iteration Post Closure Safety Assessment Technical Support Document (PostSA TSD); consideration of preferential pathways is part of the normal evolution scenario. Change to EIS: Section 9.3 of the EIS has been updated to reflect the updated Postclosure Safety Assessment (PostSA) results, which take into the account the most recent groundwater modelling results. References: <i>Groundwater Modelling TSD: Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Calder, N. 2024c. Near-field groundwater model at the site of the proposed decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-013. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i> <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
134	Government of Quebec	Section 9.3.3 Identification of Residual Effects (Surface Water Environment), Table 9.3-3	p.9-40	Comment: In Table 9.3-3, for “Surface Water: Water Quality (radiological)” under Institutional Controls and Post-Institutional Controls, will sand been placed between the concrete walls and the existing rock? If so, the NPD site is surrounded by a layer of permeable sand that allows groundwater to flow around the areas that will be grouted, which would reduce groundwater flow through the grouted facility. Expectation to Address Comment: Please provide clarity with respect to in-design mitigation measures to reduce the potential of groundwater contamination during the postclosure period.	Resolved As: To clarify, the following has been extracted from Section 3.1 of the Post Closure Safety Analysis Technical Support Document (PostSA TSD): “The reactor building was constructed in a pit dug through overburden and into bedrock. The concrete for the vault walls was poured into a shuttered frame, leaving a gap between the rock/overburden and the exterior walls of the facility. The gap between the exterior building walls and rock/overburden was backfilled with concrete.” The in-design measures to reduce the potential of groundwater contamination during the post closure period mainly include design features for containment. In terms of Containment, most of the radioactivity is embedded within the metals of the reactor components, so they are not available for release to environment until those metal have corroded. Also, the radioactive and non-radioactive contaminants in the facility would be entombed within the grout. The grout creates a very alkaline or high pH environment which would limit the solubility of contaminants thus inhibiting their release into the environment. As well, the thick concrete walls of the facility slows the movement of any groundwater entering the facility. Additionally, an engineered cover will be installed over the grouted facility, one of the design purposes being to minimize infiltration of precipitation. Given the higher permeability of the fill / sand in the overburden compared to the concrete structure, groundwater will preferentially flow around the building. It should be noted that even at highly degraded concrete conditions, concrete would be less permeable than the fill / sand in the overburden, and the amount of water entering the building is driven by the permeability of the concrete walls. Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound. References: <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
135	CNSC, MOECC	Section 9.3.5 Monitoring and Follow-up (Surface Water Environment)	p.9-38 to 9-42	Comment: Section 9.3.5 indicates that CNL will conduct periodic inspections as they relate to site drainage, as well as periodic water quality sampling in the Ottawa River. However, the surface water monitoring program is described in very general terms and lacks sufficient detail to be able to comment on its ability to identify developing surface water issues in a timely manner.	Incorporated: CNL has prepared a draft follow-up monitoring program (Gilbert and Kovacs 2018, Kovacs 2018, McKee and Kovacs 2018) to provide greater detail on how the follow-up monitoring will be undertaken during the Decommissioning Execution and Institutional Control phases of the Project. The draft follow-up monitoring program was developed using a systematic informed planning process (in accordance with CSA documents N288.4-19, N288.5-22, and N288.7-23) and include specific information on monitoring locations, frequency, parameters, etc.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				For example, it is unclear if routine sampling will be conducted throughout the lifecycle of the project, including during the Decommissioning Execution phase. There seems to be no mention of routine sampling analysis of Ottawa River water prior to the Institutional Controls phase. CSA N288.4-10, <i>Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills</i> (Section 5.2.2) states that “[t]he operator of a nuclear facility may also measure the contaminants in the environment where there are other business reasons, i.e., <u>stakeholder concerns</u>, due diligence, etc.” Given public involvement in this project, ensuring a robust environmental monitoring program is in place for the Ottawa River would be prudent. Expectation to Address Comment: At a minimum, please include the parameters to be monitored (physical and chemical), the minimum number of monitoring locations and the frequency of monitoring for the conceptual surface water monitoring program. In addition, please clarify whether or not routine sampling analysis of water quality in the Ottawa River will be conducted throughout the lifecycle of the project, and not only during the Institutional Controls phase. If not, please justify why no monitoring and follow-up activity for water quality in the Ottawa River is necessary.	The draft follow-up monitoring plans were submitted to the Canadian Nuclear Safety Commission (CNSC) in October 2018. The CNSC, as the regulatory authority for the designated project, will also coordinate the review of the follow-up monitoring program with other interested federal and provincial agencies. The final follow-up monitoring program will be required to meet any objectives and activities that the Environmental Assessment (EA) report (to be prepared by the CNSC) specifies. Specifically, the draft environmental monitoring program identifies quarterly sampling and analysis of Ottawa River water quality during the Decommissioning Execution and Institutional Controls phases. The NPD Closure Project determined that precipitation-based triggers for event-based monitoring of the cover material installation during the Decommissioning Execution Phase is not required. During installation, CNL staff will be regularly inspecting the cover material to ensure that it meets design specifications. In addition, stormwater management measures will be in place during the Decommissioning Execution phase, namely installing silt fencing around the side of the facility closest to the river. The silt fencing would capture water runoff during storm events during the Decommissioning Execution phase. Change to EIS: Sections 9.3 and 12.3 of the EIS have been updated to include details (including parameters, monitoring locations, frequency) related to surface water monitoring from the draft follow-up monitoring plans. References: <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i>
136	Government of Quebec	Section 9.3.5 Monitoring and Follow-up (Surface Water Environment), Table 9.3-4	p.9-44	Comment: CNL’s proposed follow-up monitoring program has been designed to detect water infiltration into the facility and contaminant transport to the Ottawa River. However, this program does not track uranium descendants in the Ottawa River. It is therefore recommended that descendant of uranium be added to the surface water monitoring program, particularly radium, which has a half-life of 1,600 years. Indeed, considering that a secular equilibrium could be established in the cells once the waste is buried, the analysis of a representative of the uranium decay chain having a half-life greater than 10 days, such as radium, is recommended. Many studies have shown that radionuclides that have a non-negligible impact on organisms and that must be retained during a radiotoxic risk assessment are those with a half-life greater than 10 days (CEAEQ, 2015). In addition, since radium is considered the most soluble element, it is more likely to leach in the event of groundwater infiltration into the grouted facility. In the event that radium would be detected, CNL’s contingency plan could be	Resolved As: Monitoring results for radioactivity in the Ottawa River at Rolphton (upstream of NPD) and Deep River (downstream of NPD) over the past several years has been added to Section 8.3.4 of the EIS, along with a map of monitoring locations. Gross alpha is one of the monitored parameters, thus as an alpha-emitter the contributions of uranium, if present in the Ottawa River, are currently being monitored. The current observed concentrations are at natural background levels, and far below the Maximum Acceptable Concentrations specified by Health Canada. Consistent with the Health Canada guidelines, if screening levels are exceeded (0.5 Bq/L for gross alpha and 1.0 Bq/L for gross beta), then concentrations of specific radionuclides would be analyzed (including radium and uranium). In addition, draft detailed follow-up monitoring plans (Gilbert and Kovacs 2018, Kovacs 2018, McKee and Kovacs 2018) were developed in accordance with the systematic informed planning process outlined in CSA Standards N288.4-19 (environmental monitoring), N288.5-22 (effluent monitoring), and N288.7-23 (groundwater monitoring). These monitoring plans specify the radiological and non-radiological contaminants that require monitoring, as well as the location, frequency and duration of monitoring. This includes monitoring of gross alpha in surface water upstream, downstream and offshore of the NPD facility. These draft detailed follow-up monitoring plans were submitted to the Canadian Nuclear Safety Commission for in 2018 October.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				implemented, in particular to identify the origin of this contamination. Expectation to Address Comment: Please confirm if a descendant of uranium could be added to the surface water monitoring program, particularly radium.	Please note that these documents are complete, but they are titled “Draft” because The NPD Closure Project is seeking input from the public and Indigenous Nations, communities, and organizations. The CNSC, as the regulatory authority for the designated project, will coordinate the review of the follow-up monitoring plans with other interested federal and provincial agencies. The plans will be finalized after an EA decision is reached, so that any additional monitoring activities specified in the Commission decision can be incorporated. Change to EIS: Radioactivity monitored in the Ottawa River at Rolphton (upstream of NPD) and Deep River (downstream of NPD) over the past several years has been added to Section 8.3.4.2 of the EIS along with a map of the monitoring locations. The following text has been added to section 8.3.4. “Gross alpha and beta results of monitoring of radioactivity in the Ottawa River upstream (Rolphton) and downstream (Deep River) of NPDWF from 2013 to 2018 are shown in Table 8.3-8, and the sampling locations are shown in Figure 8.3-9. The observed concentrations are at natural background levels, and far below the screening levels for radioactivity in drinking water specified by Health Canada (0.5 Bq/L for gross alpha and 1.0 Bq/L for gross beta).” References: <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i>
137	CNSC	Section 9.4 Aquatic Environment, Table 9.4-1	p.9-45	Comment: In Table 9.4-1, it is unclear if First Nation and Métis groups were given an opportunity to provide input on which fish species were chosen as VCs. Expectation to Address Comment: As per CNSC’s <i>Generic EIS Guidelines</i>, and considering that fish resources have high value for Aboriginal peoples, please clarify whether CNL has engaged with First Nation and Métis groups regarding which fish species are of importance to them. Also, specify if the resulting information helped define the rationale for the selection of VCs for the aquatic environment.	Incorporated: As per the CNSC’s <i>Generic EIS Guidelines</i>, CNL has engaged Indigenous Nations, communities and organizations on which fish species are of importance to them. The resulting information helped define the rationale for the selection of Valued Components (VCs) for the aquatic environment. CNL obtained this input on fish species from Indigenous Nations, communities and organizations through engagement activities, including discussions at meetings, through correspondence and through Indigenous Knowledge and Land Use Studies. To see the resulting VCs, please see Section 6.3 of the EIS that is specific to Indigenous Engagement on the VCs. Tables 6.3-1, 6.3-2, 6.3-3, 6.3-4 and 6.3-5 in the NPD Closure Project EIS were prepared to demonstrate how Indigenous input, particularly from the Algonquins of Ontario (AOO) (Table 6.3-2), the Métis Nation of Ontario (MNO) (Table 6.3-3), Algonquins of Pikwàkanagàn First Nation (AOPFN) (Table 6.3-4) and Curve Lake First Nation (CLFN) (Table 6.3-5) influenced and/or was consistent with the VCs that CNL selected. The following fish species of value were selected by the MNO: bass, Northern pike/jackfish, trout, walleye and sturgeon. This was discussed with the MNO at a working session in April 2019, and MNO Committee members indicated that they were satisfied with the explanation of the methodology that that all fish species are assessed through the general categories of benthic and pelagic fish. The following fish species of value were selected by the AOO: lake trout, northern pike, walleye, sauger, smallmouth bass and muskellunge. AOPFN identified the following as fish species of importance:

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					bait fish, bass, brook trout, burbot, catfish, chub, eel, jackfish/northern pike, lake sturgeon, lake trout, lake whitefish, mud pout, muskellunge, pickerel/walleye, speckled trout, sucker, sunfish and yellow perch. The VCs for the NPD EIS were presented by CNL in project engagements to the AOO (which included invites to AOPFN members); the MNO, and Kitigan Zibi Anishinabeg First Nation (KZA). CNL and the Algonquin Anishinabeg Nation Tribal Council (AANTC) had also coordinated a meeting in May 2019 that would have included a presentation on VCs for the NPD EIS, however the AANTC had to cancel and were unable to reschedule. With the exception of the MNO, AOO and AOPFN, there has been little in the way of comments from other Indigenous Nations, communities or organizations on the specific VCs that were used in the assessment. The MNO took a significant interest in the VCs and requested that CNL provide the funding for a VC workshop (which CNL provided). The results of this workshop are appended to the MNO Traditional Knowledge and Land Use Study (TKLUS). CNL and the MNO have thoroughly discussed MNO feedback and considerations on the VCs, as demonstrated through the engagements outlined with the MNO in Table C-5, Appendix C of the EIS. The MNO have completed a TKLUS that was provided to CNL in February 2019 and was used as a direct input into the VC list. The AOPFN and the AOO have also each completed an AKLUS in September 2020 and December 2020, respectively. These studies have also been used as a direct input into the VCs. CNL and the AOO discussed VCs during six Working Group meetings. Late in 2022, the AOO Working Group developed a simplified table incorporating all VCs from the AOO AKLUS mapping their inclusion in CNL’s EIS to assist AOO members confirming that all their identified VCs are considered in CNL’s assessment. This VC summary table explained how AOO identified VCs are included, assessed and protected through CNL’s proposed project. In June 2023, CNL shared the complete VC summary table with the AOO. CNL has summarized the feedback received from each Indigenous Nation. community and organization up to March 2024 (May 2024 and June 2024 for KZA and Kebaowek First Nation (KFN), respectively) in the Tables of Interests and Concerns (EIS Appendix C). CNL’s ongoing engagement with Indigenous Nations, communities and organizations, particularly with respect to VCs will be captured in a revised Indigenous Engagement Report, which will be submitted to the CNSC as supplemental documentation prior to the Commission Hearing. Note: The order of EIS sections has been changed in the 2024 EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples. References: <i>IER TSD: Chennette, R. 2024. Nuclear Power Demonstration (NPD) Indigenous Engagement Report. 64-513130-REPT-001. Revision 5.</i>
138	MOECC	Section 9.4.3 Identification of Residual Effects (Aquatic Environment), Table 9.4-2	p.9-47	Comment: Project-environment interactions in the aquatic environment relate exclusively to exposure; no possible habitat interactions are identified. However, physical impacts to habitat are possible if releases from the site contain excess concentrations of suspended solids or sediment, which may cause siltation / sedimentation of the receiving waters (i.e., the Ottawa River) and associated benthic habitat. Expectation to Address Comment:	Incorporated: The effects of releases containing suspended solids is considered in the EIS as part of the surface water environment. However, the project-environment interactions matrix (Table 5.2-1) has been updated to include potential adverse interactions to account for the potential for sedimentation to impact aquatic habitat. These interactions have been added where interactions were identified for the surface water environment related to increased runoff or wash out pit releases. Change to EIS: Table 5.2-1 (Potential Project Environmental Interactions) has been updated to include potential adverse interactions to account for the potential for sedimentation to impact the aquatic habitat. Specifically, potential adverse

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Please consider the physical effects of the project on the aquatic habitat.	interactions have been added to “Aquatic Habitat” for activity numbers: 1.2, 1.10, 1.11, 3.1, 3.2, 3.3, 3.10, 3.14, 3.16, 4.2, and 5.3. Table 9.4-2 has been updated for these same activities. In addition, the following text was added to the EIS after the first sentence in section 9.4.3.3 (under “ <u>Habitat-Related Effects</u> ” during the <i>Decommissioning Execution phase</i>): “Any potential releases of suspended solids to the Ottawa River will be mitigated through dust suppression and runoff diversion mitigation measures, as well as sampling prior to wash out pit dewatering. As discussed in Section 9.3.3.3, these mitigation measures will ensure negligible effects to surface water quality.”
139	ECCC	Section 9.4.3 Identification of Residual Effects (Aquatic Environment) Also applicable to the Postclosure Safety Assessment Technical Supporting Document, Figures 5.7 and 5.8	p.9-48	Comment: Figures 5.7 and 5.8 in the Postclosure Safety Assessment TSD suggest that if the monolith is permeated by groundwater and starts leaching after 70 years (instead of 100), the total activity of the radionuclides becomes substantially higher for multiple components. Elsewhere in the EIS, it has been stated that the monolith might become saturated within a period of decades. It is also plausible that the lower portions of the monolith (where most of the radionuclide inventory resides) will become saturated and begin to release contaminants prior to saturation of the entire monolith. Expectation to Address Comment: Please assess the risk to the environment associated with early saturation of the monolith for the time period of 0-100 years, including as it relates to COPCs and radionuclides, and assess the risk to the environment associated with partial saturation (e.g., lower portions of the monolith – where most of the radionuclide inventory resides).	Resolved As: In the NPD Waste Facility (NPDWF) model, resaturation of rooms below the water table is represented as beginning immediately, with parts of the facility gradually “filling up” with water until a specified time when resaturation is complete. However, it is noted that even before resaturation is complete, some releases are permitted through the portion of the outer walls that are wetted on both sides (i.e. corresponding to the water “depth” in the NPDWF at a given time) by diffusion. The rate of resaturation of the grouted monolith was recognised as an area of uncertainty that may be of importance. As such, the NPD Closure Project added groundwater flow modelling cases examining the resaturation timescales in earlier versions of the resaturation modelling report Calder (2020). Based on this and other information, two Postclosure Safety Assessment (PostSA) sensitivity calculations were included in the 3 rd iteration and used to examine these potentially important uncertainties. As described in Appendix D of the PostSA (3 rd iteration), one of the two resaturation-related sensitivity analyses specifically examines earlier resaturation. Results of the early resaturation sensitivity case of 25 years, presented in Appendix G of the 3 rd iteration PostSA TSD, showed only a slightly increased rate of release of H-3 into groundwater, but this is the only radionuclide affected. The resulting peak concentration insoils is only 8 Bq kg ⁻¹ compared with the peak for the Normal Evolution Scenario of 5 Bq kg ⁻¹ and, after 40 years, all concentrations were found to be identical regardless. Based on this analysis, an early resaturation does not need to be investigated. With respect resaturation relating to non-radionuclides: The non-radiological contaminants of potential concern (COPCs) identified for the NPD Closure Project would sorb and behave similarly to the non-tritium radionuclides. Therefore, no non-radiological effects are expected related to the resaturation scenarios. (Figure 5-11 and 5-12 of the PostSA). References: <i>Calder, N. 2020. Resaturation Modelling at the site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor, 64-508760-REPT-005 Revision 2.</i> <i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). 2020. Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project. (3rd Iteration). 64-508760-ASD-003. Revision 0. 2020 March 30. Prepared by Arcadis and Quintessa for CNL.</i>
140	Government of Quebec	Section 9.5.3 Identification of Residual Effects (Geological and	p.9-59 to 9-60	Comment: The demolition of the roof of the facility will allow precipitation water to flow into radioactive rooms. Will this water be removed and treated before grouting? It would be possible to immobilize the	Resolved As: The current plan is to remove standing water prior to grouting, in any room, and dispose of accordingly. Additionally, the entire nuclear area will be grouted prior to removing the roof, largely minimizing the potential for

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		Hydrogeological Environment)		water by using grout containing an excess of bentonite, which would absorb the water. Expectation to Address Comment: Please explain how precipitation water will be dealt with once the roof of the facility is removed.	precipitation entering radiologically contaminated rooms. The room(s) that the superstructure will be placed into is in the non-nuclear area, therefore precipitation contact with contamination is greatly minimized.
141	CNSC, MOECC	Section 9.5.5 Monitoring and Follow-up (Geological and Hydrogeological Environment)	N/A	Comment: Limited details regarding the groundwater monitoring program are provided in the EIS. The EIS generally states that a groundwater monitoring program will be conducted over the Institutional Controls period intermittently. No information regarding the location and frequency of monitoring is provided. It is also not clear if monitoring is to be conducted utilising the existing monitoring well network, which may not meet the requirements of monitoring associated with this project. Expectation to Address Comment: Consistent with Section 12 of CNSC’s <i>Generic EIS Guidelines</i> (p.19-20), please provide sufficient details on the groundwater monitoring program “to allow independent judgement as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures.”	Incorporated: Separate from the EIS, the NPD Closure Project developed a draft detailed follow up monitoring program in accordance with relevant CSA N288 standards for effluent, environmental and groundwater monitoring (Gilbert and Kovacs 2018, Kovacs 2018, McKee and Kovacs 2018), which were submitted to the CNSC in October 2018. These three plans expand upon the follow-up monitoring framework in the EIS and were developed in accordance with the CSA N288 systematic process, which requires justification for monitoring parameters, frequency and location. The draft groundwater monitoring plan (Kovacs 2018) includes specific information on monitoring locations and frequency. It identifies both existing and new monitoring wells, which were evaluated based on their suitability for the monitoring plan. Predicted environmental release modeling in the Post Closure Safety Assessment Technical Support Document (PostSA TSD) was used to inform the frequency and duration of monitoring as well as the parameters for analysis in the draft groundwater monitoring plan (Kovacs 2018). Note that the word "Draft" appears in the title of the three follow-up monitoring plans, to reflect the fact that CNL is seeking input from Indigenous Nations, communities, and organizations, the public and stakeholders before finalizing the plans. The plans will only be finalized after an Environmental Assessment (EA) decision is reached, because any additional monitoring requirements specified by the CNSC will be incorporated into the plans. Section 9.5.5 and Section 12 of the EIS have been updated to include additional details from and a reference to the draft groundwater monitoring plan (Kovacs 2018). The monitoring details added to the EIS will fulfill the requirements of Section 12 of CNSC’s <i>Generic EIS Guidelines</i> (CNSC 2016a). Change to EIS: Sections 9.5.5 and 12.3 of the EIS have been revised to reflect the above response. References: <i>Canadian Nuclear Safety Commission (CNSC). 2016a. Generic Guidelines for Preparation of an Environmental Impact Statement. 64-NOCN-16-0002-E. May.</i> <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i> <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
142	Government of Quebec	Section 9.6.3 Identification of Residual Effects	p.9-73	Comment:	Resolved As: Figures 3.3-1 and 3.3-2 do not show the furnace room or the pressure relief pit because of the way the cut-away of the building is oriented. The furnace room is located in the lower part of the control wing on the west side of the

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		(Terrestrial Environment), Table 9.6-2 Also applicable to Section 3.3.2 NPDWF Description, Figures 3.3-1 and 3.3-2, p.3-11 to 3-12		Table 9.6-2 states: (at Step 3.15) “Grout furnace room and adjacent areas to ground level” and (at Step 3.16) “Demolish above grade portion of pressure relief pit. Fill with grout.” The furnace room or pressure relief pit components are not shown in Figures 3.3-1 and 3.3-2. Expectation to Address Comment: Please provide a figure that contains all these components.	facility, and the pressure relief pit is adjacent to the maintenance wing on the east side of the facility. The furnace room is an open area and has no interior components. The pressure relief pit is also an open area and contains some metal platforms and supporting structures, but otherwise is similarly devoid of components. The pressure relief pit is shown in Figure 3.1-5, labelled as the Pressure Relief Duct, and is open to the atmosphere with walls that extend approximately 2.4 meters (8’-0”) above grade. In the same figure, the furnace room is located in the first level below grade, immediately towards the bottom of the page from the area written “Control Wing”. No change to EIS.
143	ECCC	Section 9.6.3 Identification of Residual Effects (Terrestrial Environment), Table 9.6-2	p.9-74	Comment: Table 9.6-2 (row 5.2) indicates that ancillary equipment would be removed from the ventilation stack during Ventilation Stack Isolation (e.g., ladder, lights), and that modifications would be made to the stack to maintain the Chimney Swift roosting requirements (i.e., creating an opening for continued venting near the base). It is unknown, however, what impact removing the ancillary equipment from the stack will have on the Chimney Swifts. Also, there are no details on what will be undertaken to modify the ventilation stack and what the potential impacts to Chimney Swifts would be. Also, the existing lights on the stack may be expected to be present for aviation navigation safety purposes. Any removal of these lights should be done in consultation with Transport Canada, who regulates this aspect. Furthermore, Table 9.6-2 (Row 5.3) states: “Demobilizing the site will result in dust and decrease some of the habitat-related benefits of the decommissioning.” It is unknown if dust will accumulate in the stack and what impact that would have on Chimney Swifts. The dust suppression measures outlined in Section 9.2.3.2 do not mention dust accumulation in the stack. Expectation to Address Comment: Please provide details on how the ventilation stack will be modified and describe the potential impacts on Chimney Swifts. Please consult with Transport Canada regarding the proposed removal of the existing lights from the ventilation stack. If necessary, update Section 3.5.3 and other relevant sections of the EIS to reflect the results of the consultation. If consultation with Transport Canada has already occurred, please provide an update. Please discuss the potential for dust accumulation in the stack and identify mitigation measures to address potential impacts to	Incorporated: 1. Details on how the ventilation stack will be modified and potential impacts on Chimney Swifts: At the time of initial EIS submission, approval of the NPD Closure Project was anticipated in 2018 and the communication equipment at the top of the ventilation stack was still in service, therefore removing the equipment from the stack was included as part of site closure activities. Since that time project approval has been delayed and the communications equipment at the top of the stack has been replaced with current and more reliable technology (fibre optic). Additionally, other legacy equipment such as the working platforms and access ladder were removed from service in 2013 as they did not meet current code requirements and could not be confirmed to be in safe service condition. Given that the equipment on the stack was legacy and no longer required, and continued inspection and maintenance of this equipment at an elevation of approximately 45m (150 feet) posed industrial working hazards, CNL determined the safest approach to ensure that the facility is maintained in a safe configuration during the current Storage with Surveillance phase was to permanently remove this legacy and out of service equipment from the ventilation stack. It is also important to note that the required removal of this equipment is not linked to the NPD Closure Project, and was required whether the project proceeds or not. The obsolete equipment was removed from the top of the ventilation stack in 2021 October. Prior to removing the equipment, CNL discussed this activity with the CNSC. The CNSC agreed that this activity may be removed from the EIS provided that ECCC approved of this activity. CNL Environmental Protection staff discussed this activity with ECCC. ECCC agreed that no permit was required and that this activity may proceed in advance of EIS approval (and be removed from the EIS scope) provided that certain protective measures be taken to ensure no impact to Chimney Swifts: • Removal of equipment must be outside of the Chimney Swift roosting season (May - August). • The interior of the stack (which is the part of the stack used by the swifts) must not be altered. Both these precautions were taken when the obsolete equipment was removed from the top of the ventilation stack. CNL communicated ECCC's approval to undertake this activity ahead of EIS approval (and remove it from the EIS scope) to the CNSC in August 2021 [1].

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Chimney Swifts and monitoring to verify the effectiveness of mitigation measures.	To clarify the other modifications to the stack which will take place as part of ISD activities: The ventilation stack will be isolated from the reactor building by filling the underground ventilation duct with grout, and the bottom of the stack will be filled with grout to an elevation equivalent with the top of the engineered cover. At a location above the top of the engineered cover and near the bottom of the stack, wall penetrations of the stack will be created to allow for continued natural ventilation up the stack and will be designed to provide a flow similar to the current “stack affect” flow. The design will also ensure stack structural integrity is maintained. Section 3.5.3.1 of the EIS explains that a permit is being sought under the Species at Risk Act (SARA) to undertake project activities which may affect chimney swifts that use the ventilation stack at the NPD site as a roosting site. CNL Environmental Protection staff is in regular communication with ECCC regarding the Terms and Conditions of the Species at Risk permit, which are subject to evolve and will be finalized in parallel with approval of the EIS. The potential impact to the Chimney Swifts from decommissioning activities has been identified and assessed by a Subject Matter Expert; Dr. Joe J. Nocera. Dr. Nocera published several manuscripts on the species, developed “The rules for altering a chimney that is habitat for chimney swift”, legal requirements in the Province of Ontario, and has also provided information on the Federal Recovery Strategy for the species. As part of the EIS, Dr. Nocera provided scientific advice to CNL where he concluded that direct effects of decommissioning activities are most likely to occur when the activities overlap with swifts being present in the roost. Swifts roost only at night, or during the day when the weather is inclement. Therefore, the only decommissioning activities that pose a greater risk of directly disturbing roosting swifts are those that occur at night. For this reason the modifications to the base of the stack will be performed outside of the Chimney Swift roosting season and hence no impact to the Chimney Swifts is anticipated. Changes to EIS: Section 4.3.3.3 (Project Scope Changes) was updated to provide a rationale for removing the activity “Remove Ancillary Equipment from Stack” from the EIS scope. Section 4.3.1.6 (Project Components and Activities) was updated to include grouting the base of the stack and creating penetrations near the base of the stack as part of the “Grouting of Below Grade Structures” activity (it used to be grouped with the “Stack Equipment Removal” activity). Section 4.3.1.7 (Project Description – Removal of Above Grade Structures), Table 4.3-2 (Schedule of Activities), Table 5.2-1 (Project-Environment Interactions), Table 9.6-2 (Project-Environment Interactions in the Terrestrial Environment) were updated to remove the activity “Remove Ancillary Equipment from Stack.” Section 9.6.3.2 (Mitigation Measures): A statement was added to describe the timing restriction for grouting the base of the stack and creating penetrations at base of the stack (to take place outside of chimney swift roosting season). 2. Removal of the existing lights from the ventilation stack: Transport Canada was consulted using the "Aeronautical Assessment Form for Obstruction Evaluation", this has resulted in Transport Canada clarifying that neither lighting nor marking is currently required for the NPD ventilation stack. NAV CANADA was notified prior to 2021 April when the stack lights were permanently turned off. The lights were subsequently removed in 2021 October. 3. Potential for dust accumulation in the stack, mitigation measures to address potential impacts to Chimney Swifts and monitoring to verify the effectiveness of mitigation measures

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Sources of disturbance to swifts that may be predicted from decommissioning activities have been identified and include dust generation. Activities that can regularly create airborne particulates have been shown to reduce avian diversity as birds vacate the area. Further, particulates may introduce toxic material into the air which, in extreme cases, may cause reproductive failure or mortality. Birds would be expected to respond to such disturbance by moving away from the stressor source. Therefore, a detailed monitoring program is proposed in the EIS section 9.6.5. With that said, the ventilation stack is 46 m (150 feet) in height and the Chimney Swift roost in top portion of the stack; coupled with the low flow within the stack results in a reasonable conclusion that dust will not reach the upper portion of the stack and impact critical roost habitat (as discussed during the ECCC-CWS/CNSC/CNL Wildlife theme meeting that took place on 30 Aug 2019.) There are several responses that may be exhibited by roosting swifts to indicate the possibility of having been disturbed by contemporaneous decommissioning activities: 1) a population-level response, 2) behavioral response, and 3) physiological response. The monitoring program outlined in section 9.6.5 can be used to assess population and behavioral responses. Measuring physiological responses to dust for example would provide detailed information on the degree of disturbance experienced by swifts but does not present as part of a feasible monitoring program because it would require capturing the birds and taking measurements for a hormone stressor for example. Not only would capturing the birds be costly, but the handling of Chimney Swifts will likely cause greater disturbance to roosting swifts than the decommissioning activities. Therefore, only passive monitoring is recommended that focuses on population and behavioral responses. Even if physiological response measurements on the potential impact of dust accumulation in the stack on the Chimney Swift is not possible, as identified in the EIS section 9.2.3.2, dust suppression activities will be implemented. In order to monitor a potential population-level response or a behavioral response of the chimney swifts to a change in stack configuration (i.e. grouting base of stack and creating penetrations at the base of the stack), the monitoring program and effectiveness monitoring as described in section 9.6.5 of the EIS will be implemented. Change to EIS: The following statement has been added to Section 9.6.3.2: “Given that the ventilation stack is 46 m (150 feet) in height and the Chimney Swift roost in top portion of the stack, coupled with the low flow within the stack, it is considered reasonable to assume that dust will not reach the upper portion of the stack and impact critical roost habitat. For this reason, dust suppression measures in addition to those described in Section 9.2.3.2 are not warranted.” Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound. References: <i>B. Wilcox, letter to M. Phaneuf, “Correspondence from Environment and Climate Change Canada Approving CNL’s request to remove the activity “Remove Ancillary Equipment from Stack” from the Nuclear Power Demonstration Closure Project Environmental Impact Statement”, 64-CNNO-21-0004-L, 2021 Aug 31.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
144	ECCC	Section 9.6.3 Identification of Residual Effects (Terrestrial Environment), Table 9.6-3	p.9-75	Comment: Wildlife exclusion fencing is only mentioned briefly in Table 9.6-3 (p.9-83) and nowhere else in the EIS. Given that there is a high potential for road mortality of wildlife (specifically for Eastern Milksnake), this should be adequately addressed in the EIS. There is insufficient information to understand the potential effects of the wildlife exclusion fencing on road mortality for the Eastern Milksnake (SARA listed as “Special Concern”). Expectation to Address Comment: Please update this section of the EIS to include additional details on the wildlife exclusion fencing in order to mitigate road mortality to terrestrial wildlife, in particular to the Eastern Milksnake. These details should include the fencing material, height, mesh size or porosity, installation locations, timing of installation, installation process, monitoring, and maintenance and repair.	Incorporated: There have been three Milksnake sightings on the NPD site since the establishment of the NPD Closure Project. On 2015 August 31, one juvenile Milksnake was seen inside the Facility. In 2019 August, a Milksnake was seen basking in the lower Parking Lot at NPD, near the guardhouse. On 2023 November 23, one juvenile Milksnake was seen within the Facility. These sightings were observed and reported as a result of staff training on the identification and reporting of species at risk. The road leading to the NPD facility from Highway 17 is approximately 1km in length. No road mortality has ever been reported for this site nor any herpetofauna sightings. Staff members regularly walk on the road and have been instructed to report any wildlife observations, thus the project is confident that Eastern Milksnakes are not frequently crossing the road, hence no hot spots are suspected nor confirmed. The speed limit of this short stretch of road leading to the NPD facility from Highway 17 is currently set at 50 km/h, and lowers to 20 km/h in the vicinity of the facility. Currently the traffic density is very low - no more than 20 cars per day. This is expected to at most double during decommissioning activities from staff and contractors. In terms of truck traffic, conservative estimates for the Decommissioning Execution Phase is roughly 3000 vehicles over two construction seasons (a total of 12 months). The Eastern Milksnake can use a variety of habitat such as forests, woodlands, fields, rocky outcrops, forest clearings and edges of wetlands. Unlike turtle species, in the absence of Milksnake sightings on the road, it is not possible to develop a predictive model for the identification of hot spots for the species using available geo-spatial information of habitat (unlike turtle habitat which is predominantly wetland features). Since to date no Eastern Milksnakes have been seen on the road at NPD and due to the fact that the estimated traffic density and speed limit will remain low during this project, the mitigation measures to be implemented for the protection of the species during decommissioning operations will focus on staff and contractors behavior rather than exclusion fencing. <u>Proposed mitigation measures</u> As per the Ontario Ministry of Natural Resources and Forestry, Best Management Practices for Mitigating the Effects of Road on Amphibians and Reptiles (https://arc-solutions.org/wp-content/uploads/2017/02/mnrf_herp_road_mitigation_bmp_2016.pdf), CNL will be implementing mitigation measures to influence driver behavior. Staff and contractors will receive a Species at Risk Awareness training session offered by CNL to increase their knowledge about the potential species at risk present at NPD, how to identify them, what do to if detected and how to report it to Environmental Protection. A species at risk identification field guide will be available on the job site at all times, and frequent inspection for wildlife presence will be conducted by the environmental personnel in the field. To summarize, the mitigation measures to prevent road mortality are: 1- The low speed limit of 50 km/h or 20 km/h on NPD property will be enforced for all staff and contractors. 2- Daily road mortality survey will be conducted (only on days when activities occur), during the herpetofauna active season (April 15 to Sept 30th). 3- If any road mortality is detected (i.e. one individual) for the Eastern Milksnake, CNL will evaluate if exclusion fencing of the area would be an appropriate mitigation measure. Due to the temporary nature of the NPD Closure Project, temporary fencing will be considered such as silt fences.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					4- Two signs have been installed on each end of the NPD road to remind employees and contractors of the potential presence of herpetofauna, namely snakes, on the road.  Change to EIS: Section 9.6.3.2 and Table 9.6-4 of the EIS have been updated with the above-described mitigation measures. Section 10.3 (Table 10.3-1), and Section 12.3.2 (Table 12.3-4) in the EIS have also been updated to incorporate mitigation measures for the Eastern Milksnake as listed above.
145	CNSC	9.7.3 Identification of Residual Effects (Ambient Radioactivity)	p.9-96	Comment: The section states” Mitigation measures with respect to radiation doses to humans are discussed in Section 9.8.3.2”. There is no mention on mitigation measures with respect to doses to the environment. There is no information on limits in monitoring points/wells that would establish an acceptable performance of barriers. Those limits are necessary in order to establish the point at which mitigation measures may need to be triggered. Expectation to Address Comment: CNL needs to explain the mitigation measures with regard to releases to the environment they will consider. As part of this the limits which may trigger those measures need to be presented.	Incorporated: Mitigation measures for doses to the environment would be similar to the mitigation measures for radiation dose to humans (e.g., dust suppression, sediment and erosion controls, and use of localized HEPA ventilation as necessary). The following text has replaced the existing text in EIS Section 9.7.3.2: “In addition to the in-design mitigation measures (e.g., grout creating an alkaline environment that helps to contain radioactivity, isolation of radiological inventory with grout fill and concrete cap) identified in Section 4.1 above, the following mitigation measures have been identified for ambient radioactivity: • dust suppression measures outlined in Section 9.2.3.2; • sediment and erosion controls outlined in Section 9.3.3.2; • use of localized HEPA ventilation as necessary during grouting operations; The mitigation measures presented above are preliminary and have been developed based on the current understanding of the project. As the project approaches detailed work planning, details will be refined, and additional mitigation measures may be developed as required.” Separate from the EIS, the NPD Closure Project has developed a draft detailed follow up monitoring program in accordance with relevant CSA N288 standards for effluent, environmental and groundwater monitoring (Gilbert and Kovacs 2018, Kovacs 2018, McKee and Kovacs 2018), which were submitted to the CNSC in 2018 October (64-CNNO-18-0026-E and 64-CNNO-18-0027-E). These three plans expand upon the follow-up monitoring framework in the EIS and were developed in accordance with the CSA N288 systematic process which includes providing justification for the sampling design, including trigger levels which are intended to give early warnings related to barrier performance. These trigger levels (called ‘tiers’ in the EIS) would initiate response actions like

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					additional mitigation measures. A description of the tiers I provided in Section 9.1.2.3 and the introduction to Section 12 of the EIS. The NPD Closure Project held the first of the public workshops on follow-up monitoring in the summer of 2019. The feedback received on the draft follow up monitoring reports was very valuable, including a recommendation to revise the "Tiers" for evaluation criteria (to determine when response actions should be taken). Further workshops will be held in the future, to refine the plans based on feedback from interested parties. Each follow-up monitoring plan provides a tiered system for the interpretation of monitoring data based on the data evaluation criteria that provides a framework to address exceedances. In general, exceedances will be addressed as follows: Tier 1 exceedances: • Data review (e.g., trend evaluation, and secondary sampling to confirm exceedance); • Investigate source of exceedance; and • Consider increased monitoring frequency. Tier 2 exceedances: • Data review (e.g., trend evaluation, and secondary sampling to confirm exceedance); • Investigate source of exceedance; • Apply additional mitigation measures, consider remediation (if applicable); • Consider stop work; and • Increase monitoring (e.g., increased frequency, additional parameters, additional locations). For more information on addressing exceedances the relevant sections of draft monitoring plans are: • Effluent (Gilbert and Kovacs, 2018) – Section 7.10 • Environmental (McKee and Kovacs, 2018) – Section 7.8 • Groundwater (Kovacs, 2018) – Section 7.11.1 The specific criteria (or limits) for Tier 1 and Tier 2 are also documented in the draft monitoring plans. They can be found as follows: • Effluent (Gilbert and Kovacs, 2018) – Tables 7-17 to 7-27 for the Decommissioning Execution phase and Tables 7-28 and 7-29 for the Institutional Control phase. • Environmental (McKee and Kovacs, 2018) – Table 7-16 for the Decommissioning Execution phase and Table 7-17 for the Institutional Control phase. • Groundwater (Kovacs, 2018) – Table 7-18. Change to EIS: Section 9.7.3.2, has been revised to reflect the response above. References: <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i>
146	CNSC	Section 9.8.1 Selection of Valued Components (Human Health)	p.9-102	Comment: The proposed project occurs within the general area where Aboriginal groups practice traditional land use activities, including but not limited to hunting, trapping, and fishing. In the selection of VCs, however, Aboriginal receptors were not included in the assessment of human health. How has this been considered in the Human Health Risk Assessment (HHRA)? Expectation to Address Comment: Aboriginal receptors should be included in the HHRA, taking into account their cultural practices and their higher reliance (compared to the general Canadian population) on traditional and country foods.	Resolved As: Risks to Human Health are considered in the Postclosure Safety Assessment Technical Support Document (PostSA TSD) where end-points for the evolution of the NPD Disposal Facility are calculated for: • Radiation dose rate to adults, children and infants; • Environmental concentrations of radionuclides; and • Environmental concentrations of non-radioactive hazardous substances. These end-points are then compared against the postclosure acceptance criteria similarly to a Risk Assessment. As a result of Indigenous feedback, the PostSA Normal Evolution Scenario examines an Indigenous receptor intended to represent traditional Indigenous lifestyles, based on a new study of the diet and harvest of the Algonquins of Pikwàkanagàn First Nation (AOPFN) (Fediuk et al., 2021) which shows that today, members are more likely to supplement their diet with additional groceries purchased from local shops. The Indigenous receptor does not live on the NPD site but uses the land surrounding the facility for some traditional activities (such as hunting, fishing, and harvesting of wild plants). As noted, this receptor has a diet that includes harvested and gathered food (from the area around the site) as well as purchased foodstuffs (based on AOPFN diet and harvest study). Another Indigenous receptor, which is referred to as the Self-Sufficient Indigenous Receptor (based on SENES (2014) and which has more conservative exposure characteristics than the AOPFN receptor, is also considered in a Sensitivity Case analysed in the 4th Iteration PostSA. The doses seen by the indigenous receptor and the self-sufficient receptor are less than the doses seen by the most exposed receptor (Resident (Infant)) and show the impacts to a very conservatively characterized receptor where the sensitivity case considers a self-sufficient Indigenous receptor whose exposure characteristics bound the dietary and lifestyle of Indigenous Nations and communities in the area. References: <i>Fediuk, Karen, Ginger Gibson, and Firelight Research Inc. Diet and Harvest Study. Confidential Report Specific to Canadian Nuclear Laboratories Nuclear Power Demonstration Decommissioning Project. Submitted to the Algonquins of Pikwàkanagàn First Nation. 2021 August 10.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> <i>SENES Consultants Limited (2014) – Aboriginal Lifestyle Characterization. Prepared for Nuclear Waste Management Organization. NWMO TR-2014-13. SENES Reference No. 350696. June.</i>
147	Government of Quebec	Section 9.8.3 Identification of Residual Effects (Human Health)	p.9-107	Comment: Section 9.8.3 states: “Emergency response capability is available from local municipalities. Does CNL consider the municipality of Rapides-des-Joachims as a local municipality with emergency response capability? Has CNL checked the ability of this municipality to respond to a nuclear emergency? Has CNL collaborated with the <i>Organisation régionale de sécurité civile de l’Outaouais</i> (ORDCO) to include the competent Quebec authority in the emergency response plan for the proposed project?	Resolved As: The statement in Section 9.8.3 refers to the provision of emergency services by the local municipality, the Town of Laurentian Hills. A memorandum of understanding between CNL and the local municipality ensures the Laurentian Hills Fire Department agrees to the provision of emergency response services to the NPD facility. None of the abnormal or accident conditions associated with the NPD Closure Project are likely to result in offsite consequences. The Outaouais Region’s external nuclear Emergency Response Plan (ERP) for Chalk River Laboratories (CRL) is a requirement because there are radiological hazards present at the CRL site with the potential for off-site consequences (e.g. a potential impact to Quebec). The NPD Closure Project has no such hazards which could pose an off-site consequence, therefore off-site municipal and provincial response plans are not required.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				The Outaouais Region has an external nuclear Emergency Response Plan (ERP) for Chalk River Laboratories (<i>Plan de mesures d'urgence nucléaire externe – Laboratoires de Chalk River</i>). The ERP was developed by the ORDCO under the coordination of the Quebec Department of Public Security (known as MSP). The ERP specifies the response structure, as well as the role played by the various government departments and agencies that are likely to intervene in case of emergency. The ORDCO, which includes representatives of Quebec government departments and agencies present in the region and coordinates the commitment of resources to support municipalities when they are no longer able to cope with a disaster, was only informed of the proposed project once it was well under way. It would have been relevant for the ORDCO to be informed in the early stages of the EA. Expectation to Address Comment: Please respond to the above questions related to the emergency response capability in Quebec. Also, explain how the current ERP is adequate for the Decommissioning Execution period of the proposed project. In addition, consider amending the ERP to account for the potential long-term effects of the proposed project, if needed.	With respect to how current emergency response procedures are adequate for the Decommissioning Execution period, NPD’s current emergency response procedure outlines actions to take in response to events such as earthquake, fire, flood, loss of power, radiological contamination, evacuation, spill response, thunderstorm and tornado. In addition, as stated in EIS section 9.12.5, additional procedures and safeguards will be implemented if required as part of the project's decommissioning activities.
148	CNSC	Section 9.8.3 Identification of Residual Effects Also applicable to the Decommissioning Safety Assessment Technical Supporting Document	p.9-108	Comment: Section 9.8.3.3 (Effects After Mitigation) states that the maximum total dose for workers received during grouting and emplacement is predicted to be 1.79×10^{-5} mSv/year, as per the Decommissioning Safety Assessment TSD. Sections 8.5.2 (Grout Fill Nuclear Area) and 8.6.4 (Emplace Demolition Material and Grout) of the Decommissioning Safety Assessment TSD provides worker doses for work activities involving grout filling of the nuclear area and all other areas (noting that doses for grouting all other areas are predicted to be bounded by the estimates for the grout filling of the nuclear area). In particular, Table 8-12 (on p. 8-33) provides the predicted dose estimate to workers for this activity as 1.35×10^{-5} mSv/year, which is lower than what is stated in section 9.8.3.3 of the EIS. In addition, this dose estimate only considers inhalation and immersion pathways. There is no discussion on external radiation dose rates or a conservative dose estimate provided for the external dose component during all grouting activities. Expectation to Address Comment: Please clarify the discrepancy between the EIS and the Decommissioning Safety Assessment TSD regarding the worker dose estimate for grouting and emplacement activities.	Incorporated: The discrepancy between the EIS and the Decommissioning Safety Assessment Technical Supporting Document (DecomSA TSD) is acknowledged and has been corrected. In considering the hazard of external radiation fields and potential dose, section 8.5.1.6 of the DecomSA TSD “Effects on Worker Health,” states that the assessment is bounded by the dose associated with drilling into the concrete of the reactor vault, assessed in section 8.4.4. This statement does not seek to remove the process of applying the As Low As Reasonably Achievable (ALARA) principle. Section 15.3 of the NPD Detailed Decommissioning Plan (DDP), (Johnson 2022a), describes the Canadian Nuclear Laboratories (CNL) Radiation Protection Program and its application of ALARA and Section 5 includes the estimated collective external dose to workers for the project, whereas the DecomSA TSD is concerned with the magnitude of potential exposures associated with discrete activities. Change to EIS: Predicted dose to worker is corrected in Section 9.8.3.3 to align with the DecomSA TSD -deleted “$1.79\text{E-}05$ mSv/yr” and replaced with “$1.35\text{E-}05$ mSv/yr”. References: <i>Johnson D. 2022a. Detailed Decommissioning Plan for Nuclear Power Demonstration Waste Facility. 64-508310-DDP-001. Revision 3.</i> <i>DecomSA TSD: Garisto, N., Kovacs, R., Music, S., Gilbert, J., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Please clarify why external radiation dose rates were not considered in worker dose estimates during grouting and emplacement activities.	
149	CNSC	Section 9.8.3 Identification of Residual Effects Also applicable to the Decommissioning Safety Assessment Technical Supporting Document	p.9-108	Comment: Section 9.8.3.3 (Effects After Mitigation) states that the maximum total dose received by a driller while creating slip pipe access is predicted to be 0.436 mSv. This predicted dose is substantiated in the Decommissioning Safety Assessment TSD. However, it assumes one driller drilling each of three holes (i.e., a total of three workers) and does not consider internal dose (i.e., via dust inhalation and immersion). Section 8.4.4.6 (Provide Slip Access to Nuclear Area – Effects on Worker Health) of the Decommissioning Safety Assessment TSD indicates that for the drilling activities, it is assumed that dust and inhalation safeguards will be in place, such that inhalation of dust is mitigated. However, no further information is provided. For completeness, the effects on worker health due to inhalation and immersion of airborne radionuclides should be assessed. Section 9.1.6 (Bounding Scenario 6: Accidental Exposure to Radioactivity) of the Decommissioning Safety Assessment TSD notes that CNL’s radiological work control process requires radiation surveyor coverage during drilling work activities. There is no discussion provided regarding radiological effects on the radiation surveyor present during the drilling work activities. Expectation to Address Comment: ☐ Please clarify if the dose estimate for the driller creating slip pipe access is bounding, since it assumes three different drillers (although not explicitly stated), and therefore, the dose estimate is not cumulative. For instance, if only one driller will drill all three slip pipe access holes, this scenario may not be bounding. ☐ Please justify why internal dose due to dust inhalation and immersion is not considered in the dose estimate for the driller while creating slip pipe access. ☐ Please clarify whether the radiological effects on the radiation surveyor that is expected to be present during the slip pipe access work activities are bounded by the radiation dose estimates for the driller. If not, provide the dose estimate for the radiological surveyor.	Resolved As: The dose estimate for drilling activities in section 9.8.3.3 of the EIS, is considered a bounding individual dose and is written conservatively with the assumption that a single worker is most exposed for the entire drilling period. The Decommissioning Safety Assessment Technical Supporting Document (DecomSA TSD), considers conservative assessments of worker exposure scenarios to provide bounding estimates of radiation dose. This statement does not seek to remove the application of the As Low As Reasonably Achievable (ALARA) principle. Section 15 of the NPD Detailed Decommissioning Plan (DDP) (Johnson 2022a), describes the Canadian Nuclear Laboratories (CNL) Radiation Protection Program and its application of ALARA and Section 5 includes the estimated collective external dose to workers for the project whereas the DecomSA TSD is concerned with the magnitude of potential exposures associated with discrete activities for decommissioning of the NPD Waste Facility. During the decommissioning planning phase, and prior to execution of the activities and tasks described in the DecomSA TSD, all work will be assessed following CNL’s Radiation Protection Program requirements, specifically, ALARA Review and Assessment – Planning and Control of Radiation Work, (CNL 2023). At this point <u>all</u> exposure pathways and <u>all</u> workers involved will be considered, assessed and the output documented and not just those considered bounding or most exposed. Internal dose due to inhalation would be very small and is considered bounded by the conservative dose above because it is assumed that dust and inhalation safeguards will be in place such that inhalation of dust is mitigated. The radiation dose estimate for the driller is considered to bound the exposure of any support workers including that of the Radiation Protection Staff. References: <i>Johnson D. 2022a, Detailed Decommissioning Plan for Nuclear Power Demonstration Waste Facility, 64-508310-DDP-001, Revision 3.</i> <i>Canadian Nuclear Laboratories (CNL). 2023, ALARA Review and Assessment – Planning and Control of Radiation Work, 900-508740-MCP-026, Revision 1.</i> DecomSA TSD: <i>Garisto, N., Kovacs, R., Music, S., Gilbert, J., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
150	Government of Quebec	Section 9.8.3 Identification of Residual Effects (Human Health)	p.9-110	Comment: Section 9.8.3 states: “In the normal evolution scenario dose estimates, the highest dose was received by an adult hunter (0.0001 mSv/y).” In all likelihood, this risk (of 0.1 µSv/year) would come from chlorine-36. This value is much lower than the value given by Helbrecht (2002) of 22 µSv/year. Expectation to Address Comment: Please provide the technical explanation to help understand this difference. Reference: Helbrecht, R.A. 2002. <i>Summary of feasibility studies on in situ disposal as a decommissioning option for nuclear facilities</i> (IAEA-TECDOC--1273). International Atomic Energy Agency.	Resolved As: In the 4th Iteration of the Postclosure Safety Assessment Technical Support Document (PostSA TSD) the highest dose to a receptor is a site resident (infant) at 0.00008 mSv/yr dominated by ingestion of milk/food from animals raised on the surrounding land, in which Cl-36 has accumulated. The highest dose received by the adult hunter is 0.0000004 mSv/y primarily due to C-14 as the dominant radionuclide. The current modeling in the PostSA TSD builds on the previous feasibility studies referenced by the reviewer. However, the project has introduced a considerable amount of new information and modern modelling methods which would cause a noticeable difference in results. For example the scoping assessment referenced by the reviewer calculated a normal evolution scenario dose of 0.01 mSv/y, around 100 times greater than calculated in the more recent version. The difference can be assigned to a range of factors, but broadly these reflect the preliminary nature of that feasibility study and consequently a more cautious approach. Some differences which could be attributed to the differences of doses as a result of Cl-36 may include: - Corrosion rates for the reactor components assumed in the scoping study were up to 100 times greater than used in the recent project modeling. - Sorption coefficients utilized in the recent project modeling are improved thus reflecting recent waste disposal research programs which have contributed to this field since the feasibility study. Peak doses due to Cl-36 appear in the disruptive scenarios of the current modeling. These scenarios tend to reflect events where the facility is directly interacting with the biosphere environment (i.e. human intrusion, early glaciation and mass excavation). References: <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
151	CNSC	EIS, Section 9.8.3 Identification of Residual Effects Also applicable to the Postclosure Safety Assessment Technical Supporting Document	p.9-112	Comment: Section 9.8.3.4 (Prediction Confidence and Uncertainty – Human Health) states: “There is some uncertainty in the characterization of potential effects to Aboriginal groups, due to lack of site-specific information on diet and lifestyle. However, this has been accounted for by using conservative assumptions.” The intake rates specified for the recreational/hunter group should conservatively reflect what was learned from local Indigenous groups during consultation. Expectation to Address Comment: Please confirm that dietary intake rates conservatively reflect those of local Indigenous groups. This may be based on what was learned from Indigenous engagement activities.	Resolved As: CNL notes for the Postclosure Safety Assessment Technical Supporting Document (PostSA TSD), a conservative hunter / gatherer self-sufficient Indigenous receptor, was included. This receptor was assumed to be an Indigenous person (including adults and children) who obtained all their food through hunting and gathering in the area. It was also assumed that this person would have increased consumption of fish and wild game and would also consume local mushrooms and berries. CNL utilized an Aboriginal Lifestyle Characterization report completed for the Nuclear Waste Management Organization (SENES 2014), endorsed by the Assembly of First Nations, as the basis for the self--sufficient Indigenous receptor. The 2020 March EIS that includes the new Indigenous receptor was shared with Indigenous Nations, communities, and organizations in 2020 May. In engagement sessions so far with the Métis Nation of Ontario (MNO), the Algonquins of Ontario (AOO) and Kitigan Zibi Anishinabeg (KZA), the NPD Closure Project has stated its assumptions that gathering likely occurs on Crown land around NPD by Indigenous peoples. To date, no one has suggested anything different. Section 2.6.8 of the EIS states: “A significant effort has been made to better understand traditional Indigenous land and resource use near the site. Access to the current NPD site is restricted so traditional use does not occur on site. While some of the traditional knowledge and land use studies are not completed, Indigenous land and resource use (trapping, hunting, fishing and gathering) has and likely does occur adjacent and near the site. CNL has assumed that those activities will likely continue to occur in the future.”

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					By identifying that Indigenous traditional activities, such as gathering, likely occurs on the nearest Crown land, the NPD Closure Project has exercised a precautionary approach of where these activities might occur in relation to the NPD site. Furthermore, engagement to date has not suggested that these assumptions are incorrect. Future engagement activities with Indigenous Nations, communities, and organizations will continue to seek information related to local food consumption. CNL also provided funding for a specific Diet and Harvest Study to the Algonquins of Pikwàkanagàn First Nation (AOPFN), the results of which were received in August 2021. CNL is committed to documenting results and discussions with Indigenous Nations, communities, and organizations on the Traditional Use Studies and the Diet and Harvest Study in a future revision of the Indigenous Engagement Report (IER), which will be submitted to the CNSC as supplemental documentation prior to the Commission Hearing. As a result of Indigenous feedback, the PostSA TSD Normal Evolution Scenario examines an Indigenous receptor intended to represent traditional Indigenous lifestyles, based on the AOPFN Diet and Harvest Study (Fediuk et al., 2021), which shows that today, members are more likely to supplement their diet with additional groceries purchased from local shops. The Indigenous receptor does not live on the NPD site but uses the land surrounding the facility for some traditional activities (such as hunting, fishing, and harvesting of wild plants). As noted, this receptor has a diet that includes harvested and gathered food (from the area around the site) as well as purchased foodstuffs (based on the AOPFN Diet and Harvest Study). Another Indigenous receptor, which is referred to as the self-sufficient Indigenous receptor (based on SENES (2014) and which has more conservative exposure characteristics than the AOPFN receptor), is also considered in a Sensitivity Case analysed in the 4th iteration of the PostSA. The doses seen by the indigenous receptor and the self-sufficient receptor are less than the doses seen by the most exposed receptor (Resident (Infant)) and show the impacts to a very conservatively characterized receptor where the sensitivity case considers a self-sufficient Indigenous receptor whose exposure characteristics bound the dietary and lifestyle of Indigenous Nations and communities in the area. References: <i>Fediuk, Karen, Ginger Gibson, and Firelight Research Inc. Diet and Harvest Study. Confidential Report Specific to Canadian Nuclear Laboratories Nuclear Power Demonstration Decommissioning Project. Submitted to the Algonquins of Pikwàkanagàn First Nation. 2021 August 10.</i> PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL. <i>SENES Consultants Limited (2014) – Aboriginal Lifestyle Characterization. Prepared for Nuclear Waste Management Organization. NWMO TR-2014-13. SENES Reference No. 350696. June.</i>
152	Government of Quebec	Section 9.8.3 Identification of Residual Effects (Human Health)	p.9-102 to 9-119	Comment: The draft EIS covers the assessment and mitigation of environmental impacts on human health. In a context where we recognize health as “a state of complete physical, mental and social well-being”, CNL does not seem to consider the assessment of the potential social and psychological impacts that may arise from the perception of risks associated with decommissioning activities. Moreover, on page 9-111, the draft EIS clearly states that the spatial boundaries of the project (Site and Local Study Areas) are restricted to lands that are “owned by the federal government”, and	Resolved As: The assessment of health effects in the EIS is consistent with guidance outlined in REGDOC-2.9.1 (CNSC 2017a), which states: <i>“The licensee should describe the potential effects of the facility or activity on the physical well-being of Aboriginal groups and other people resulting from biophysical effects...”</i> There is no further explanation of Health in the <i>Generic Guidelines for the Preparation of an Environmental Impact Statement</i>. In the EIS, no residents are present in the Site or Local Study Areas. However, Quebec residents are present and considered as part of the Regional Study Area. In the Post Closure Safety Assessment Technical Support Document

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				therefore, where “there are no residents present.” However, there are Quebec residents living at less than 5 km away from the NPD site. Expectation to Address Comment: Please explain the lack of assessment of potential social and psychological impacts of the proposed project in the draft EIS. In addition, please justify why the proximity of Quebec residents to the NPD site was not considered as part of the human health assessment, and in the light of the existing literature, knowledge, and outcomes from public engagement activities with residents living near the site (including Rapides-des-Joachims). In the final EIS, CNL should also highlight whether new mitigation measures will be implemented, which could, for example, require adjustments to future engagement activities with Quebec residents.	(PostSA TSD), a hypothetical site resident is considered, and the doses are below relevant criteria. Residents in Quebec are bounded by the site resident. As stated in the EIS, ongoing engagement activities with the public and stakeholders will take place during the Decommissioning Execution and Institutional Controls phases to identify any changing concerns or perceptions related to the project. References: <i>Canadian Nuclear Safety Commission (CNSC). 2017a. CNSC REGDOC-2.9.1: Environmental Protection: Environmental Principles, Assessments and Protection Measures. Version 1.1.</i> PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. <i>Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
153	CNSC	Section 9.9 Aboriginal Land and Resource Use, Table 9.9-1	p.9-119	Comment: Based on Table 9.9-1, it is unclear how CNL identified the Aboriginal Land and Resource Use VCs. Expectation to Address Comment: As per Section 3.3.2 of CNSC’s <i>Generic EIS Guidelines</i>, please indicate if Aboriginal traditional knowledge was considered when identifying the Aboriginal Land and Resource Use VCs, and if so, what potentially affected Aboriginal groups were engaged with to develop those VCs, if any.	Resolved As: Indigenous traditional knowledge was considered when identifying the Traditional Land and Resource Use Valued Components (VCs), as per Section 3.3.2 of CNSC’s Generic EIS Guidelines. Section 9.9.1 of the NPD Environmental Impact Statement (EIS), titled Selection of Valued Components, details how VCs for traditional land and resource use were selected considering a number of factors, including: • Knowledge of Indigenous traditional land and resource use practices that interact with the environment; • Indigenous and / or treaty rights; • Engagement, as documented in the Indigenous Engagement Report (IER) Technical Support Document (TSD); and, • Consideration of other environmental assessments (EA). Table 9.9-1 continues to include the rationale for how and why each of the traditional use VCs was selected and Section 8.9.2.1 describes how traditional land and resource use information was gathered. CNL has also developed a new table (Table 9.9-2) that highlights key interests and concerns identified by Indigenous Nations, communities, and organizations through engagements and completion of new studies related to traditional land and resource use VCs. This new table provides a summary of how and where the interests and concerns are addressed in the NPD EIS (i.e., the specific VCs or environmental components). The areas of interest and concern include: • Loss of connection to, and use of, lands and water; • Presence and preservation of cultural landscapes and sites; • Commercial trapping; • Wildlife, harvesting and fishing areas; • Plant and natural materials gathering areas; and • Indigenous rights. Results of the traditional knowledge studies provided by specific Indigenous Nations, communities and organizations and direct engagement with Indigenous Nations, communities and organizations support and align with the traditional land and resource use VCs: trapping, hunting, fishing, gathering and cultural resources and ceremonies. The VCs remain the same as identified in the 2017 draft EIS. Included below is a summary of CNL’s

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					efforts and the resources used to gather information on traditional land and resource use VCs and validate the VCs selected for this study. CNL has gathered or attempted to gather information on traditional use near the NPD site from all identified Indigenous Nations, communities, and organizations (Table 6.2-1 of the EIS includes the identified Indigenous Nations, communities, and organizations). Requests for traditional use information have been made in letters, presentations, and through direct discussions. CNL has described traditional use for Indigenous Nations, communities and organizations where information about it is documented in existing: reports, studies, database, etc.; or where that information has been provided verbally in meetings and other communications. In 2016, CNL sent two letters (IER TSD Appendices B and C) to the identified Indigenous Nations, communities and organizations requesting information on traditional land and resource use in the area surrounding the NPD site. CNL sent letters (IER TSD Appendix D) in May 2020 asking relevant questions again to verify assumptions CNL made in lieu of having responses or direct input from the various Indigenous Nations, communities and organizations. The VCs for the NPD EIS were presented by CNL in project engagements to the Algonquins of Ontario (AOO) (which included invites to Algonquins of Pikwàkanagàn First Nation (AOPFN) members); the Métis Nation of Ontario (MNO), and Kitigan Zibi Anishinabeg (KZA). CNL and the Algonquin Anishinabeg Nation Tribal Council (AANTC) had also coordinated a meeting in May 2019 that would have included a presentation on VCs for the NPD EIS, however the AANTC had to cancel and were unable to reschedule. These Indigenous Nations, communities and organizations expressed an interest in learning more about the NPD project VCs. A summary of Indigenous feedback on VCs is included in Section 6.3.2 of the EIS. Information on traditional land use activities by Indigenous peoples has been drawn from: existing studies and reports; Indigenous Nation, community and organization websites; the MNO Traditional Knowledge and Land Use Study (KnowHistory 2019); the AOO AKLUS (SVS, AOO, 2020); the AOPFN AKLUS (SVS, AOPFN, 2020); the AOPFN Diet and Harvest Study (Fediuk, et. al, 2021) and the AOPFN Culture and Rights Study (Malone et. al, 2021); formal and informal consultation activities. The MNO reviewed the March 2020 draft EIS which included incorporation of the findings of the MNO TKLUS (Section 8.9.2.2.4). The AOO (Section 8.9.2.2.3) and AOPFN (Section 8.9.2.2.2) have also provided CNL with feedback on how their AKLUS studies were incorporated into this section. Further detail on how information on traditional land and resource use was gathered for each Indigenous Nation, community or organization is included in Section 8.9.2.1. The remainder of Section 8.9.2 of the EIS outlines specific Traditional Land and Resource VCs highlighting which sources have been used to compile the information: Trapping (Section 8.9.2.3), Hunting (Section 8.9.2.4), Fishing (Section 8.9.2.5), Gathering (Section 8.9.2.6) and Cultural Resources and Ceremonies (Section 8.9.3). In the absence of specific feedback from other Indigenous Nations, communities and organizations, traditional land and resource use is assumed wherever there are publicly accessible lands (e.g., Ontario Crown land), which is a conservative approach to the assessment and also to reflect the dynamic practice of traditional land and resource use by Indigenous peoples in time and space. By making this assumption, it is more likely effects will be identified and assessed and potential use will be factored into project planning. CNL has also created Tables of Interests and Concerns (EIS Appendix C, IER Appendices J through Y) that include interests, concerns, and / or feedback related to Traditional knowledge and land use from each Indigenous Nation, community, and organization, as well as how CNL has addressed this feedback. To address concerns related to traditional land and resource use, CNL has: • contributed funds for the MNO, AOO and AOPFN to undertake traditional knowledge studies; • assumed in the EIS that traditional uses do occur adjacent to the NPD site including in the Ottawa River (Section 8.9.2.1);

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					- assumed that there is an interest to re-establish traditional use activities on the NPD site in the future; - responded to specific comments on this topic area and recommendations from traditional use studies; and - updated the content of Section 8.9 with the results of the traditional knowledge studies as well as from traditional knowledge shared with CNL through other designated projects. For both the AOO and AOPFN continued discussions on the results and recommendations from the traditional use studies, concerns about impacts to traditional land and resource use and forward commitments by the project are planned. The validation of traditional land and resource use information is recorded in Section 6.2.4.2.4 for the AOO and Section 6.2.4.3.4 for AOPFN. CNL and the AOO had focused discussions on VCs in 2022 and 2023. Together, AOO and CNL developed a simplified table incorporating all VCs from the AOO AKLUS mapping their inclusion in CNL’s EIS to assist AOO members confirming that all their identified VCs are considered in CNL’s assessment. In June 2023, CNL shared the complete VC summary table with the AOO. With the exception of the MNO, AOO and AOPFN, there has been little in the way of comments from other Indigenous Nations, communities or organizations on the specific VCs that were used in the assessment, or – more critical to this question – on the VCs selected to evaluate Traditional Land and Resource Use. Note: The order of EIS sections has been changed in the EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples. References: <i>Fediuk, Karen, Ginger Gibson, and Firelight Research Inc. Diet and Harvest Study. Confidential Report Specific to Canadian Nuclear Laboratories Nuclear Power Demonstration Decommissioning Project. Submitted to the Algonquins of Pikwàkanagàn First Nation. 2021 August 10.</i> IER TSD: <i>Chennette, R, 2024. Nuclear Power Demonstration (NPD) Indigenous Engagement Report. 64-513130-REPT-001. Revision 5.</i> <i>KnowHistory. 2019. Chalk River TKLUS Report. 2019 February 28.</i> <i>Malone, Molly and Firelight Research Inc. with the Algonquins of Pikwakangan First Nation. Algonquins of Pikwakangan First Nation Culture and Rights Study Specific to Canadian Nuclear Laboratories Nuclear Power Demonstration Decommissioning Project. Final Report (Confidential). 2021 August 09.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Ontario (AOO). 2020 December 15.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Pikwàkanagàn First Nation (AOPFN). 2020 September 24.</i>
154	CNSC	Section 9.9.2 Assessment Boundaries (Aboriginal Land and Resource Use)	p.9-121	Comment: It is unclear whether CNL considered Aboriginal traditional knowledge when determining the assessment boundaries to measure the project’s effects on Aboriginal Land and Resource Use VCs. Expectation to Address Comment:	Resolved As: Yes, Canadian Nuclear Laboratories (CNL) has considered Indigenous traditional knowledge in determining the assessment boundaries to measure the project’s effects on Indigenous Land and Resource Use Valued Components (VCs). CNL originally considered Traditional Knowledge (TK) from secondary research to establish the assessment boundaries in the draft Environmental Impact Statement (EIS). Once CNL received TK directly through engagement (TK studies, correspondence, comments on the draft EIS, meetings) with Indigenous Nations, communities and organizations, CNL considered the TK and determined that it did not necessitate a change to the established assessment boundaries – CNL verified that it was consistent with information used originally to establish assessment boundaries. The established assessment boundaries (defined as study areas) provide an accurate effects assessment

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Please indicate whether CNL considered Aboriginal traditional knowledge, as identified in CNSC’s <i>Generic EIS Guidelines</i> , when determining the assessment boundaries to measure the project’s effects on Aboriginal Land and Resource Use VCs.	for those VCs related to Indigenous interests, which must be considered under <i>CEAA</i>, 2012, falling under the environmental component of Traditional Land and Resource Use or the species VCs, which were identified by First Nations and the Métis Nation of Ontario (MNO) for the project. It also should be emphasized that the project’s EIS predicts no significant adverse environmental effects for the VCs assessed within the study areas and therefore it is the understanding of CNL, from established environmental assessment (EA) methodology (in the western science tradition), that expanding the study areas does not change the effects assessment for the project. CNL is committed to meaningful engagement with Indigenous Nations, communities and organizations on the NPD Closure Project. As context, CNL provides the following details on the relationships of the Algonquin Nations, communities and organizations located near the NPD site. The Algonquins of Ontario (AOO) is an organized collective of Algonquin communities assembled to enable a unified approach to reaching a settlement over a comprehensive land claim. As the NPD site is located within unceded Algonquin traditional territory, the NPD Closure Project is situated on lands that are of interest to the AOO. The AOO is comprised of ten Algonquin communities located within the Ottawa Valley. Algonquin Negotiation Representatives (ANRs) represent these communities and are comprised of the AOPFN Chief and Council (six Councilors) along with one representative from each of the other Algonquin communities. Although the AOO asserts existing Indigenous rights and title throughout unceded Algonquin traditional territory, including the NPD site, it is the individual First Nations who are the sovereign entities that retain title to the land and resources. Individual First Nations, such as AOPFN, are independently governed Treaty and Aboriginal rights-holders who retain sacred responsibility to care for the land. CNL recognizes this distinction and is committed to meaningful engagement with both Treaty and Aboriginal rights-holders, as well as communities and organizations who have interests on the lands. The paragraphs below discuss: 1. The established assessment boundaries for study areas. 2. The TK that was provided to CNL, how CNL considered that TK and incorporated TK into the project with respect to those VCs related to Indigenous interests, which must be considered under <i>CEAA</i>, 2012. 3. Finally, why CNL has concluded that the established study areas are able to give a fulsome effects assessment for those VCs related to Indigenous interests, which must be considered under <i>CEAA</i>, 2012. Assessment boundaries The assessment boundaries have been established and have stayed consistent throughout all revisions of the draft EIS and remain unchanged after the addition of new VCs related to Indigenous interests that were provided to CNL through TK studies and engagement with Indigenous Nations, communities and organizations. The Local Study Area (LSA) and Regional Study Area (RSA) assessment boundaries were established to encompass areas where potential effects could occur as a result of the NPD Closure Project. CNL drew the assessment boundaries beyond the NPD property boundaries to include Crown land in Ontario and Quebec and also to include the Kichi-Sibi (Ottawa River). CNL recognizes that traditional land and resource use activities most commonly occur on Crown lands (as opposed to private lands) and waters, therefore, the inclusion of Crown lands in addition to the NPD property and the Kichi-Sibi (Ottawa River) ensures that CNL has taken into account areas near the NPD site where traditional land and resource use activities occur. The following describes the assessment boundaries for Indigenous VCs: • The Site Study Area (SSA) is the same as the general Site Study Area, which is the project footprint where project activities would take place on the NPD site and extends 50 metres into the Kichi-Sibi (Ottawa River);

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					• The LSA comprises the entire NPD property, including the shoreline, and extends 50 metres into the Kichi-Sibi (Ottawa River). It was chosen to be the entire NPD site as a convenient estimate of this area, with the intention of increasing the boundary if required, based on the results of the EA. In Section 9 of the EIS, the assessment confirmed that there are no measurable effects for any environmental component beyond the LSA; and • The RSA is the SSA in addition to an area within a 5 kilometre radius beyond the SSA. This includes the Kichi-Sibi (Ottawa River). Similar to the LSA, the boundaries for the RSA were chosen to include the expected area of possible effects. Traditional Knowledge, Assessment Boundaries and VC Selection For the draft EIS, CNL selected the following five VCs related to the environmental component of Traditional Land and Resource Use: trapping, hunting, fishing, gathering, as well as cultural resources and ceremonies. CNL also selected several species VCs; this list of species VCs has expanded with the completion of TK studies and discussions / meetings with Indigenous Nations, communities and organizations. As described in Section 6.3.2 of the EIS, berries, mushrooms, mink, river otter, weasel, red fox, moose and monarch butterflies were added as VCs as a result of Indigenous engagement activities. The selection of VCs was informed by multiple sources, including, and most relevant to this IR, Traditional Knowledge. In CNL’s earliest outreach with all 15 Indigenous communities and organizations with rights and interests in the vicinity of the NPD site (identified by CNL and the CNSC), CNL directly sought information related to the environmental component of Traditional Land and Resource Use. Specifically, in a letter dated November 10, 2016, CNL asked the following questions: • Do you have any members that currently practice traditional activities such as trapping, hunting, fishing and/or gathering, near the two projects? • Do the [community name] or any members, have sites of ceremonial significance in close proximity to either of the two sites, or more generally, any cultural activities near either of the two sites? CNL sent an additional letter inquiring about traditional land use to Indigenous Nations, communities and organizations in May 2020. CNL also sought to obtain TK information during direct discussions between Indigenous Nations, communities and organizations and CNL. For instance, representatives from some of the Williams Treaties First Nations (WTFN), specifically Curve Lake First Nation (CLFN) and Hiawatha First Nation (HFN), indicated during a meeting in May 2020 that community members did practice traditional activities in the vicinity of the NPD site. The Anishinabeg Nation Tribal Council (AANTC), Kebaowek First Nation (KFN) and Kitigan Zibi Anishinabeg (KZA) also reiterated in written correspondence throughout engagement about the importance of the Ottawa River for traditional land and resource use, as well as culturally. Later in the engagement process, CNL received several TK study reports from the Algonquins of Ontario (AOO), the Algonquins of Pikwàkanagàn First Nation (AOPFN) and the Métis Nation of Ontario (MNO): • MNO Traditional Knowledge and Land Use Study (KnowHistory 2019); • AOO AKLUS (SVS, AOO, 2020); • AOPFN AKLUS (SVS, AOPFN, 2020); • AOPFN Diet and Harvest Study (Fediuk, et. al, 2021); and

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																										
					AOPFN Culture and Rights Study (Malone et. al, 2021). Although not shared specifically in relation to the NPD Closure Project, KFN and KZA shared some history of their Nations and TK through submissions to CNL and CNSC on other designated projects (e.g., the procedural directive submissions for the NSDF Project). Despite various attempts and opportunities to gain TK from all 15 Indigenous communities (identified by CNL and the CNSC), CNL has not received specific TK information from: Anishinabek Nation, Algonquin Nation Secretariat, Georgina Island First Nation, Chippewas of Beausoleil First Nation, Alderville First Nation, Mississaugas of Scugog Island First Nation, and Chippewas of Rama First Nation. This does not present a challenge for the assessment because as noted above, the project assumes and considers that traditional activities may be practiced in the LSA and RSA. Overall, it is understood that Indigenous peoples practice or have likely practiced some traditional activities within the LSA and RSA of the NPD Closure Project. Indigenous Nations, communities and organizations have conducted the above TK studies to support the NPD Closure Project EIS and have identified VCs of particular interest to them. Through this engagement process, Indigenous interests have been incorporated into the selection of final VCs for the NPD Closure Project. VCs were then assessed to determine what effects (if any) the project may have on each VC. Several Indigenous Nations, communities and organizations (AOO, AOPFN, MNO, Curve Lake First Nation, and Hiawatha First Nation) have confirmed the VCs related to Traditional Land and Resource Use and shared specific species VCs either through their written comments on the draft EIS, meetings and engagement activities or through sharing studies of traditional knowledge, and land use. CNL reviewed the Indigenous-identified species VCs, against the VCs selected by CNL for the draft EIS and the Ecological Risk Assessment (EcoRA). As mentioned above, certain species were added to the final VC list and the remainder of species identified as VCs by Indigenous Nations, communities and organizations are already represented through receptors in the EcoRA. An example of how CNL has mapped Indigenous VCs to receptor species is outlined below in Table 6.3-3, which is found in Section 6.3 of the EIS and in Section 5 of the Indigenous Engagement Report (IER). Table 6.3-3 VCs Identified by Métis Nation of Ontario through the TKLUS <table><tr><th>Valued Component (species)</th><th>Represented by receptors (see EcoRA TSD)</th></tr><tr><td>Moose</td><td>Moose</td></tr><tr><td>Berries (chokecherries, blueberries, raspberries)</td><td>Berries</td></tr><tr><td>Bass</td><td>Pelagic Fish</td></tr><tr><td>Northern pike / jackfish</td><td>Pelagic Fish</td></tr><tr><td>Trout</td><td>Pelagic Fish</td></tr><tr><td>Walleye</td><td>Pelagic Fish</td></tr><tr><td>Partridge</td><td>Ruffed grouse</td></tr><tr><td>Goose</td><td>Mallard</td></tr><tr><td>Grouse</td><td>Ruffed grouse</td></tr><tr><td>Turkey</td><td>Ruffed grouse</td></tr><tr><td>Rabbit</td><td>Meadow vole</td></tr><tr><td>Sturgeon</td><td>Benthic Fish</td></tr></table>	Valued Component (species)	Represented by receptors (see EcoRA TSD)	Moose	Moose	Berries (chokecherries, blueberries, raspberries)	Berries	Bass	Pelagic Fish	Northern pike / jackfish	Pelagic Fish	Trout	Pelagic Fish	Walleye	Pelagic Fish	Partridge	Ruffed grouse	Goose	Mallard	Grouse	Ruffed grouse	Turkey	Ruffed grouse	Rabbit	Meadow vole	Sturgeon	Benthic Fish
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					<table><tr><td>Ottawa River water quality</td><td>Environmental component, pathway to human health and non-human biota</td></tr><tr><td>Wintergreen</td><td>Terrestrial vegetation</td></tr><tr><td>Chaga</td><td>Fungi (mushrooms)</td></tr><tr><td>Fiddleheads</td><td>Terrestrial vegetation</td></tr><tr><td>Trees suitable for the traditional métis craft of canoe building (cedar, oak, ash, yellow birch)</td><td>Terrestrial vegetation</td></tr></table>	Ottawa River water quality	Environmental component, pathway to human health and non-human biota	Wintergreen	Terrestrial vegetation	Chaga	Fungi (mushrooms)	Fiddleheads	Terrestrial vegetation	Trees suitable for the traditional métis craft of canoe building (cedar, oak, ash, yellow birch)	Terrestrial vegetation
Ottawa River water quality	Environmental component, pathway to human health and non-human biota														
Wintergreen	Terrestrial vegetation														
Chaga	Fungi (mushrooms)														
Fiddleheads	Terrestrial vegetation														
Trees suitable for the traditional métis craft of canoe building (cedar, oak, ash, yellow birch)	Terrestrial vegetation														
					The TK collected by CNL has been used to validate VCs established in the biophysical environment, which in some instances resulted in the direct assessment of a VC and in others was considered by other appropriate receptor species as illustrated in the table above. Verification and Validation Process CNL has sought feedback on the EIS, which contains the details of the environmental assessment, including how and why the assessment boundaries were chosen, from Indigenous Nations, communities, and organizations. The AOO, the MNO and the AANTC submitted comments to the CNSC on the 2017 draft EIS through the formal EIS comment period in 2018. CNL shared the EIS with other Nations, communities and organizations providing an additional informal opportunity to comment. In 2020, the AOPFN reviewed the EIS, in 2021 CLFN reviewed the EIS, in 2023 Wolf Lake First Nation (WLFN) and KZA reviewed the EIS, and in 2024 KFN reviewed the EIS. From these EIS comments and review, the AOO, the AOPFN and the MNO raised concerns with CNL’s assessment approach for effects and disagree with the study areas selected by CNL and ultimately the results of the effects assessment (AOPFN – Section 6.2.4.3.3 and MNO – Section 6.2.4.4.3). CNL has included a sub-section (Section 9.9.6) in the EIS that presents AOPFN's perspective on effects to traditional land and resource use including assessment boundaries and perceived effects. The AOO and CNL, as well as the MNO and CNL, have reached an understanding on CNL’s assessment approach. However, this concern remains outstanding between CNL and AOPFN. To address this concern (and other outstanding interests), CNL and AOPFN have agreed to a series of collaborative and focused next steps. The steps specific for working together to address the concern related to assessment boundaries include the following, in addition to the inclusion of the AOPFN’s own perspective on the use of representative species as a sub-section in the EIS and IER: • Collaborative development of risk-informed communication materials for the NPD Closure Project for AOPFN community members and application of the AOPFN Algonquin Risk Communication Program at the NPD Site. • NPD site-specific Guardian monitoring activities, incorporating traditional knowledge and AOPFN valued components. • AOPFN-led site inventory work to develop an Algonquin Knowledge baseline for the entire NPD site. References: <i>Fediuk, Karen, Ginger Gibson, and Firelight Research Inc. Diet and Harvest Study. Confidential Report Specific to Canadian Nuclear Laboratories Nuclear Power Demonstration Decommissioning Project. Submitted to the Algonquins of Pikwàkanagàn First Nation. 2021 August 10.</i> IER TSD: <i>Chennette, R. 2024. Nuclear Power Demonstration (NPD) Indigenous Engagement Report. 64-513130-REPT-001. Revision 5.</i> <i>KnowHistory. 2019. Chalk River TKLUS Report. 2019 February 28.</i> <i>Malone, Molly and Firelight Research Inc. with the Algonquins of Pikwakangan First Nation. Algonquins of Pikwakangan First Nation Culture and Rights Study Specific to Canadian Nuclear Laboratories Nuclear Power Demonstration Decommissioning Project. Final Report (Confidential). 2021 August 09.</i>										

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Ontario (AOO). 2020 December 15.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project Algonquins of Pikwàkanagàn First Nation (AOPFN). 2020 September 24.</i>
155	CNSC	Section 9.9.3 Identification of Residual Effects (Aboriginal Land and Resource Use)	p.9-125	Comment: As per CNSC’s <i>Generic EIS Guidelines</i>, CNL is required to discuss potential environmental effects and mitigation measures with First Nation and Métis groups. Expectation to Address Comment: Please indicate whether CNL has engaged with First Nation and Métis groups when developing mitigation measures for potential impacts on Aboriginal Land and Resource Use VCs, and confirm which groups were engaged and how their input was addressed.	Incorporated: Yes, Canadian Nuclear Laboratories (CNL) has both shared and discussed monitoring and mitigation measures and has offered all 15 Indigenous Nations, communities and organizations (identified by CNL and the Canadian Nuclear Safety Commission (CNSC)) with the opportunity to participate in the development of mitigation measures. Furthermore, CNL has committed to providing Indigenous Nations, communities, and organizations with the opportunity to be involved in the implementation and review of mitigation measures as per the guidance of REGDOC 3.2.2 (CNSC 2019) and CNSC’s <i>Generic Environmental Impact Statement (EIS) Guidelines</i> (CNSC 2016). It should be noted the Environmental Impact Statement (EIS) for the NPD Closure Project, per <i>CEAA</i>, 2012 considers mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the designated project (Section 10 of the EIS). The NPD Closure Project’s EIS predicts no residual adverse environmental effects. CNL is committed to meaningful engagement with Indigenous Nations, communities and organizations on the NPD Closure Project. As context, CNL provides the following details on the relationships of the Algonquin Nations, communities and organizations located near the NPD site. The Algonquins of Ontario (AOO) is an organized collective of Algonquin communities assembled to enable a unified approach to reaching a settlement over a comprehensive land claim. As the NPD site is located within unceded Algonquin traditional territory, the NPD Closure Project is situated on lands that are of interest to the AOO. The AOO is comprised of ten Algonquin communities located within the Ottawa Valley. Algonquin Negotiation Representatives (ANRs) represent these communities and are comprised of the AOPFN Chief and Council (six Councilors) along with one representative from each of the other Algonquin communities. Although the AOO asserts existing Indigenous rights and title throughout unceded Algonquin traditional territory, including the NPD site, it is the individual First Nations who are the sovereign entities that retain title to the land and resources. Individual First Nations, such as AOPFN, are independently governed Treaty and Aboriginal rights-holders who retain sacred responsibility to care for the land. CNL recognizes this distinction and is committed to meaningful engagement with both Treaty and Aboriginal rights-holders, as well as communities and organizations who have interests on the lands. The paragraphs below discuss: 1. Indigenous peoples involvement in developing monitoring and mitigation measures; 2. Discussion of monitoring and mitigation measures with Indigenous peoples; 3. Feedback and response; and, 4. Verification and validation process and changes to the EIS. Involvement in monitoring and mitigation measures The proposed NPD Disposal Facility (NPDDF) includes a series of in-design mitigation measures to isolate and contain the waste including the grout, the concrete structure and engineered cover. The purpose of containment measures is to ensure that people and the environment are protected. The project has also identified mitigation measures to be employed during physical decommissioning work and monitoring during both the Decommissioning Execution and Institutional Control phases. As project activities are dependent on a licensing decision, the mitigation

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					measures to be employed during physical work have not yet been implemented and cannot be reviewed for effectiveness. CNL has committed to provide a practical and meaningful role in the NPD Closure Project monitoring program to Indigenous Nations, communities, and organizations. CNL has also made specific commitments to several Indigenous Nations, communities and organizations for collaborative development of additional mitigation measures to ensure Valued Components (VCs) are protected. For example, as part of next steps, CNL and the Algonquins of Pikwàkanagàn First Nation (AOPFN) are continuing engagement through the framework of the Contribution Agreement. Using the findings and recommendations from AOPFN’s initial four days of seasonal site inventories and CNL supporting a more comprehensive and site-wide inventory, CNL looks forward to continuing to work with AOPFN to ensure that mitigations are in place to protect terrestrial and aquatic biota that are important to AOPFN. This may be through planned workshops to hear and implement feedback. CNL and AOPFN have agreed to the following commitments: • Collaborative development of risk-informed communication materials for the NPD Closure Project for AOPFN community members and application of the AOPFN Algonquin Risk Communication Program at the NPD site; • NPD site specific Guardian monitoring activities, incorporating traditional knowledge and AOPFN VCs; • Engage with AOPFN on the NPD Environmental Assessment Follow-up Monitoring Program (EAFMP); • Implement the chance find procedure, TLRU discovery plan and Eagle Feather Protocol at the NPD site; and • Co-develop additional mitigation measures to include within the NPD Closure Project Environmental Protection Plan to ensure that items of value to AOPFN are protected. In addition, through the Algonquins of Ontario (AOO)-CNL Working Group meetings, AOO and CNL reviewed together the AKLUS recommendations and worked collaboratively to develop a simplified list of commitments. For example, CNL will provide capacity to the AOO to undertake a socio-economic study with results captured in a subsequent revision of the Indigenous Engagement Report (IER). Through the study recommendations, CNL and AOO will develop together opportunities to improve CNL’s monitoring and mitigations to ensure traditional knowledge is incorporated and that interdependencies between ecological, socio-economic, community and cultural health are recognized. It should also be noted that Indigenous feedback on the NPD Closure Project has resulted in CNL implementing mitigations and changing its current operations related to effluent management and protecting species at risk (SAR) at the NPD site. Mitigations measures, which are planned for implementation during NPD closure activities, are designed to be protective of SAR to ensure that effects on species are minimized both now and into the future. The Algonquins of Anishinabeg Nation Tribal Council (AANTC) raised a concern around the release of effluent from a sump area at the NPD site in their review of the draft EIS. CNL has recognized this concern and has since ceased this practice and now collects and transfers the effluent from the sump area in question to Chalk River Laboratories for treatment. The concern pertaining to SAR is discussed below under Kitigan Zibi Anishinabeg (KZA). Discussion of monitoring and mitigation measures In a letter sent to all Indigenous Nations, communities, and organizations in 2016 November, CNL stated: “Along with providing information about the two proposed projects their benefits and possible impacts and mitigation measures we would also welcome the opportunity to share general information about CNL and its activities.” CNL sent an additional letter to Indigenous Nations, communities, and organizations in 2020 May, following up on traditional land use activities and rights impacts. The AANTC, the Algonquins of Ontario (AOO), AOPFN, the Métis Nation of Ontario (MNO), Curve Lake First Nation (CLFN), Wolf Lake First Nation (WLFN), KZA, and Kebaowek First Nation (KFN) have all reviewed a draft

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					of the EIS and provided comments. Some of these comments, which CNL has been working collaboratively with each of these interested communities to address, discuss mitigation measures and monitoring. In addition to this feedback, the MNO and the AOO have provided comments to CNL on the draft follow-up monitoring plans and the AOPFN and CLFN have indicated that they plan to review. With respect to Indigenous Nations, communities, and organizations that have pursued greater engagement with CNL, CNL (with environmental subject matter experts) has discussed monitoring and mitigation measures on several occasions, which are outlined below: MNO 2016 July 20: MNO’s Mattawa/Lake Nipissing Traditional Territory Consultation Committee and CNL representatives met in North Bay. CNL shared information, including project monitoring plans, and discussed the NPD Closure Project. 2017 June 16: the MNO representative on the Environmental Stewardship Council attended a meeting at the NPD site, which included a poster board session highlighting monitoring and mitigation measures with environmental staff available for discussion. 2019 October 23: A community information session was held in North Bay as an opportunity for MNO citizens to discuss and share feedback, including topics such as follow-up monitoring. 2020 November 09: MNO representatives from the Region 5 and 6 Traditional Territory Consultation Committee met with the NPD Closure Project team, including environmental specialists for a discussion on monitoring, which included mitigation measures. AOO 2016 August 10: The AOO and CNL met to discuss CNL’s environmental assessments (EAs). The discussion on the NPD Closure Project included monitoring, SAR and mitigation measures. 2017 June 09: The AOO’s Algonquin Negotiation Representatives (ANRs) and CNL met at the Chalk River and NPD sites for a full day of discussion and facility tours. The discussions on the NPD Closure Project involved environmental specialists and focused on a number of aspects of the EA including monitoring and mitigation measures. 2017 June 19: The AOO and CNL co-hosted an AOO community information session on CNL’s environmental assessments. The AOO advertised the session to all of their community members. The information session included poster boards and subject matter experts available to discuss mitigation measures and monitoring and the presentation, which CNL delivered, discussed monitoring, proposed follow-up monitoring and mitigation measures in relation to the NPD Closure Project. 2020 December 16: The AOO shared the results of the AKLUS and site-specific recommendations for ways in which CNL can avoid, mitigate, or compensate for the potential impacts of the proposed NPD Closure Project on Algonquin rights and interests. 2023 January 11: The AOO and CNL met to discuss valued components, how they are represented in the NPD EIS and how the project protects (mitigates effects to) VCs. 2023 February 08: The AOO and CNL met to discuss the recommendations of the AKLUS including mitigations for species of importance to the AOO. 2023 May 10: The AOO and CNL met to discuss commitments. The most relevant is a commitment for collaborative work to improve CNL’s monitoring and mitigations to ensure traditional knowledge is incorporated

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					and that monitoring, and mitigation measures recognize interdependencies between ecological, socio-economic, community and cultural health. 2023 June 14: The AOO shared with CNL a copy of the AOO proposed construction / mitigation measures. 2023 August 15: CNL hosted an AOO-CNL site tour of NPD to tour the reactor and view the vegetation and groundwater monitoring wells as part of a harvest survey. 2023 September 13: During the AOO-CNL Working Group meeting, CNL provided a presentation on current and follow-up environmental monitoring at NPD and heard and noted AOO’s feedback for incorporation into its planned monitoring programs. 2023 September 19: The AOO shared with CNL the harvesting survey field notes from the 2023 August site visit to NPD. 2024 February 14: CNL shared with AOO the 2024 field monitoring schedule for NPD based on AOO interest during a previous meeting. AANTC 2017 April 26: The AANTC (including representatives from KFN and KZA) and CNL held a meeting to discuss CNL’s EAs. This meeting included an NPD-focused discussion of SAR and mitigation measures for SAR (namely, the Chimney Swifts as the residual effect to SAR bats had not yet been identified). KZA 2017 May 03: This meeting between KZA and CNL included a discussion on monitoring, mitigation measures and SAR in relation to the NPD Closure Project. 2017 July 20: This meeting at the NPD site involved the identification of milkweed by the KZA representatives, subsequently leading to the addition of the monarch butterfly to the VC list and the implementation of mitigation measures to ensure the SAR was not impacted by the project. 2023 September 07: CNL and KZA met to discuss the EA process, including CNL’s follow-up monitoring plans for NPD which generated discussions on monitoring and mitigation measures. 2023 November 14: CNL shared with KZA the monitoring locations for NPD based on interest from previous meetings. KFN 2022 June: Through their review of the community’s interests and concerns recorded for the project, KFN identified they would like provide input on mitigation to ensure reduction and elimination of potential effects. KFN highlighted that mitigation measures need to take into consideration the importance of and balancing of interrelationships among cultural, environmental and social elements. 2023 April 26: KFN attended a site visit at NPD for a facility tour and project discussion. KFN indicated interest in learning more about CNL’s environmental monitoring results for NPD. 2024 May: KFN provided an Information Request (IR) to CNL as part of KFN’s technical review of the NPD EIS. KFN indicated interest in learning more about the current routine environmental monitoring at NPD, as well as the proposed EA follow-up monitoring plans for NPD, including information on monitoring pathways, locations, and frequencies. KFN also indicated that they would like additional information on plans, protocols, or strategies for Indigenous engagement/consultation on potential impacts to the aquatic environment since the Kichi--Sibi (Ottawa

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					River) and aquatic species are of particular importance to KFN. CNL is currently working to respond to the KFN information requests including focused discussions on topics as needed. AOPFN 2020 November 20: This meeting between the AOPFN’s Algonquin Advisory Committee (AAC) and CNL discussed an overview of the project, including mitigation measures, monitoring and SAR. 2020 November 30: This meeting between the AOPFN and CNL about the NPD Closure Project included discussions on monitoring, mitigation measures and SAR in the context of the AOPFN’s EIS comments. CNL followed up (to this meeting) by sharing the draft follow-up monitoring plans. 2020 December 17: This meeting between the AOPFN and CNL about the NPD Closure Project included discussions on monitoring, mitigation measures and SAR in the context of the AOPFN’s EIS comments. 2021 July 22: This meeting with the AAC and CNL was a focused discussion on the NPD Closure Project, including SAR, monitoring and mitigation measures. 2021 September 21: This meeting with the AAC and CNL was a focused discussion on alternative means, which also touched on monitoring and mitigation measures. 2021 September 27; 2021 October 20; 2021 November 15: These meetings between the AOPFN and CNL were discussions on commitments, including those related to involvement in a monitoring program for CNL-managed sites (the Guardian Program). 2021 October 05: This meeting with the AAC and CNL was a focused discussion on “What if” scenarios and touched on how monitoring and mitigation measures could be employed in a scenario outside of “normal evolution”. 2022: Several meetings related to NPD commitments which include a continuation of the Working Group as a forum to review and recommend mitigations and identify ways to avoid adverse effects. The proposed commitments also include monitoring. 2023 May 31: AOPFN shared recommendations from their seasonal site inventory visits. WTFN 2020 May 19: This meeting between four WTFN communities (Curve Lake First Nation (CLFN), Hiawatha First Nation (HFN), Alderville First Nation, and Chippewas of Georgina Island) and CNL representatives discussed monitoring, species at risk (SAR) and mitigation measures in relation to the NPD Closure Project. 2021 April 28: This meeting between representatives of CLFN, HFN, Chippewas of Rama, Alderville First Nation, and CNL included a focus on monitoring and SAR related to the project. 2023 January 25: During the WTFN-CNL information sharing meeting, WTFN and CNL agreed that follow up monitoring and restoration plans are topics for collaboration. 2023 April 25: This meeting was held between Chippewas of Rama First Nation and CNL to provide a refresher on NPD and to discuss past monitoring results and plans for future monitoring. Wolf Lake First Nation (WLFN) 2023 March 07: CNL received EIS comments from WLFN. There were 30 Comments and Recommendations on various topics, including environmental monitoring, VCs, and mitigation measures. CNL has responded to these comments and offered follow-up; no response from WLFN.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Despite various attempts and opportunities as described above CNL has not received feedback on monitoring and mitigation from: Anishinabek Nation, Algonquin Nation Secretariat, Georgina Island First Nation, Chippewas of Beausoleil First Nation, and Mississaugas of Scugog Island First Nation. Feedback and Response Indigenous feedback on the NPD Closure Project has led to the addition of the following mitigation measures: • The AANTC raised a concern around the release of effluent from a sump area at the NPD site in its review of the draft EIS. CNL has recognized this concern and has since ceased this practice and now collects and ships the effluent from that sump area to Chalk River Laboratories (CRL) for treatment. • KZA noted SAR presence (Monarch butterflies) during a site tour. This SAR was subsequently added to the VC list and mitigation measures around habitat (milkweed) were subsequently implemented. • In response to AOO and AOPFN concerns, CNL has added mitigations around what will happen if undocumented archaeological resources are found (chance find procedure), as well, the Cultural Resource Management Procedure has been added as a mitigation. • As part of their respective Long-Term Relationship Agreements (with AECL and CNL), the AOPFN and the AOO will have the opportunity to make recommendations on environmental and cultural monitoring that would address ecological-community health inter-dependencies of AOPFN and AOO importance. • With the MNO, the development of a Long-Term Relationship Agreement also includes collaboration for environmental monitoring at CNL sites including facilitating the involvement of MNO Monitors in environmental monitoring activities at the NPD site. • In response to AOO concerns raised in their EIS comments, CNL has included additional mitigation measures related to migratory birds and avian and herpetofauna species at risk (for example, related to driver behaviour). • In response to AOPFN concerns raised in their EIS comments, CNL has expanded mitigation measures for the protection of surface water, including the Kichi-Sibi (Ottawa River). • In response to AOO comments, CNL also revised the monitoring plan to address the specific interests and concerns expressed by the AOO: annual sediment monitoring and monitoring of SAR mitigation measures. • CNL has added mitigation measures for Indigenous Land and Resource Use and Indigenous Socioe-conomic and Health to the EIS to address concerns raised by the AOO, the AOPFN and the MNO. Note that since project activities are dependent on a licensing decision, mitigation measures will be implemented and reviewed for effectiveness following regulatory approval of the project. CNL has highlighted under the heading above ‘Involvement in monitoring and mitigation measures’, the specific commitments made regarding monitoring and mitigation measures. Overall, CNL is committed to incorporating additional mitigation measures identified by Indigenous Nations, communities, and organizations during on-going engagement. Verification and Validation process: CNL has shared details about the planned mitigation and monitoring activities as well as provided opportunities for Indigenous Nations, communities and organizations to review the mitigations that have already been identified for the project. As noted below, under change to the EIS, in several cases Indigenous feedback has led to the addition of mitigations for example mitigations to protect cultural resources and SAR. Where Indigenous Nations, communities and organizations provided specific feedback or comments on CNL’s mitigation measures, CNL has provided a written response and sought validation from the Indigenous Nation, community or organization that the response addressed or resolved their concern. In addition, CNL has agreed to commitments with several communities (e.g., AOPFN and AOO) to continue identifying and implementing mitigations to ensure traditional knowledge is incorporated and items of value and TLRU components are protected. With other Indigenous Nations (e.g., KFN),

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					communities and organizations, only preliminary engagement activities have occurred however, CNL is committed to evaluating and implementing additional mitigation measures as identified through on-going engagement. CNL is especially interested in exploring mitigation measures that support removing or lessening concerns, fears and stigma about using the lands and waterways near the NPD site. Change to EIS: Changes have been made to Section 9.9.3.2 to include proposed mitigation measures that will be employed if undocumented archaeological resources are discovered during the project. CNL revised Section 9.3.3.2 of the EIS to update and expand mitigation measures for the protection of surface water, including the Kichi-Sibi (Ottawa River). CNL has added mitigation measures for Indigenous Land and Resource Use to Section 9.9.3.2 of the EIS, and for Indigenous Socio-Economic and Health in Section 9.10.1.3.2 of the EIS. CNL’s EIS contains five column tables of interests and concerns where issues related monitoring and mitigations are documented along with CNL’s response and corresponding changes to the EIS (if applicable). References: <i>CNSC 2016. Generic Guidelines for the Preparation of an Environmental Impact Statement. 2016 May.</i> <i>Canadian Nuclear Safety Commission (CNSC). 2022. Public and Indigenous Engagement: Indigenous Engagement. REGDOC-3.2.2. Version 1.2. February.</i>
156	CNSC	Section 9.9.3 Identification of Residual Effects (Aboriginal Land and Resource Use), Table 9.9-2	p.9-125	Comment: Table 9.9-2 (Post-Institutional Controls Section, p.9-125) states that “Land Use may change during and/or after the Institutional Controls phase. Renaturalization of site may lead to an increase of wildlife and may benefit trapping, hunting, and gathering activities.” Has CNL engaged with First Nation and Métis groups regarding this renaturalization process? Expectation to Address Comment: While the renaturalization process may benefit trapping, hunting, and gathering activities, please indicate if First Nation and Métis groups have been engaged on this renaturalization process given the importance of these activities to Aboriginal peoples.	Resolved As: Yes, Canadian Nuclear Laboratories (CNL) is engaging with Indigenous Nations, communities, and organizations on the renaturalization of the site. CNL has shared the draft Environmental Impact Statement (EIS), which details the end-state. CNL will incorporate Indigenous Knowledge systems and undertake engagement on site restoration activities. These discussions will be captured in a revised Indigenous Engagement Report (IER), which will be submitted to the Canadian Nuclear Safety Commission (CNSC) as supplemental documentation prior to the Commission Hearing. In addition, CNL has prepared a formal Commitments Report to capture all the mitigation measures, follow-up program measures, and commitments that have been referenced in the Environmental Assessment (EA) documentation, for completeness and traceability. The Commitments Report will support both the final EIS submission and the NPD license amendment. CNL has used the terms renaturalize/renaturalization to mean: return to natural. As much of the site is forested, disturbed areas outside the final licensed area will be left to return to natural via natural succession. Renaturalization will have a positive impact on terrestrial biodiversity because vegetation will provide habitat for nests and dens, cover for animals as they roam, and will promote movement of animals by increasing connectivity (reducing habitat fragmentation). Renaturalization may increase vegetation and habitat for wildlife, providing a potential benefit to hunters and trappers in the Site and Local Study Areas. Renaturalization on the site, and protection of chimney swift habitat may attract bird watchers to the site. This may be a potential minor economic benefit to nearby businesses. Forest resources may become available for forestry activities in the Site Study Area (SSA) and Local Study Area (LSA) during the Institutional Controls and Post-Institutional Controls phases. Renaturalization may also increase forest resources. The landowner, Atomic Energy of Canada Limited (AECL), is also committed to engagement and consultation with Indigenous Nations, communities, and organizations, on future end-state and land use. The potential land options will not be fully determined until the NPD Closure Project EA and license amendment process proceeds further. In

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					the meantime, CNL is preparing a plan for site restoration after decommissioning is complete, which CNL is committed to sharing with Indigenous Nations, communities, and organizations. Over the course of the EA, the Algonquins of Ontario (AOO), the Algonquins of Pikwàkanagàn First Nation (AOPFN), Curve Lake First Nation (CLFN), Hiawatha First Nation (HFN), and Kitigan Zibi Anishinabeg (KZA) have brought forward particular interest in next land use through comments on the draft EIS. CNL is committed to providing all 15 Indigenous Nations, communities and organizations an opportunity to share feedback on the Site Restoration Plan, which will detail renaturalization activities for the NPD site. CNL is committed to meaningful engagement with Indigenous Nations, communities and organizations on the NPD Closure Project. As context CNL provides the following details on the relationships of the Algonquin Nations, communities and organizations located near the NPD site. The Algonquins of Ontario (AOO) is an organized collective of Algonquin communities assembled to enable a unified approach to reaching a settlement over a comprehensive land claim. As the NPD site is located within unceded Algonquin traditional territory, the NPD Closure Project is situated on lands that are of interest to the AOO. The AOO is comprised of ten Algonquin communities located within the Ottawa Valley. Algonquin Negotiation Representatives (ANRs) represent these communities and are comprised of the AOPFN Chief and Council (six Councilors) along with one representative from each of the other Algonquin communities. Although the AOO asserts existing Indigenous rights and title throughout unceded Algonquin traditional territory, including the NPD site, it is the individual First Nations who are the sovereign entities that retain title to the land and resources. Individual First Nations, such as AOPFN, are independently governed Treaty and Aboriginal rights-holders who retain sacred responsibility to care for the land. CNL recognizes this distinction and is committed to meaningful engagement with both Treaty and Aboriginal rights-holders, as well as communities and organizations who have interests on the lands. The following paragraphs demonstrate the agreed path forward between CNL and interested Indigenous Nations, communities, and organizations for engagement on renaturalization. AOO It is important to AOO that its members be engaged / consulted meaningfully, not just informed, on end-state, site restoration and future land use. Additionally, it is important to the AOO that the end-state of the NPD site is safe for future land users. Involvement is important to the AOO, to ensure transparency and promote confidence in these activities. The AOO submitted formal comments on the 2017 draft EIS, several comments were related to end-state, site restoration and future use of the land. CNL has responded in writing to AOO comments on this topic, citing relevant sections of the EIS as part of the comment responses and has also responded in writing to recommendations from the AKLUS and comments on the ESA studies. The AOO has identified that the restoration plan should incorporate traditional values, habitat protection and replanting of species of cultural significance if appropriate. As part of next steps, CNL and AOO have established the following commitments which will help to address this concern: • CNL will collaborate with AOO to ensure that the site restoration plan incorporates in its design traditional values, habitat protection and replanting species of cultural significance (e.g., medicines) as appropriate. CNL to coordinate a tri-party discussion (AOO, AECL, and CNL) about future access to the NPD site including the exclusion zone (undisturbed forested lands that surround the facility). • CNL will provide support for site survey work including pre-decommissioning site visit(s) and specifically capacity for a baseline plant inventory survey.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					AOPFN It is important to AOPFN that it receives reassurance that the land around the facility will be renaturalized over time, so that AOPFN community members can reconnect with the site and be able to practice traditional land use activities. CNL has responded in writing to AOPFN comments on collaborative end land use planning citing relevant section of the EIS as part of the comment response. AOPFN provided feedback on these dispositions in December 2020, and two meetings to discuss responses were held in 2020. CNL’s next step is to engage with AOPFN through targeted discussions to seek input as part of restoration plan development. AOPFN and CNL have agreed to the following commitment: CNL is committed to seeking input from the AOPFN on the proposed ISD project end-state, including AOPFN input on lands restoration of the disturbed areas. Tri-party discussion including AECL/CNL/AOPFN will be required for site-wide end-state planning. CLFN and HFN It is important to CLFN and HFN to be engaged meaningfully about final site restoration. It is important to CLFN that the end-state of the NPD site is safe for future land users and that the rights and interests of future Indigenous peoples are preserved. CNL has responded in writing to CLFN comments on this topic, citing relevant sections of the EIS as part of the comment responses. CNL’s next step is to engage with CLFN and HFN through targeted discussions to seek input as part of restoration plan development. KZA CNL received preliminary feedback on KZA’s desire to be involved in site restoration and end-state planning during an NPD-specific meeting with the KZA Working Group in 2023 November. This concern has been repeated in KZA’s preliminary written feedback on the EIS (2023 December). It is the position of KZA that the NPD site should be remediated before being returned to the care of Indigenous peoples who have always been responsible for these lands and waters. If there is a possibility for the return of these lands for Indigenous use, they should not be returned to Indigenous peoples contaminated and destroyed. CNL understands from feedback provided by KZA that it is important to KZA that it receives reassurance that the area will move towards renaturalization and healing over time through involvement in site restoration planning. CNL is committed to seeking input from the KZA on the proposed ISD project end-state, including KZA input on lands restoration of the disturbed areas and will look for opportunities to discuss this topic through ongoing engagement with KZA. Despite various attempts and opportunities as described above, CNL has not received specific feedback on site renaturalization from: Anishinabek Nation, Algonquin Nation Secretariat, MNO, Georgina Island First Nation, Chippewas of Beausoleil First Nation, KFN, the AANTC, Mississaugas of Scugog Island First Nation, Alderville First Nation, and Chippewas of Rama Fist Nation. Verification and Validation process: CNL has shared preliminary planning on site restoration and end-state at NPD through its public webinar held in 2023 November. Opportunities for preliminary engagement with Indigenous Nations, communities, and organizations to review the draft restoration and end-state plan for NPD has been identified for the project. Where Indigenous Nations, communities, and organizations provide specific feedback or comments on the restoration and end-state plans for NPD, CNL will verify that input has been adequately recorded and/or justification given for why

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					information could not be included. In addition, CNL has agreed to commitments with Indigenous Nations (e.g., AOPFN, AOO), to continue working towards collaborative restoration planning to ensure traditional knowledge is considered and Indigenous VCs are protected. With other Indigenous Nations (e.g., KZA), communities and organizations, CNL has only documented and verified the interest or concern with the Indigenous Nation, community or organization, however CNL is looking to work together will all interested parties to ensure input and feedback is captured within its plans. CNL’s next step is to engage with interested Indigenous Nations, communities and organizations through targeted discussions to seek input prior to developing and issuing its restoration plan. The restoration and end-state plan draft will also be shared back with those who have provided input to verify that input has been adequately recorded, and/or justification given for why information could not be included. Change to the EIS: CNL has provided AOPFN an opportunity to directly integrate a summary of its differing perspective on renaturalization (Section 9.9.6.1) into the EIS. Section 6.5 of the draft EIS was revised to recognize CNL’s ongoing commitment to engage on topic of site restoration: <i>“Additional activities may include... input on the draft restoration plan to consider the perspectives from Indigenous peoples who have interest in future use of the land on, and in the vicinity of, the NPD site, ensuring that next land use aligns with Indigenous interests on the land.”</i>
157	CNSC	Section 9.9.3 Identification of Residual Effects (Aboriginal Land and Resource Use)	p.9-126	Comment: On page 9-126, it is stated that “...no potential undue effects have been predicted for terrestrial or aquatic biota.” However, Table 9.9-2 (Post-Institutional Controls Section, p.9-125) states that “[g]roundwater will enter the eventually degraded grouted structure. Contaminant release from the grouted structure may affect non-human biota (e.g., game and fish species) health and/or populations.” Expectation to Address Comment: Please include a discussion on the potential impacts to First Nation and Métis fishing rights that could potentially occur during the Institutional Controls and Post-Institutional Controls phases. Also, explain how CNL has engaged with First Nation and Métis groups with regards to addressing / mitigating these impacts, as per CNSC’s <i>Generic EIS Guidelines</i>.	Resolved As: With respect to the text quoted in the comment, Table 9.9-2 (now Table 9.9-3) describes potential interactions. During the Institutional Control and Post-Institutional Control Phases, the potential interaction identified is that “Groundwater will start to enter and eventually resaturate the grouted structure. Contaminant release from the grouted structure may affect non-human biota (e.g., game and fish species) health and/or populations”. Subsequently, Canadian Nuclear Laboratories (CNL) described mitigations measures (Section 9.9.3.2) and then evaluated effects after mitigation (Section 9.9.3.3). Although the project-environment interactions table identifies a possible effect to non-human biota, CNL’s modelling of the long-term performance of the facility predicts the contaminant concentrations in the environment over time; subsequently the Ecological Risk Assessment (EcoRA) evaluates risks to non-human biota. Fish are assessed in the EcoRA considering the predicted concentrations of contaminants in both the surface water and sediment. In no case did the predicted dose to fish exceed the ecological dose benchmark and based on the normal evolution of the site, predicted doses are five orders of magnitude less than the dose benchmark. Overall, it is important to note that the EcoRA determined that no adverse residual effects are predicted for terrestrial or aquatic biota. Therefore, CNL’s Environmental Impact Statement (EIS) concludes that although there may be short-term effects on non-human biota through contaminant release from the grouted structure, there are no significant long-term effects. CNL acknowledges that the findings of the on-going rights impact assessment may require additional engagement and a mutually agreed upon resolution of any found impacts on rights. CNL, as the proponent, has supported the rights impact assessment with evidence provided through the environmental assessment (EA) process, namely, Traditional Knowledge information and discussions of effects of the project during engagement. Through engagement activities with identified Indigenous Nations, communities and organizations, CNL has discussed potential environmental effects of the NPD Closure Project and mitigation measures including those related to Indigenous Rights, such as traditional harvesting (including fishing). The next few paragraphs discuss how

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					each Indigenous Nation, community and organization has engaged with CNL on potential effects, followed by a discussion of how Indigenous Nations, communities and organizations are involved in the mitigation measures. Engagement on potential effects of the project The Algonquins of Pikwàkanagàn First Nation (AOPFN), Algonquins of Ontario (AOO), Métis Nation of Ontario (MNO), Algonquins of Anishinabeg Nation Tribal Council (AANTC), Curve Lake First Nation (CLFN), Williams Treaties First Nations (WTFN), Wolf Lake First Nation (WLFN), Kebaowek First Nation (KFN), and Kitigan Zibi Anishinabeg (KZA) all reviewed the draft Environmental Impact Statement (EIS) for the NPD Closure Project, which included details on potential effects. CNL is committed to meaningful engagement with Indigenous Nations, communities, and organizations on the NPD Closure Project. As context, CNL provides the following details on the relationships of the Algonquin Nations, communities and organizations located near the NPD site. The Algonquins of Ontario (AOO) is an organized collective of Algonquin communities assembled to enable a unified approach to reaching a settlement over a comprehensive land claim. As the NPD site is located within unceded Algonquin traditional territory, the NPD Closure Project is situated on lands that are of interest to the AOO. The AOO is comprised of ten Algonquin communities located within the Ottawa Valley. Algonquin Negotiation Representatives (ANRs) represent these communities and are comprised of the AOPFN Chief and Council (six Councilors) along with one representative from each of the other Algonquin communities. Although the AOO asserts existing Indigenous rights and title throughout unceded Algonquin traditional territory, including the NPD site, it is the individual First Nations who are the sovereign entities that retain title to the land and resources. Individual First Nations, such as AOPFN, are independently governed Treaty and Aboriginal rights-holders who retain sacred responsibility to care for the land. CNL recognizes this distinction and is committed to meaningful engagement with both Treaty and Aboriginal rights-holders, as well as communities and organizations who have interests on the lands. AOPFN AOPFN raised a number of concerns related to potential impacts to fish in their comments on the 2020 draft EIS, including: • Potential impacts to AOPFN rights to fish; • Lack of fish tissue studies; and • Potential impacts to fish habitat. AOPFN and CNL have shared their responses and further comments on the AOPFN’s draft EIS comments. While the AOPFN and CNL have diverging perspectives on the assessment of effects, there is an understanding of where these perspectives diverge and both perspectives are clearly described in the draft EIS. This has been done through key EIS subsections, which the AOPFN have provided to CNL to be used “as is” in the EIS that detail AOPFN’s perspective. Through continued engagement CNL has put forward several commitments related to this topic that it hopes will resolve outstanding concerns on this topic from AOPFN including: • supporting for a comprehensive and site-wide inventory, followed by collaborative review to ensure that mitigations are in place to protect terrestrial and aquatic biota that are important to AOPFN; • NPD site specific Guardian monitoring activities, incorporating traditional knowledge and AOPFN VCs; and • Co-development of additional mitigation measures to include within the NPD Closure Project Environmental Protection Plan to ensure that items of value to AOPFN are protected.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					AOO The AOO raised a number of comments related to potential impacts to fish in their comments on the 2017 draft EIS, including: • Surface water and groundwater (concerns that if not managed or mitigated, contaminants could have “lethal and sublethal toxicological effects on fish, other aquatic species”; • Aquatic environment (concerns about ensuring adequate protections for promoting sustainability of aquatic ecosystems and AOO members that rely on them); • Environmental monitoring; • Identification of specific fish VCs, that are of importance to the AOO and had not been considered (for instance, piscivorous fish are not represented in the initial VCs list, found in the 2017 draft EIS Revision 0, and these kinds of fish are important to the AOO, neither are commercial or game fish); • Concerns about fish impingement during Decommissioning Execution; and • Contamination of game fish from NPD (and no fish tissue studies had been completed to assess risk). The AOO shared further fish VCs in correspondence from 2020 July. CNL has additional fish species to its assessment in response to the AOO’s comments. CNL and the AOO discussed VCs during six Working Group meetings. Late in 2022, the CNL/AOO Working Group developed a simplified table incorporating all VCs from the AOO AKLUS (including fish) mapping their inclusion in CNL’s EIS to assist AOO members confirming that all their identified VCs are considered in CNL’s assessment. This VC summary table explained how AOO identified VCs are included, assessed and protected through CNL’s proposed project. In June 2023, CNL shared the complete VC summary table with the AOO. In addition, through the AOO-CNL Working Group, AOO and CNL reviewed together the AKLUS recommendations and worked collaboratively to develop a simplified list of commitments. For example, CNL will provide capacity to the AOO to undertake a socio-economic study with results captured in a subsequent revision of the Indigenous Engagement Report. Through the study recommendations, CNL and AOO will develop together opportunities to improve CNL’s monitoring and mitigations to ensure traditional knowledge is incorporated and that interdependencies between ecological, socio-economic, community and cultural health are recognized. MNO The MNO raised a number of comments related to potential impacts to fish in their comments on the 2017 draft EIS, including: • Potential impacts to Métis fishing use of the area; • Potential impacts on Métis fishing rights and interests; • Surface water quality impacts (could impact fish intake and habitat); and • Lack of comparison of fish VC to list of fish of important to the MNO. The MNO and CNL have shared their responses and further comments on the 2017 draft EIS. CNL understands from a meeting in 2021 July that CNL has sufficiently addressed the comments from MNO on the 2017 draft EIS, and the MNO have no further comments. AANTC The AANTC shared comments related to potential impacts to fish in their comments on the 2017 draft EIS, including effects to groundwater and surface water.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					The AANTC and CNL have shared their responses and further comments on the 2017 draft EIS. CNL responded to clarifications sought by the AANTC in October 2020 and understood at that time (from correspondence in July 2020) that the AANTC was reviewing the EIS for the NPD Closure Project. CNL has continued to try to discuss the project with the AANTC although the AANTC have indicated there was not an interest in engaging with CNL until the Minister of Natural Resources responded to their letters shared in 2020. In January 2021, following the Minister’s response to the AANTC, CNL followed up to inquire whether there was an interest in meeting to discuss CNL’s EAs. As of May 2022, CNL has not received a response. CNL continues to reach out to the AANTC for further engagement. CLFN CLFN has shared a review of the 2020 draft EIS and CNL has shared initial responses. CLFN did not raise specific concerns around potential impact to fish. CLFN and CNL met in September 2021 to discuss these comments and responses and CNL is updating dispositions to the CLFN review based on the discussion at that meeting. CLFN concluded in their review that pending a visit to the NPD site to confirm the review, CLFN, “does not believe that there will be a significant impact to the rights of the Williams Treaties First Nation Communities.” WTFN In 2020 May, a meeting was held between all seven of the WTFN and CNL. Representatives from Hiawatha First Nation, Alderville First Nation, Georgina Island First Nation and Curve Lake First Nation attended. The other three WTFN communities have not indicated interest on the NPD Closure Project, although Rama First Nation, Chippewas of Beausoleil First Nation, and Mississaugas of Scugog Island First Nation have all attended a handful of the monthly WTFN-CNL meetings that began in 2021. WTFN-CNL information-sharing meetings continue to occur regularly (e.g., on a quarterly basis). The presentation and discussion in May 2020 included environmental effects of the project. No specific concerns were raised regarding impacts to fish. CNL provided follow-up information related to the discussion and later incorporated the input into the interests and concerns tables for Hiawatha First Nation and Alderville First Nation, which were verified by Hiawatha First Nation at a meeting in 2021 July. WLFN WLFN raised a number of comments related to fish in their review of the 2021 draft EIS, including: • Quebec’s side of the Ottawa River is used by WLFN citizens for traditional fishing activities; • Fish are a significant staple resource for WLFN citizens, utilizing a variety of species for either food, medicine or ceremonial purposes; • Fish are respected and connected to WLFN as part of their cultural systems and beliefs. There are many fish species listed within the EIS that are particularly significant to WLFN; • Extensive changes to the landscape have resulted in obliterated fish habitats and depleted fish stocks; • Fish represent the expression of WLFN’s rights and their ability to exercise their Aboriginal rights to fish; and • Concerns of cumulative effects related to fish (bioaccumulation), leading to uncertainties, fear, and avoidance of the area. CNL responded to WLFN EIS comments and recommendations (received 2023 March) in June 2023. Despite multiple attempts by CNL to coordinate a meeting to discuss the WLFN feedback, CNL has received very limited response from WLFN and no meetings have been possible.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					KFN CNL first met with KFN in 2017 April and continued to share information until KFN and the AANTC met with CNL in 2020 June after indicating an interest in formalizing capacity funding for involvement in CNL’s EAs. KFN and CNL established a Framework Agreement for engagement on CNL activities including the NPD Closure Project in 2023 January. In 2024 May, KFN provided Information Requests (IRs) to CNL as part of KFN’s technical review of the NPD EIS. KFN indicated interest in learning more about the current routine environmental monitoring at NPD, as well as the proposed EA follow-up monitoring plans for NPD, including information on monitoring pathways, locations, and frequencies. KFN also indicated that they would like additional information on plans, protocols, or strategies for Indigenous engagement / consultation on potential impacts to the aquatic environment since the Kichi-Sibi (Ottawa River) and aquatic species are of particular importance to KFN. CNL is currently working to respond to the KFN IRs, including focused discussions on topics of interest as needed. KZA KZA indicated early interest in the project and toured the NPD site in 2017 July. KZA also cited early concerns around potential impacts on the waterways in their comments on the NPD Project Description. CNL has continued to share information with KZA and followed up five times in 2021 to validate the interests and concerns previously provided by the KZA. KZA met again in November 2021 with CNL to review the project and discuss the potential effects. CNL provided responses to questions raised at the meeting, as well as documents containing baseline characterization information by email following the meeting. CNL has followed up with KZA twice since the meeting. KZA remains concerned that the project poses significant risk of detrimental impact to KZA’s rights to trap, hunt, fish, gather, or harvest as, as communicated in KZA preliminary feedback on the EIS in 2023 December and 2024 February. Through continued engagement at the Working Group, CNL hopes that the parties are able to find common ground on this topic, which may include commitments. Algonquin Nation Secretariat and Anishinabek Nation CNL has sought information and shared information on the EA for the NPD Closure Project with the ANS and the Anishinabek Nation since 2016. Neither organization have raised specific concerns around impacts to fish. Involvement in monitoring and mitigation measures Indigenous feedback on the NPD Closure Project has led to the addition of the following mitigation measures to the EIS related to fishing: • The AANTC raised a concern around the release of effluent from a sump area at the NPD site in its review of the draft EIS. CNL has recognized this concern and has since ceased this practice and now collects and ships the effluent from that sump area to Chalk River Laboratories for treatment. • As part of their respective long-term relationship agreements (with AECL and CNL), which outlines the focus and parameters of the relationship and agreement, the AOPFN and the AOO will have the opportunity to make recommendations on environmental and cultural monitoring that would address ecological-community health inter-dependencies of importance to AOPFN and AOO. • With the MNO, the development of a long-term relationship agreement also includes collaboration in the area of environmental monitoring at CNL sites including facilitating the involvement of MNO Monitors in environmental monitoring activities at the NPD site. • In response to AOO concerns raised in their draft EIS comments, CNL has expanded mitigation measures for the protection of surface water, including the Kichi-Sibi (Ottawa River). • In response to AOO comments, CNL also revised the monitoring plan to address the specific interests and concerns expressed by the AOO: annual sediment monitoring and monitoring of SAR mitigation measures.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Note that since project activities are dependent on a licensing decision, mitigation measures will be implemented and reviewed for effectiveness following regulatory approval of the project. To foster Indigenous involvement in planning mitigation measures, CNL has committed to provide a practical and meaningful role in the NPD Closure Project monitoring program to Indigenous Nations and community members. This includes the support for the development of a Guardian Program which is to be developed across the Chalk River Laboratories and NPD sites to enable Indigenous involvement in monitoring at CNL, including the ability to identify mitigation measures. CNL has committed to incorporating additional mitigation measures related to fish identified by Indigenous Nations, communities and organizations during ongoing engagement. Discussion of monitoring and mitigation measures In a letter sent to all communities in 2016 November, CNL stated: <i>“Along with providing information about the two proposed projects (the Near Surface Disposal Facility and the NPD Closure Project) - their benefits and possible impacts and mitigation measures- we would also welcome the opportunity to share general information about CNL and its activities.”</i> CNL also sent an additional letter on inquiring on traditional land use, including fishing, to Indigenous Nations, communities and organizations in 2020 May. The AANTC, AOO, MNO, AOPFN, CLFN, WLFN, KFN and KZA have all reviewed a draft of the EIS. The AANTC, the AOO and the MNO reviewed the 2017 draft EIS Revision 0. AOPFN and CLFN reviewed the 2020 December draft EIS Revision 2, and WLFN, KFA and KZA reviewed the 2021 draft EIS Revision 3. Some of these comments, which CNL has been working collaboratively with each Nation, community and organization (via meetings and correspondence) to address, discuss mitigation measures and monitoring. In addition to this feedback, the MNO and the AOO have provided comments to CNL on the draft follow-up monitoring plans and the AOPFN and CLFN have indicated they plan to review. Verification and validation process: CNL has shared details about the planned mitigation and monitoring activities and provided opportunities for communities to review the mitigations that have already been identified for the project. As noted below under change to the EIS, in several cases Indigenous feedback has led to the addition of mitigations for example mitigations for the protection of surface water. Where communities provided specific feedback or comments on First Nation and Métis fishing rights or CNL’s mitigation measures, CNL has provided a written response and sought validation from the community that the response addressed or resolved their concern. In addition, CNL has agreed to commitments with several communities (<i>e.g.</i>, AOPFN and AOO) to continue identifying and implementing mitigations to ensure traditional knowledge is incorporated and items of value and TLRU components are protected. With other communities <i>e.g.</i>, KFN, only preliminary engagement activities have occurred however, CNL is committed to evaluating and implementing additional mitigation measures as identified through ongoing engagement. CNL is especially interested in exploring mitigation measures that support removing or lessening concerns, fears and stigma about using the area near the NPD site. Change to EIS: CNL revised Section 9.3.3.2 of the draft EIS to update and expand mitigation measures for the protection of surface water, including the Kichi-Sibi (Ottawa River). CNL’s revised EIS contains five column tables of interests and concerns where issues related monitoring and mitigations are documented along with CNL’s response and corresponding changes to the EIS (if applicable).

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					References: <i>4 Directions of Conservation Consulting. 2021. CNL EIS Review. Submitted to Curve Lake First Nation. 2021 July 15.</i> <i>Fediuk, Karen, Ginger Gibson, and Firelight Research Inc. Diet and Harvest Study. Confidential Report Specific to Canadian Nuclear Laboratories Nuclear Power Demonstration Decommissioning Project. Submitted to the Algonquins of Pikwàkanagàn First Nation. 2021 August 10.</i> IER TSD: <i>Chennette, R. 2024. Nuclear Power Demonstration (NPD) Indigenous Engagement Report. 64-513130-REPT-001. Revision 5.</i> <i>KnowHistory. 2019. Chalk River TKLUS Report. 2019 February 28.</i> <i>Malone, Molly and Firelight Research Inc. with the Algonquins of Pikwakangan First Nation. Algonquins of Pikwakangan First Nation Culture and Rights Study Specific to Canadian Nuclear Laboratories Nuclear Power Demonstration Decommissioning Project. Final Report (Confidential). 2021 August 09.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Ontario (AOO). 2020 December 15.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Pikwàkanagàn First Nation (AOPFN). 2020 September 24.</i>
158	Health Canada	Section 9.9.3 Identification of Residual Effects (Aboriginal Land and Resource Use)	p.9-126	Comment: “CNL will minimize potential nuisance effects (i.e., noise) on nearby land users (e.g., hunters, trappers, and gatherers) by instituting restrictions on construction hours and days of the week. Other nuisance-related mitigation measures (i.e., dust suppression) are discussed in section 9.2.3.2 of the EIS.” Restricting construction hours is not an effective measure to mitigate potential nuisance noise effects on traditional land use, since it is reasonable to assume that hunting, trapping and gathering activities are likely to coincide with construction / daylight hours. Expectation to Address Comment: Please provide mitigation measures that are likely to be effective at addressing disturbance from noise emissions.	Resolved As: Section 9.9.3 describes restrictions on construction hours as just one example of a noise mitigation measure. Section 9.2.3 has a full list of noise mitigation measures. These include: • sequencing of work such that the simultaneous operation of noisy equipment is minimized, where possible; • location of the batch mixing plant at least 1 km from all nearby residences; direct piping of grout into the facility rather than delivery by truck, where reasonable. This would reduce the on-site truck movement noise; • trucks operating at the project site are well maintained and are equipped with appropriate mufflers; • placement of the generator in an acoustically treated enclosure to reduce noise (if required); • maintenance of noise levels in compliance with CNL’s Occupational Health & Safety Program requirements; and, • Maintenance of on-site truck route in good condition in order to prevent truck tray noise caused by driving over uneven roadway. CNL has a public feedback process which enables the public to submit noise complaints. Every page of CNL’s website has a link to a “Contact Us” page which lists various phone numbers to call depending on the nature of the inquiry. The “Contact Us” page also has as a link to provide email feedback and an option to complete an online form to submit feedback and receive a reply. In addition, the NPD Closure Project webpage on the CNL website has a link to provide feedback. The online feedback form allows the user to enter their contact information and explain their question or concern. Upon receipt of a noise complaint, the complaint would be channeled to the appropriate CNL staff and once a path of action was decided upon, a follow-up response would be shared with the complainant through Communications staff.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
159	CNSC	Section 9.9.3 Identification of Residual Effects (Aboriginal Land and Resource Use), Table 9.9-3	p.9-128	Comment: According to Table 9.9-3, no residual effects on any of the Aboriginal Land and Resource Use VCs are predicted during all phases of the project. Expectation to Address Comment: Please demonstrate how engagement activities with First Nation and Métis groups have informed CNL’s conclusion that there will be no residual effects on Aboriginal Land and Resource Use VCs during all phases of the project.	Resolved as: Through engagement activities with Indigenous Nations, communities, and organizations (see Section 6.2.2 of the EIS for a complete list of identified Indigenous Nations, communities, and organizations), CNL has discussed the conclusions of the EIS – that there will be no residual effects on Indigenous Land and Resource Use valued components (VCs) during all phases of the Project. In Appendix C, CNL includes a record of engagement summary that highlights when important environmental assessment (EA) topics, including residual effects, were discussed. There is one record of engagement summary table for each Indigenous Nation, community, or organization. A written summary of engagement can be found in Section 6.2.4.X.1 where X represents each individual community’s subsection on engagement. For the traditional land and resource use VCs, effects to this environmental component and mitigation measures to protect these VCs are an area of interest and concern for several Indigenous Nations, communities, and organizations, most directly, the Algonquins of Ontario (AOO) and the Algonquins of Pikwàkanagàn First Nation (AOPFN). For example, in their comments on the draft EIS, AOPFN have indicated interest in ensuring effects on traditional land and resource use and cultural impacts are properly identified and mitigated, specifically, perceived and sensory effects that may result in alienation from the lands. The AOO, AOPFN, and the Métis Nation of Ontario (MNO) have all prepared traditional land use studies that highlight VCs and the Indigenous perspective on potential impacts to traditional land and resource use: • MNO Traditional Knowledge and Land Use Study (KnowHistory 2019); • AOO AKLUS (SVS, AOO, 2020); • AOPFN AKLUS (SVS, AOPFN, 2020); • AOPFN Diet and Harvest Study (Fediuk, et. al, 2021); and • AOPFN Culture and Rights Study (Malone et. al, 2021). For AOO and AOPFN, CNL has recorded this interest and concern in Section 6.2.4.2 and Table C-2, and Section 6.2.4.3 and Table C-4, respectively. Both AOO and AOPFN provided feedback to CNL on how their interest or concern related to this topic area was recorded. CNL revised the record in both the Appendix C tables and narrative in Section 6.2.4 based on this feedback ensuring that the concern is accurately represented. Mitigation measures, protection of the environment and VCs were also raised as areas of interest and concern by the MNO (Table C-6), Algonquins of Anishinabeg Nation Tribal Council (AANTC) (Table C-8), Kitigan Zibi Anishinabeg (KZA) (Table C-12), Curve Lake First Nation (CLFN) (Table C-21), and Wolf Lake First Nation (WLFN) (Table C-31). These Indigenous Nations, communities, and organizations did not focus on residual effects on traditional land and resource use VCs, but instead were interested in mitigations for species at risk, other terrestrial biota, the aquatic environment, protection of the environment, specifically water, and protection of cultural resources. The protection and mitigation measures for these other environmental components, in turn, ensures protection of traditional land and resource use VCs. No other Indigenous Nations, communities, or organizations have identified residual impacts on traditional land and resource use VCs as an interest or concern. To address concerns related to traditional land and resource use and address feedback on mitigations, CNL has: • Updated and included additional mitigation measures for the protection of surface water (Section 9.3.3.2) (including the Ottawa River) from the initial mitigations outlined in the 2017 draft EIS; • Included additional mitigations for species at risk (Section 9.6.3.2) from the initial mitigations outlined in the 2017 draft EIS; • Expanded the mitigation measures related to cultural resource management (Sections 9.9.3.2 and 9.10.1.3.2) from the initial mitigations outlined in the 2017 draft EIS;

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response														
					- contributed funds for the MNO, AOO, Kebaowek First Nation (KFN) and AOPFN to undertake traditional knowledge studies; - Assumed in the EIS that traditional uses do occur adjacent to the NPD site including in the Ottawa River (Section 8.9.2.1); - Assumed that in the future there is an interest to re-establish traditional use activities on the NPD site; - Responded to specific comments on this topic area and recommendations from traditional use studies; and - Updated the content of Section 8.9 with the results of the traditional knowledge studies. CNL’s summary of residual effects on traditional land and resource use and proposed mitigations for all phases of the project is as follows (excerpt of Table 9.9-4): <table><tr><th colspan="2">Decommissioning Execution</th></tr><tr><th>Potential Effect</th><th>Proposed Mitigation</th></tr><tr><td>Nuisance effects (dust, and noise).</td><td>Dust suppression, restricting hours of activity, communication with Indigenous Nations, communities, and organizations.</td></tr><tr><td>Wildlife displacement, contamination, or mortality affecting hunting activities</td><td>See mitigation measures identified for the terrestrial environment in Section 9.6.3.2.</td></tr><tr><td>Fish displacement, contamination, or mortality affecting traditional angling activities.</td><td>See mitigation measures identified for the aquatic environment in Section 9.4.3.2.</td></tr><tr><th colspan="2">Institutional Controls and Post-Institutional Controls phase</th></tr><tr><td>During the Institutional Controls and Post--Institutional Controls phases, renaturalization of site may lead to an increase of wildlife and may benefit trapping, hunting, and gathering activities.</td><td>No proposed mitigation.</td></tr></table> Note that mitigation measures in some instances are the same as those described for other environmental components (e.g., the terrestrial and aquatic environments). It remains CNL’s conclusion that after mitigation there are no adverse residual effects to traditional land and resource use VCs. Indigenous Nations, communities, and organizations have concerns with CNL’s assessment approach for effects of the project on traditional land and resource use and disagree with the results of the effects assessment (specifically, AOPFN, AOO, MNO, and KFN). CNL has included in the EIS a sub-section (Section 9.9.6) that presents the AOPFN perspective on effects to traditional land and resource use. This concern remains outstanding between CNL and AOO and CNL and AOPFN and CNL and KFN. CNL has taken steps to address this concern with Indigenous Nations, communities, and organizations by establishing project commitments which will form part of the final EIS submission package. Relevant commitments for AOPFN outlined in and Section 6.2.4.3.5 are: - Support for cultural protection and commemoration in relation to the NPD site; - collaborative development of risk-informed communication materials for the NPD Closure Project for AOPFN community members and application of the AOPFN Algonquin Risk Communication Program at the NPD Site; - NPD site specific Guardian monitoring activities, incorporating traditional knowledge and AOPFN VCs; - AOPFN-led site inventory work to develop an Algonquin Knowledge baseline for the entire NPD site; - Engage with AOPFN on the NPD Environmental Assessment Follow-up Monitoring Program (EAFMP); - Implement the chance find procedure, TLRU discovery plan and Eagle Feather Protocol at the NPD site; and	Decommissioning Execution		Potential Effect	Proposed Mitigation	Nuisance effects (dust, and noise).	Dust suppression, restricting hours of activity, communication with Indigenous Nations, communities, and organizations.	Wildlife displacement, contamination, or mortality affecting hunting activities	See mitigation measures identified for the terrestrial environment in Section 9.6.3.2.	Fish displacement, contamination, or mortality affecting traditional angling activities.	See mitigation measures identified for the aquatic environment in Section 9.4.3.2.	Institutional Controls and Post-Institutional Controls phase		During the Institutional Controls and Post--Institutional Controls phases, renaturalization of site may lead to an increase of wildlife and may benefit trapping, hunting, and gathering activities.	No proposed mitigation.
Decommissioning Execution																			
Potential Effect	Proposed Mitigation																		
Nuisance effects (dust, and noise).	Dust suppression, restricting hours of activity, communication with Indigenous Nations, communities, and organizations.																		
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Fish displacement, contamination, or mortality affecting traditional angling activities.	See mitigation measures identified for the aquatic environment in Section 9.4.3.2.																		
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During the Institutional Controls and Post--Institutional Controls phases, renaturalization of site may lead to an increase of wildlife and may benefit trapping, hunting, and gathering activities.	No proposed mitigation.																		

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					- Co-develop additional mitigation measures to include within the NPD Closure Project Environmental Protection Plan to ensure that items of value to AOPFN are protected. CNL and the AOO discussed VCs and the results of the AKLUS study at multiple Working Group meetings in 2022 and 2023. Together, AOO and CNL developed a simplified table incorporating all VCs from the AOO AKLUS mapping their inclusion in CNL’s EIS to assist AOO members confirming that all their identified VCs are considered in CNL’s assessment. In June 2023, CNL shared the complete VC summary table with the AOO. Section 6.2.4.2.5 (AOO) identifies important next steps to progress resolution of this concern with the communities. For AOO, the key next steps and relevant commitments are: - An NPD Site Visit and Survey Work; - Participation in monitoring and sharing of results; - Socio-Economic Considerations, Monitoring and Mitigations - capacity to the AOO to undertake a socio-economic study with results captured in a subsequent revision of the Indigenous Engagement Report; and, - Continuation of the working group with AOO to promote continued open communication, information sharing and education including collaborating on the development of communications and engagement material for various audiences (e.g., AOO staff, Algonquin Negotiation Representatives (ANRs), and specific Nations and communities). Through an amendment to the existing Consultation and Engagement Framework Agreement with KFN, CNL has agreed to fund supplemental Indigenous led studies, including KFN led Indigenous land and resource use and occupancy, territorial sovereignty, biocultural valued components / criteria data collection and analysis. Any new traditional knowledge that is shared will be incorporated into the project and into the Indigenous Engagement Report (IER) Technical Supporting Document (TSD), as the IER is a living document. CNL continues efforts to engage all identified Indigenous Nations, communities, and organizations and will continue to incorporate any information shared on predicted residual effects to traditional land and resource use VCs into the final EIS and/or future revision of the IER, which will be submitted to the CNSC as supplemental documentation prior to the Commission Hearing. References: <i>Fediuk, Karen, Ginger Gibson, and Firelight Research Inc. Diet and Harvest Study. Confidential Report Specific to Canadian Nuclear Laboratories Nuclear Power Demonstration Decommissioning Project. Submitted to the Algonquins of Pikwàkanagàn First Nation. 2021 August 10.</i> IER TSD: <i>Chennette, R. 2024. Nuclear Power Demonstration (NPD) Indigenous Engagement Report. 64-513130-REPT-001. Revision 5.</i> <i>KnowHistory. 2019. Chalk River TKLUS Report. 2019 February 28.</i> <i>Malone, Molly and Firelight Research Inc. with the Algonquins of Pikwàkanagàn First Nation. Algonquins of Pikwàkanagàn First Nation Culture and Rights Study Specific to Canadian Nuclear Laboratories Nuclear Power Demonstration Decommissioning Project. Final Report (Confidential). 2021 August 09.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Ontario (AOO). 2020 December 15.</i> <i>Shared Values Solutions (SVS). 2020. Algonquin Knowledge and Land Use Study: Nuclear Power Demonstration (NPD) Closure Project. Algonquins of Pikwàkanagàn First Nation (AOPFN). 2020 September 24.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
160	Government of Quebec	Section 9.11 Accidents and Malfunctions	p.9-143 to 9-144	Comment: CNL should outline the impacts of a worst-case scenario combining failures and natural hazards (e.g., scenario including the failure of grout and a flood or earthquake). Expectation to Address Comment: Please clarify if such a combination of scenarios was considered, and if not, explain if it will be considered in the final EIS.	Resolved As: Standard methods and internationally accepted approaches were used for assessing the risks of the proposed project. For the short-term decommissioning phase this included a systematic hazard identification process and an evaluation of risks from potential bounding accident scenarios (Section 7 of the Decommissioning Safety Assessment Technical Support Document (DecomSA TSD)). This methodology is based on guidance from the Center for Chemical Process Safety of the American Institute of Chemical Engineers, Guidelines for Chemical Process Quantitative Risk Analysis, 2000. It is also consistent with guidance presented in (Weaver 2023) Standard – Hazard Identification and Analysis, and with general safety assessment guidance from CSA N294-09 (CSA 2019). The analyses have been performed in accordance with the requirements of Section 7.5 of CNSC guidance document REGDOC 2.11.1 Volume III, Assessing the Safety of Long Term Waste Management, which details the process for assessment scenarios. The scenarios identified in the report have been developed in a systematic, transparent, and traceable manner through a structured analysis of relevant FEPs in the PostSA TSD. The Post Closure Safety Assessment (PostSA) has been undertaken using international best practice, specifically the International Atomic Energy Agency’s Improving Safety Assessment Methodologies (ISAM) guidance (IAEA 2004). This is a systematic, stepwise approach. The PostSA has been documented in a way that corresponds to the ISAM approach, describing the key elements of the assessment and its outcomes. It includes a systematic evaluation of Features, Events and Processes (FEPs) (Appendix C of the Post Closure Safety Assessment Technical Support Document (PostSA TSD)) and based on this evaluation included disruptive scenarios as well as hyper conservative hypothetical “what if” scenarios. These scenarios and the associated model have been developed by examining the FEPs that could affect the long-term performance and safety of the NPD Facility, including physical features, events and processes directly or indirectly influencing the release and transport of contaminants (radiological and non-radiological) from the NPD facility or subsequent radiation exposures to humans, as well as factors such as regulatory requirements or modelling issues that constrain or focus the analysis. The PostSA TSD documents the comprehensive description of the FEPs in terms of the NPD waste facility and its environment that captures all of the phenomena that are important to its long-term performance and safety. Appendix C of the PostSA TSD also documents the relevance of each feature's effects and processes to the facility and the reasons to either include or exclude the FEPs from the facility safety analysis. Application of this process results in a reference scenario, referred to as “normal evolution” and a set of alternatives which describe potential deviations from the expected evolution of the system. The approach also enables the identification of conditions that are useful to examine to understand the behavior of the system by asking “what if” a certain event happens, or by exploring different ways for decommissioning of the facility. In conclusion, the systematic methodology and the inclusion of accident assessment in the DecomSA TSD and of disruptive and “what-if” scenarios in the PostSA TSD address all the regulatory requirements for evaluating unexpected occurrences beyond those included during the expected normal evolution of the system. References: <i>Canadian Nuclear Safety Commission (CNSC) 2021a, REGDOC 2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. Version 2.</i> <i>Canadian Standards Association (CSA). 2019. N294-09 (R2019) standard, Decommissioning of Facilities Containing Nuclear Substances.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					DecomSA TSD: Garisto, N., Kovacs, and Tong, X. 2021. <i>Decommissioning Safety Assessment</i>. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL. <i>International Atomic Energy Agency (IAEA). 2004. Safety Assessment Methodologies for Near Surface Disposal Facilities Volume 1, IAEA, VIENNA, 2004, ISBN 92–0–104004–0.</i> PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. <i>Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0.</i> 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL. Weaver. 2023. <i>Hazard Identification and Analysis</i>, 900-508770-STD-002, Revision 2.
161	Government of Quebec	Section 9.11 Accidents and Malfunctions	p.9-143 to 9-144	Comment: In Section 9.11.2, CNL assesses accident and malfunction scenarios during the Decommissioning Execution and Institutional Controls phases, without considering the Post-Institutional Controls phase. Expectation to Address Comment: Please explain why accidents and malfunctions are not assessed for the Post-Institutional Controls phase.	Resolved As: Accidents and malfunctions are not assessed in the post Institutional Control phase because, for the long-term safety assessment of a waste disposal facility, the performance of the disposal system under both present and future conditions needs assessment. Due to the long time periods involved many different factors need to be considered, and evaluated in a consistent way, often in the absence of quantitative data. Accidents and malfunctions are therefore covered by the development of scenarios based on Features Events and Processes that could have an impact on the facility. A long term assessment scenario should ensure it accounts for all the potential future states of the site and the biosphere, thus assumes accidents and malfunctions that would happen as part of the normal evolution based on probabilistic considerations. Disruptive event scenarios are then established to address uncertainties that have arisen during the definition of the scenarios and conceptual models. Each is a variant on the normal evolution scenario and is described within scenario-specific assumption. For the NPD project this is achieved through the formulation and analysis of a set of scenarios, using the (IAEA 2004) method, referred to as ISAM. The ISAM method uses the initial construction of a comprehensive list of Features, Events and Processes (FEPs) that could influence the disposal system and the migration and fate of radionuclides within it. ISAM defines a FEP as: A FEP is a feature, event, process or other factor that may be necessary to consider in a repository safety assessment. This includes physical features, events and processes that could directly or indirectly influence the release and transport of radionuclides from the repository or subsequent radiation exposures to humans, plus other factors, e.g. regulatory requirements or modelling issues that constrain or focus the analysis. The FEPs used in the NPD Project use the ISAM List. These include scenarios that take into account accidents and malfunctions that could occur over the lifetime of the waste repository. The FEPs identified as applicable scenarios for the NPD Project are presented in Appendix C of the Postclosure Safety Assessment Technical Support Document (PostSA TSD). References: <i>International Atomic Energy Agency (IAEA). 2004. Improvement of Safety Assessment Methodologies for Near Surface Disposal Facilities. Volume I: Review and Enhancement of Safety Assessment Approaches and Tools. International Atomic Energy Agency IAEA-ISAM-1.</i> PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. <i>Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0.</i> 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
162	CNSC	Section 9.11.4 Radiological Accidents and Malfunctions Effects Also applicable to the Decommissioning Safety Assessment Technical Supporting Document	p.9-151	Comment: In section 9.11.4.2 (Accidental Exposure), the accidental exposure to the radiation bounding scenario (Scenario #6) results in doses to both members of the public and workers that is below their respective acceptance criteria. The two scenarios considered are: 1. A worker spends additional time drilling, thereby increasing exposure time. 2. The source is stronger than originally estimated, resulting in additional exposure. This predicted dose is substantiated in the Decommissioning Safety Assessment TSD. Since a total of three holes are required for slip pipe access into the reactor vault, it is unclear if only considering these scenarios happening at one location is bounding (i.e., should the bounding scenario evaluate an accident / malfunction occurring at all three locations?). Section 9.1.6 (Bounding Scenario 6: Accidental Exposure to Radioactivity) of the Decommissioning Safety Assessment TSD notes that CNL’s radiological work control process requires radiation surveyor coverage during drilling work activities. There is no discussion provided regarding radiological effects on the radiation surveyor present during the drilling work activities. Expectation to Address Comment: • Please clarify if the radiation dose estimates for Scenario #6 are bounding, as the scenario assumes an accident / malfunction occurring at only one of three holes being drilled into the reactor vault. • Please clarify whether Scenario #6 is bounding for the radiation surveyor that is expected to be present during the slip pipe access work activities. If not, provide the dose estimates for the radiation surveyor.	Resolved As: In the Decommissioning Safety Assessment Technical Support Document (DecomSA TSD) the assessed duration of work to complete all drilling in the Fuel Machine Room, (i.e. 3 distinct hole locations), is up to 16 hrs (for each hole) for the Normal Operations Assessment. The Scenario 6a assumes that this duration is doubled to 32 hrs and therefore still incorporates the 3 locations. Radiation dose estimates for the Accidental Exposure Scenarios 6a & 6b are considered bounding in terms of their magnitude, i.e. “Hole A”. It is expected that in the unlikely event the scenario circumstances are realised for a single task or hole, further controls would be implemented and optimised to ensure worker exposure to the radiological hazard is maintained As Low As Reasonably Achievable (ALARA) for any remaining tasks or task elements. The radiation dose estimate for the worker undertaking the drilling is considered to bound the exposure of any support workers including that of the Radiation Protection Staff. Change to EIS: Section 9.12.4.2 has been revised with the correct dose, (which is still the bounding hole and not the sum of all three) from the updated DecomSA TSD. References: <i>DecomSA TSD: Garisto, N., Kovacs, and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i>
163	CNSC	Section 9.11.4 Radiological Accidents and Malfunctions Effects	p.9-153	Comment: Section 4.3.3 indicates that the intended future life of the ventilation stack is 50 years, with periodic inspections every 5 years (or after a trigger event like an earthquake) to establish the condition of the stack and its ability to perform its intended function. It is necessary to confirm the following with regard to the stack: • That the present condition of the stack is well known and documented (e.g., through periodic civil inspections) to be used as a reference point in establishing degradation in the future	Resolved As: A Life Management Program (Milman 2004) is in place for the NPD facility. This includes the timetable for periodic inspection and criteria for the inspections. The Life Management Program is based on the system adopted from Naus, D. J. et al, 1996 (ACI 2002). The Life Management Program will be maintained for the ventilation stack during the period of Institutional Control for at least 50 years based on an initial assessment of its remining lifetime (WP 2016). Life Management Program inspections for concrete structures begin with a visual assessment and may be augmented by non-destructive (e.g. hammer sounding) or destructive (e.g. coring) techniques depending on findings. Repair may be a recommendation following an investigation of any identified deficiencies. Independent inspections were conducted in 1999 (visual, impact hammer survey and strength testing of concrete cores), 2002 (visual) and 2007 (visual and impact hammer), concluding no major problems in the stack. Concrete consistency, and structure quality were considered to be in good condition. Further independent assessments in 2016

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				- That the entombed state of the facility will not have a negative effect on the stack, especially on its foundation (e.g., that there will be no changes to the drainage around the foundation, or if there are, that they will be acceptable; that the additional topsoil added will not have negative impacts on the stack and will provide additional lateral support for the part of the stack that will be below-grade – this below-grade part may benefit from improved detailing, such as water insulation, to ensure its durability) - That the degradation mechanisms that may affect the stack during the next 50 years, based on the actual conditions and environment, will be evaluated - That a periodic inspection program is in place and sets the activities, methods and acceptance criteria - While visual inspection may be the starting point for such inspection, CNL should confirm if it will be strictly limited to visual examination and no other options (e.g., non-destructive testing), as suggested in the follow-up program (on p.12-9). - That a plan explaining how the almost 50-meter tall structure will be inspected is in place - That radiological and conventional health and safety measures are considered in the periodic inspection program to ensure the well-being of the staff performing the inspection - That consideration is given to possible maintenance and repair approaches Expectation to Address Comment: Please confirm/clarify the aforementioned points.	(WP 2016) and 2019 (Aly 2019) were conducted pertaining to the stack long term condition as a Chimney Swift roost. Recommendations for removing extraneous attachments, ladder, platform, lights and microwave dish were initially incorporated in the decommissioning plans, but given delays in anticipated approval for decommissioning, these structures were removed proactively in 2021 due to an inability to inspect them. Periodic inspection of the ventilation stack was recommended for every five years with criteria for repairs (e.g. crack sizes) and repair methods. Degradation mechanisms for concrete are well understood, and the inspection criteria in the Life Management Program are based on these mechanisms. The ventilation stack sits on bedrock with a 0.6 m thick, double reinforced hexagonal pad 4.8 m in diameter. The ventilation stack is not structurally linked to the Main Building so will be unaffected by the demolition. The underground vent line to the stack will be filled with grout. The ventilation stack interior will be filled with grout to the height of the engineered cover. Venting will be installed to allow future water drainage and camera inspection of the interior. The barrier design will be shaped at the interface to direct water away from the stack. Any work conducted on the stack will adhere to current CNL programs for HSSE that include performing work under CNL’s Integrated Work Control process that ensures hazards are identified and properly addressed before work is undertaken. An array of holes will be drilled into the stack up from the level of the top of the engineered cover. The holes will be covered with protective vents to prevent small animals from entering. A number of holes will be provided to allow substantially similar passive airflow as in the current configuration. Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound. References: <i>Aly. 2019. Periodic Evaluation of Nuclear Power Demonstration Structures, 64-20000-INR-003, December.</i> <i>American Concrete Institute (ACI). 2002. 349.3R-02: Evaluation of Existing Nuclear Safety-Related Concrete Structures. (Reapp 2010).</i> <i>Milman, I. 2004. Life Management Program for NPD Structures, 64-20000-680-001, February.</i> <i>Naus, D. J. et al, 1996. “Report on Ageing of Nuclear Power Plant Reinforced Concrete Structures”, Oak Ridge National Laboratory, NUREG/CR-6424.</i> <i>WorleyParsons Canada Services Ltd (WP). 2016. Evaluation of NPD Air Effluent Stack and Modifications Required for Facility. NPD Decommissioning. 64-508340-REPT-002. Revision 0. Prepared by WorleyParsons Canada for CNL.</i>
164	CNSC	Section 9.11.4 Radiological Accidents and Malfunctions Effects	p.9-153	Comment: Section 9.11.4.4 only discusses radiological consequences from stack failure, which is one of the accident scenarios considered. It is unclear why non-radiological consequences are not accounted for. Expectation to Address Comment:	Resolved As: A fundamental premise of the case for In-Situ Disposal (ISD) is that the condition of the concrete portion of the Facility as it stands today is retained during Decommissioning Execution. The work performed by CNL in assessing the Facility served to characterize the condition and expected performance of the Facility based on its current state. Should any significant damage occur to the Facility prior to closure, that damage would be repaired prior to closure. Neglecting the current Storage with Surveillance (SwS) phase, as it does not form part of the project, there are thus

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Please clarify / confirm if a possible stack failure could have impacts on certain parts of the site (e.g., the entombed waste, security fence, future monitoring wells). Also, please clarify how the well-being of workers, who may be in the vicinity of the stack to conduct some activities (e.g., periodic civil inspections, access to monitoring wells, etc.), albeit for limited periods of time, will be guaranteed.	three time periods to consider when assessing a collapse of the Ventilation Stack, and any impacts it may have on the proposed disposal facility and on worker safety. These time periods are discussed below. The well-being of workers cannot be ‘guaranteed’ as this is not physically attainable. Any risks to workers will be minimized. This is achieved through the use of detailed work planning, integrated safety management systems, development of a company safety culture, safe work execution and oversight, waste management, facility maintenance and safety. Safety assessments supporting decommissioning planning, emergency planning, training and qualification of staff, are also subject to CNSC oversight and acceptance prior to any work being performed. The stack is inspected periodically as part of the current Storage with Surveillance activities. Additionally, the NPD Life Management Program (LMP) requires a visual inspection of the ventilation stack by an engineer every five years. The most recent LMP inspection took place in late 2024, thus its condition is well understood. The results of the inspection concluded the ventilation stack remains in satisfactory condition, so there are currently no indications of impending failure. Nonetheless, if the ventilation stack were to collapse, there could be two sets of potential consequences: one to the Facility, and one to workers. CNL has not performed analyses to quantify the extent of damage during a ventilation stack collapse event, thus impacts presented are qualitative. Should the ventilation stack collapse, accessible parts of the Facility would be inspected to identify any gross damage and determine the requirement for corrective actions. During the Institutional Controls Phase, if the follow-up monitoring program were to detect higher rates of release following the collapse, this could indicate some effect on the disposed waste, and CNL would take action at that time to assess what corrective actions may be required if the performance of the facility is trending towards the bounds of the assessment basis. Any damage to the fence or monitoring wells would be repaired to restore the required function. The current Safety Assessment Report (SAR), (CNL 2015) does not identify stack collapse as a credible event. This is because the current SAR takes into account that the stack has been designed, built and maintained to meet the required design basis so should not collapse in the event of a design basis accident. On site operations do not currently involve heavy machinery in the vicinity of the stack and any other activities or events that could cause stack collapse would have been screened out as they are very low frequency events. Given the anticipated lifetime of the stack, its collapse is not considered to be a credible event. <u>With respect to the Decommissioning Execution Phase:</u> Should a collapse of the Ventilation Stack occur during the Decommissioning Execution Phase, it is likely to cause damage to the portion of the Facility that is struck. Damage to the Facility struck by the tip of the Ventilation Stack would likely be greater than damage to the Facility struck by lower parts of the Ventilation Stack. The tip of the Ventilation Stack will be traveling at a relatively high speed when it strikes the Facility and would likely cause failure of any structural steel member(s), i.e. superstructure, it contacts. Damage to reinforced concrete structural slabs would likely be limited to local failure near the zone of impact. Damage to the reinforced concrete foundation walls would likely be less than the reinforced concrete structural slabs, due to their more massive structure, and higher resistance to axial loading relative to the flexural resistance of the structural slabs. The energy from an impact of the tip of the stack would be partly used in deformation of the stack itself, as the circular section is likely to fail and crush on impact. Damage from lower parts of the Ventilation Stack would be less severe than upper parts, due to the lower speed immediately prior to impact. Collapse of the Ventilation Stack would result in crushing of any parts of the security fence that are impacted, and likely substantial damage to adjacent portions of the security fence several metres to each side of the impact location. Collapse of the Ventilation Stack onto monitoring wells would crush the plastic stand-pipe marking the well and is likely to cause local sloughing of material into the top of the well, effectively sealing it. Regarding worker well-being, the main hazards from a potential collapse of the ventilation stack would be the immediate industrial hazard, and any dose consequence from releases from the structure. Section 9.6.6 of the DecomSA TSD examines the probability of a stack collapse event. It focusses on 3

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					potential causes: Earthquake, Tornado, and Heavy Equipment (Large Crane) operation. The overall frequency of a collapse is thus calculated by summing the frequency for each cause, and is given as 9.1E-04/yr, however a collapse of the stack does not necessarily lead to a worker injury. The contribution from tornado is very low, thus it is the large crane and earthquake that are the major contributors to the frequency. Hazards associated with cranes can be further mitigated through work planning, reducing the overall frequency of collapse, and may approach 4E-04/yr due to just earthquakes, which can be considered the same level as current operation. Section 9.5.10 of the DecomSA TSD presents the maximum dose to a receptor resulting from a potential collapse of the Ventilation Stack, calculated to be 6.45E-02 mSv to a worker at the site. The potential for collapse and the industrial safety and radiological consequences associated with it are thus judged low enough to be acceptable. <u>With respect to the Institutional Controls Phase:</u> The NPD Closure Project’s Surveillance Plan (Taylor 2019) discusses the proposed surveillance activities and frequencies required on site during the Institutional Controls Phase. The ventilation stack would continue to be assessed on a comparable frequency to the present, and further assessments will be undertaken if required based on the results of these visual inspections. As outlined in the NPD Closure Project’s Design Description document (CNL 2020), the ventilation stack is planned to be retained for approximately 50 years, or until the ongoing inspections determine it is no longer fit for continued service. Should a collapse occur in this time period, the likely effect on the grouted facility and disposed waste will be low as the load from the impact will be distributed through the engineered cover prior to acting on the grouted facility. Some potential exists for surface cracking of the grout fill or the reinforced concrete cap, however, loads impinging on the concrete cap are expected to be low following distribution of the loads through the engineered cover and subsequent deformation of the cover, and are not likely to challenge the integrity of the structure. Impacts to the disposed waste are anticipated to be negligible. Significant damage is expected to the engineered cover, mostly resulting in compression and potential redistribution of the fill materials in the vicinity of the impact location. Should the Ventilation Stack collapse onto the facility fence or a monitoring well, the damage will be mostly identical to what would have occurred during Decommissioning Execution. The frequency of worker injury resulting from collapse during this time period is lower than during the Decommissioning Execution phase, due to reduced activities on site (i.e. no contribution from cranes), and a reduced worker presence. Given the hazards of this event during the Decommissioning Execution are judged to be acceptable, no further consideration is warranted here. <u>With respect to the Postclosure Phase:</u> By the end of the Institutional Controls Phase, CNL will have removed the Ventilation Stack and the facility fence, and will have capped the monitoring wells. Thus a collapse of the Ventilation Stack could not occur during the Postclosure Phase, so no impact is possible. Section 9.12.4.4 of the EIS has been updated to include the above information. Change to EIS: Section 9.12.4.4 of the EIS has been revised to reflect the response above. References: <i>Canadian Nuclear Laboratories (CNL) 2015. Safety Analysis Report for the Nuclear Power Demonstration Waste Management Facility, 64-03610-SAR-001, Revision 3.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Canadian Nuclear Laboratories (CNL) 2020. Design Description of NPD Disposal Facility, 64-508120-DD-001, Revision 2.</i> <i>DecomSA TSD: Garisto, N., Kovacs, R., Music, S., Gilbert, J., and Tong, X. 2020. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i> <i>Taylor, A. 2019. Surveillance Plan for Institutional Control Phase - NPD Disposal Facility NPD Decommissioning. 64-508640-PLA-001. Revision 0.</i>
165	Government of Quebec	Section 9.12.2 Assessment of Cumulative Effects	p.9-159	Comment: Section 9.12.2 states: “Since the project has no residual effects, cumulative effects assessment is therefore not required.” In previous sections of the draft EIS, however, several assessments of risk of various contaminants are presented, without taking into account the sum of the radiological and non-radiological impacts on the environment and the human health. Expectation to Address Comment: Please carry out a cumulative impact assessment of radiological and non-radiological contaminants, including all risks to which the public could be exposed to.	Resolved As: According to Paragraph 19(1)(a) of <i>CEAA</i> 2012, a proponent shall assess any residual adverse environmental effects of the project in combination with other past, present or reasonably foreseeable projects and / or activities. For the NPD Closure Project, all predicted effects were below the screening criteria which were established to represent regulatory limits or guidelines to ensure protection of human health or the environment. As all of the predicted exposures were below these limits there are no residual adverse environmental effects predicted; thus a cumulative effects assessment is therefore not required. It should be noted that within the Post Closure Safety Assessment Technical Support Document (PostSA TSD) the total radiation dose to site receptors is presented and includes the contribution of all radionuclides released to the respective pathways. A summary of dose by the five most significant radionuclides is also presented (Table 5-19 of the PostSA TSD) and the total dose is summed for comparison to the dose criterion. A separate Ecological Risk Assessment (Arcadis 2020) assesses the environmental concentrations calculated in the PostSA for potential effects on non-human biota. The reader is referred to the Arcadis (2020) Ecological Risk Assessment for further information on the methodology and conclusions. Overall, the Ecological Risk Assessment (Arcadis 2020) did not identify any potential undue effects to non-human biota. Guidance on the cumulative effects of non-radiological contaminants is provided in Federal Contaminated Sites Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment, Version 3.0. Section 5.1.2 of the PostSA TSD presents the predicted environmental concentrations which are sufficiently low for the normal evolution scenario (e.g. below applicable environmental quality guidelines) thus no further risk assessment consideration is required. Further, since the contaminants of potential concern for the NPD Closure Project (asbestos, lead, mercury and PCBs) each have different target tissues and mechanisms of action, summation of hazard quotients as part of a human health risk assessment is not warranted. References: <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> <i>EcoRA TSD: Garisto, N., Manolopoulos, H., Arbaban-Esfahani, E., and Tong, X. 2020. Ecological Risk Assessment. 64-509200-ASD-004. Revision 2. Prepared by Arcadis for CNL.</i>
166	Government of Quebec	Section 9.13.6 Flood and Section 9.13.7 Earthquake	p.9-162 to 9-163	Comment: It seems appropriate to examine flood and earthquake impacts with a recurrence period of 10,000 years and not only 100 years. In fact, the power of earthquakes with a 100-year recurrence period has a 63% probability of being exceeded during the Institutional Controls period. In the case of floods, the annual risk of 7.3×10^{-3} translates into a 52% probability of occurrence over 100 years. In both cases, these are neither rare nor exceptional events. This is of	Resolved As: The Ottawa River is a dominant feature of the area. All surface drainage on the Nuclear Power Demonstration Waste Facility (NPDWF) site is to the Ottawa River. The Ottawa River is a large river with an average flow of $850 \text{ m}^3 \text{ s}^{-1}$ with widths of several hundred meters. The Des Joachims Generating Station, approximately 3 km upstream from NPDWF controls flows and river levels. A study considered an extreme weather event combined with a dam break (a probability estimated as less than 1 in 10 million years), and found that the maximum flood level was just sufficient to reach the ground level of the NPDWF (OPG 1999). Flooding to this level would not have a major impact on the wastes in the NPDWF as they are located in the zone that is permanently saturated. The additional floodwater would

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				particular concern because the soil surface layer of the NPD site is composed of sand or filling materials (based on Figure 8.5-7), which increases the risk of long-term erosion. Expectation to Address Comment: Please consider assessing flood and earthquake impacts with a recurrence period of 10,000 years instead of 100 years. Otherwise, justify why this type of assessment is not needed.	only act to dilute any contaminants released into the overburden. The majority of the wastes at NPDWF is located tens of meters below the surface in bedrock in the saturated zone, and will therefore not be impacted by a flood or extreme weather. For the extreme weather flooding, i.e. snow melt and extreme rainfall, it is only expected that some of the overburden would be lost. This should not contain any contaminated soil, as characterisation of the outer NPDWF areas have shown that they are free from contamination. Sources of contamination found inside the fence would be grouted in the facility. Should there be a large flood equivalent to a 10,000 year event the conditions would still be the same as that considered in the Post Closure Safety Assessment Technical Support Document (PostSA TSD). A significant loss of overburden is unlikely to occur as floods of this magnitude don’t usually have high flows due to the large areas they occupy. In addition, when a flood has dissipated you also tend to get a lot of material/sediment deposited which was picked up in the watershed and then dropped in the slower moving areas, so again loss of overburden wouldn’t be an issue. If material was released it would also be extremely diluted by the large amount of floodwater so again risks to people / environment etc. are likely to be very low. Therefore, extreme flooding is not of concern. Incorporated: The NPD Closure Project has updated the Underground Structure Seismic Assessment to include the 1/10,000 year event as the design basis event (DBE), consistent with the requirements of CSA N289.1 (CSA 2018b). The updated Assessment also includes a 1/50,000 year event as an abnormal scenario, with peak ground accelerations (PGA) extrapolated from higher frequency events using a conservative log: log extrapolation developed by the Canadian Geologic Survey. For clarity between the two time periods of “design life” of the NPDDF and the “assessment timeframe” of the analyses, the following criteria are applied: • From the International Atomic Energy Agency (IAEA) Safety Glossary, the design life is the period of time during which a facility or component is expected to perform according to the technical specifications to which it was produced. For the NPDDF there are no design life requirements necessary for the waste form, reactor vault concrete walls, reactor building concrete wall, and grout filling the underground building structure. Only the concrete cap and engineered cover, have a design life which is specified to be 100 years. As such the seismic performance of the concrete cap and cover have been assessed using an earthquake with a 2% probability of exceedance in 50 years. This is considered to be a significantly large enough earthquake that can be expected to occur during the design life of the concrete cap and barrier. • From REGDOC 2.11.1 (CNSC 2021a), “The assessment of future impacts of radioactive waste on the health and safety of persons and the environment encompasses the period of time during which the maximum impact is predicted to occur.” The period of time during which the maximum impact is predicted to occur is referred to as the assessment timeframe and for the NPDDF CNL is proposing an assessment timeframe of 10,000 years. The assessment timeframe is also expected to encompass the design life of the facility; thus, it also contemplates beyond design basis events. CNL has conservatively chosen a 1 in 10,000 year earthquake as the Design Basis Earthquake (DBE) and has a return period approximately 10 times longer than the structural lifetime of the facility and is thus considered to be a maximum credible event within the 10,000 year timeframe. This is the earthquake in the CSA N289.1 standard that is to be applied to the design of a nuclear power plant. The adoption of this size of earthquake is considered conservative because the inventory of radioactive material in the NPDDF is significantly less than the radioactive inventory of a nuclear power plant; thus, the consequence of exceeding the DBE at the NPDDF site during the 1,000 year structural lifetime of the facility is much less than the consequence of exceeding a DBE at an operating power

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					reactor if the safety and containment systems do not mitigate the event as designed. The DBE is commensurate with the design life and the risk associated with the concrete cap and cover. Effects of these events have been modeled and are included in an update to the Post Closure Safety Assessment. The PostSA TSD assessed the impacts from what is now considered the DBE, and found peak dose rates associated with this event are 8.0E-5 mSv/yr, well below the acceptance criterion of 2.5E-1 mSv/yr. Change to EIS: Section 9.14.7 Earthquake, Table 9.14-7 has been updated to identify the 1/10,000 year event as the DBE, and the 1/50,000 year event as the BDBE. References: <i>Canadian Nuclear Safety Commission (CNSC) 2021a, REGDOC 2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. Version 2.</i> <i>Canadian Standards Association (CSA). 2018b. General Requirements for Seismic Design and Qualification of Nuclear Power Plants. N289.1-2018.</i> <i>Ontario Power Generation (OPG). 1999. Ottawa River Dam Break and Inundation Mapping Study. Volume 1. 1999 December.</i> PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.
167	CNSC	Section 9.13.7 Earthquake	p.9-162	Comment: The effects of an earthquake on the NPD facility should be conducted in the Normal Evolution Scenario with a DBE commensurate with the defined assessment timeframe. The assessment should also include the seismic impact on the stability of the slopes of the NPDWF site, since slope failure could result in exposure of and/or damage to the concrete monolith, and impact the safety of the facility. There are low to moderate slopes at the NPD site, which are stable under current conditions. However, these slopes may experience higher earthquakes during the post-closure period and could fail. The earthquakes could also cause liquefaction of the overburden, which could compromise the integrity of the top engineered barrier. Expectation to Address Comment: Please conduct stability analyses of the slopes at the NPD site with a DBE corresponding to the defined assessment timeframe. If the slope failure is expected, its impact on the facility should be assessed.	Resolved As: CNL recognizes responses that there may be some confusion between the two time periods of “design life” of the NPD components and the “assessment timeframe” of the analyses. CNL would like to provide the following clarification: - From the International Atomic Energy Agency (IAEA) Safety Glossary, the design life is the period of time during which a facility or component is expected to perform according to the technical specifications to which it was produced. For the NPDDF there are no design life requirements necessary for the waste form, reactor vault concrete walls, reactor building concrete wall, and grout filling the underground building structure. Only the concrete cap and engineered cover, have a design life which is specified to be 100 years. As such the seismic performance of the concrete cap and cover have been assessed using an earthquake with a 2% probability of exceedance in 50 years. This is considered to be a significantly large enough earthquake that can be expected to occur during the design life of the concrete cap and barrier. - From REGDOC 2.11.1 Volume III, Section 8.1.3.3, “The licensee or applicant shall ensure that future impact that may arise from the radioactive waste includes the period of time during which the maximum impact is predicted to occur.” The period of time during which the maximum impact is predicted to occur is referred to as the assessment timeframe and for the NPDDF CNL is proposing an assessment timeframe of 10,000 years. The assessment timeframe is also expected to encompass the design life of the facility; thus, it also contemplates beyond design basis events. Incorporated: For clarity between the two time periods of “design life” of the NPDDF and the “assessment timeframe” of the analyses, the following criteria are applied:

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					- From the International Atomic Energy Agency (IAEA) Safety Glossary, the design life is the period of time during which a facility or component is expected to perform according to the technical specifications to which it was produced. For the NPDDF there are no design life requirements necessary for the waste form, reactor vault concrete walls, reactor building concrete wall, and grout filling the underground building structure. Only the concrete cap and engineered cover, have a design life which is specified to be 100 years. - In accordance with REGDOC 2.11.1 Volume III, Section 8.1.3.3, “The assessment of future impacts of radioactive waste on the health and safety of persons and the environment encompasses the period of time during which the maximum impact is predicted to occur.” The period of time during which the maximum impact is predicted to occur is referred to as the assessment timeframe and for the NPDDF CNL is proposing an assessment timeframe of 10,000 years. The assessment timeframe is also expected to encompass the design life of the facility; thus, it also contemplates beyond design basis events. CNL has conservatively chosen a 1 in 10,000 year earthquake as the Design Basis Earthquake (DBE) and has a return period approximately 10 times longer than the structural lifetime of the facility and is thus considered to be a maximum credible event within the 10,000 year timeframe. This is the earthquake in the CSA N289.1 standard that is to be applied to the design of a nuclear power plant. The adoption of this size of earthquake is considered conservative because the inventory of radioactive material in the NPDDF is significantly less than the radioactive inventory of a nuclear power plant; thus, the consequence of exceeding the DBE at the NPDDF site during the 1,000 year structural lifetime of the facility is much less than the consequence of exceeding a DBE at an operating power reactor if the safety and containment systems do not mitigate the event as designed. The DBE is commensurate with the design life and the risk associated with the concrete cap and cover. Two different slopes are considered in the assessments, and are detailed below. The engineered cover is designed to resist an earthquake with a peak ground acceleration of 0.253g, equivalent to a 2,500 year return period (AECOM 2019). The design life for the barrier is 100 years, chosen to aid in preventing mobility of short-lived radionuclides (mostly tritium), which will have decayed by the end of the design life. If the slopes become unstable during the design life of the engineered cover, whether from a seismic or other event, maintenance activities during the period of Institutional Control will be able to restore the slope and thus function of the engineered cover. Nonetheless, the slopes of the barrier are expected to remain stable for the duration of its design life, after which the confinement function provided by the barrier becomes much less important. The second slope under consideration is the slope north of the NPD Facility. A slope stability study (Arcadis 2021b) using a grain size analyses of 11 archived soil samples collected as part of drilling investigations was completed at the NPDWF site. The results of the liquefaction and slope stability assessments are intended to provide a screening-level evaluation of the North Slope. The slope stability study also assessed liquefaction of saturated site soils based on earthquake characteristics, site soil characteristics, hydrogeological setting, and soil texture screening methods. To assess stability of the overburden slope located north of the NPDWF to the Ottawa River (the North Slope), two stratigraphic cross sections (A-A’ and B-B’) were constructed based on results of available overburden drilling and soil sampling and elevation surveying of ground surface at drilling locations. For earthquake-induced soil liquefaction, the results show that the North Slope under current water level conditions is stable under static loading conditions and under loading conditions associated with a 1:2,250-year earthquake. Parts of the North Slope (cross section A-A’) are stable, and parts of the North Slope (slightly steeper slope of cross section B-B’) are unstable under a 1:10,000-year earthquake. Both cross sections of the North Slope are likely to fail during a 1; 50,000-year earthquake. For cross section A-A’, initial liquefaction failure of the silt to boulder till at the toe of the slope for the 1:50,000-year earthquake has the potential to destabilize the overall slope causing retrogressive failure of the back slope down

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					to the bedrock surface and toward the NPDWF. Such retrogressive failure has potential to cause failure of the sloping engineered earth cover in the area northeast of the NPDWF building footprint. For cross section B-B’, the predicted slope failures for the 1:10,000-year and 1:50,000-year earthquakes both occur at the crest of the North Slope within the sand and gravel fill. For cross section B-B’ migration of the crest failure toward the NPDWF is unlikely. The identified slope failures on cross sections A-A’ and B-B’ are unlikely to expose the grouted NPDWF. It is unlikely that the predicted failures of the North Slope at cross section A-A’ and B-B’ will result in the direct exposure of groundwater to a new ground surface that would be established following earthquake induced slope failures. Slope failures at the North Slope are expected to result in accumulations of failed granular materials on the lower half of the North Slope because the angles of repose of the failed granular materials (30° - 34°) are much more than the slope angles of the bedrock surface (10° - 12°). Given the permeable nature of all soils that comprise the North Slope, the expected redistribution of soils following slope failure is unlikely to change groundwater flows from the NPDWF to the Ottawa River. The scenario of the failure of the north slope exposing some or all of the NPD structure is bounded by the Surface Erosion case considered in the Postclosure Safety Assessment TSD. The Surface Erosion scenario examined the effects of a triple dam break, leading to flooding and scouring of the overburden, and bounds any other situation that could lead to scouring of the overburden. The peak dose from this scenario results from exposure and use of sediments contaminated with groundwater leaking from the NPD Disposal Facility, and was assessed at 5E-4 mSv/yr, well below the threshold dose for a Disruptive Evolution Scenario. Change to EIS: Section 9.14.7 (Earthquake) has been updated to include the following: “The engineered cover has been designed to resist an earthquake with a peak ground acceleration of 0.253g, equivalent to a 2,500 year return period. If the slopes of the engineered cover become unstable during the design life of 100 years from a seismic or other event, maintenance activities during the period of Institutional Control will be able to restore the slope and thus function of the engineered cover. The slopes of the barrier are expected to remain stable for the duration of the design life, after which the confinement function provided by the barrier becomes much less important. The design of the engineered cover included a review to assess the potential for liquefaction of the overburden. The results of this review indicated the overburden was not homogeneous in nature, and thus did not have a high potential for liquefaction. Additionally, the soil materials chosen for the engineered cover were selected in part for their resistance to liquefaction (AECOM 2023). The slope north of the NPD Facility is likely to have a failure in the backfill material overlying bedrock following a large earthquake, approximately equal to a Design Basis Earthquake (1 in 10,000 year event). It is unlikely that the predicted slope failures of the North Slope will result in the direct exposure of groundwater to a new ground surface that would be established following earthquake induced slope failures. Slope failures at the North Slope are expected to result in accumulations of failed granular materials on the lower half of the North Slope because the angles of repose of the failed granular materials (30° - 34°) are much more than the slope angles of the bedrock surface (10° - 12°). Given the permeable nature of all soils that comprise the North Slope, the expected redistribution of soils following slope failure is unlikely to change groundwater flows from the NPDWF to the Ottawa River. The identified slope failures are unlikely to expose the grouted NPDWF. The scenario of the failure of the north slope exposing some or all of the NPD structure is bounded by the Surface Erosion case considered in the PostSA. The Surface Erosion scenario examined the effects of a triple dam break,

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					leading to flooding and scouring of the overburden, and bounds any other situation that could lead to scouring of the overburden. The peak dose from this scenario results from exposure and use of sediments contaminated with groundwater leaking from the NPD Disposal Facility, and was assessed at 4E-3 mSv/y, well below the threshold dose for a Disruptive Evolution Scenario.” Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound. References: <i>AECOM. 2023. Design of the Concrete Cap and Engineered Barrier at NPD – Design Requirements, 64-508120-10045839.</i> <i>Arcadis 2021b. Slope Stability Assessment Nuclear Power Demonstration Closure Project, 64-509410-REPT-016. Revision 0.</i> <i>Canadian Nuclear Laboratories (CNL). 2019b. Seismic Loading Effects on Earth Fill and Slope North of NPD, 64-20000-021-000, Revision 0.</i> <i>Canadian Nuclear Safety Commission (CNSC) 2021a, REGDOC 2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. Version 2.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
10. Mitigation Measures					
168	Government of Quebec	General	General	Comment: Most of the scenarios set out in the draft EIS address the potential effects of in-situ decommissioning without considering site-specific data; rather, they are based on general, historical studies. CNL believes that mitigation measures to limit the radiological and non-radiological contamination of groundwater, the Ottawa River and the air will result in a gradual removal of contaminants without high concentrations. However, no guarantee is provided as to the effectiveness of these mitigation measures or the frequency of monitoring. Expectation to Address Comment: Please demonstrate clearly how the planned mitigation measures will ensure that contamination is eliminated (by disintegration, attenuation or dilution) and that hazardous levels of radionuclides will not persist in the future. Also, provide more information on the long-term monitoring, including the contamination threshold values that would trigger corrective action.	Resolved As: For the long-term post-closure phase, standard safety assessment methods including the IAEA ISAM methodology (IAEA 2004) and CNSC REGDOC 2.11.1, Volume III have been followed. The Post Closure Safety Assessment Technical Support Document (PostSA TSD) has thus included a systematic evaluation of a list of over 200 Features, Events and Processes. These have been reviewed for their relevance to the NPD site (Appendix C of the PostSA TSD). Site specific data, such as the waste inventory and facility configuration as well as the surrounding geosphere and biosphere conditions, have been incorporated into the model. This is discussed in Section 4.2 of the PostSA TSD. Many of the in-design mitigation measures are current features of the facility. These have a proven effectiveness shown by the last 60 years of environmental performance of the facility. The in-design mitigation measures restricting radionuclide / contaminant release from the NPD facility include: waste form: the majority of the radioactivity is embedded within iron-based matrices (carbon steel, stainless steel) and zirconium alloy. The rate of release of this inventory is expected to be low because of the passive nature of the metals and because of the grouting of the facility with which results in slow corrosion rates due to the resulting alkaline conditions in the cement pore water. Because of the importance of the waste form in ensuring safety, additional information justifying the expected long-term performance of these waste forms is presented in a Waste Form Synthesis report (Arcadis 2021).

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					- the thick concrete walls of the reactor vault and structure inhibit movements of radionuclides and other contaminants from the NPD facility into the surrounding environment. - the grout backfill inhibits movement of radionuclides and other contaminants and creates an alkaline environment that limits the solubility of key contaminants. Section 5.4 of the PostSA TSD, assesses the performance of these mitigation measures. By modelling the facility without any grout, the project is able to assess the adequacy of the existing foundation walls, as well as the benefit of adding grout. The majority of the radioactive inventory is embedded in a metal with very slow corrosion rates. The corrosion resistant metal acts as an effective barrier to slow the release of radioactivity into the grout. Further modelling of the reactor vault devoid of grout and grouting the rest of the facility demonstrates the robustness of the thick concrete reactor vault walls, which is where the majority of the radiologic inventory resides. The proposed environmental monitoring activities to be carried out during the Institutional Control period for the NPD Closure Project provide a list of triggers for further action for each environmental component and sub-component. See Section 12 of the EIS for the framework of the follow-up monitoring program for the NPD Closure Project. Preliminary monitoring plans have been developed by the project. These monitoring plans follow the systematic informed planning process outlined in CSA Standards N288.4-19, Environmental Monitoring Programs at Nuclear Facilities and Uranium Mines and Mills, N288.5-22 Effluent Monitoring Programs at Nuclear Facilities and Uranium Mines and Mills, and N288.7-23, Groundwater Protection and Monitoring Programs for Nuclear Facilities and Uranium Mines and Mills, and include proposed trigger or action levels with rationale. Trigger or action levels for these environmental components are set well below regulatory limits or selected performance indicators if no regulatory limit is applicable to act as triggers to ensure that the operation and performance of the NPD disposal facility is meeting expectations and to ensure release limits are not reached. Should an action level be triggered then investigative actions would be taken to determine the cause and if necessary appropriate mitigations would be put in place. References: <i>Arcadis. 2021. NPD and WR1 In-Situ Disposal Projects Waste Form Synthesis Report, 64-508760-REPT-017, Revision 1.</i> <i>Canadian Nuclear Safety Commission (CNSC) 2021a, REGDOC 2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. Version 2.</i> <i>International Atomic Energy Agency (IAEA). 2004. Improvement of Safety Assessment Methodologies for Near Surface Disposal Facilities. Volume I: Review and Enhancement of Safety Assessment Approaches and Tools. International Atomic Energy Agency IAEA-ISAM-1.</i> PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.
169	CNSC	Section 10.1 Regulatory Requirements	p.10-2	Comment: This section makes reference to the International Atomic Energy Agency (IAEA) Safety Guide SSG-29, <i>Near Surface Disposal Facilities for Radioactive Waste</i>. This guide “... does not apply to intermediate level waste (ILW) that will not decay to safe levels over a period of a few hundred years or to high level waste (HLW), as both are unsuitable for near surface disposal (Section 1.11).” Expectation to Address Comment:	Resolved As: International Atomic Energy Agency (IAEA) Safety Guide SSG-29, <i>Near Surface Disposal Facilities for Radioactive Waste</i> (SSG-29) describes near surface disposal as covering a wide range of facilities from at the surface to varying depths down to a few tens of meters. SSR-5 describes suitable ILW disposal as occurring at depths of a few tens of meters down to a few hundred meters below ground level. Thus, it can be seen, that there is some overlap between the types of disposal requirements for ILW and LLW. The historic siting of the reactor and associated components, comprising the ILW inventory in the NPD facility, is in the bedrock, within a concrete vault, in the range of tens of meters below the ground level. These are all features that

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Please clarify if you agree with Section 1.11 of the IAEA SSG-29 (and why), in order to establish applicability of this document to the NPD Closure Project.	are consistent with IAEA Safety Standard SSR-5, Disposal of Radioactive Waste, regarding cavern or vault disposal for ILW. In particular, the proposed NPD Closure Project satisfies Section 1.14(c), which states: <i>Disposal of intermediate level waste:</i> <i>Depending on its characteristics, intermediate level radioactive waste (ILW) can be disposed of in different types of facility [Classification of Radioactive Waste, IAEA Safety Standards Series No. GSG-1, IAEA, Vienna (2009)].</i> <i>Disposal could be by emplacement in a facility constructed in caverns, vaults or silos at least a few tens of meters below ground level and up to a few hundred meters below ground level. It could include purpose built facilities and facilities developed in or from existing mines. It could also include facilities developed by drift mining into mountainsides or hillsides, in which case the overlying cover could be more than 100 m deep.</i> The entire facility is designed and will be constructed to meet the needs of ILW disposal. As a significant portion of the disposal facility is at a depth less than 10m below ground level, it is prudent to take into account the best practice guidance given in SSG-29. This part of the facility only contains LLW and does not contain significant quantities of long lived isotopes. Therefore, in addition to the requirements for ILW disposal best practices in near surface disposal should be applied to the upper portion of the NPD disposal Facility. In summary as the NPD Disposal facility contains ILW, SSG-29 is not applicable to the NPD Closure Project. Where relevant, guidance given in SSG-29 has been taken into account. Section 10.1 of the EIS has been updated to reflect this position. Change to EIS: The following text has been added to Section 10.1 of the EIS: “It is noted that as the NPDDF contains ILW, SSG-29 is not applicable to the NPD Closure Project; however, where relevant, guidance given in SSG-29 has been taken into account.”
170	Health Canada	Section 10.3 Scope, Table 10.3-1	p.10-6	Comment: The proposed mitigation measures include locating “the batch mixing plant at least 1 km from nearby residences (if possible)”. The location of residences is known and it should therefore be possible to determine if the batch mixing plant can be located at least 1 km from residences. Expectation to Address Comment: Please determine the location of the batch mixing plant. If this is not possible, then identify what additional information is required to determine its location, and when this determination will be made. Any potential changes to the assessment of air and noise effects resulting from a change to the siting of the batch mixing plant should be identified.	Incorporated: Since preparation of the draft EIS, the detailed planning for the NPD Closure Project has progressed to enable determination of the preferred location of the batch mixing plant. The preferred location for the batch mixing plant, including the materials lay-up areas, is in the parking lot of the previously removed training facility (Phillips 2020). This preferred location for the batch mixing plant is located over 1,000 m from the three closest residential properties which surround the NPD property. This has been confirmed using GIS information taken from the County of Renfrew, ON. Change to EIS: Text in Section 9.2.3.2 and Table 10.3-1 has been updated to remove the “if possible” clause for ensuring the batch plant is at least 1,000 m from the closest residential properties. References: <i>Phillips, B. 2020. Memo: Batch Plant Siting Locations. 64-15700-021-000. 2020 November 23.</i>
11. Conclusion on Significance					
171	CNSC	Section 11.2 Confidence in Assessment Findings	p.11-1	Comment:	Resolved As: Regulating nuclear safety in Canada is the responsibility of the Canadian Nuclear Safety Commission (CNSC). The IAEA is a valuable resource to provide guidance for decisions concerning safety related to CNL’s plans to decommission NPD. Current IAEA guidance states that in-situ decommissioning / in-situ disposal (ISD) should not

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Section 11.2 states that “[t]he proposed technologies are known and proven. In-situ decommissioning has been in use for at least 50 years.” Section 1.10 of the IAEA General Safety Requirements (GSR) Part 6, <i>Decommissioning of facilities</i> states that “[e]ntombment, in which all or part of the facility is encased in a structurally long lived material, is not considered a decommissioning strategy and is not an option in the case of planned permanent shutdown. It may be considered a solution only under exceptional circumstances (e.g. following a severe accident).” Expectation to Address Comment: Please provide additional information on how this decommissioning strategy compares to the IAEA GSR Part 6.	be the preferred decommissioning strategy for nuclear power reactors, except possibly under exceptional circumstances (IAEA General Safety Requirements (GSR) Part 6, STI/PUB/1652, ISBN 78–92–0–102614–9). The IAEA goes on to list the 15 requirements that should be met when selecting a specific decommissioning pathway for a facility. The following outlines how the proposed project, CNL policies, programs and procedures, and regulatory framework address the requirements of IAEA GSR Part 6. 1. <u>Optimization of protection and safety in decommissioning</u> - Exposure during decommissioning shall be considered to be a planned exposure situation and the relevant requirements of the Basic Safety Standards shall be applied accordingly during decommissioning. <i>National regulations on the protection of the environment shall be complied with during decommissioning, and beyond if a facility is released from regulatory control with restrictions on its future use.</i> 2. All decommissioning work at CNL is carried out under the oversight of the CNSC and conducted in accordance with CNL’s Radiation Protection Program, which provides the framework and constraints for planned exposures during decommissioning work at NPD. The proposed in-situ disposal of the NPD is subject to Federal Legislation including the <i>Nuclear Safety and Control Act (NSCA)</i>, and <i>Canadian Environmental Assessment Act (CEAA)</i>. The Project is further subject to oversight and approval from the Canadian Nuclear Safety Commission (CNSC), which licenses all activities performed by CNL related to decommissioning and waste management. The NPD licence dictates requirements for CNL to comply with and outlines what activities CNL is permitted to perform. Regular inspections by the CNSC ensure compliance with the licence, and all applicable relevant Federal legislation. These conditions remain in place until the CNSC deems them no longer necessary for the safety of workers, the public and the environment. 3. <u>Graded approach in decommissioning</u> - A graded approach shall be applied in all aspects of decommissioning in determining the scope and level of detail for any particular facility, consistent with the magnitude of the possible radiation risks arising from the decommissioning. <i>The conduct and regulatory oversight of decommissioning actions shall be applied in a manner that is commensurate with the hazards and risks associated with the decommissioning of the facility.</i> All decommissioning activities carried out by CNL are subject to CNSC oversight under a licence. The licence outlines the activities which CNL is permitted to perform and conditions that must be met while performing it. The licence further identifies all the relevant CNL policies, programs and procedures that decommissioning activities must be performed in accordance with. The CNSC provides compliance oversight to ensure CNL is following the specified policies, program and procedures. One such requirement is the adherence to the CSA N286 quality assurance standard Section 4.1.3, which has specific provisions for application of graded approaches to performing work, commensurate with the risk level involved. As such this graded approach has been implemented in many of the policies, programs and procedures identified in the NPD site licence, which have been accepted as satisfactory by the CNSC. The graded approach is reflected in procedures for environmental review, radiation and contamination monitoring, occupational health and safety measures, quality assurance and waste management and minimization, among others. The ALARA Principle (As Low As Reasonably Achievable) permeates CNL’s safety culture, and the ‘Reasonably’ portion of that is where the graded approach is applied. 4. <u>Assessment of safety for decommissioning</u> - Safety shall be assessed for all facilities for which decommissioning is planned and for all facilities undergoing decommissioning. <i>The final decommissioning plan shall be supported by a safety assessment addressing the planned decommissioning actions and incidents, including accidents that may occur or situations that may arise during decommissioning.</i> As part of the ongoing Environmental Assessment (EA), under <i>CEAA</i> 2012, CNL has prepared an Environmental Impact Statement (EIS) which summarizes the assessed impacts of the project on the identified Valued Components (VCs). The EIS is supported by a number of Technical Support Documents (TSD), two of which are safety

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					assessments: Decommissioning Safety Assessment (DecomSA); and Postclosure Safety Assessment (PostSA). The DecomSA assesses the safety of human receptors (i.e., workers and members of the public) from normal operations and accidents as part of the Decommissioning Execution phase. The PostSA assesses the long-term implications of the project by undertaking a quantitative assessment of the postclosure radiological and non-radiological safety of the in-situ disposal of the NPD and identifying those uncertainties that have the greatest potential effect on the long-term performance of the disposal facility. All of these documents provide supporting information for the Detailed Decommissioning Plan (DDP) (Johnson 2022a) that is prepared in compliance with CSA N294 and submitted for CNSC acceptance as a component of the licence application. 5. <u>Responsibilities of the government for decommissioning</u> - The government shall establish and maintain a governmental, legal and regulatory framework within which all aspects of decommissioning, including management of the resulting radioactive waste, can be planned and carried out safely. This framework shall include a clear allocation of responsibilities, provision of independent regulatory functions, and requirements in respect of financial assurance for decommissioning. <i>The responsibilities of the government shall include:</i> • <i>Establishing a national policy for the management of radioactive waste, including radioactive waste generated during decommissioning;</i> • <i>Establishing and maintaining the legal, technical and financial responsibilities for organizations involved in decommissioning, including responsibilities for granting the authorization to conduct decommissioning and for the management of the resulting radioactive waste;</i> • <i>Ensuring that the necessary scientific and technical expertise is available both for the licensee and for the support of regulatory review and other independent national review functions;</i> • <i>Establishing a mechanism to ensure that adequate financial resources are available when necessary for safe decommissioning and for the management of the resulting radioactive waste.</i> The Government of Canada provides the legislative framework supporting the CNSC, including defining its mandate and authority as Canada’s independent nuclear regulatory. The CNSC is responsible for the oversight of all civilian nuclear activities in Canada. The CNSC has a suite of Regulatory Documents and Guidelines that cover the decommissioning of nuclear facilities, the management of radioactive waste and the requirement for financial guarantees. The NPD site is the property of Atomic Energy of Canada Limited (AECL) which is a Schedule III, Part 1 Crown Corporation under the Financial Administration Act and an agent of Her Majesty in Right of Canada. As owners AECL retains responsibility for the site, financial obligations for decommissioning, and long term management of the site post-closure. These liabilities have been officially recognized by the Minister of Natural Resources in a letter dated 2015 July 31, (e-Doc 4803454, 4815508), and satisfy CNSC Regulatory Guide G-206 –Financial Guarantees for the Decommissioning of Licensed Activities. 6. <u>Responsibilities of the regulatory body for decommissioning</u> - The regulatory body shall regulate all aspects of decommissioning throughout all stages of the facility’s lifetime, from initial planning for decommissioning during the siting and design of the facility, to the completion of decommissioning actions and the termination of authorization for decommissioning. The regulatory body shall establish the safety requirements for decommissioning, including requirements for management of the resulting radioactive waste, and shall adopt associated regulations and guides. The regulatory body shall also take actions to ensure that the regulatory requirements are met.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					The CNSC is the authority having jurisdiction for all nuclear decommissioning work in Canada. The CNSC has developed a rigorous licencing approach that ensures nuclear safety in all licenced nuclear decommissioning work. The licence currently issued to CNL, and all future licences and licence revisions granted to CNL for decommissioning the NPD site, do and will include specific requirements, standards and guidance for maintaining safe decommissioning operations. These requirements are developed with input from regulatory and industry experience, and take into consideration international guidance and best practices. As a member state of the IAEA, Canada and therefore the CNSC are committed to pursuing the highest standards in nuclear safety through international collaboration and sharing operational experience. 7. Responsibilities of the licensee for decommissioning - The licensee shall plan for decommissioning and shall conduct the decommissioning actions in compliance with the authorization for decommissioning and with requirements derived from the national legal and regulatory framework. The licensee shall be responsible for all aspects of safety, radiation protection and protection of the environment during decommissioning. <i>The responsibilities of the licensee shall include:</i> • <i>Selecting a decommissioning strategy as the basis for preparing and maintaining the decommissioning plans throughout the lifetime of the facility.</i> • <i>Preparing and submitting an initial decommissioning plan and its updates for review by the regulatory body.</i> • <i>Establishing and implementing an integrated management system. If the licensee changes during the lifetime of the facility, procedures shall be put in place to ensure the transfer of responsibilities for decommissioning to the new licensee.</i> • <i>Fostering a safety culture in order to encourage a questioning and learning attitude towards safety, and to discourage complacency.</i> • <i>Estimating the cost of decommissioning and providing financial assurances and resources to cover the costs associated with safe decommissioning, including the management of the resulting radioactive waste.</i> • <i>Notifying the regulatory body prior to the permanent shutdown of the facility.</i> • <i>Submitting a final decommissioning plan and supporting documents for review and approval by the regulatory body, in accordance with national regulations, in order to obtain an authorization to conduct decommissioning.</i> • <i>Managing the decommissioning project and conducting decommissioning or ensuring oversight of the actions conducted by contractors.</i> • <i>Managing the remaining operational waste from the facility and all waste from decommissioning.</i> • <i>Ensuring that the facility is maintained in a safe configuration during the period of transition following permanent shutdown and until the approval of the final decommissioning plan.</i> • <i>Performing safety assessments and environmental impact assessments in support of decommissioning actions.</i> • <i>Preparing and implementing appropriate safety procedures, including emergency plans.</i> • <i>Ensuring that properly trained, qualified and competent staff are available for the decommissioning project.</i> • <i>Performing radiological surveys in support of decommissioning.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Verifying that end-state criteria have been met by performing a final survey. Keeping and retaining records and submitting reports as required by the regulatory body.</i> CNL, performs each of the above bullet items on a daily basis as part of its core business operations, Nuclear Decommissioning. CNL carries out all work at NPD under a Licence from the CNSC. The requirements for obtaining and maintaining a licence align with the objectives of the bullet list above. All aspects of the decommissioning work, including preliminary and detailed planning, integrated management systems, development of company safety culture, cost estimating and financial guarantees, safe work execution and oversight, waste management, facility maintenance and safety, safety assessments supporting decommissioning planning, emergency planning, training and qualification of staff, and record retention are subject to CNSC oversight and acceptance prior to any work being performed. The preparation of a Detailed Decommissioning Plan (DDP) (Johnson 2022a) by CNL effectively summarizes the pertinent information noted above for CNSC review and acceptance. The CNSC performs regular compliance inspections to verify CNL complies with the requirements of the decommissioning licence and the work summarized in the DDP. CNL also develops Work Plans with additional detail on how work scope of the DDP will be carried. These Work Plans are provided to the CNSC for information, as a means to assess the detailed plans compliance with the goals outlined in the DDP. Upon completion of the work, End-State reports are prepared to summarize the work performed against the planned activities, noting discrepancies or changes, for CNSC acceptance. 8. <u>Integrated management system for decommissioning</u> – The Licensee shall ensure that its integrated management system covers all aspects of decommissioning. <i>The prime responsibility for safety shall remain with the licensee.</i> CNL is the licensee for the NPD site. Under the terms of that licence, CNL has a management system comprised of an integrated set of documented policies, expectations, standards, procedures and responsibilities through which CNL is governed and managed, from the setting of direction through to day-to-day operations, all within a coherent control and accountability framework. Decommissioning is a specific activity covered by CNL’s integrated management system. 9. <u>Selecting a decommissioning strategy</u> - The licensee shall select a decommissioning strategy that will form the basis for the planning for decommissioning. The strategy shall be consistent with the national policy on the management of radioactive waste. <i>There may be situations in which immediate dismantling is not a practicable strategy when all relevant factors are considered. The selection of a decommissioning strategy shall be justified by the licensee. The licensee shall demonstrate that, under the strategy selected, the facility will be maintained in a safe configuration at all times and will reach the specified decommissioning end-state, and that no undue burdens will be imposed on future generations.</i> CNL has selected in situ disposal as the decommissioning strategy for NPD. In the absence of a well-defined national waste strategy, CNL continues to pursue a risk based approach to radioactive waste management that complies with all CNSC regulations, applicable legislation, and where appropriate aligns with international guidance and best practises. The justification for the selection of this strategy is presented in the Environmental Impact Statement (Section 4.2 Alternative Means Assessment). The EIS, supported by the Decommissioning Safety Assessment, Postclosure Safety Assessment and Ecological Risk Assessment, and other technical documents demonstrate that the impacts of this approach on people and the environment do not place an undue burden on future generations. 10. <u>Financing of decommissioning</u> – Responsibilities in respect of financial provisions for decommissioning shall be set out in national legislation. These provisions shall include establishing a mechanism to provide adequate financial resources and to ensure that they are available when necessary, for ensuring safe decommissioning.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					The requirements for Financial Guarantees are laid out in CNSC’s regulatory document REGDOC-3.3.1, Financial guarantees for decommissioning of nuclear facilities and termination of licensed activities. This regulatory guide provides guidance regarding the establishment and maintenance of measures to fund the decommissioning of activities licensed by the Canadian Nuclear Safety Commission (CNSC). CNL adherence to this regulatory guide is mandated through the NPD Site Licence. 11. Planning for decommissioning - The licensee shall prepare a decommissioning plan and shall maintain it throughout the lifetime of the facility, in accordance with the requirements of the regulatory body, in order to show that decommissioning can be accomplished safely to meet the defined end-state. CNL has prepared a Detailed Decommissioning Plan (Johnson 2022a) for the Nuclear Power Demonstration Waste Facility that outlines how the decommissioning activities will safely be undertaken to meet to proposed end-state. The plan contents are organized based on the Canadian Nuclear Safety Commission (CNSC) Regulatory Document, REGDOC-2.11.2, Decommissioning, and Canadian Standards Association N294-09 “Decommissioning of Facilities Containing Nuclear Substances”. 12. Final decommissioning plan – Prior to the conduct of decommissioning actions, a final decommissioning plan shall be prepared and submitted to the regulatory body for approval. <i>The final decommissioning plan and supporting documents shall cover the selected decommissioning strategy; the schedule, type and sequence of decommissioning actions; the waste management strategy applied, including clearance, the proposed end-state and how the licensee will demonstrate that the end-state has been achieved; the storage and disposal of the waste from decommissioning; the timeframe for decommissioning; and financing for the completion of decommissioning. If the final decommissioning plan includes new technologies and concepts for decommissioning, the licensee shall demonstrate that such methods are safe and effective. Interested parties shall be provided with an opportunity to examine the final decommissioning plan can provide comments prior to its approval.</i> CNL has prepared a Detailed Decommissioning Plan (Johnson 2022a) for the Nuclear Power Demonstration Waste Facility based on the Canadian Nuclear Safety Commission (CNSC) Regulatory Document, REGDOC-2.11.2, Decommissioning, and Canadian Standards Association N294-09 “Decommissioning of Facilities Containing Nuclear Substances”. The Detailed Decommissioning Plan addresses the requirements of a final decommissioning plan including each of the items listed above. 13. Conduct of decommissioning actions - The licensee shall implement the final decommissioning plan, including management of radioactive waste, in compliance with national regulations. <i>Decommissioning techniques shall be selected such that protection and safety is optimized, protection of the environment is ensured, the generation of waste is minimized and any potential negative impact on the storage and disposal of waste is minimized.</i> All operations at CNL, decommissioning or otherwise, are subject to approval by the CNSC. Approval is granted via a site licence which summarizes the CNSC accepted policies, programs and key procedures that govern the work processes at NPD. All work is performed in accordance with the policies, programs and key procedures identified, including Radiation and Environmental Protection, Occupational Health and Safety, Waste Management, Security and Quality Assurance. Any changes to these policies programs or key procedures are submitted to the CNSC for review and acceptance prior to being implemented to perform work. All work to decommissioning NPD will comply with these accepted practices to ensure protection of workers, the public and the environment, safe and optimized waste management and minimization. Furthermore, the in-situ disposal of NPD is subject to an EA which must demonstrate safety and protection of people and the environment

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					and a licensing approval which must demonstrate compliance with applicable CNSC regulatory requirements and Canadian Standards, prior to receiving CNSC approval to proceed. 14. Emergency response arrangements for decommissioning - Emergency response arrangements for decommissioning, commensurate with the hazards, shall be established and maintained, and events significant to safety shall be reported to the regulatory body in a timely manner. Establishment of appropriate emergency response measures is required as per NPD Site Licence (section 12) and the Licence Conditions Handbook (Condition 12.1). NPD meets this requirement through the implementation of CNL’s Emergency Preparedness Program Requirements Document, with is reviewed and accepted by the CNSC. 15. Radioactive waste management in decommissioning - Radioactive waste shall be managed for all waste streams in decommissioning. <i>Radioactive waste that remains at the facility and radioactive waste that is generated during decommissioning shall be disposed of properly. If disposal capacity is not available, radioactive waste shall be stored safely in accordance with the relevant requirements.</i> The safe and effective management of radioactive wastes is mandated through the CNSC licence under which all activities at NPD are performed. Section 13 of the NPD Site Licence mandates that NPD maintain a waste management program. NPD meets this requirement through the implementation of CNL’s Waste Management Program Requirements Document, with is reviewed and accepted by the CNSC. 16. Completion of decommissioning actions and termination of the authorization for decommissioning - On the completion of decommissioning actions, the licensee shall demonstrate that the end-state criteria as specified in the final decommissioning plan and any additional regulatory requirements have been met. The regulatory body shall verify compliance with the end-state criteria and shall decide on termination of the authorization for decommissioning. Upon completion of in situ disposal of NPD, CNL will prepare an End-State Report, which will document the work performed and the end-state achieved. Once the end-state has been reached, the NPD site will remain under a CNSC site license and enter into a period of Institutional Control for a period of at least 100 years. During this Institutional Control period, CNL will implement a follow-up monitoring program to provide evidence that the system is performing as designed after the end-state has been achieved. CNL will not adjust or cease monitoring of the new disposal facility without the approval of the CNSC, and any decision to terminate, amend or transfer the licence for the NPD site will be made by the CNSC. Notwithstanding any of the above, IAEA GSR Part 6 explicitly excludes the closure of waste disposal facilities from its scope in Sections 1.1 and 1.17: <i>“1.17. These requirements do not apply to radioactive waste disposal facilities or disposal facilities for NORM or for waste from mining and mineral processing. Requirements for the closure of such facilities are established in Ref. [3]. However, requirements for the decommissioning of supporting buildings and services of such facilities are established in the present publication.”</i> All aspects of ISD that do not include final grouting and disposal are in compliance with GSR Part 6. The in-situ disposal of NPD further aligns with applicable IAEA SSR-5 Disposal of Radioactive Waste requirements. The NPD Closure Project is not simply the in-situ disposal of NPD as a decommissioning strategy, it is the construction of a permanent waste disposal facility, assessed according to CNSC regulations for determining the performance of such a facility.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					References: <i>Canadian Standards Association (CSA). 2012c. Management System Requirements for Nuclear Facilities. N286. 2012 January.</i> <i>Canadian Standards Association (CSA). 2019b. Decommissioning of Facilities Containing Nuclear Substances. N294-19.</i> <i>Canadian Nuclear Safety Commission (CNSC). 2021b. Regulatory Document REGDOC-3.3.1, Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities.</i> <i>Canadian Nuclear Safety Commission (CNSC). 2021c. Regulatory Document REGDOC-2.11.2, Decommissioning.</i> DecomSA TSD: Garisto, N., Kovacs, R., Music, S., Gilbert, J., and Tong, X. 2020. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL. EcoRA TSD: Garisto, N., Manolopoulos, H., Arbaban-Esfahani, E., and Tong, X. 2020. Ecological Risk Assessment. 64-509200-ASD-004. Revision 2. Prepared by Arcadis for CNL. <i>International Atomic Energy Agency (IAEA). 2014c. Decommissioning of Facilities, IAEA General Safety Requirements Part 6. STI/PUB/1652, ISBN 78–92–0–102614–9.</i> <i>International Atomic Energy Agency (IAEA). 2011. Disposal of Radioactive Waste, IAEA Specific Safety Requirements Series No. SSR-5.</i> PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL. <i>Johnson, D. 2022a. Detailed Decommissioning Plan for Nuclear Power Demonstration Waste Facility. 64-508310-DDP-001. Revision 3.</i>
12. Follow-Up Program					
172	CNSC, ECCC	Section 12.5 Preliminary EA Follow-up Monitoring Program, Table 12-5.1	p.12-3 to 12-11	Comment: Section A.3.10 of REGDOC-2.9.1 requires that the EIS present a framework or preliminary follow-up program. Section 12 of CNSC’s <i>Generic EIS Guidelines</i> (p.19) specifies that the EIS should include, among other requirements: • The specific monitoring objective for each monitoring activity • A planned schedule (<u>timing, frequency</u> and duration of monitoring) • The roles and responsibilities to be played by the proponent, regulatory agencies, Aboriginal peoples, local and regional organizations and others in the design, implementation and evaluation of the program results • Information management and reporting (<u>reporting frequency, methods and format</u>) • A description of any contingency procedures or plans or adaptive management provisions.	Incorporated: The level of detail in the EIS is consistent with guidance in CNSC REGDOC 2.9.1: "<i>Paragraph 19(1) (e) of CEAA 2012 states that the EIS shall include a framework or preliminary program upon which EA follow-up actions will be managed throughout the life of the project.</i>" Section 12 of the EIS has been revised to include a reference to the quote above. The introductory paragraph of Section 12 of the EIS has been clarified to state that the EIS has a framework for follow-up monitoring. In Sections 9.1.2.3, 10.4 and 12, a description has been added about how the detailed follow up monitoring program (effluent, environmental and groundwater) is being developed separately from the EIS and include consideration of Indigenous, public and stakeholder input. In response to each of the bullets on items that should be included in the EIS as part of presenting a framework or preliminary follow-up program (Section A.3.10 of REGDOC-2.9.1): • The specific monitoring objective for each monitoring activity The individual monitoring plans identify different objectives from CSA and CNL company-wide objectives but at minimum and consistent across all three draft plans are the objectives to: • Verify the accuracy of EA predictions; and

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				The information presented in the summary provided in Section 12 lacks sufficient detail on the information requirements above. For example, listed below are elements of the proposed groundwater follow-up monitoring program (taken from Table 12.5-1 for the Institutional Controls phase), with comments provided after each element to illustrate what level of detail would be expected at this stage. “Proposed monitoring: Routine groundwater analyses for parameters of concern related to degradation (e.g., pH), as per geological and hydrogeological environment above. Trigger for further action: If groundwater monitoring results indicate potential for degradation or other performance issues (after accounting for changes to baseline), assess need to confirm integrity of concrete monolith.” Other than pH, no other groups of parameters are listed. Broad categories of parameters should be included such as “metals”, “radionuclides”, “alkalinity”, etc. In addition, triggers need to be more clearly defined, even though a numerical trigger may not be necessary during the EA phase. “Monitoring Program Objective: Verify EA predictions (i.e., no degradation or performance issues during the Institutional Controls phase).” Additional detail would be required to outline the parameter types and measures that would be used to assess “no degradation or performance issues”, such as target ranges for pH and alkalinity, upper bounds for metals and radionuclides. Although it is not expected that specific numerical limits be included for the purpose of the EA, identification of the key parameters and measures to “verify EA predictions” should be provided. “Suggested Duration: Sampling and analysis of groundwater: periodic.” The proposed frequency “periodic” is quite vague; something more definitive such as “quarterly” or “semi-annually” would be appropriate for the purposes of the EA. Also, there should be a description of whether or not the monitoring frequency will remain the same throughout the Institutional Controls phase, or whether there may be changes in frequency over that timeframe, and the reasons why a change in frequency might be contemplated. Expectation to Address Comment: Please include further details on the requirements stated above (from CNSC’s <i>Generic EIS Guidelines</i>), including the monitoring	- Determine the effectiveness of any measures implemented to mitigate potential adverse environmental effects. A planned schedule (timing, frequency and duration of monitoring) The timing of monitoring is broken down by monitoring during the Decommissioning Execution Phase and monitoring in the Institutional Control Phase. Duration of the project phases are outlined in Table 2.1-1 of the EIS. Frequency of monitoring is outlined in Tables 12.3-2 and 12.3-3 (effluent), 12.3-4 and 12.3-5 (environmental) and 12.3-6 and 12.3-7 (groundwater) of the EIS. Roles and responsibilities EIS Section 12.1 notes that the CNSC, as the regulatory authority for the project, will coordinate the review of the follow-up monitoring program with Environment Canada and other interested Federal and Provincial agencies. Input from the public and Indigenous peoples will also be considered. EIS Section 12.4 describes at a high level the proponent’s roles and responsibilities of data collection and management. EIS Section 9.1.2.3 describes an example of public review of the effluent monitoring plan, in the form of a workshop, and states that future workshops will be undertaken to refine the details of the follow up monitoring plans. EIS Section 12.8 discusses the role of regulatory agencies (specifically that reporting requirements are outlined by CNSC REGDOC 3.1.2). EIS Section 4.1 states that in Canada, nuclear waste producers and owners are responsible for the funding, organization, management and operation of nuclear disposal facilities. EIS Section 2.1 states that AECL holds the responsibility for the NPD site. In the drafted follow-up monitoring plans, CNL has outline in more detail specific responsibilities. This can be found in Table 11-1, Table 13-1 and Table 11-1 of the Effluent (Gilbert and Kovacs, 2018), Groundwater (Kovacs, 2018) and Environmental (McKee and Kovacs, 2018) follow-up monitoring plans, respectively. Information management and reporting (reporting frequency, methods and format) Information management and reporting are outlined in Section 12.7 of the EIS. The reporting frequency will be annual and details to be included in the annual report are outlined in Section 12.7.1 of the EIS. In addition to an annual report, annual (Section 12.7.2) and periodic (Section 12.7.3) reviews and audit (Section 12.7.4) are identified. A description of any contingency plans or adaptive management provisions CNL is committed to achieving continual improvement in environmental performance through its management systems. CNL manages environmental related matters through an existing Environmental Management System (EMS). The EMS is registered within the requirements of the International Organization for Standardization 14001:2015 standard (ISO 2015). It includes compliance and improvement systems to evaluate areas for improvement or trending. It will continue to be implemented for the NPD Closure Project and will be updated, as needed, as part of an annual management review process. As site conditions and monitoring dictate, or as new technology emerges, CNL will adaptively manage site practices and the monitoring program to meet the defined objectives. This may include regular evaluation of predictive models; which will be defined in the detailed follow-up monitoring program.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				timing and frequency, parameters, locations, triggers and potential adaptive management actions for each follow-up element.	If the follow-up monitoring program identifies that adverse environmental effects are greater than predicted, then CNL will evaluate whether they result in changes to the conclusions in this EIS. If changes are confirmed, then CNL will evaluate the need for revised mitigation actions and management practices to manage effects. Where the need for revised mitigations is identified, they will be developed and implemented. Specific mitigation measures would depend on the nature of the exceedance and would be defined after the exceedance is characterized. Response to Tier 2 exceedances defined in Section 12 of the EIS define the contingency plan actions. First, investigate the source of the exceedance and then apply additional mitigation measure or consider remediation. Again, the specific mitigation measures implemented will depend on the nature of the exceedance. And in addition as requested parameters, locations and triggers. Parameters and locations are outlined in Tables 12.3-2 and 12.3-3 (effluent), 12.3-4 and 12.3-5 (environmental) and 12.3-6 and 12.3-7 (groundwater) of the EIS. Each follow-up monitoring plan provides a tiered system for the interpretation of monitoring data based on the data evaluation criteria that provides a framework to address exceedances. The general response to a ‘trigger’ is as follows (from Section 12 of the EIS): Tier 1 exceedances: • Data review (e.g., trend evaluation, and secondary sampling to confirm exceedance); • Investigate source of exceedance; and • Consider increased monitoring frequency. Tier 2 exceedances: • Data review (e.g., trend evaluation, and secondary sampling to confirm exceedance); • Investigate source of exceedance; • Apply additional mitigation measures, consider remediation (if applicable); • Consider stop work; and • Increase monitoring (e.g., increased frequency, additional parameters, additional locations). EIS Sections 9.1.2.3 and Section 12.6.1 provide an overview of the two-tiered system of evaluation criteria to evaluate monitoring results, which allows for contingency plans to be initiated. Contingency plans (responses to Tier 1 and Tier 2 exceedances) are described in these sections. Details of the actual evaluation criteria are evolving based on public and Indigenous feedback and are not included in the EIS. These are outlined in the three draft follow-up monitoring plans (Gilbert and Kovacs, 2018), (Kovacs, 2018) and (McKee and Kovacs, 2018) which will continue to evolve as feedback is received until EA approval is obtained. For more information on addressing exceedances the relevant sections of draft monitoring plans are: • Effluent (Gilbert and Kovacs, 2018) – Section 7.10; • Environmental (McKee and Kovacs, 2018) – Section 7.8; and • Groundwater (Kovacs, 2018) – Section 7.11.1. The NPD Closure Project has developed a draft detailed follow up monitoring plan in accordance with relevant CSA N288 standards for effluent, environmental and groundwater monitoring (Gilbert and Kovacs 2018, Kovacs 2018, McKee and Kovacs 2018), which were submitted to the CNSC in 2018 October (64-CNNO-18-0026-E and 64-CNNO-18-0027-E).

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					The plans will be refined based on feedback from interested parties, hence the use of the word "Draft" in the title of the three documents. In accordance with Section 12 of the Generic Guidelines for Preparation of an EIS, the NPD Closure Project is seeking input from Indigenous Nations, communities, and organizations, the public and stakeholders before finalizing the plans. The NPD Closure Project held their first public workshops on follow-up monitoring in the summer of 2019. The feedback received on the draft follow up monitoring reports was very valuable, including a recommendation to revise the "Tiers" for evaluation criteria (to determine when response actions should be taken). Further workshops will be held in the future, to refine the plans based on feedback from interested parties. For clarity, the three follow up monitoring plans have the full details developed for follow up monitoring to this point and these plans will be refined and incorporate feedback from Indigenous Nations, communities, and organizations, the public and stakeholders with the program being finalized once there has been an EA decision. Only the framework for follow-up monitoring is outlined in the EIS while the draft follow-up monitoring plans contain the full details. Change to EIS: Sections 9.1.2.3, 10.4 and 12 have been revised to reflect the response above. References: <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i>
173	Government of Quebec	Section 12.5 Preliminary EA Follow-up Monitoring Program, Table 12.5-1	p.12-5 to 12-6	Comment: In Table 12.5-1 (for Soil and Groundwater Quality during the Decommissioning Execution Phase), are the strainers of the observation wells placed at the right depths to provide representative samples, considering that the groundwater circulates mainly in the horizontal plane? Expectation to Address Comment: Please address the above question regarding proposed follow-up and monitoring activities for groundwater.	Resolved As: Section 12 of the EIS has been updated to provide a high-level framework for proposed follow up monitoring. Separate from the EIS, a draft follow-up monitoring program was developed for the NPD Closure Project (Gilbert and Kovacs 2018, Kovacs 2018, McKee and Kovacs 2018) for effluent, environmental, and groundwater monitoring in both the Decommissioning Execution and Institutional Control phases. All plans were developed in accordance with relevant CSA standards (CSA N288.5, CSA N288.4 and CSA N288.7 respectively). The plans were submitted to the CNSC in 2018 October. The groundwater monitoring plan includes wells located within the preferential pathway of modelled contaminant transport and will have screens placed at appropriate depths to capture representative groundwater samples. The EIS presents a framework for follow-up monitoring. Preliminary follow-up monitoring plans, including during the decommissioning phase, are being currently being developed by the project and plans will follow the systematic informed planning process outlined in CSA Standard N288.7-23. CSA N288.7-23 requires consideration of the “<i>location, design, installation and maintenance of groundwater monitoring wells</i>”. As such the NPD Closure Project groundwater monitoring plan will have to demonstrate how this requirement is met. For example, the development of the groundwater monitoring plan will be based on the conceptual model for groundwater contaminant pathways and will identify the appropriate sample locations to ensure representative samples are collected from the groundwater exiting the facility.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					CNL has borehole logs for the current groundwater observation wells at the NPD site and will assess if the current wells will satisfy the design of the project’s groundwater monitoring plan. If not, new groundwater observations wells would be installed and redundant wells will be properly sealed. The preliminary follow-up monitoring program will be submitted to the Canadian Nuclear Safety Commission (CNSC) for review. The CNSC, as the regulatory authority for the designated project, will also coordinate the review of the follow-up monitoring program with other interested federal and provincial agencies. The final follow-up monitoring program will be required to meet any objectives and activities that the EA Report specifies (to be prepared by the CNSC). Change to EIS: Section 12 of the EIS has been updated to describe the draft monitoring program, and to include tables showing summaries of sampling locations, sampling parameters, and frequencies. Section 12 also includes figures showing the sampling locations. References: <i>Canadian Standards Association (CSA). 2019. CSA Standard N288.4-19. Environmental Monitoring Programs at Nuclear Facilities.</i> <i>Canadian Standards Association (CSA). 2023. CSA Standard N288.7-23. Groundwater Protection and Monitoring Programs for Nuclear Facilities and Uranium Mines and Mills.</i> <i>Canadian Standards Association (CSA).2022. CSA Standard N288.5-22. Effluent and emissions Monitoring Programs at Nuclear Facilities.</i> <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i>
174	Government of Quebec	Section 12.6 Conclusions	p.12-12	Comment: In Section 12.6, the draft EIS states: “Due to the conceptual nature of the NPD closure project at this point, further details of the follow-up program (e.g., statistical analyses and confidence, probable effect sizes) and schedule (e.g., timing, frequency, duration) will be developed at a later date according to the CNSC EIS guidelines...” Environmental monitoring during the Institutional Controls period is not clearly established. Furthermore, CNL should pay particular attention to the monitoring of surface water quality in the Ottawa River in the final EIS. Expectation to Address Comment: Please clarify what EA follow-up monitoring activities will be conducted during the Institutional Controls period. At a minimum,	Incorporated: The Environmental Impact Statement presents a high-level framework for the proposed follow-up monitoring program in alignment with the requirements in the <i>Generic Guidelines for the Preparation of an EIS</i>. Draft detailed follow-up monitoring plans were developed by in accordance with the systematic informed planning process outlined in CSA Standards N288.4-19 (environmental monitoring), N288.5-22 (effluent monitoring), and N288.7-23 (groundwater monitoring). These monitoring plans specify the radiological and non-radiological contaminants that require monitoring, as well as the location, frequency and duration of monitoring. CNL's draft detailed follow-up monitoring program was submitted to the Canadian Nuclear Safety Commission in 2018 October. Please note that these are complete plans, however they are titled “Draft” because the NPD Closure Project is seeking input from the public and Indigenous Nations, communities, and organizations. The CNSC, as the regulatory authority for the designated project, will coordinate the review of the follow-up monitoring plans with other interested federal and provincial agencies. These plans will be finalized after an EA

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																
				in the final EIS, please describe the nature of the radiological and non-radiological contaminants being monitored, as well as their frequency and duration. Moreover, please outline the emergency response plan in the case of contamination of the Ottawa River.	decision is reached, so that any additional monitoring activities specified in the Commission decision can be incorporated. The duration of monitoring during the Institutional Control phase will last a minimum of 100 years. The table below provides a general summary of the nature of the radiological and non-radiological components that will be monitored during this time period, and the frequency of the sampling. It is important to also note that there are various other parameters that could also be included in the monitoring such as atmospheric, terrestrial, aquatic environment if triggered by the parameters listed below. <table><tr><th>Stream</th><th>Component</th><th>Frequency</th></tr><tr><td>Effluent Monitoring</td><td>Airborne Emissions (dust & diesel emissions)</td><td>Annual</td></tr><tr><td rowspan="3">Environmental Monitoring</td><td>On-site surface Water Environment (radionuclides)</td><td>Monthly</td></tr><tr><td>Ottawa River quality (radionuclides, pH, metals)</td><td>Quarterly</td></tr><tr><td>Ambient Radioactivity (gamma dose rate)</td><td>Continuous</td></tr><tr><td>Groundwater Monitoring</td><td>Groundwater (radionuclides, anions, alkalinity, cations, metals, petroleum components)</td><td>1st year: quarterly 2nd year until complete resaturation: semi-annual After resaturation: quarterly for one year, and then semi-annual.</td></tr></table> With respect to an emergency response plan in case of contamination of the Ottawa River, none of the abnormal or accident conditions associated with the NPD Closure Project are likely to result in offsite consequences. An emergency response plan is not required when there are no anticipated off-site consequences. However, monitoring of groundwater wells installed as part of the follow-up monitoring program would detect any increase in contaminants before the groundwater would reach the Ottawa River. This would enable CNL to evaluate options to rectify the situation and proceed with the appropriate remediation. Change to EIS: Table 12.3-5 has been updated to include more details on proposed follow-up monitoring during the Institutional Control Phase.	Stream	Component	Frequency	Effluent Monitoring	Airborne Emissions (dust & diesel emissions)	Annual	Environmental Monitoring	On-site surface Water Environment (radionuclides)	Monthly	Ottawa River quality (radionuclides, pH, metals)	Quarterly	Ambient Radioactivity (gamma dose rate)	Continuous	Groundwater Monitoring	Groundwater (radionuclides, anions, alkalinity, cations, metals, petroleum components)	1 st year: quarterly 2 nd year until complete resaturation: semi-annual After resaturation: quarterly for one year, and then semi-annual.
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175	CNSC	General	General	Comment: For all existing and new barriers, a plan should be provided explaining how the effectiveness of the barriers will be monitored. It is understood that this will occur through environmental monitoring. For example, will the wells at the site be monitored because the barriers themselves will be inaccessible? Limits / acceptable levels should be established for environmental monitoring results in order to indirectly demonstrate the satisfactory performance of the barriers. When determining the ability for waste to migrate from its original position of immobilization inside the facility structure towards the environment, site-specific data and studies that support the analytical models should be used. This analysis should be	Resolved As: The NPD project has prepared a Surveillance Plan (Taylor 2019), to expand upon the Environmental Assessment Follow-up Program outlined in the NPD Closure Project EIS. The Surveillance Plan follows the objectives of the EA Follow-up Program, which are the same as those specified in REGDOC 2.9-1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, and <i>Canadian Environmental Assessment Act</i> (CEAA (2012)), as follows: • Verify the accuracy of EA predictions; and • Determine the effectiveness of mitigation measures. Monitoring of the environment is addressed through a follow up monitoring program (effluent, environmental and groundwater monitoring) which was developed with the objectives to verify the accuracy of the EIS predictions and to determine the effectiveness of mitigation measures. A summary of the follow-up monitoring program, and the surveillance plan, are given below.																

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				established in a verifiable and traceable way, prior to a licence decision, and should be subject to confirmation the at implementation phase only (i.e., it should not be conducted during the implementation phase). In addition, contingency planning and mitigation measures should be in placed (and provided to the CNSC) in case limits / acceptable levels for environmental monitoring are exceeded. Expectation to Address Comment: In considering the aforementioned points, please provide a plan that shows how the effectiveness of all existing and new barriers will be monitored. Also, clarify if remote sensing technology is to be used to monitor the structural health of the barriers.	The scope of the Surveillance Plan includes the activities being performed in the NPD Disposal Facility (NPDDF) to meet the requirements of applicable laws and regulations, the EA Follow-up Monitoring Program, and requirements of CNL management systems. These activities will meet expectations for post closure surveillance of passive safety features, as recommended by the IAEA Specific Safety Guide, SSG-31, Monitoring and Surveillance of Radioactive Waste Disposal Facilities, (SSG-31). In accordance with SSG-31 the surveillance programme provides oversight of the disposal facility to verify the integrity of accessible passive barriers, and to enable the prompt identification of conditions that may lead to a migration or release of radionuclides or other contaminants to the environment. The Surveillance Plan will be updated and re-evaluated, as required, if conditions of the facility change. The surveillance plan does not address the monitoring of radioactive and non-radioactive contaminants present in the environment, as well as physical stressors and Valued Components (VCs), which is covered under the Effluent Monitoring Plan, the Environmental Monitoring Plan and the Groundwater Monitoring Plan. CNL personnel will perform routine surveillance activities for the NPDDF to detect any deficiencies. Appropriate maintenance and repair activities are initiated based on inspection findings. Table 5-2 in the Surveillance Plan (Taylor 2019) summarizes the task and frequency requirements to be put in place to monitor the disposal facility. CNL has developed three follow-up monitoring plans to verify EA predictions and determine the effectiveness of the mitigation measures, including the performance of the engineered barriers, (Gilbert and Kovacs 2018, Kovacs 2018, McKee and Kovacs 2018). The follow-up monitoring plans were developed based on the radiological and non-radiological hazards and the associated uncertainties that have the greatest potential impact to the environment and the public over the lifetime of the NPD disposal facility as identified in the Post Closure Safety Assessment Technical Support Document (PostSA TSD). All the follow up monitoring plans incorporate a tiered system of evaluating monitoring results with response actions outlined to address exceedances, if they should occur. The tiered system utilises two tiers. The first tier is similar to an action level where predicted environmental concentrations or site-specific background concentrations are breached. Breaches of these conditions triggers actions such as further investigation to determine the cause of the exceedance or monitoring additional media. The second tier is based on guideline and benchmark values, e.g., CCME Environmental Quality Guidelines, Health Canada Drinking Water Quality Guidelines, etc. The second tier applies additional response actions to those undertaken for Tier 1 exceedances, such as additional mitigation measures, possible remediation, and consideration of stop work. In general, the monitoring plans follow CNL’s Management Control Procedure- Improvement Action (IMPACT) Corrective Action Program when dealing with exceedances of performance criteria. Specific mitigation measures would depend on the nature of the exceedance and would be defined after the exceedance is characterized. Examples of potential mitigation measures include a pump-and-treat system or permeable reactive barrier to mitigate contaminated groundwater. In accordance with CSA N288.8:2017 Establishing and Implementing Action Levels for Releases to the Environment from Nuclear Facilities in evaluating the performance of the engineered barrier, as described in the Draft Effluent Follow-Up Monitoring Plan, the only controlled releases (emissions) in the Institutional Control phase would be dust and diesel emissions and annual checks would be performed against NPRI and Greenhouse Gas reporting requirements. Because there would be no other controlled releases during the Institutional Control phase, action levels in accordance with N288.8 would not be applicable. As stated in the standard, "A facility might have a licence post decommissioning; however, it assumed there are no longer controlled releases, and, therefore, ALs are not required". CNL has determined that the most effective way to monitor the performance of the NPD Disposal Facility is primarily through the groundwater monitoring plan, drafted as part of the Environmental Assessment Follow-Up

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Monitoring Program. The groundwater monitoring plan was developed to verify that the engineered barriers as a whole are performing as expected / designed. Performance monitoring of the facility, specifically routine groundwater analyses for parameters of concern related to degradation of the concrete monolith, will primarily use groundwater wells downgradient of the facility. The remaining inventories in the disposal facility can be inferred based on chemical analyses of these wells. If concentrations in the wells begin to increase above the predicted concentrations, it is an indication that the barriers are not functioning as expected. Tritium in groundwater is the primary indicator of facility performance because it is released earliest during the Institutional Control period. It is simple to measure successfully and reliably and is indicative of performance. If tritium and gross beta / gamma concentrations are found to be increasing, then the groundwater monitoring plan recommends that measurements be refined to focus on specific radionuclides. The engineered barriers associated with the NPD Disposal Facility that provide a safety function in the protection of the environment and the public include the waste form, the grouted below grade concrete monolith and the concrete cap and engineered cover. The waste form is the primary barrier and consists of activated metals found in the zircaloy and stainless steels that form the calandria. CNL has considered monitoring the performance of individual barriers of the NPD Disposal Facility, such as infiltration rate into the facility and test blocks for measuring corrosion and grout performance but has determined that they are not as effective as the proposed plans for monitoring the overall effectiveness of the grouted facility. If CNL were to install a test block, coupons of zirconium could be placed in the same grout as used in the facility and installed at the bedrock level where it would be subject to saturation from groundwater. These test blocks could then be retrieved at specified intervals and the corrosion of the metal could be measured and compared to the values used in the PostSA TSD models. CNL does not believe this information would be as useful as monitoring data from the groundwater monitoring plan because the corrosion of zirconium and stainless steel is very well understood. The 3rd iteration PostSA TSD (Arcadis and Quinessa 2020) looked at the impact that faster corrosion would have on the barrier performance and determined that an increase in the corrosion rate by a factor of 10 only results in a 3 times faster release from the facility. This is due to sorption of the released radionuclides in the grout. Due to the low waste inventory, even significant changes (e.g. 200 times larger) in the corrosion rate would not result in exceeding the dose acceptance criteria. In addition to corrosion measurements, the test block could also be used for monitoring the degradation of the grout. The PostSA also looked at the performance of the grout and concrete in the facility by removing the grout from the model. It was determined that if this barrier was not present the dose would increase by a factor of two compared to the normal evolution case. This dose is still orders of magnitude below the acceptance criteria. It can therefore be seen that the while the grout provides some defence in depth it is not required to ensure safety of the facility or to ensure the performance of the other barriers. CNL believes that the use of test blocks would not provide useful information as it could not be guaranteed that the grout in the facility and the test blocks are performing identically. If an issue was detected with a test block, it would require further investigation of the remaining test blocks. Faults with the test blocks may also result in intrusive investigations into the facility to confirm that the barriers are performing as required. This would impact the integrity of the facility containment and could also lead to premature failure of the barriers. Another option that was considered was monitoring the infiltration of water through the engineered cover. CNL prepared a technical report (Calder 2020) which assessed the timeframes for resaturation of the Disposal Facility once the facility was grouted and the engineered cover installed. Based on the resaturation model prepared, the driving factor for resaturation of the facility is groundwater infiltration. Surface water infiltration is a very small contributor to resaturation of the facility. If the engineered cover does not function as required and the facility

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					resaturates faster, the 3rd iteration PostSA TSD, (Arcadis & Quintessa, 2020), shows that there is no change over the normal evolution dose, hence this barrier only provides a minor contribution to defence in depth. It can also be seen that if the barriers are removed or deteriorated, that releases to the environment will be low and this can be seen from the doses predicted to be received by the most exposed groups which remain significantly below the acceptance criteria of 0.25 mSv per year. Considering the low inventory, the low possible rates of release of waste, the defence in depth of the barriers, and the small impact that the individual barriers have on the release of wastes to the environment, CNL determined that monitoring of individual barrier performance is not necessary or required. As stated above, the most effective way to monitor the overall performance of the NPD Disposal Facility is primarily through the groundwater monitoring plan developed for the Facility. Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound. References: <i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). 2020. Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project. (3rd Iteration). 64-508760-ASD-003. Revision 0. 2020 March 30. Prepared by Arcadis and Quintessa for CNL.</i> <i>Calder, N. 2020. Update to Resaturation Modelling for the Proposed In-Situ Disposal of the Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-011. Revision 2. Prepared by Arcadis and Geofirma for CNL.</i> <i>Gilbert, G. and Kovacs, R. 2018. Draft Effluent Follow-Up Monitoring Plan. 64-509200-PLA-003. Revision 1. Prepared by Arcadis for CNL.</i> <i>International Atomic Energy Agency (IAEA). 2014b. Monitoring and Surveillance of Radioactive Waste Disposal Facilities. SSG-31.</i> <i>Kovacs, R. 2018. Draft Groundwater Follow-Up Monitoring Plan. 64-509200-PLA-004. Revision 0. Prepared by Arcadis for CNL.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> <i>Taylor 2019, Surveillance Plan for Institutional Control Phase - NPD Disposal Facility, 64-508640-PLA-001, Revision 0.</i>
Technical Supporting Documents					
Indigenous Engagement Technical Supporting Document (previously titled Aboriginal Engagement Technical Supporting Document)					
176	CNSC	General	General	Comment:	Resolved As: CNL has gathered Indigenous traditional knowledge from Nations, communities and organizations to inform the Indigenous Engagement Report (IER) and the Environmental Impact Statement (EIS) and aid in the identification of the Traditional Land and Resource Use VCs. The information on traditional land use activities by Indigenous

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				It is not clearly indicate whether CNL has gathered any traditional knowledge from identified First Nation and Métis groups to inform the EIS, including the identification of VCs. Expectation to Address Comment: As per the CNSC’s <i>Generic EIS Guidelines</i>, please identify if First Nation or Métis groups have been engaged to obtain their input and any traditional knowledge they are willing to share to inform the EIS, including the identification of VCs	peoples has been drawn from: existing studies and reports; Indigenous Nation, community or organization websites; the Métis Nation of Ontario (MNO) Traditional Knowledge and Land Use Study; the Algonquins of Pikwàkanagàn First Nation (AOPFN) and the Algonquins of Ontario (AOO) AKLUS; Kitigan Zibi Anishinabeg (KZA) and Kebaowek First Nation (KFN) procedural directive submissions for the NSDF Project hearing; formal and informal engagement activities; and general knowledge of the region. More specifically, information on traditional land and resource use and how it was gathered for each Indigenous Nation, organization, and community is documented below. CNL has attempted to gather information on traditional use near the NPD site from all identified Indigenous Nations, communities and organizations. Requests for traditional use information has been made in letters, presentations, and through direct discussions. CNL has described traditional use for Indigenous Nations, communities and organizations where information is documented in existing: reports, studies, database, etc.; or where that information has been provided verbally in meetings and other communications. This information has been summarized in Section 6.1 of the IER. To date, only the MNO, the AOO and AOPFN have completed traditional knowledge studies which have been incorporated throughout the IER and in particular in Section 4, 5, 6 and 7. Note that CNL’s Engagement Tables (IER TSD Appendices J through BB) provide details on the engagement with all communities including: meetings where VCs and Indigenous knowledge were discussed and correspondence enclosing information on VCs and seeking feedback from Indigenous Nations, communities and organizations. In 2016, CNL sent two letters (IER TSD Appendices B and C) to the identified Indigenous Nations, communities and organizations requesting information on traditional land and resource use in the area surrounding the NPD site. CNL sent letters again in May 2020 (IER TSD Appendix D) asking relevant questions again to verify assumptions CNL made in lieu of having responses or direct input from the various Indigenous Nations, communities and organizations. CNL has developed specific Tables of Interests and Concerns for each Indigenous Nation, community or organization (IER TSD Appendices J through BB) to address the concerns of the CNSC staff with respect to the verification of input shared by Indigenous Nations, communities and organizations and the associated responses by CNL. These tables include a general topic, the interest / concern from the Indigenous Nation, community or organization, how CNL is addressing the interest / concern, any changes to the EIS, status of resolution of the interest/concern and verification with the community, and identification of next steps. Identification of Valued Components With respect to VCs, the VCs for the NPD EIS were presented by CNL in project engagements to the AOO (including AOPFN members), the MNO and KZA. The AOO, AOPFN, MNO, KFN and WLFN have all expressed interest in the VCs used in the NPD EIS. These Indigenous Nations, communities and organizations expressed an interest in learning more about the NPD Closure Project VCs. See Appendices J through BB of the IER TSD for specific engagements that included discussion of VCs, specific concerns and CNL’s response. As examples: • CNL and the CNSC provided capacity funding to the MNO to conduct a Valued Components (VC) workshop. Subsequently, CNL met with MNO Councilors and staff and presented on proposed NPD VCs. The VCs presentation included definition and identification, types of VCs, approach and selection of NPD VCs and the MNO VCs addressed in the NPD EIS. This meeting also included a review and discussion of the draft dispositions to MNO VCs workshop comments. Outcomes of the VCs study is incorporated into the EIS. • CNL and the AOO discussed VCs at several Working Group meetings in 2023. CNL prepared a summary table that maps AOO VCs to those VCs used in CNL’s assessment. This table also shows how the project is

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					protective of each VC, whether any potential impacts have been identified and how CNL will monitor to confirm those VCs remain protected. CNL shared this table with the AOO in June 2023. Section 5 of the IER includes Indigenous VCs in Tables 5.2 through 5.5 showing how Indigenous VCs are represented by the species evaluated in the Ecological Risk Assessment (EcoRA). As a result of feedback provided by Indigenous Nations, communities and organizations, new Ecological Profiles have been added for moose, fox, otter, mink, short-tailed weasel. CNL also includes Table 5.1 that summarizes the key interests and concerns related to VCs (not strictly species) that were expressed during engagement activities with Indigenous Nations, communities, and organizations. Table 5.1 identifies where VC-related feedback has resulted in the addition of a new VC. Where the table indicates that no new VCs have been added, this affirms that direct, representative or related VCs that encompass the value or interest of the Indigenous Nations, community or organization were already included in the assessment. Traditional Knowledge The MNO shared a TKLUS specific to the region around NPD developed for CNL’s NPD Closure Project and NSDF Project. CNL has incorporated information from the MNO TKLUS provided to CNL in 2019 February into the IER Section 5, specifically, Table 5.4-1, is informed by the MNO TKLUS. As well the following Sections in the NPD Closure Project IER all have information from the MNO TKLUS incorporated: • Section 6.1 Description of the Existing Environment - Traditional Land and Resource Use. • Section 7.1 Assessment & Mitigation of Environmental Effects - Traditional Land and Resource Use. The AOO also completed an Algonquin Knowledge and Land Use Study (AKLUS). CNL has incorporated information from the AOO AKLUS provided to CNL in 2020 December into the IER Section 5, specifically, Table 5.1. AOO also provided CNL recommendations based on the outcomes of the AKLUS study which CNL responded to in September 2021. The AOO assessed the adequacy of the AKLUS recommendation responses in December 2021 and AOO and CNL met in 2022 January to discuss the responses. CNL shared the most up to date AKLUS recommendation responses with the AOO in February 2023. At the 2023 May Working Group meeting, CNL and the AOO reviewed each of the AOO’s recommendations and identified draft commitments that were proposed to address the recommendations. To capture this ongoing discussion, CNL will revise the traditional land and resource use section in a new revision to the IER TSD to support the Commission Hearing on the NPD Closure Project. The Algonquins of Pikwàkanagàn First Nation (AOPFN) also requested support to complete a number of studies related to rights, culture and harvesting from the specific perspective of the AOPFN. CNL received the AOPFN AKLUS in September 2020 and received the AOPFN’s Diet and Harvest Study and Culture and Rights Study in August 2021. AOPFN shared a series of implications and recommendations from these three studies in 2022 August. These implications and recommendations have informed AOPFN and CNL discussions and led to the development of project commitments. CNL has incorporated information from the AOPFN AKLUS into the IER Section 5, specifically, Table 5.1. The three AOPFN studies were also used to enhance CNL’s Description of the Existing Environment - Traditional Land and Resource Use (IER Section 6.1). CNL has worked closely with AOPFN to ensure that the study findings are used in the EIS to accurately convey the Algonquin perspective. In 2023 May, AOPFN Knowledge Keepers completed the fourth seasonal inventory visit (spring) at the NPD site. The previous inventory dates include August 2022 (summer), 2022 October (fall) and 2023 March (winter). The purpose of these field visits was to allow AOPFN to identify cultural and environmental values that are present at the NPD site prior to authorization to proceed by the CNSC for the NPD site closure. CNL staff assisted with environmental data collection, supported species identification, and answered questions regarding the NPD Closure Project and biodiversity monitoring as requested. CNL received the AOPFN’s NPD Seasonal Surveys Implications

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Letter and the four associated seasonal survey reports at the end of 2023 May. Using the findings and recommendations from AOPFN’s site-wide inventory, CNL looks forward to working with AOPFN to ensure that mitigations are in place to protect terrestrial and aquatic biota that are important to AOPFN. CNL commits to support and fund further AOPFN-led site inventory work covering the whole NPD site in 2024 and 2025 to develop an Algonquin Knowledge baseline for the site. The IER TSD, as a living document, will include any updates related to the progress and next steps with AOPFN at the time of submission of the final EIS and prior to the Commission Hearing process. As CNL continues engagement with Indigenous Nations, communities and organizations any new traditional knowledge that is shared will be incorporated into the project and into the IER TSD, as the IER is a living document. With the exception of the MNO the AOO and AOPFN, there has been little in the way of comments from other Indigenous Nations, communities or organizations on the specific VCs that were used in the assessment. Note the information described in the IER above, is also found in the EIS, Sections 6, 8.9 and 9.9.
177	CNSC	General	General	Comment: References to any requests from First Nation or Métis groups to undertake, or have undertaken, traditional knowledge, traditional land use or other studies in relation to the EIS are missing. Expectation to Address Comment: Please indicate if any of the identified First Nation or Métis groups have requested any additional studies to be conducted by CNL in relation to the EIS, including traditional land use or traditional knowledge studies, as per the guidance of CNSC’s <i>Generic EIS Guidelines</i> and promoted within REGDOC-3.2.2.	Resolved As: As per the guidance of the CNSC’s <i>Generic EIS Guidelines</i>, CNL has reached out to all identified Indigenous Nations, communities and organizations inquiring about traditional knowledge. As detailed in Appendices J through BB of the NPD Closure Project Indigenous Engagement Report (IER), CNL sent two letters in 2016 (IER TSD Appendices B and C) to the identified Indigenous Nations, communities and organizations requesting information on traditional land and resource use in the area surrounding the NPD site. CNL sent letters in May 2020 (IER TSD Appendix D) asking relevant questions again to verify assumptions CNL made in lieu of having responses or direct input from the various Indigenous Nations, communities and organizations. To date, four of the identified Indigenous Nations, communities and organizations have requested to CNL that additional studies be conducted in relation to the NPD EIS. The Métis Nation of Ontario (MNO) stated in their comments on the 2017 draft EIS that a “Métis-specific traditional land use study should be completed to provide CNL insight into the Métis perspective on terrestrial resources.” In response, CNL and the CNSC jointly provided funded an MNO Traditional Knowledge and Land Use Study (TKLUS) to collect information about the way of life and land use of MNO Citizens and their Métis forbearers around the project site. The information from the MNO TKLUS has been incorporated into the 2021 draft EIS. Specifically, CNL has incorporated information from the MNO TKLUS provided to CNL in 2019 February into the IER Section 5, specifically, Table 5.1, is informed by the MNO TKLUS. As well, the following Sections in the IER all have information from the MNO TKLUS incorporated: • Section 6.1 Description of the Existing Environment - Indigenous Land and Resource Use. This is the main section that documents MNO traditional use. This section refers to MNO traditional use specifically information is provided on: trapping, hunting, fishing, gathering and cultural ceremonies. • Section 7.1 Assessment & Mitigation of Environmental Effects – Indigenous Land and Resource Use. As part of the MNO’s review of the EIS, an interest to participate in future Diet and Harvest Studies conducted by CNL was expressed. As committed to, CNL informed the MNO about the opportunity to participate in a Diet and Harvest Study to support the update of derived release limits for airborne and liquid emissions at the Chalk River Laboratories (CRL) site. Of particular interest for CNL are the diets and harvesting activities of Métis Nations living in communities closest to the CRL Site. The MNO hosted a community information session October 2022, the session gave citizens the opportunity to participate in a survey to ensure that the environmental models developed by

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					CNL at CRL adequately consider the diet and harvest patterns of Métis citizens. CNL shared the results of the study in April 2023. The Algonquins of Ontario (AOO) requested in their comments on the 2017 draft EIS, “that AOO-specific harvesting, cultural, and/ or ecological values be incorporated into project planning, monitoring, and emergency response, either through engaging the AOO in conducting a traditional land and resource use study or another methodology (i.e., community cultural values mapping; oral history study etc.), decided upon by the AOO for sharing traditional land and resource use information related to the NPD project.” Both CNSC and CNL provided financial support to the AOO to undertake the Algonquin Knowledge and Use Study. CNL has incorporated information from the AOO AKLUS provided to CNL in December 2020 into the IER Section 5, specifically, Table 5.1. AOO also provided CNL recommendations based on the outcomes of the AKLUS study which CNL responded to in 2021 September. The AOO and CNL established Monthly Working Group meetings and a budget and work plan to facilitate collaboration and discussion of the AKLUS results and recommendations is an activity called out in the work plan. To date, the Working Group has had four meetings dedicated to the AKLUS, its implications and CNL’s incorporation of information into the commitments. To capture any future discussions on this topic, CNL will revise the traditional land and resource use section in a new revision to the IER TSD to support the Commission Hearing on the NPD Closure Project. The Algonquins of Pikwàkanagàn First Nation (AOPFN) also requested support to complete a number of studies related to rights, culture and harvesting from the specific perspective of the AOPFN. CNL received the AOPFN AKLUS in 2020 September and received the AOPFN’s Diet and Harvest Study and Culture and Rights Study in 2021 August. CNL has incorporated information from the AOPFN AKLUS into the IER Section 5, specifically, Table 5.1. The three AOPFN studies were also used to enhance CNL’s Description of the Existing Environment - Traditional Land and Resource Use (IER Section 6.1). CNL has worked closely with AOPFN to ensure that the study findings are used in the EIS to accurately convey the Algonquin perspective. Continued work is planned between CNL and AOPFN to continue to discuss the implications of the three studies facilitated through the regular Working Group meetings and the Contribution Agreement. AOPFN also requested support from CNL for and AOPFN-led Alternative Means Assessment (AMA). CNL funded the AOPFN AMA and a report was completed in April 2022. The report includes AOPFN community perspectives and concerns about the alternatives to decommission the site. The report also identifies full removal as AOPFN’s preferred decommissioning strategy. CNL has included a summary of the results of the AOPFN AMA, written by AOPFN, in the EIS as part of Section 4.2 (Alternative Means). In the summer of 2023, CNL was notified that Kebaowek First Nation (KFN) was interested in reviewing the EIS and began discussions to provide capacity for increased involvement by KFN in the NPD environmental assessment (EA). Through these discussions it was identified that KFN was interested in Indigenous-led studies on the topics of land and resource use and occupancy, territorial sovereignty, and biocultural Valued Components (VCs). The amendment to the Framework Agreement that came into effect in July 2024 will enable further discussions on KFN-led studies. Results from any KFN-led studies would be included in the IER that will support the final EIS submission. Further information from the Indigenous studies completed and planned will be incorporated into the project and into the IER TSD, as the IER is a living document. Note the information described in the IER above, is also found in the EIS, Sections 6, 8.9 and 9.9.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
178	CNSC	Section 3.0 Description of Aboriginal Communities, Table 3-1 Also applicable to the main EIS, Section 7.3 Identified First Nation and Métis Communities, Table 7.3-1, p.7-3	p.3-1	Comment: Table 3-1 (and Table 7.3-1 in the main EIS) identifies the following rationale for the Algonquin Anishinabeg Nation Tribal Council (AANTC): “Comprehensive Land Claim”. This rationale is not accurate as there has been no formal submission from the Algonquins of Quebec to the Government of Canada to commence a Lands Claims process. Instead, the rationale should speak to the fact that the project is located within the vicinity of known traditional territory. Specifically, the AANTC, which represents seven First Nations with potential or established Aboriginal and treaty rights, have asserted rights and title to the region within the project’s vicinity Expectation to Address Comment: Please revise Table 3-1 (and Table 7.3-1 in the main EIS) accordingly.	Incorporated: The project is located within the vicinity of known traditional territory of the Algonquins of Anishinabeg Nation Tribal Council (AANTC) and the AANTC have asserted rights. Change to EIS: CNL has revised Table 6.2-2 accordingly to identify the rationale that the project is located within the vicinity of known traditional territory and that the AANTC have asserted rights. Note: The order of EIS sections has been changed in the 2024 EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples. Change to IER: CNL has revised Table 3-1 to identify the rationale that the project is located within the vicinity of known traditional territory and that the AANTC have asserted rights.
179	CNSC	Section 4.5 Engagement Activities Completed, Table 4-1 Also applicable to the main EIS, Section 7.5 Engagement Activities Completed, Table 7.5-1	p.4-5 to 4-30	Comment: While Table 4-1 provides a list of engagement activities with First Nation and Métis groups, the final report needs to go into more detail on whether important issues were raised during or as a result of those activities and what actions CNL has taken to address them. For example, the table indicates that the Métis Nation of Ontario (MNO) met with CNL staff on July 20, 2016. However, it is unclear what specific issues or concerns the MNO raised to CNL during the meeting (i.e., were the concerns only about chimney swifts?). Expectation to Address Comment: Please provide more detail in the final report on whether CNL has received any important information or correspondence from First Nation and Métis groups as a result of engagement activities, and what actions CNL has taken to address them.	Resolved As: As engagement activities progressed and relationships with interested Indigenous Nations, communities and organizations have developed, issues and concerns continue to be put forward (e.g., from the Algonquins of Pikwàkanagàn First Nation (AOPFN) related to accidents, malfunctions and effects of the environment on the project). Change to IER: The issues / concerns raised by Indigenous Nations, communities and organizations up to March 2024 (May 2024 and June 2024 for Kitigan Zibi Anishinabeg and Kebaowek First Nation, respectively), and the actions CNL has taken to address them, have been detailed in Section 4.4 and presented in Tables of Interests and Concerns in Appendices J through Y, one for each community or organization. These tables include a general topic, the interest / concern from the Indigenous Nation, community or organization, how CNL is addressing the interest / concern, any changes to the EIS, status of resolution of the interest/concern and verification with the community, and identification of next steps. Change to EIS: The issues / concerns raised by Indigenous Nations, communities and organizations up to March 2024 (May 2024 and June 2024 for Kitigan Zibi Anishinabeg and Kebaowek First Nation, respectively), and the actions CNL has taken to address them, have been detailed in Section 6.2.4 and Appendix C. Note: The order of EIS sections has been changed in the 2024 EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples.
180	CNSC	Section 4.5 Feedback Received to Date	p.4-15 [sic] (p.4-31)	Comment: As per CNSC’s REGDOC-3.2.2, <i>Aboriginal Engagement</i> and CNSC’s <i>Generic EIS Guidelines</i>, CNL is expected to identify issues raised by First Nation and Métis groups, and demonstrate how those issues will be addressed, including how their input on	Resolved As: Engagement activities have been ongoing since the posting of the Project Description in 2016 and, throughout the public review of the 2017 draft Environmental Impact Statement (EIS). CNL has been recording and tracking issues raised by Indigenous Nations, communities and organizations during engagements and also through written comments provided either as part of the formal public review process for the Environmental Assessment (EA) or that

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		Also applicable to the main EIS, Section 7.6 Feedback Received to Date		potential mitigation measures has been taken into consideration. Currently, this is not clearly defined within the Aboriginal Engagement TSD or the main EIS. Expectation to Address Comment: Please include further details on specific concerns and questions raised by First Nation and Métis groups, especially those related to impacts on any potential or established Aboriginal and/or treaty rights. Also include how CNL is addressing those issues and concerns (e.g., mitigation measures).	have been submitted separately. These issues / concerns and the actions CNL has taken to address them, including how input on potential mitigation measures has been taken into consideration, has been detailed in the EIS. Change to IER: The issues / concerns raised by Indigenous Nations, communities and organizations up to March 2024 (May 2024 and June 2024 for Kitigan Zibi Anishinabeg and Kebaowek First Nation, respectively) and the actions CNL has taken to address them, have been detailed in Section 4.4 and presented in Tables of Interests and Concerns in Appendices J through BB of the IER TSD, one for each Nation, community or organization. These tables include lists of interests, concerns, and / or feedback which were raised by each Indigenous Nation, community or organization, as well as how CNL addressed these, verification with the applicable Indigenous Nation, community or organization that the interest / concern is resolved and next steps. The themes of Indigenous interest are as follows: • Accidents, leaks or malfunctions; • Alternative Means Assessment; • Aquatic Environment; • Archaeology; • Baseline Characterization; • Biological Considerations, Species at Risk and Habitat; • Communication, Engagement and Relationship; • EA Methodology and Process; • Effects Assessment Approach; • Employment, Training, Contracting, and other Economic Interests; • Environmental and Cultural Heritage Stewardship and Monitoring; • Environmental Effects and Mitigations; • End-state, Site Restoration and Future Use of the Land; • Environmental Monitoring; • Governance; • Impacts on Rights; • Indigenous Health and Community Statistics; • In-situ Disposal (ISD) Concept; • Long-Term Relationships; • Protection of the Environment; • Protection of the Ottawa River; • Protection of Flora and Fauna; • Socio-Economic; • Species at Risk; • Study areas used in the Assessment; • Technical; • Traditional Knowledge, Land and Resource Use and Cultural Impacts; and • Valued Components. More details on the specific concerns and how CNL is addressing them can be found in IER Section 4.4 and Appendices J through BB.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Change to EIS: The issues / concerns raised by Indigenous Nations, communities and organizations up to 2024 March (2024 May and 2024 June for KZA and KFN, respectively) and the actions CNL has taken to address them have been detailed in Section 6.2.4 and Appendix C. Note: The order of EIS sections has been changed in the 2024 EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples.
181	CNSC	Section 4.5 Feedback Received to Date Also applicable the main EIS, Section 7.6 Feedback Received to Date	p.4-15 [sic] (p.4-31)	Comment: Section 4.5 states that “[t]o date, biodiversity and cultural heritage studies have been identified by communities as topics of interest.” Expectation to Address Comment: Please identify which First Nation and Métis communities have come to CNL expressing interest in conducting biodiversity and cultural heritage studies, and whether or not any such studies have been submitted and results taken into consideration as advocated within Section 3.3.2 of CNSC’s <i>Generic EIS Guidelines</i>.	Resolved As: As per the guidance of the CNSC’s <i>Generic EIS Guidelines</i>, CNL has reached out to all identified Indigenous Nations, communities and organizations inquiring about traditional knowledge. In 2016, CNL sent letters (IER TSD Appendices B and C) to the identified Indigenous Nations, communities and organizations requesting information on cultural and traditional activities in the area surrounding the NPD site. CNL sent letters again in May 2020 (IER TSD Appendix D) asking relevant questions to verify assumptions CNL made in lieu of having responses or direct input from the various Indigenous Nations, communities and organizations. To date, there has been interest in cultural heritage and biodiversity studies, with three of the identified Indigenous Nations, communities and organizations having requested to CNL that additional studies be conducted in relation to the NPD EIS. The Métis Nation of Ontario (MNO) stated in their comments on the 2017 draft EIS that a “Métis-specific traditional land use study should be completed to provide CNL insight into the Métis perspective on terrestrial resources.” In response, CNL and the CNSC jointly provided funded an MNO Traditional Knowledge and Land Use Study (TKLUS) to collect information about the way of life and land use of MNO Citizens and their Métis forbearers around the project site. The information from the MNO TKLUS has been incorporated into the 2021 draft EIS and the IER. Specifically, CNL has incorporated information from the MNO TKLUS provided to CNL in February 2019 into the IER Section 5; specifically, Table 5.4-1 is informed by the MNO TKLUS. In addition, the following sections in the IER all have information from the MNO TKLUS incorporated: • Section 6.1 Description of the Existing Environment - Indigenous Land and Resource Use. This is the main section that documents MNO traditional use. This section refers to MNO traditional use specifically information is provided on: trapping, hunting, fishing, gathering and cultural ceremonies. • Section 7.1 Assessment & Mitigation of Environmental Effects – Indigenous Land and Resource Use. The Algonquins of Ontario (AOO) requested in their comments on the 2017 draft EIS, “that AOO-specific harvesting, cultural, and / or ecological values be incorporated into project planning, monitoring, and emergency response, either through engaging the AOO in conducting a traditional land and resource use study or another methodology (<i>i.e.</i>, community cultural values mapping; oral history study etc.), decided upon by the AOO for sharing traditional land and resource use information related to the NPD project.” Both CNSC and CNL provided financial support to the AOO to undertake the Algonquin Knowledge and Use Study. CNL has incorporated information from the AOO AKLUS provided to CNL in December 2020 into the IER Section 5, specifically, Table 5.1. AOO also provided CNL recommendations based on the outcomes of the AKLUS study which CNL responded to in September 2021. The AOO and CNL established Monthly Working Group meetings and a budget and work plan to facilitate collaboration and discussion of the AKLUS results and recommendations is an activity called out in the work plan. To date, the Working Group has had four meetings dedicated to the AKLUS, its implications and CNL’s incorporation of information into the commitments. To capture any future discussions on

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					this topic, CNL will revise the traditional land and resource use section in the IER TSD to support the Commission Hearing on the NPD Closure Project. The Algonquins of Pikwàkanagàn First Nation (AOPFN) also requested support to complete a number of studies related to rights, culture and harvesting from the specific perspective of the AOPFN. CNL received the AOPFN AKLUS in September 2020 and received the AOPFN’s Diet and Harvest Study and Culture and Rights Study in August 2021. CNL has incorporated information from the AOPFN AKLUS into the IER Section 5, specifically Table 5.1. The three AOPFN studies were also used to enhance CNL’s Description of the Existing Environment - Traditional Land and Resource Use (IER Section 6.1). CNL has worked closely with AOPFN to ensure that the study findings are used in the EIS to accurately convey the Algonquin perspective. Continued work is planned between CNL and AOPFN to continue to discuss the implications of the three studies facilitated through the regular Working Group meetings and the Contribution Agreement. AOPFN also requested support from CNL for an AOPFN-led Alternative Means Assessment (AMA). CNL funded the AOPFN AMA and a report was completed in April 2022. The report includes AOPFN community perspectives and concerns about the alternatives to decommission the NPD site. The report also identifies full removal as AOPFN’s preferred decommissioning strategy. CNL has included a summary of the results of the AOPFN AMA, written by AOPFN, in the EIS as part of Section 4.2 (Alternative Means). Through the Contribution Agreement, AOPFN and CNL have worked together to conduct site-wide Algonquin Knowledge inventories at the NPD site in 2022 and 2023. AOPFN members generously shared their time and interest in biodiversity, and in turn CNL was able to share information on the nuclear industry and environmental monitoring. The time spent together in the field has proven to be very valuable to improve the relationship as well as to increase the available biodiversity data at the NPD site. Using the findings and recommendations from AOPFN’s site-wide inventory shared with CNL in May 2023 via a Seasonal Surveys Implications Letter and the 4 associated seasonal survey reports, CNL looks forward to continuing discussions with AOPFN to ensure that mitigations are in place to protect terrestrial and aquatic biota that are important to AOPFN. As previously indicated, the AOO and MNO have both indicated an interest in the archaeological cultural studies that have occurred at NPD. The AOO, MNO and Curve Lake First Nation have all requested the archaeological assessment. The MNO undertook their own technical review of the archeological assessment. With respect to biodiversity, the AOO, AOPFN, MNO, Kebaowek First Nation (KFN), Kitigan Zibi Anishinabeg (KZA), and a number of the Williams Treaties First Nations (WTFN) have asked questions on biological resources. In the summer of 2023, CNL was notified that KFN was interested in reviewing the EIS, therefore discussions began to provide capacity for increased involvement by KFN in the NPD environmental assessment (EA). Through these discussions, it was identified that KFN was interested in Indigenous-led studies on the topics of land and resource use and occupancy, territorial sovereignty, and biocultural Valued Components (VCs). The amendment to the Framework Agreement that came into effect in July 2024 will enable further discussions on KFN-led studies. Results from any KFN-led studies would be included in the IER that will support the final EIS submission. CNL has developed Tables of Interests and Concerns (IER TSD Appendices J through BB) to address the concerns of the CNSC staff with respect to the verification of input shared by Indigenous Nations, communities and organizations and the associated responses by CNL. These tables include the general topic, the interest / concern from the Indigenous Nation, community or organization, how CNL is addressing the interest / concern, any changes to the EIS, status of resolution of the interest / concern and verification with the community, and identification of next steps. Of note, the information described in the IER is also found in Sections 6, 8.9 and 9.9 of the EIS.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
182	CNSC	Section 4.6 Planned Engagement Activities	p.4-16 to 4-18 [sic] (p.4-32 to 4-33)	Comment: There is no a schedule of proposed engagement activities and meetings with First Nation and Métis groups. Expectation to Address Comment: Please include a schedule of proposed engagement activities and meetings with First Nation and Métis groups, as per the requirements of REGDOC-3.2.2.	Resolved As: Upcoming engagement activities and meetings with Indigenous Nations, communities or organizations are regularly communicated with the Canadian Nuclear Safety Commission (CNSC) during monthly interim reporting to meet the requirements of REGDOC-3.2.2. Proposed engagement activities and meetings with Indigenous Nations, communities, and organizations into the Decommissioning Execution phase have been included in the Environmental Impact Statement (EIS) and Indigenous Engagement Report (IER). Change to IER: Section 4.4 describes specific next steps with each Indigenous Nation, community or organization and Section 4.5 describes continued engagement activities more broadly. The Tables of Interests for Indigenous Nation, community or organization are included in IER Appendices J through BB and identify specific next steps with each Indigenous Nation, community or organization. Change to EIS: Section 6.2.4 describes specific next steps with each Indigenous Nation, community or organization and Section 6.2.4.5 describes continued engagement activities more broadly. The Tables of Interests for each Indigenous Nation, community and organization are included in Appendix C and identify specific next steps with each Indigenous Nation, community and organization. Note: The order of EIS sections has been changed in the 2024 EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples. References: <i>Canadian Nuclear Safety Commission (CNSC). 2022. Public and Indigenous Engagement Indigenous Engagement: REGDOC-3.2.2. Version 1.2. February.</i>
183	CNSC	Section 4.6 Planned Engagement Activities Also applicable to the main EIS, Section 7.7 Planned Engagement Activities	p.4-16 [sic] (p.4-32)	Comment: As per Sections 4.2.3 and 4.2.4 of REGDOC-3.2.2, CNL is required to develop and provide updates on their Aboriginal engagement plans. Expectation to Address Comment: Please include an update on the status of the development of CNL’s Aboriginal Engagement work plans.	Resolved As: As per Sections 4.2.3 and 4.2.4 of REGDOC-3.2.2, CNL has developed formal engagement plans with interested Indigenous Nations, communities, and organizations. CNL has established regular engagement touchpoints (monthly or quarterly) with eleven of the identified Indigenous Nations, communities and organizations. To date, the Métis Nation of Ontario (MNO), the Algonquins of Ontario (AOO), Algonquins of Pikwàkanagàn First Nation (AOPFN), Kebaowek First Nation (KFN), Kitigan Zibi Anishinabeg (KZA), Chippewas of Beausoleil, Georgina Island, Rama, Mississaugas of Scugog Island First Nation, Alderville First Nation, Curve Lake First Nation, and Hiawatha First Nation, have all established regular engagement with CNL. In 2023/24, at the request of the First Nations, the meeting frequency with the Williams Treaties First Nations (WTFN) was updated. CNL meets quarterly with WTFN, as well as quarterly with Curve Lake First Nation, Mississaugas of Scugog Island First Nation, and Hiawatha First Nation, or any other time a project milestone is reached or at the request of the First Nation. Section 6.2.4 of the EIS includes information on formal agreements and their development and progress. CNL has entered into two Memorandums of Understanding (MOU), three Contribution Agreements, one Long Term Relationship Agreement (LTRA) and one Framework Agreement: • MOUs with the AOO and the MNO, • Contribution Agreements with AOPFN, Curve Lake First Nation and Hiawatha First Nation, • LTRA established with AOPFN, and

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Framework Agreement signed with KFN. These agreements are the building blocks of a mutually beneficial relationship between CNL and the individual Nations, communities and organizations. Based on these agreements, parties will work collaboratively to meet the needs of the individual communities as well as CNL’s project requirements. Additional details about agreements or progress in development with specific communities are outlined below. In June 2023, CNL, AECL, and AOPFN signed a Long-Term Relationship Agreement. The agreement includes various Working Groups for ongoing collaborations including the Neya Wabun (Guardian) Program that will establish a regular AOPFN monitoring presence at designated sites within the Traditional Territory of the AOPFN and other environmental, cultural and economic protection and promotion activities and programs. The MNO and the AOO are also all working with CNL and AECL to make progress towards long-term relationship agreements. Since 2020, discussion on an AOO LTRA has been limited. CNL, AECL and AOO are still working together on the NPD Closure Project and other projects, but LTRA discussion has not been prioritized. In 2024, CNL and the AOO started discussions on developing an NPD project-specific Contribution Agreement, which includes a workplan for the full year. CNL anticipates signing of the agreement in 2024. The MNO and CNL met in early October 2021 to extend the current MOU, supporting the MNO’s continued participation and engagement on the NPD Closure Project. As well, meetings aimed at developing an LTRA between CNL, the MNO and AECL, to cover all of CNL’s activities and operations in the region, took place. The LTRA with the MNO is anticipated to be signed in late 2024. Kebaowek First Nation (KFN) have renewed discussions on an agreement with CNL focused on NPD. Through Monthly Working Group meetings, CNL, AECL and KFN agreed to amend the Framework Agreement to include a schedule specific to NPD as a mechanism to enable KFN’s review of the EIS. In early 2024, CNL, AECL and KFN worked to draft the amendment, including activities, schedule and budget. The activities identified by KFN included support for engagement, and supplemental Indigenous-led studies to be included in the Indigenous Engagement Report (IER). The amendment to the Framework Agreement was signed in July 2024. In November 2022, CNL received a request from Wolf Lake First Nation (WLFN) to meet and develop a Contribution Agreement to fund the review both the technical requirements of the project and a review of the EIS report. CNL and WLFN met in December 2022, the parties discussed capacity for technical review of the EIS. CNL shared technical supporting documents and documents listed on the IAA Registry to assist in WLFN’s review. During the month of December 2022, CNL and WLFN drafted a Contribution Agreement to facilitate WLFN’s review of the NPD EIS and other technical supporting documents. The agreement was signed at the end of the month. WLFN sent CNL comments on the NPD Closure Project EIS in March 2023. In June 2023, CNL sent WLFN responses to the EIS comments and recommendations. CNL also shared a draft version of the WLFN Table of Interests and Concerns for WLFN verification. CNL continues to reach out to meet with WLFN. Section 6.2.4 of the EIS and Section 4.4 of the IER TSD provide information on MOUs with the AOO and MNO and other agreements with the AOPFN, Curve Lake, Hiawatha, WLFN, and KFN. Appendix C of the EIS provides a record of engagement (verbal and written) with identified Nations, communities and organizations and Section 6.5 of the EIS outlines ongoing engagements with all identified Nations, communities and organizations. CNL has also developed Tables of Interests and Concerns (Appendices J through BB of the IER TSD) to address the concerns of the CNSC staff with respect to the verification of input shared by Indigenous Nations, communities and organizations and the associated responses by CNL. These tables include a general topic, the interest/concern from the Indigenous Nation, community or organization, how CNL is addressing the interest/concern, any changes to the EIS, status of resolution of the interest / concern and verification with the community, and identification of next

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					steps. The next steps identified in these Tables of Interests and Concerns provide the focus for ongoing engagements with Indigenous Nations, communities and organizations. As per the guidance of REGDOC 3.2.2 Section 4.2 – Indigenous Engagement Report, CNL has included planned activities with Indigenous Nations, communities and organizations in the IER TSD Section 9. Moving forward, engagement will be ongoing with all interested Nations, communities and organizations. Specifically, CNL is actively engaging in an on-going manner with the MNO, the AOO, the AOPFN, KZA, KFN, Curve Lake First Nation and Hiawatha First Nation, as well as other WTFNs, on the NPD Closure Project. While CNL has held discussions on determining a framework and capacity for continued Algonquins of Anishinabeg Nation Tribal Council (AANTC) participation in the environmental assessment (EA) process for the NPD Closure Project, as of September 2021, the AANTC have been unable to continue discussions. CNL continues to be open to engage with the AANTC and any other Indigenous Nations, communities or organizations that are interested. As of November 2021, KFN and KZA have expressed the desire to be engaged as separate First Nations, independent from the AANTC regarding CNL-related projects and activities. CNL have also taken steps towards meaningful engagement with KFN through the signing of an Engagement and Consultation Framework Agreement and an NPD specific schedule of activities. More specific ongoing engagement is described below: For the AOO, CNL has received an Algonquin Knowledge and Land Use Study (AKLUS) and have incorporated the findings of the report into the 2024 EIS. CNL has also received comments from the AOO on the draft follow-up monitoring plans for the NPD Closure Project. The forward-looking work plan with AOO is to continue to work together to ensure the input from the AOO, including the AKLUS, comments on the draft EIS, the alternative means review, VC and comments on the follow-up monitoring plans, are incorporated into the Project. The AOO and CNL have established Monthly Working Group meetings and a budget and work plan to facilitate this collaboration. Furthermore, the AOO and CNL continue to work to deliver on commitments and work on a long-term relationship. The MNO and CNL will continue to work together to ensure the input from the MNO, including the TKLUS and comments on the follow-up monitoring plans are incorporated into the Project. Furthermore, the MNO and CNL continue to work to deliver on commitments and work on a long-term relationship agreement. The AOPFN and CNL will continue to work together to ensure the input from the AOPFN, including the AKLUS, the Diet and Harvest Study, the Culture and Rights Study, comments on the draft EIS, VCs, comments on the follow-up monitoring plans, Alternative Means Assessment information, findings and recommendations from AOPFN’s site-wide inventory and additional feedback from the community are incorporated into the Project. The AOPFN and CNL have Monthly Working Group meetings, will establish Project specific meetings, and the AOPFN coordinate ad-hoc Algonquin Advisory Committee (AAC) meetings with CNL on an as-needed basis. Furthermore, AOPFN and CNL continue to work to deliver on current commitments, identify proactive additional commitments through the remainder of the EA process, and work on a project-specific Contribution Agreement. Curve Lake First Nation, and Hiawatha First Nation will continue to work with CNL to ensure the input from Curve Lake, including Curve Lake First Nation’s review of the 2020 draft EIS and additional feedback from the community, are incorporated into the Project. Curve Lake and Hiawatha First Nations and CNL have quarterly meetings, in addition to the quarterly WTFN meeting, which is open to all the Williams Treaties First Nations. CNL and Curve Lake First Nation signed a contribution amendment in September 2023 to further enable their ongoing participation. CNL and Hiawatha First Nation signed a Contribution Agreement in July 2023. CNL will continue to share project information with Curve Lake First Nation and Hiawatha First Nation and continue the scope outlined in the Contribution Agreement. Should either First Nation bring forward any new concerns or interests through the

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					ongoing engagement or regulatory proceeding, CNL will seek to understand those concerns in the context of the EIS and further consider feedback on the project. CNL will continue engaging on a regular basis at the information-sharing level with the other WTFNs through quarterly meetings. CNL continues to follow-up with the AANTC and share information on the Project. Note: The order of EIS sections has been changed in the 2024 EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples.
Alternative Means Assessment Technical Supporting Documents					
184	CNSC	Section 2.2 Definition of Alternative Means Also applicable to Section 4.2 Alternative Means of Carrying out the Project of the main EIS, p.4-5 to 4-6	p.2-2 to 2-3	Comment: The type of waste associated with each alternative is missing in Section 4.2 (Alternative Means of Carrying out the Project) of the main EIS, as well as in Section 2.2. (Definition of Alternative Means) of the Alternative Means Assessment TSD. More specifically, these sections should indicate if the reactor system and components qualify as intermediate-level waste because, although near-surface disposal is acceptable for low-level waste, it requires further justification for intermediate-level waste, as indicated in the International Atomic Energy Agency’s Disposal of Radioactive Waste Specific Safety Requirements No. SSR-5 (2011). Expectation to Address Comment: CNL should provide clarification regarding the type of waste associated with each alternative in Section 4.2 of the main EIS, as well as in the Alternative Means Assessment TSD.	Incorporated As: The classification of the waste associated with the NPD Closure Project is provided in Section 4.4.1.1 of the draft EIS. Clarity is provided here that the majority of the waste (by volume) can be categorized as Low Level Waste (LLW). It is only the reactor systems and components that are classified as Intermediate Level Waste (ILW). Further the legend used in the pictographic diagrams in Section 4.2 differentiates “Low Level Radioactive Material” from the “Reactor System and Components”. The historic siting of the reactor and associated components, comprising the ILW inventory in the NPD facility, is in the bedrock, within a concrete vault, in the range of tens of metres below the ground level. These are all features that are consistent with IAEA Safety Standard SSR-5, Disposal of Radioactive Waste, regarding cavern or vault disposal for ILW. In particular, the proposed NPD Closure Project satisfies Section 1.14(c), which states: Disposal of intermediate level waste: Depending on its characteristics, intermediate level radioactive waste (ILW) can be disposed of in different types of facility [Classification of Radioactive Waste, IAEA Safety Standards Series No. GSG-1, IAEA, Vienna (2009b)]. Disposal could be by emplacement in a facility constructed in caverns, vaults, or silos at least a few tens of metres below ground level and up to a few hundred metres below ground level. It could include purpose built facilities and facilities developed in or from existing mines. It could also include facilities developed by drift mining into mountainsides or hillsides, in which case the overlying cover could be more than 100 m deep. The entire facility is designed and will be constructed to meet the needs of ILW disposal. Change to Alternative Means Assessment TSD: Detail has been added to the legend in Section 2.2 of the TSD for clarification. Change to EIS: Detail has been added to the legends in Section 4.2.2 of the EIS for clarification. Reference: <i>Alternative Means Assessment TSD: Garisto, N. and McKee, S. 2019. Alternative Means Assessment Revision 1. 64-509200-ASD-002. Revision 1. Prepared by Arcadis for CNL</i> <i>International Atomic Energy Agency (IAEA). 2009b. Classification of Radioactive Waste, IAEA General Safety Guide GSG-1.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>International Atomic Energy Agency (IAEA). 2014d. Disposal of Radioactive Waste, IAEA General Safety Requirements Part 5.</i>
185	CNSC	Section 4.3 Environmental Effects of Alternative Means	p.4-4 to 4-11	Comment: The risks to the atmospheric environment, surface water, aquatic environment, and radiation and radioactivity environment are considered to be lower for in-situ decommissioning relative to the partial or full dismantling and removal of the reactor and its components, because CNL assumes that off-site storage of the reactor components will increase the risk during the Institutional and Post-Institutional Controls periods at the CRL site. It would be quite surprising should the reactor core be stored at the CRL site for such a long period and not be disposed of within a deep geological repository. Therefore, it seems as though the dismantling and removal of the reactor comes with a much lower risk than in-situ decommissioning. The presented decommissioning alternatives no.2 and no.3 appear to be systematically biased, since CNL assumes that the removed activated products are stored in an interim (e.g., open end / no solution) storage facility. Considering this method as a final disposal solution for the activated products would reflect a long-term waste management solution. Would such a solution change the outcome of this systematic comparison of alternative disposal methods (e.g., p. 4-5, 4-8 and 4-18)? Expectation to Address Comment: Please justify using long-term storage of the reactor core at the Chalk River site over the Institutional and Post-Institutional Controls periods as an argument for in-situ decommissioning. Also, please include a discussion addressing the apparent bias.	Incorporated: The Alternative Means Assessment TSD has been revised to include the assumption that disposal will be available for low-level and intermediate level waste generated during decommissioning options no. 2 and no. 3. This results in a reduction of risk in the Post-Institutional Controls period for both of these options as the waste is now in a permanent disposal state as opposed to long-term storage. There are however still risks that exist in handling the waste generated during options no.2 and no. 3 during the Institutional Control period until it is permanently disposed. Change to Alternative Means Assessment TSD: The Alternative Means Assessment TSD has been revised to include the assumption that waste disposal will become available during the Institutional Control period for both low-level and intermediate level waste. Change to EIS: Section 4.2 of the EIS has been updated to reflect the results of the revised Alternative Means Assessment TSD. References: <i>Alternative Means Assessment TSD: Garisto, N. and McKee, S. 2019. Alternative Means Assessment Revision 1. 64-509200-ASD-002. Revision 1. Prepared by Arcadis for CNL.</i>
186	CNSC	Section 4.3 Environmental Effects of Alternative Means	p.4-2 to 4-53	Comment: Sufficient detail should be available to justify the relative risks associated with each environmental component (per alternative), and these risks should be consistent across environmental components (or matrices). For example, on page 4-21 (Radiation and Radioactivity Environment), part of the description of the relative risk associated with “3. Full Dismantling and Removal” for the Post-Institutional Controls timeframe says that “[a]t the storage site, it is expected that the gamma fields will be higher than those in the “1. Continued SwS” alternative, due to the limited shielding.” On page 4-40 (Public Health), however, the description of relative risk also associated with “3. Full Dismantling and Removal” for the Post-Institutional Controls timeframe says that “[t]he off-site storage facility will have lower risks than “1.Continued SwS” due to the containers limiting the releases of	Resolved As: The Alternative Means Assessment TSD contains the qualitative arguments and details that allow the risks to be ranked against the baseline case of continued storage with surveillance. The environmental effects evaluated for each environmental component are not intended to be the same thus the risks across environmental components may differ. With respect to the example given there isn’t a contradiction as the risks in ‘Radiation and Radioactive Environment’ relate specifically to ambient radioactivity (where the presence of shielding is being compared) while the other example of risks for ‘Public Health’ relates specifically to the potential of public dose due to environmental releases (where the presence of containment is being compared). In the discussion on ‘Radiation and Radioactive Environment”, although there is a potential for emissions of radionuclides in the environment thus a risk for increase in ambient radioactivity in “1. Continued SwS” the largest contribution to an increase in ambient radiation fields would be reduced shielding of the reactor itself. If the reactor components were removed from the NPD facility and placed into a waste storage facility, even an engineered waste container shielding is unlikely to be equivalent to the reactor’s current shielding (i.e. consisting of concrete walls up

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				contaminants.” These two descriptions seem contradictory and should be further justified to ensure that the relative risks are clear and consistent across environmental components. Expectation to Address Comment: CNL should provide sufficient detail to justify the relative risks associated with each environmental component. CNL should also make sure that these risks are consistent across environmental components (or matrices).	to 9 feet thick, lead and steel which was to minimise the radiation doses from an operating reactor). Therefore alternate “3. Full Dismantling and Removal” has higher risk to the ambient radioactivity than “1. Continued SwS” due to limited shielding. In the focus of the discussion on ‘Public Health’, is the potential of public dose due to risk of radionuclide releases. If the facility is left in continued SwS, the facility’s containment will slowly degrade over the Institutional Control phase and the risk of release of radioactivity from the reactor components and contaminated nuclear systems will gradually increase. In alternate “3. Full Dismantling and Removal” the waste would be packaged into engineered containers to restrict radionuclide release as the reactor components or contaminated nuclear systems degrade. The use of engineered containers will therefore provide a new safety barrier for the longer-term containment of the waste that is not currently present in the NPD facility. Therefore alternate “3. Full Dismantling and Removal” has lower risk to public health than “1. Continued SwS” due to engineered waste containers limiting the release of radionuclides which would potentially result in a dose to a member of the public. In addition to the above the Alternative Means Assessment TSD has been revised to clarify the methodology used and to further explain the comparison of relative risks between alternatives and that the weighting of criteria between alternatives are treated equally (see Section 4.2.1 of the revised Alternative Means Assessment TSD). It has also been clarified in the revised Alternative Means Assessment TSD that: • Disposal within the Institutional Control period for options where waste is removed has been taken into account (reflected in Sections 2 to 5 of the revised Alternative Means Assessment TSD). • Worker dose the Alternative Means Assessment TSD now acknowledges that dismantling can be performed safely and is managed within regulatory limits, but still has a relative risk comparison (Section 5.2 of the revised Alternative Means Assessment TSD). • Quantifies Occupational Health and Safety risk by hours worked and industry norms for injuries (Section 4.3.6.2 of the revised Alternative Means Assessment TSD).
Decommissioning Safety Assessment Technical Supporting Document					
187	Health Canada	Section 4.1.6 Non-Radiological Benchmarks Also applicable to Section 8.5.2.5 Effects on Public Health and Table 8-17	p.4-4	Comment: A screening index / hazard quotient approach may not fully address the human health effects of non-threshold contaminants. To fully address the health effects of non-threshold contaminants, like PM_{2.5} and NO₂, the attributable health risk can be determined based on relative risk above background for the specific population that would experience air quality changes. For remote locations where few people reside, this may not be necessary. Note that the Air Quality Management System (AQMS) includes Management Levels set below the CAAQS. Management Level 1 is based on actions for keeping clean areas clean; Management Level 2 is based on actions for preventing air quality deterioration; and Management Level 3 is to prevent exceedance of the CAAQS. More information on air management threshold values and actions is available in the <i>Guidance Document on Air Zone Management</i> produced by the Canadian Council of Ministers of the Environment (CCME) found here:	Resolved As: The following clarification demonstrates how screening indices were used adequately to address potential human health effects of non-threshold contaminants. <u>Air Quality Criteria Used in the Decommissioning Safety Assessment (DecomSA) TSD</u> Appendix F of the DecomSA TSD contains the detailed air quality assessment for compounds that are not radiological or mazardous materials. DecomSA TSD Table F-1 outlines the air quality concentration criteria used in this assessment. The criteria for PM_{2.5} as shown in DecomSA Appendix F, Table F-1, are as follows: • PM_{2.5} (24-hr): 27 µg/m³ • PM_{2.5} (annual): 8.8 µg/m³ <u>Canadian Ambient Air Quality Standards (CAAQS)</u> The Air Quality Management System (AQMS) adopted by Canadian Council of Ministers of the Environment (CCME) involves the Canadian Ambient Air Quality Standards (CAAQS) as well as the Air Zone Management Framework, among other aspects. The Canadian Ambient Air Quality Standards (CAAQS) are updated from time to time. For context, the PM_{2.5} CAAQS values <i>for 2020</i> (i.e. the most recent iteration of the CAAQS) are as follows: • PM_{2.5} (24-hr): 27 µg/m³

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				http://www.ccme.ca/files/Resources/air/aqms/pn_1481_gdazm_e.pdf Expectation to Address Comment: Please demonstrate that the use of screening indices adequately addresses the potential human health effects of non-threshold contaminants.	- PM_{2.5} (annual): 8.8 µg/m³ <u>Air Zone Management Framework (AZMF) and Associated Threshold Values (based on CAAQS)</u> Air Zone Management aspects of the CCME’s AQMS are outlined in the reference document provided by the comment, i.e. the CCME Air Zone Management Framework (AZMF) document titled <i>Guidance Document on Air Zone Management</i> (CCME 2019). As outlined in CCME (2019), the AZMF involves four (4) “Management Levels” (i.e. Red, Orange, Yellow, and Green) corresponding to three (3) tiers of air quality threshold values (i.e. Highest, Middle, and Lowest) for ozone and PM_{2.5}. The “Lowest Threshold Value” tier contains the most restrictive values. It is also important to understand what the “Lowest Threshold Value” tier represents: <i>“Under the AZMF, progressively more rigorous actions are to be implemented at an air zone level as air quality approaches or exceeds the CAAQS.</i> <i>Lowest Threshold Value – based on an analysis of 10 years of data from the “cleanest” monitoring sites across Canada, on the “cleanest” days.</i> <i>For simplicity the Middle and Lowest Threshold Values would be the same for 2015 and 2020, based on the 2020 CAAQS [Canadian Ambient Air Quality Standards].</i> <i>The lowest threshold value corresponds to “baseline” concentrations. The term “baseline” refers to air quality data that is least influenced by local and regional anthropogenic sources, as far as possible reflecting natural source emissions and very long range (intercontinental) anthropogenic emissions. Baseline concentrations provide the basis for determining the lowest Threshold Value because they can be grounded in actual Canadian air quality data. The lowest Threshold Value represents the cleanest sites across Canada.” (CCME 2019)</i> The PM_{2.5} values associated with the “Lowest Threshold Value” tier are as follows (CCME 2019): - PM_{2.5} (24-hr): 10 µg/m³ - PM_{2.5} (annual): 4 µg/m³ <u>Comparison & Conclusion</u> By comparison, the highest calculated PM_{2.5} air concentrations for NPD (see DecomSA TSD, Appendix F, Table F--12) – <i>which include background levels</i> - are: - PM_{2.5} (24-hr): 9 µg/m³ - PM_{2.5} (annual): 5 µg/m³ The calculated 24-hr PM_{2.5} value is less than the CCME (2019) AZM “Lowest Threshold Value” tier (i.e. 9 µg/m³ versus 10 µg/m³). The calculated annual PM_{2.5} value is less than the 2020 CAAQS, and only slightly greater than the CCME (2019) AZM “Lowest Threshold Value” tier (i.e., 5 µg/m³ versus 8.8 µg/m³ and 4 µg/m³ respectively). In addition, it is very important to understand that <i>the calculated annual PM_{2.5} air concentrations are driven entirely by background levels; the incremental amounts from the NPD Closure Project are considered to be non-measurable.</i> Change to DecomSA TSD: Table F-12 will be updated as follows:

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																																																	
					Table F-12 Predicted PM₁₀ and PM_{2.5} Concentrations at Discrete Receptors and along the Property Line (Including Background) <table><tr><th rowspan="4">Constituent</th><th rowspan="4">Averaging Period</th><th rowspan="4">CAAQS Criterion (µg/m³)</th><th rowspan="4">AZM “Lowest Threshold Value” (µg/m³) ^c</th><th rowspan="4">Upwind Background (µg/m³)</th><th colspan="4">Receptor Type</th><th rowspan="4">Max. Con. along the property line (µg/m³)</th></tr><tr><th colspan="3">Residential</th><th rowspan="3">Rec . R4</th></tr><tr><th>R1</th><th>R2</th><th>R3</th></tr><tr><th colspan="3">(µg/m³)</th></tr><tr><td>PM₁₀</td><td>24 hour</td><td>50</td><td>Not Available</td><td>18</td><td>19</td><td>19</td><td>19</td><td>19</td><td>25</td></tr><tr><td rowspan="2">PM_{2.5}</td><td>24 hour</td><td>27^a</td><td>10</td><td>9</td><td>9</td><td>9</td><td>9</td><td>9</td><td>12</td></tr><tr><td>Annual</td><td>8.8^b</td><td>4</td><td>5</td><td>5</td><td>5</td><td>5</td><td>5</td><td>6</td></tr></table> Note: ^a The 3-year average of annual 98th percentile of daily 24-hour average concentrations (CCME, 2019). ^b The 3-year average of the annual average concentrations (CCME, 2019). ^c AZM “Lowest Threshold Value”(s) from CCME (2019). References: <i>Canadian Council of Ministers of the Environment (CCME). 2019. Guidance Document on Air Zone Management. ISBN: 2978-1-77202-050-2. https://ccme.ca/en/res/guidancedocumentonairzonemanagement_secured.pdf</i>	Constituent	Averaging Period	CAAQS Criterion (µg/m³)	AZM “Lowest Threshold Value” (µg/m³) ^c	Upwind Background (µg/m³)	Receptor Type				Max. Con. along the property line (µg/m³)	Residential			Rec . R4	R1	R2	R3	(µg/m³)			PM ₁₀	24 hour	50	Not Available	18	19	19	19	19	25	PM _{2.5}	24 hour	27 ^a	10	9	9	9	9	9	12	Annual	8.8 ^b	4	5	5	5	5	5	6
Constituent	Averaging Period	CAAQS Criterion (µg/m³)	AZM “Lowest Threshold Value” (µg/m³) ^c	Upwind Background (µg/m³)	Receptor Type						Max. Con. along the property line (µg/m³)																																											
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PM ₁₀	24 hour	50	Not Available	18	19	19	19	19	25																																													
PM _{2.5}	24 hour	27 ^a	10	9	9	9	9	9	12																																													
	Annual	8.8 ^b	4	5	5	5	5	5	6																																													
188	Health Canada	Section 5.2 Non-Radiological Compounds Also applicable to Section 10.2 Malfunctions & Accidents Assessment, Figure 10-7	p.5-10	Comment: It is unclear whether the volumes and types of contamination referred to in Section 4.4.1.3 (Generated Waste) of the main EIS are known and accounted for in the modeling. Furthermore, the sensitivity of models to the accuracy of the inventory estimates are not discussed, particularly for contaminant releases that result in exposures approaching the specified criteria (e.g., for asbestos in some accident and malfunction scenarios – see Tornado (Non-Rad) (EF2) in Figure 10-7). Expectation to Address Comment: Please include additional information regarding the volumes of non-radiological contaminants and the sensitivity of the exposure scenario conclusions to the accuracy of asbestos and lead inventory estimates. Also, clarify the potential for release of asbestos from the sealand container. If contaminants are not accounted for in the modeling, a statement similar to the one provided for the radiological inventory in Section 4.4.1.3 of the main EIS should be provided (i.e., “the projected volumes are trivial and the total radiological inventory will be negligible and bounded by the reference radiological inventory”).	Incorporated: Section 4.4.1.3 of the EIS has been clarified to explain that much of the generated waste (mops rags, temporary floor coverings, floor sweepings, protective equipment and clothing will continue to be managed at the CRL Site. Localized remediation activities may also produce low level contaminated soils which may be emplaced into NPDWF for grouting, however the volume is trivial, and was not accounted for in the modelling. Regarding the volume of non-radiological contaminants, Section 5.2 of the DecomSA provides detailed information on the quantities of non-radiological contaminants. The total volumetric inventory of asbestos is given as 230 m³ of which 165 m³ is found in the sealand containers. The volume of lead is not given, but its mass is given in Table 5-18 of the DecomSA, broken down by quantity and location. The estimated volume of mercury is negligible, i.e. <0.01 kg of mercury remaining in the boiler room, based on residual levels measured in the wells area sump. The only PCBs remaining in the facility are associated with light ballasts with a total mass of less than 3 kg. These will have been removed by the end of decommissioning. No petroleum hydrocarbons that exceed the 200 µg/L concentration recommended in the Environment Canada guideline for high- sensitivity sites are found in the NPDWF, therefore petroleum hydrocarbons do not warrant further assessment. The volume of lead within the facility is calculated using a 3D CAD model of the facility created from the as built drawings of the NPD reactor. The estimate of the volume is thus considered to be accurate. In calculating the lead volume it was assumed there were no voids. Thus, the lead volume is the theoretical upper bound of the quantity of lead present. Increased accuracy in the estimate of the lead volume would therefore only result in a lowering of the results in the scenario conclusions. The volume of asbestos has also been partly estimated using the 3D CAD model and also on conservative estimates of the volume of asbestos remaining in the facility following the asbestos abatement activities. In addition to this the																																																	

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					volume of asbestos in the sealand containers is based on the total internal volume of five 20 foot intermodal containers, giving a conservative overestimate of the volume of asbestos present. It can therefore be seen that the estimated asbestos volume is bounding. Further refinement of the asbestos volume would only result in a reduction in the asbestos inventory that would be seen as a lowering of the results in the scenario conclusions. The asbestos inventory within the sealand containers has a low potential for release given the containers’ robust construction. The asbestos within the container is also double bagged providing additional containment. This is accounted for in the bounding scenarios by the use of conservative damage ratios, airborne release fractions, respirable fractions and leak path factors. Change to EIS: Section 4.4.1.3 of the EIS has been revised to state: “In addition to the waste that is already present at NPDWF, further waste will be generated during the project. Some of these generated decommissioning wastes will be LLW and consist of common industrial items that have become contaminated with low levels of radioactivity during the grouting and demolition activities. This may consist of mops, rags, temporary floor coverings, floor sweepings, protective equipment and clothing as well as possibly hardware items which become expendable such as cameras or temporary lighting. These wastes will continue to be managed at the CRL Site. Localized remediation activities may also produce low level contaminated soils which may be emplaced into NPDWF for grouting. The NPDWF currently generates on the order of 10 m³/y of LLW in the form of PPE or general consumables. Due to recent work to prepare for decommissioning (i.e. asbestos abatement and system characterization), this volume reflects to the volume of organic waste that may be disposed of during the Decommissioning Execution phase. For context, O.Reg 232/98 (Ontario 1998) includes requirements for gas generation assessment but the regulation applies for (municipal) waste disposal volumes of 40,000 m³ or more. Thus, the projected volumes are trivial, and the total radiological inventory will be negligible and bounded by the reference radiological inventory.” Resolved As: CNL understands that there may be concern about the remaining quantities of lead and asbestos from a worker protection viewpoint. The NPD Closure Project has added more information to the Decommissioning Safety Assessment (DecomSA) TSD, on the selection of PAC benchmarks and the level of protection they are based on. The Table of PAC values has also been expanded to not only show the value, but to also list the underlying effect-value that they are based on (US DOE 2016). References: <i>DecomSA TSD:</i> Garisto, N., Kovacs, R., and Tong, X. 2021. <i>Decommissioning Safety Assessment</i>. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL. Ontario. 1998. <i>Landfilling Sites</i>. Ontario Regulation (O. Reg) 232/98 under the Environmental Protection Act, R.S.O. 1990. https://www.ontario.ca/laws/regulation/980232 United States Department of Energy (US DOE). 2016. <i>Protective Action Criteria (PAC): Chemicals with AEGLs, ERPGs, & TEELs</i>. Database. Rev. 29. Accessed online: https://pacteels.pnnl.gov/#/

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
189	Health Canada	Section 5.2.4 PCBs	p.5-11	Comment: Section 5.2.4 discusses the “potential for PCBs to be present in paint and caulking in the NPD facility by noting that paint and caulking samples collected at Whiteshell facilities - of similar vintage - all contained less than the regulated level of 50 mg/kg of PCBs in solids. Thus, the assumption for NPD is that any paint or caulking will contain less than the regulated level of 50 mg/kg of PCBs in solids.” However, it is not clear whether PCBs in paint were included in the estimated total PCB inventory of 2.97 kg at NPD. Expectation to Address Comment: Please clarify if the estimated PCB inventory of 2.97 kg is inclusive of PCBs present in paint and/or caulking. Indicate potential contingency plans and mitigation measures that may be required if the PCB content of the paint is greater than anticipated.	Resolved As: The estimated inventory of 2.97 kg was not intended to be inclusive of PCBs present in paint and/or caulking. If concentrations were below the regulated level of 50 mg/kg of PCBs in solids they were not included as part of the modelling. Sampling and analysis of paint and caulking in the NPD facility has been completed as per NPD’s Characterization Plan. The analysis results indicates that PCB concentrations in NPD paint and caulking is below the regulated level of 50 mg/kg. However, if any PCBs above regulatory limits are discovered during decommissioning of the NPD facility, this waste would be deemed non-compliant and would be removed and dispositioned accordingly through Canadian Nuclear Laboratories (CNL)’s Hazardous Waste processes.
190	CNSC	Section 6.2.2 Atmospheric Dispersion Factor	p.6-5 to 6-8	Comment: Atmospheric Dispersion Factors (ADFs) were calculated for accident scenarios using CALPUFF. ADFs were also calculated for normal operations using both AERMOD and CALPUFF. It was determined that for normal operations, the ADFs calculated using CALPUFF were more conservative than those calculated using AERMOD. Based on this comparison, it was determined that “CALPUFF-derived ADFs for normal operations are used in subsequent calculations.” It is not clear from this statement or in Appendix C under what scenarios or circumstances the CALPUFF-ADFs apply. Expectation to Address Comment: Additional clarity and explanation should be provided regarding when the CALPUFF-derived ADFs are applied later in the assessment.	Resolved As: The following statement: “A comparison of ADFs from AERMOD vs. CALPUFF shows that those derived by CALPUFF are more conservative. Therefore, CALPUFF-derived ADFs for normal operations are used in subsequent calculations.” is meant to clarify that the AERMOD ADFs were not used in calculations. For further clarity, there are 3 conditions for which ADFs are needed: 1. Accidents, Fire; 2. Accidents, Non-Fire; and, 3. Normal Operations. For (1) and (2) above, CALPUFF-derived ADFs are used because CALPUFF can incorporate buoyancy considerations. For (3) above, buoyancy considerations are not crucial, and ADFs can be derived using either AERMOD or CALPUFF. So, ADFs were derived using AERMOD and also using CALPUFF. These were compared. The more conservative values were found to be the CALPUFF-derived values. Therefore, they (i.e. the CALPUFF-derived values) were using as the ADFs for Normal Operations calculations. Therefore, all calculations ultimately used CALPUFF-derived ADFs.
191	CNSC	Section 6.2.2 Atmospheric Dispersion Factor	p.6-5 to 6-8	Comment: The text in the third paragraph of page 6-6 states that “[m]odelling results for fire scenarios are presented in Table 6-5 as ADFs (in g/m³ per g/s) and 1-hour concentrations (in µg/m³) at discrete receptor locations.” The subsequent sentence indicates that the same information is provided in Table 6-6 for non-fire scenarios. However, the 1-hour concentrations are absent from both tables for fire and non-fire scenarios.	Incorporated: The requested information has been added to the Decommissioning Safety Assessment (DecomSA) TSD. Change to DecomSA TSD: Table 6-5 and Table 6-6 of the DecomSA have been updated to include the maximum 1-hour concentration results from Appendix C, Table C-3 and Table C-4.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Expectation to Address Comment: Please update Tables 6-5 and 6-6 to include the 1-hour concentrations at the discrete receptor locations.	
192	CNSC	Section 7.4 Existing Measures/Safeguards	p.7-14	Comment: Section 7.4 lists radiation safeguards for the decommissioning work, including: "...[c]ontinuous air monitors, dosimeters, and bioassay will be used as appropriate to detect the spread and uptake of contamination before it exceeds limits". However, there is no mention of provisions for other radiological monitoring and surveys that should also be performed to identify adverse radiological conditions. Expectation to Address Comment: Please clarify if radiological surveys (including dose rate and contamination monitoring) will be conducted during decommissioning work activities.	Incorporated: In addition to routine compliance surveys, the development of radiological work control documents will include the requirement for operational radiation and contamination surveys during work to ensure that the magnitude of the workplace hazard is maintained within the bounds of the radiological assessment and ensure protection is optimized at all times. Change to DecomSA TSD: Radiation Safeguards in Section 7.4 has been expanded to include the following text: "In addition to routine compliance surveys, the development of radiological work control documents will include the requirement for operational radiation and contamination surveys during work to ensure that the magnitude of the workplace hazard is maintained within the bounds of the radiological assessment and ensure protection is optimised at all times."
193	CNSC	Section 7.9.2 Severity Screening	p.7-22	Comment: Regarding the severity criteria, particularly that for radiological effects, it is unclear whether the criteria have been applied in the bounding scenarios for dose to workers and dose to members of the public, along with the rationale for applicability. Upon examination of the 10 bounding scenarios, it does not appear that the radiological effects severity screening criterion was actually used, as the scenarios were assessed against dose acceptance criteria for both workers and the public, by frequency (i.e., events / year), as presented in Table 4-2). Expectation to Address Comment: Please clarify the use of the radiological effects severity screening criteria for the bounding scenarios.	Incorporated: The Decommissioning Safety Assessment (DecomSA) TSD has been updated to clarify the use of radiological effects severity screening for the bounding scenarios. Change to DecomSA TSD: Section 7.9.1 and Section 7.9.2 of the DecomSA TSD have been updated to reflect the following text changes: <u>7.9.1 Screening Based on Potential Frequency</u> The Canadian Nuclear Safety Commission (CNSC 2020), across documents, has relied on the event frequency of 10 ⁻⁶ per year as the threshold for credibility. The Canadian Standards Association (CSA 2007, 2008) has also used event frequency of 10 ⁻⁶ per year as the threshold for credibility. In this study, a frequency criterion of <10 ⁻⁶ (i.e. less-than 10 ⁻⁶) per year is used as the credibility threshold, consistent with the lowest frequency-category cut-off from the prior Athauda-Arachchige (2015) <i>Safety Analysis</i> . Scenarios with estimated frequencies that are greater than or equal to 10 ⁻⁶ per year are considered to be credible, and as such, warrant further assessment from a frequency perspective. Scenarios with estimated frequencies that are less than 10 ⁻⁶ per year are non-credible due to their extremely low frequencies. Section 7.7 provides the initiating event frequency estimates greater than 10 ⁻⁶ per year for various accident scenarios. For example, scenarios initiated by aircraft crash were not considered because the frequency of such an initiating event was determined to be less than 10 ⁻⁶ per year (Athauda-Arachchige 2015). <u>7.9.2 Screening Based on Potential Consequence Severity</u> From the perspective of consequence assessment, the performance criteria for any accident scenario are based on the exposure and health effects associated with the accident. Therefore, scenarios with no or negligible effects are not considered to be bounding. To ensure consistency with the severity rankings used in the Athauda-Arachchige (2015) <i>Safety Analysis</i> , the severity cut-off criterion encompasses three different types of effects as follows (from Table 7-5): Non-Radiological (Physical) Effects [Severity Rating ‘S0’ – No Discernable Effects]:

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					○ Public Receptors: None. ○ Worker Receptors: Superficial physical injuries not requiring medical attention. ● Non-Radiological (Chemical) Effects [Severity Rating ‘S0’ – No Discernable Effects]: ○ Public Receptors: None. ○ Worker Receptors: Short-term chemical exposure up to 10% of occupational limit. ● Radiological Effects [Severity Rating ‘S0’ – No Discernable Effects]: ○ Public Receptors: None. ○ Worker Receptors: Effective dose up to 0.1 mSv. Therefore, scenarios with estimated consequences that meet or are less than the criterion above are considered negligible, and as such, they are excluded from further assessment. Scenarios assigned preliminary consequences ranks that are greater than the criteria above are considered non-trivial, and as such, are considered for selection of bounding scenarios. References: <i>Athauda-Arachchige, H. 2015. Safety Analysis Report for the Nuclear Power Demonstration Waste Management Facility. 64-03610-SAR-001. Revision 3.</i> <i>Canadian Nuclear Safety Commission (CNSC). 2020. REGDOC-2.4.3, Nuclear Criticality Safety, Version 1.1.</i> <i>Canadian Standards Association (CSA). 2012. Interim Dry Storage of Irradiated Fuel, Standard N292.2-13 (R2018).</i> <i>Canadian Standards Association (CSA). 2014c. Management of Low- and Intermediate-level Radioactive Waste. Standard N292.3-14.</i>
194	Health Canada	Section 8.3.2 Assumptions on Operational Practices	p.8-5	Comment: The statement that air emissions during decommissioning are “unlikely to have any effect on the surrounding airshed” is misleading. Although the duration of the cause of the effect (i.e., the emissions) is short, it does not necessarily mean that the duration of the potential health effects will be short. Expectation to Address Comment: Please provide additional rationale to support this statement.	Incorporated: The statement was intended only to qualify the types of emissions and their short, temporary nature. The following text has been added to Section 8.3.2 of the Decommissioning Safety Assessment (DecomSA) TSD, to better convey these qualities, and to link to the Greenhouse Gas Assessment and Air Quality Assessment: “Typical construction (and decommissioning) activities have the potential for short-term effects on air quality in the immediate vicinity of the site; primarily through exhaust emissions from equipment, and fugitive dust from disturbance of dry fine-grained soils (e.g. from dirt roads / routes or stockpiles). These are common emissions at construction and decommissioning sites. Greenhouses gas emissions from the project are assessed in the Greenhouse Gas Emissions TSD. Other gas and dust emissions from the project (i.e. NO₂, SO₂, TSP, PM₁₀, and PM_{2.5}) are assessed in Appendix F of the DecomSA TSD.” Change to DecomSA TSD: Section 8.3.2 has been revised to reflect the above response.
195	CNSC	Section 8.4.2 Stockpile Grout Ingredients	p.8-14	Comment: Section 8.4.2.4 (Radiation & Radioactivity Environment) states that fly ash will be a part of the grout ingredients. There are low concentrations of radionuclides in fly ash, and therefore, CNL indicates that a dose assessment will be completed when more site-	Resolved As: Fly ash was originally considered as a grout component based on the recommendation of the Savannah River Nuclear Labs (USDOE) for a suitable grout formulation meeting requirements for filling.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				specific fly ash information becomes available, as part of the radiological assessments conducted for specific tasks. No other information is provided. Expectation to Address Comment: Please provide additional information regarding the use of fly ash, including a preliminary analysis of the radiological effects to workers and whether an alternative was considered to avoid an additional radiological hazard to workers.	During development testing of the formula, the supplier informed Canadian Nuclear Laboratories (CNL) that availability of fly ash cannot be assured past 2019. Mixers in Ontario have substituted ground blast furnace slag (GBFS) wherever fly ash was previously used. CNL’s test program has demonstrated that the GBFS formula (90/10 GBFS/Portland) meets all performance criteria for the bulk fill grout, therefore, CNL’s grout formula no longer contains fly ash.
196	CNSC	Section 8.5.2 Grout Fill Nuclear Area Also applicable to Section 9.8.3 Identification of Residual Effects	p.8-29	Comment: Section 8.5.2.4 (Radiation and Radioactivity Environment) states that during the grouting procedure, the air that is currently in the facility will be displaced due to the pouring of grout. The air within the facility contains low levels of tritium. However, there is no discussion on whether there is potential for other radionuclides in the air that is displaced during the grouting process. Proposed mitigation measures in Section 9.8.3.2 (Proposed Mitigation Measures) and Table 9.8-4 (p.9-118) of the EIS include air monitoring for parameters of concern; however, it is unclear if air monitoring will include other radionuclides besides tritium. Expectation to Address Comment: Please clarify if other radionuclides besides tritium are expected in the air displaced during the grouting process. Also, include information on how this assumption will be confirmed during decommissioning work activities.	Incorporated: The Decommissioning Safety Assessment (Decom SA) Technical Supporting Document (TSD) considers that the radiological contaminants in air displaced as a result of grout pouring are of the same concentrations of contaminants detected during the period of Storage with Surveillance. The only chronic contaminant in the facility air is tritium in the form of tritiated water vapour (HTO) which is present at a low but persistent concentration in the deepest sections of the facility. The most conservative level, as measured using passive monitors over the Storage with Surveillance period, has been used to assess total worker exposure. During the planning phase, and prior to execution of the activities and tasks described in the DecomSA TSD, all work will be considered further following Canadian Nuclear Laboratories (CNL) Radiation Protection Program requirements, specifically (CNL. 2023). At this point <u>all</u> exposure pathways and <u>all</u> workers involved will be considered. Monitoring of airborne contamination and any limiting conditions / action levels will be assessed, documented and communicated to project staff, both CNL employees and contractors, in the form of a Radiological Work Assessment (RWA). Monitoring for particulate contaminants occurs at Nuclear Power Demonstration Waste Facility (NPDWF) on a case by case basis given any likelihood that a work task could result in the resuspension of material. The precursor tasks to grouting, particularly, preparing rooms and large vessels, will require radiological monitoring for acute airborne contaminants. Although the task is currently considered unlikely to mobilise and re-suspend material of significance, this will also be a requirement during grout filling operations and will take place using activity in air monitors for both tritium and particulate material. Change to EIS: The requirement to perform airborne monitoring for particulate contamination as well as tritium-in-air has been added in Section 9.8.3.2 Radiation Dose as well as Table 9.8-3. References: <i>Canadian Nuclear Laboratories (CNL). 2023, ALARA Review and Assessment – Planning and Control of Radiation Work, 900-508740-MCP-026 Revision 1.</i>
197	CNSC	Section 8.6.1 (Demolition of Above Grade Structures) Also applicable to the main EIS, Section 9.9 (Aboriginal Land	p.8-37 to 8-38	Comment: This TSD refers to the Derived Release Limits (DRL) and compares release rates during decommissioning activities to DRLs in order to estimate public dose. It was noted in the DRL document for the NPDWF that one family in Rapides-des-Joachims raises chickens for their own meat; however, this intake pathway was ignored for the residential group. - Furthermore, the following traditional land and resource uses are identified in the EIS (Section 9.9): - Hunting large game (deer, moose, and possibly black bear)	Incorporated: <u>With respect to consideration of locally raised chicken:</u> In the Decommissioning Safety Assessment’s (DecomSA’s) assessment of <i>Normal Operations</i>, ingestion pathways are captured as follows: - For non-radiological contaminants, by calculating soil concentrations (from predicted airborne releases) and comparing these against corresponding soil screening criteria that are a) protective of human health, and, b) inclusive of ingestion pathways. - For radionuclide contaminants, by calculating airborne releases and deriving dose estimates based on the existing Derived Release Limits for the facility (which themselves encompass ingestion pathways).

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		and Resource Use), p.9-119		- Hunting small game (waterfowl, rabbits, grouse, etc.) - Fishing walleye, northern pike, smallmouth bass, etc. - Gathering plants (including medicinal), berries, mushrooms However, it is unclear if all of these traditional land and resource uses are considered in the decommissioning and post-closure assessment of dose to the recreational/hunter group. Expectation to Address Comment: - Please include the ingestion of local chickens as part of the assessment of public dose. Please clarify if, and how, each of the traditional land and resource uses are considered in the decommissioning and post-closure assessments of dose to the recreational/hunter group.	In the Decommissioning Safety Assessment’s (DecomSA’s) assessment of <i>Accident Scenarios</i>, ingestion pathways are considered in Section 9.4.1.1 of the DecomSA TSD, following guidance from CSA N288.2 regarding ingestion pathways during short-term accident events: <i>“According to CSA N288.2 (CSA 2019), the ingestion pathway is not considered essential for safety assessments, due to the short-term nature of events and assuming that countermeasures would be put in place after an accident to avoid exposure from ingestion of contaminated foodstuffs and water. CNL has a process for notifying members of the public of emergency countermeasures, if required.”</i> In the 4th iteration (i.e., most recent) Postclosure Safety Assessment (PostSA) TSD, the Site Resident Group is assumed to eat locally-raised poultry. <u>With respect to consideration of traditional land and resource uses:</u> As mentioned above, the DecomSA’s assessment of Normal Operations captures ingestion pathways through the screening criteria used and by using the DRL to determine doses, whereas the DecomSA’s assessment of Accidents follows guidance from CSA N288.2 and focusses on inhalation (and external doses, for radionuclides). It is also important to note that, due to site access controls during Decommissioning Execution, the site would not be accessible to Recreational / Hunter receptors (hence, this receptor group was not assessed for the Decommissioning period). In the Postclosure phase, the 4th iteration PostSA includes a self-sufficient Indigenous receptor group that follows a traditional lifestyle. Exposure pathways for this receptor group include: - time spent on the shoreline for recreation and fishing; - time spent swimming in the river; - ingestion of fish caught from the river; and - hunting of game that uses the river for drinking water, foraging of wild foods and honey. Change to EIS: Sections 8.10 and 9.10 (Indigenous Socio-Economic and Health Baseline and Effects Assessments) and Section 9.8 (Human Health) have been revised to reflect the response above. References: <i>Canadian Standards Association (CSA). 2019. Guidelines for Calculating the Radiological Consequences to the Public of Release of Airborne Radioactive Material for Nuclear Reactor Accidents. N288.2.</i> DecomSA TSD: <i>Garisto, N., Kovacs, R., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
198	Health Canada	Section 8.6.1 Demolition of Above Grade Structures	p.8-38	Comment: The description of the sensitivity case in this section should refer to “dose rates” rather than “dose”. The statement should read: “The decrease in total demolition time does not affect the total amount of radiation being released, but results in a faster release of the same amount, thereby resulting in higher dose rates.”	Incorporated: The NPD Closure Project identified 17 locations in the Decommissioning Safety Assessment (DecomSA) TSD requiring revision: Sections 8.4.4, 8.5.2, 8.6.1, 9.4.2, Appendix D and Appendix E of the DecomSA TSD have been updated accordingly.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Expectation to Address Comment: Please ensure that “dose” and “dose rate” are used correctly throughout the document.	In the EIS, the following Sections have been reviewed and revised as needed, to ensure that “dose” and “dose rate” are used correctly: 2, 3.6, 4.1, 4.2, 8.1, 8.2, 8.7, 8.8, 9.1-9.14, 10, 11, 12. Changes to DecomSA TSD: Sections 8.4.4, 8.5.2, 8.6.1, 9.4.2, Appendix D and Appendix E of the DecomSA TSD have been revised to reflect the above response. Change to EIS: Sections 2, 3.6, 4.1, 4.2, 8.1, 8.2, 8.7, 8.8, 9.1-9.14, 10, 11 and 12 of the EIS have been revised to reflect the above response.
199	Health Canada	Section 8.6.2 Sizing Material	p.8-41	Comment: Section 8.6.2 does not identify PCB-containing paint dust as a potential air contaminant. Deposition of dust containing PCBs from paint on soil does not appear to have been assessed as a potential source in direct contact or ingestion exposure scenarios. Expectation to Address Comment: Address the potential effects from the release of PCB-containing dust from paint during decommissioning and sizing of materials, or provide a rationale for excluding it.	Resolved As: The concentrations of Polychlorinated Biphenyls (PCBs) in the solids at NPD is below the regulatory limit of 50 mg/kg thus is screened out as a contaminant of potential concern for the atmospheric modeling in the Decommissioning Safety Assessment Technical Supporting Document. If any PCBs above regulatory limits are discovered during decommissioning of the NPD facility, this waste would be deemed non-compliant and would be removed and dispositioned accordingly through CNL’s Hazardous Waste processes. The hazards associated with potential PCB-containing paint / caulking is discussed in the latest iteration of the DecomSA TSD and then screened out at the inventory stage due to the concentrations of PCBs in the solids at NPD being below the regulatory limit of 50 mg/kg. Because there is no potential effect, the EIS should also not include PCB-specific mitigation measures. Change to EIS: Section 4.4.1 of the EIS has been revised to include the following text: The concentrations of PCBs in the solids at NPD is below the regulatory limit of 50 mg/kg thus is screened out as a contaminant of potential concern for the atmospheric modeling in the DecomSA TSD. If any PCBs above regulatory limits are discovered during decommissioning of the NPD facility, this waste would be deemed non-compliant and would be removed and dispositioned accordingly through CNL’s Hazardous Waste processes.
200	Health Canada	Section 9.4.2 Public Receptors	N/A	Comment: The EIS notes that countermeasures can be put in place to reduce exposure from the ingestion pathway, but does not identify any specific countermeasures. The potential harms or disadvantages of long-term restrictions on the consumption of food/water/beverages (i.e., the countermeasures) may in turn have an effect on human health. Dose from ingestion is not expected to significantly increase total dose or change the conclusions of the assessment; however, additional information is required to support this conclusion. Expectation to Address Comment: Please assess potential doses due to ingestion to confirm whether countermeasures would be required. If so, discuss the effects of	Incorporated: The NPD Closure Project has updated the Decommissioning Safety Assessment (DecomSA) TSD in response to this comment. For Normal Operation releases, the DecomSA now calculates airborne releases, resulting air concentrations, and also resulting soil concentrations for the main hazardous Contaminants of Potential Concern (COPCs) (e.g. lead, asbestos, mercury, PCBs). Air concentrations and soil concentrations are compared against corresponding criteria, which in the case of soil, are protective of ingestion - and other soil-related - exposures. Air concentrations were found to be below screening levels (ambient air screening levels). Similarly, soil concentrations were found to be less than corresponding soil screening criteria. Screening criteria generally rely on their most restrictive variants, based on human health, where available. For radionuclides, the DecomSA compares release rates to Derived Release Limits (DRLs) for the NPD facility, the derivation of which includes ingestion pathways. Thus, ingestion-related pathways have been captured for non-radiological and radiological contaminants.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				these countermeasures on local producers and consumers, including Indigenous people.	Ingestion restrictions come from N288.2 (CSA 2019) which states that the ingestion pathway is not essential to consider for accidents safety assessments, due to the short-term nature of the events, and because in the event of an accident, countermeasures would be put in place. Discussion of countermeasures in the event of an accident are part of CNL’s Emergency Preparedness Program. The program is responsible for establishing emergency plans and procedures for the mitigation of harmful effects of emergencies as well as communication with local communities. Change to DecomSA TSD: Section 4.1.6.1 presents the soil criterion for the main hazardous COPCs. Sections 8.5.2 and 8.6.1.1 have been updated with soil concentrations for the main hazardous COPCs as a result of airborne releases. Accident scenario soil concentrations for COPCs can be found in Sections 9.3 and 9.5. Resolved As: In the Postclosure period, doses due to ingestion are calculated by the PostSA AMBER model. Peak doses are provided in Table 6-1 in the PostSA. In all plausible cases, the calculated dose is at least 10 times lower than the relevant dose criterion, despite conservative assumptions in many cases. No countermeasures would therefore be required. It is important to note that the calculated peak doses (presented in Table 6-1 of the PostSA TSD) for Normal Evolution, Disruptive Events, and Defence-in-Depth scenarios are all below their corresponding dose criteria of 0.25 mSv y⁻¹. “What if” scenarios are used to exhibit the robustness and performance of various natural and engineered barriers under extreme conditions. They involve parameter values or other properties such that the system is influenced in an exaggerated way, for example to show that such exaggerated conditions are impractical, do not negatively impact safety, or that they can be avoided by design. Thus, “What If” dose results are not compared to dose criteria. References: <i>Canadian Standards Association (CSA). 2019. Guidelines for Calculating the Radiological Consequences to the Public of Release of Airborne Radioactive Material for Nuclear Reactor Accidents. N288.2.</i> DecomSA TSD: <i>Garisto, N., Kovacs, R., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
201	Health Canada	9.4.2 Public Receptors, Table 9-36	p.9-43 to 9-44	Comment: Additional rationale for the use of a 1-hour exposure time for each scenario would provide additional clarity. However, given that there is also an assumption that the entire source term is released and contributes to dose, a longer exposure time would not be expected to change the conclusions of the report. Expectation to Address Comment: Please provide additional rationale for the use of a 1 hour exposure time for each scenario.	Resolved As: The 1-hour exposure time is an assumed nominal value applied to all accident scenarios, representing the time for CNL to notify the nearby resident receptors that an accident involving releases has occurred, and to communicate the necessary countermeasures. As acknowledged in the comment, the DecomSA TSD’s calculations assume that the entire source term is released within the release duration, and, that the release duration and exposure time are the same. So, the exact value of the exposure time and/or release time does not matter: if they are the same, the results will always be the same (1:1). This is a conservative approach.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
202	CNSC	Appendix F Air Quality Assessment for the NPD Project, Section F.2 Air Quality Regulations, Table F-1	p.F-1	Comment: Table F-1 cites the National Air Quality Objectives and the Canada Wide Standards for Particulate Matter and Ozone, as applicable to air quality criteria. These standards have been superseded by the CAAQS for PM_{2.5}, NO₂, SO₂ and ozone. These health-based federal standards are meant to establish ambient air targets for air pollutants that apply throughout Canada. Expectation to Address Comment: The air quality screening criteria for background air quality should be updated to the CAAQS for PM_{2.5}, NO₂ and SO₂. More specifically, the background air quality should be screened against the standards for 2015 and 2020, as the project execution phase may still be ongoing beyond 2020.	Incorporated: The new Canadian Ambient Air Quality Standards (CAAQS) for NO₂ was issued in 2017 November and the new CAAQS for SO₂ was issued in October 2016, both after the NPD Closure Project draft EIS was initiated. However, CNL will comply with standards or screening criteria which are in effect at the time of the project. Regarding the CAAQS for PM_{2.5}, the NPD Closure Project has incorporated the screening criteria from the revised standards. This implies the following: Background PM_{2.5} concentrations that were assumed to represent background air quality in the vicinity of the NPD Site include: ☐ 24-hour average 90th percentile PM_{2.5} concentration – 9 µg/m³; ☐ Annual average PM_{2.5} concentration – 5 µg/m³. The measured PM_{2.5} concentrations meet the new CAAQS for PM_{2.5}: 27 µg/m³ for 24-hour PM_{2.5} concentrations and 8.8 µg/m³ for annual PM_{2.5} concentrations that come into effect in 2020. There is therefore no implication to the project. Table F-1 of the Decommissioning Safety Assessment (DecomSA) TSD (page F-1 in the Appendix F: Air Quality Assessment for the NPD Closure Project), which is mentioned in the comment, has been updated to include the new CAAQS standards for NO₂, SO₂ and PM_{2.5}. The year when the CAAQS come into effect has been added to the table. Section 8.2.4.2 of the EIS has also been updated to include this information. Change to DecomSA TSD: Appendix F of the DecomSA TSD, specifically Table F-1, has been revised to reflect the above response. Change to EIS: Section 8.2.4.2 of the EIS has been revised to reflect the response above.
203	Health Canada	Appendix F Air Quality Assessment for the NPD Project, Section F.3 Air Dispersion Model Configuration	N/A	Comment: Employee traffic and non-truck traffic to and from the NPD site do not appear to have been included in the air dispersion model. Also, it is not clear if ventilation for the purposes of hydrogen gas mitigation has been accounted for in the air dispersion model. Ventilation may have an effect on air emissions for other contaminants. Excluding emissions from certain activities may underestimate the overall pollutant concentrations and exposure levels, and therefore, underestimate potential health risks. This is especially important for pollutants such as PM and NO₂ that have no threshold for health effects. Expectation to Address Comment: Please revise the assessment of air emissions to include all relevant sources, or provide a rationale for their exclusion.	Resolved As: The following clarifications are provided: <i>a) With respect to Employee Vehicle Traffic:</i> Employee traffic and non-truck traffic, to and from the NPD site, was not included in the air dispersion model because it is a minor source of emissions. The number of employees today is approximately 20 people, and this employee traffic <i>is</i> included in the background levels. During decommissioning, only an additional 20 contractors are anticipated to be arriving at/leaving from the NPD site, which is minor compared to Hwy 17 traffic. In fact, for National Pollutant Release Inventory (NPRI) reporting in 2017, a year where employee and contractor traffic would be considered comparable to the volume predicted for the project, the total estimated vehicle-kilometers travelled (kVt) were below reporting thresholds. Additionally, the NPD Closure Project conducted an assessment to calculate the additional contribution of employee vehicles to the project emissions. This assessment found that consideration of employee vehicle emissions does not change the conclusions of the NPD air quality assessment. Haul truck traffic from Hwy 17 to the batch mixing plant, and from the batch mixing plant to the placement areas, <i>has</i> been accounted in the air dispersion modelling. <i>b) With respect to the Ventilation System:</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					The facility ventilation system will be deactivated as part of the planned decommissioning activities. CNL may use local supplementary ventilation equipment, equipped with HEPA filters, if such a need is identified during the preparation of work control and radiation protection plans (which are prepared before decommissioning tasks are undertaken). There are only a few areas of concern within the facility where local supplementary ventilation may be required (i.e. boiler room). Additionally, local supplementary ventilation would only be required for relatively short periods of time (i.e. grouting activities) thus unlikely to have a significant contribution on the overall air quality. Therefore, the existing assessment of the air emissions accounts for all relevant sources.
204	CNSC	Appendix F Air Quality Assessment for the NPD Project, Section F.3.5 Source Characterization	p.F-8 to F-9	Comment: One maximum scenario of the predominant project activities, which were identified to interact with the atmospheric environment (air quality), was modelled in the assessment. Given the number of unknowns associated with the proposed project, justification should be provided for why one modelling scenario was sufficient to assess and bound the effects of the project. Expectations to Address Comment: Please provide justification for why additional modeling scenarios were not carried out for air quality. If sensitivity analyses were conducted, a summary should be included in the TSD.	Resolved As: CNL believes that additional modeling scenarios for air quality are not required because the scenario that was modelled in the air quality assessment is a bounding scenario. It is bounding because: 1. It uses conservative maximum emission estimates for the different anticipated project activities; 2. It assumes that the maximum anticipated amount of equipment is used for each of project activities; and, 3. All of the activities were assumed to occur simultaneously.
205	Health Canada	Appendix F Air Quality Assessment for the NPD Project, Section, Section F.4 Air Modelling Results, Table F-7	p.F-13	Comment: Table F-7 indicates that the 1-hour average upwind background NO₂ emissions fall within the CAAQS category of Green Management Level. Predicted emissions would result in air quality within the Yellow Management level. The new CAAQS for NO₂ considers NO₂ to be a non-threshold substance; therefore, any increase in exposure will result in an incremental population risk. PM_{2.5} has no population-health threshold for human health effects. Guideline values should not be construed as limits to which “polluting up to” is allowed. For additional information, refer to the CAAQS at: https://www.ccme.ca/en/current_priorities/air/caaqs.html. Expectation to Address Comment: Acknowledging that PM_{2.5} and NO₂ have no threshold for health effects, please include mitigation measures which reflect the principles of keeping clean areas clean and continuous improvement, which aim to reduce population exposure associated with the proposed project. In addition, as per Comment no.148, the air quality screening criteria for background air quality should be updated to the new CAAQS for PM2.5, NO₂ and SO₂.	Incorporated: a) With respect to mitigation measures: The project plans to implement appropriate mitigation measures to reduce the population exposure associated with the project. The mitigation measures include (but are not limited to) the following: • Post speed limits on-site to minimize dust emissions, • Limit idling of vehicles and equipment on-site to minimize emissions, • Standard forms of dust mitigation (e.g. water spray misting) will be utilized during demolition and material sizing activities, • Roads and areas will be wetted / misted as needed in dry conditions to minimize dust generation, and • Regular maintenance of machinery to efficiently reduce emissions. The above discussion has been added to Appendix F (Section F.4.1.4) of the Decommissioning Safety Assessment (DecomSA). b) With respect to criteria: Appendix F (Table F-1) of the DecomSA TSD has been revised to include the use of the updated CAAQs for PM_{2.5}, NO₂ and SO₂ as the screening criteria for background air quality. Change to DecomSA: Table F-1 and Section F.4.1.4 of the DecomSA TSD has been revised to reflect the response above.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
206	Health Canada	Appendix F Air Quality Assessment for the NPD Project, Section, Section F.4 Air Modelling Results, Table F-7	p.F-13 to F-14	Comment: The statement that “[t]he predicted 24-hour and average annual NO₂ concentrations are also less than the baseline concentrations” appears to conflict with the data presented in Table F-7. Expectation to Address Comment: Please clarify the conflicting information provided in the text and Table F-7.	Incorporated: The NPD Closure Project has removed the following sentence from the Decommissioning Safety Assessment (DecomSA) TSD. <i>“The predicted 24-hour and average annual NO₂ concentrations are also less than the baseline concentrations”.</i> It has been replaced with: <i>“The predicted incremental 24-hour and average annual NO₂ concentrations are also less than the baseline concentrations.”</i> Change to DecomSA TSD: Appendix F – Section F.4.1.1 of the DecomSA TSD has been revised to reflect the above response.
207	ECCC	Appendix F Air Quality Assessment for the NPD Project, Tables F-7, F-8 and F-9	p.F-13 to F-16	Comment: The cumulative maximum predicted concentrations for NO₂, SO₂ and particulate matter are shown for sensitive receptors (R1, R2, R3 and R4), but not at the site study boundary or property line of the facility. The analysis of air quality should incorporate the cumulative maximum ground level concentrations for NO₂, SO₂ and particulate matter at the study boundary and at the property line. In order to implement appropriate mitigation and monitoring to verify EA predictions, the air quality assessment should be based on property line concentrations. Expectation to Address Comment: Please provide the modeling results for cumulative maximum concentrations at the property line in the appropriate tables of Appendix F and shown on isopleths for each of the pollutants.	Incorporated: The NPD Closure Project has added additional text to Appendix F of the Decommissioning Safety Assessment (DecomSA) TSD (Air Quality Assessment), to clarify the following: a) The following NPD Closure Project emission sources were included in the modelling: batch plant, stock pile, internal roads and demolition area. The model results presented include all sources. These are shown in Figure F--5 in the DecomSA TSD). b) The modelling results have been updated to present cumulative (predicted + background) concentrations. c) New tables have been added to Appendix F of the DecomSA, showing these maximum cumulative (i.e., predicted + background) concentrations of NO₂, SO₂, TSP, PM₁₀ and PM_{2.5}. In addition to the discrete receptor locations, maximum cumulative concentrations at the property boundary line have been added to the tables with modelling results. Cumulative annual concentrations at fenceline locations are also presented in the tables. Figures have been updated also to present cumulative annual concentrations (in the form of contour lines) over the Local Study Area. Change to DecomSA TSD: Appendix F of the DecomSA has been revised to clarify modeling domain and emission sources, and present updated results.
208	Health Canada	Appendix F Air Quality Assessment for the NPD Project, Section, Section F.4 Air Modelling Results, Table F-9	p.F-16	Comment: The metric for annual PM_{2.5} in the CAAQS is based on the 3-year average of the <u>annual average</u> concentrations, not of the 98th percentile as indicated in the footnote to Table F-9. Expectation to Address Comment: Please confirm that the predicted concentrations are presented in the same format as the regulatory criteria.	Incorporated: The NPD Closure Project confirms that in Table F-12 of the Decommissioning Safety Assessment (DecomSA) TSD, the metric used for annual PM_{2.5} in the CAAQS <u>is</u> based on the 3-year average of the <u>annual average</u> concentrations. The table footnotes have been revised to add clarification: ^a The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations (CCME 2012b). ^b The 3-year average of the annual average concentrations (CCME 2012b). Change to DecomSA TSD: Appendix F – Section F.4.1.3 of the DecomSA TSD has been revised to reflect the above response. References:

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Guidance Document on Achievement Determination Canadian Ambient Air Quality Standards For Fine Particulate Matter and Ozone PN 1483 978-1-896997-91-9, https://ccme.ca/en/res/pn1483_gdad_eng-secured.pdf</i>
Ecological Risk Assessment Technical Supporting Document					
209	CNSC	Section 2.1 Site Characterization Also applicable to Section 8.5.3 Soil Quality of the main EIS	p.2-1	Comment: Section 8.5.3 of the main EIS provides a thorough description of soil quality at the NPD site. Clause 6.2.2 of CSA standard N288.6-12, <i>Environmental risk assessments at class I nuclear facilities and uranium mines and mills</i> makes reference to Annex C (Site Characterization Components), which provides the number and range of characteristics and parameters that could be considered as part of the site characterization (e.g., relevant background concentrations (including soil, vegetation, etc.), physical and chemical characteristics of soil (including soil type, soil texture, bulk soil density, etc.), identification of plumes and migration, and anticipated contaminant behaviour). This information does not appear to be present in the main EIS or the EcoRA TSD, although it is needed in order to fully assess all potential environmental pathways, which may be impacted by the proposed project. Expectation to Address Comment: The main EIS should provide a thorough description of the site characterization components indicated above for consistency with CSA N288.6-12 and in order to support the results of the EcoRA screening for COPCs, as appropriate.	Resolved As: The crucial information required for the EIS and Ecological Risk Assessment (EcoRA), i.e., the baseline soil quality data, was available and presented in order to conduct the screening against soil quality guidelines in the EIS, to determine constituents of potential concern (COPCs) in soil. Parallel to the preparation of the EIS, the NPD Closure Project conducted a systematic characterization for the purposes of an updated environmental liability assessment of the NPD site in 2016 and 2017, consisting of Phase I and Phase II Environmental Site Assessments (ESAs). The Phase I ESA (ORAU 2017) was conducted based on CSA Standard Z678-01 (CSA 2012b) and nuclear industry site characterization guidance (Multi-Agency Radiation Survey and Site Investigation Manual, referred to as “MARSSIM”). The Phase II ESA (Golder 2017b; McVeigh 2018b) was conducted based on CSA Standard Z769 (CSA 2013), O. Reg 153/04 and the requirements of the Characterization Plan (ORAU 2016) that was developed from the Phase I ESA. These site characterizations have provided additional chemical and radiological baseline data for soil, groundwater, and sediment that have been incorporated into Section 8 of the updated EIS. As noted by the reviewer, Annex C.2 (Site Characterization Components) of the CSA Standard N288.6 provides a list of topics that could be included in the site characterization, as applicable to the site and goals of the ERA. The specific topics and characteristics mentioned by the reviewer in the comment are listed below along with an explanation of how they have been incorporated into the EIS and Technical Supporting Documents (TSDs): - Annex C.2(d) of N288.6: geological and hydrological setting such as, soil type, soil moisture, soil grain size, soil porosity, soil stratigraphy, bulk soil density, depth of soil - Site-specific soil characteristics such as bulk density, moisture content, depth and erosion rate are not available for the NPD site. As such, soil modelling in the PostSA TSD used default parameters for soil provided in N288.1. - Consistent with CSA N288.6 Clause 6.2.3.2, these generic default parameters were used in the absence of site-specific data. - Annex C.2(g) (CSA 2012): contamination setting (if applicable), such as existing contaminants in environmental media, contaminant levels or concentrations, locations of contaminants (distribution across site), physical state of the released material, identification of plumes and migration, anticipated contaminant behaviour. - There are no plumes on the NPD site. The Historical site assessment report (ORAU 2017) compiled all previous characterization work. Killey (2014) demonstrated that there were no groundwater plumes. The Phase II ESA (Golder 2017b) results discuss localized areas of soil impact (which were remediated in spring 2018) but the Balance of Site Characterization Report (i.e MARSSIM results) demonstrates no radiological impacts or plumes (McVeigh 2018b). - Annex C.2(i) (CSA 2012): background concentration information relevant to the site. - The EIS includes the following baseline soil quality data relevant to the site in Section 8.5.3: metals and organic compounds in test pit samples in the Site and Local Study Areas, as well as tritium concentrations in soil vapour in the Site, Local and Regional Study Areas. Results discuss localized areas of soil impact (which were remediated in spring 2018).

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					○ As mentioned above, site investigations of the NPD site in the form of a Phase II ESAs were completed parallel to the EIS preparation in 2016 and 2017, which provided additional chemical and radiological baseline data for soil, groundwater, and sediment. This includes background concentration information for Am-241, Co-60, Cs-127, Eu-152, U-235, U-238, H-3, C-14, Sr-90, and Tc-99) in soils at the NPD soil. This additional baseline information has been incorporated into Section 8.5.3 of the EIS. ● Annex C.2(j) (CSA 2012): currently available environmental monitoring data and its intended uses within the context of the assessment, such as all available measurement data from sampling activities, summary stats, number of samples, depth of samples, a map showing sampling locations. ○ Available soil monitoring data (for soil quality) are presented in Section 8.5.3 of the EIS. ○ More recent soil monitoring data from the Phase II ESA includes extensive sampling of the NPD site as well the dataset includes analysis statistics (e.g., 90th percentile, maximum, minimum, mean) and maps showing sampling locations. This additional baseline information has been incorporated into Section 8.5.3 of the EIS. Overall, although additional information is now available since the draft EIS was prepared, the results of the Phase I and Phase II ESAs (ORAU 2017; Golder 2017b, McVeigh 2018b) that have provided additional baseline environmental data for inclusion in the final EIS did not identify any new conventional or radiological contaminants of concern at the NPD site, thus verifying the results of the draft EIS COPC screening in soil, groundwater, and sediment. Change to EIS: Section 8.5.3 (Baseline Characterization) has been updated to include the additional chemical and radiological baseline data for soil, groundwater, and sediment that is provided in the above-mentioned site characterization studies. Section 2.6.4 (Executive Summary – Baseline) has also been updated. References: <i>Canadian Standards Association (CSA). 2022. Environmental Risk Assessment at Nuclear facilities. CSA Standard N288.6-22.</i> <i>Canadian Standards Association (CSA). 2012b.CSA Standard Z678-01. Phase I Environmental Site Assessment. [Reaffirmed: 2012].</i> <i>Canadian Standards Association (CSA). 2013. CSA Standard Z679-00. Phase II Environmental Site Assessment. [Reaffirmed: 2013].</i> <i>Golder Associates Limited. 2017b. Environmental Site Assessment Report – NPD Closure Project. 64-509410-REPT-006. Revision 0.</i> <i>McVeigh, A. 2018b. NPD Balance of Site Characterisation Report, 64-509410-REPT-009, April.</i> <i>Oak Ridge Associated universities (ORAU). 2016. Characterization Plan for Nuclear and Conventional Hazards of the Nuclear Power Demonstration Waste Facility, Rolphton, Ontario. (CNL 64-509410-PLA-001 Revision 0)</i> <i>Oak Ridge Associated Universities (ORAU). 2017. Historical Site Assessment (HSA) for the Nuclear Power Demonstration Waste Management Facility, Rolphton, Ontario. 64-509410-ASD-001, Revision 1, May. [Phase I ESA]</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
210	CNSC	Section 2.2 Receptor Selection Also applicable to Section 4.2 Toxicological Benchmarks, Table 4.6, p.4-9	p.2-2	Comment: Toxicity reference values (TRVs) used in the assessment of SARA-listed species were derived as a fraction (10%) of the literature-derived TRVs used for indicator / surrogate species. While this approach is acceptable, it is unclear what, if any, species-specific criteria were used in this selection / substitution. For example, it appears that a shrew was used as a surrogate for eastern wolf, a protected species. A surrogate receptor can be used to evaluate risk for a SARA-listed species; however, the risk characterization must be cognizant of differences in the assessment and measurement endpoints. Surrogate selection for SARA-listed species may be done using published scientific literature (e.g., Weins et al., 2008, Banks et al., 2010), as well as other reliable sources, such as the U.S. Environmental Protection Agency (Dwyer <i>et al.</i>, 1995) and the U.S. Fish and Wildlife Service (Dwyer <i>et al.</i>, 2005). Expectation to address comment: The selection of surrogate species for SARA-listed species should be based on available, credible and scientifically defensible information. References: Banks, J.E., A.S. Ackleh, and J.D. Stark (2010). <i>The use of surrogate species in risk assessment: using life history data to safeguard against false negatives</i>. Risk Analysis. 30 (2): 175-182. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones (1995). <i>Use of surrogate species in assessing contaminant risk to endangered and threatened species</i>. U.S. Environmental Protection Agency, Final Report – September, 1995. EPA/600/R-96/029. 78 pp. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingersoll, J.L. Kunz, D.W. Whites, T. Augspurger, D.R. Mount, K. Hattala, and G.N. Neuderfer (2005). <i>Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals</i>. Arch. Environ. Contam. Toxicol, 48: 143-154.	Incorporated: The following species listed under the <i>Species at Risk Act</i> (SARA) as having either a Special Concern, Threatened, or Endangered status were assessed in the Ecological Risk Assessment (EcoRA): • Blanding’s Turtle and Eastern Milksnake (reptiles); • Monarch Butterfly (insect); • Chimney Swift (bird); • Little Brown Myotis; and Eastern Wolf (mammals). Sufficient data were not available for the quantitative assessment of the Monarch Butterfly and Eastern Milksnake, as well as Blanding’s Turtle for exposure to non-radiological constituents of potential concern (COPCs). As such, these Species at Risk (SAR) were assessed qualitatively where inferences were made regarding their exposure. Toxicity reference values (TRVs) for the EcoRA update were obtained from U.S. EPA (2005). This reference provides a single preferred mammal TRV and a single preferred avian TRV, that were derived based on numerous studies and various test species. Section 4.2 of the EcoRA, which discusses TRV selection for chemical exposure, has been updated to explain the methodology by which TRVs were selected. Change to EcoRA TSD: Section 4.2 of the EcoRA TSD has been revised to reflect the above response. References: <i>U.S. EPA (2005) Ecological Soil Screening Levels for Lead, OSWER Directive 9285.7-70. March</i>
211	CNSC	Section 2.2 Receptor Selection, Tables 2.2 and 2.4	p.2-11 and 2-13	Comment: In the selection of aquatic receptors, the American eel (<i>Anguilla rostrata</i>), a species identified as Threatened under the Committee on the Status of Endangered Wildlife in Canada (2012) and as Endangered under the <i>Ontario Endangered Species Act</i> (2007), has not been assessed.	Resolved As: The most significant threats faced by American Eels in Ontario are associated with migration (e.g., barriers to upstream migration, such as hydro-electric generating stations and mortality/injury from downstream passage through hydro-electric generating station turbines). The American Eel has not been included as a receptor because the project is not expected to engage in any activities which threaten the species or damage/destroy its habitat.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		Also applicable to Section 5.3 Species at Risk, p.5-11		Expectation to Address Comment: Please provide a justification for excluding the American Eel in the selection of aquatic receptors in the EcoRA.	Exposure assessment to biota in the aquatic environment is performed for fish generically (both benthic and pelagic) thus representative of the American Eel as well.
212	ECCC	Section 2.4.2 EcoRA Screening Also applicable to the main EIS, Section 8.7 Ambient Radioactivity, Table 8.7-2	p.2-16	Comment: It is necessary to understand the existing conditions and corresponding existing impacts on the environmental components and VCs prior to evaluating effects of the project. Section 8.7 of the main EIS includes information regarding existing conditions of radioactivity (i.e., dose rates based on thermoluminescent dosimeters (TLDs)). However, TLD data (in Table 8.7-2) is appropriate for HHRAs rather than EcoRAs. An example of missing EcoRA information is the lack of a risk assessment to non-human biota on-site soil concentrations of radiological COPCs. Expectation to Address Comment: Please revise the EcoRA to include a full risk assessment (radiological and non-radiological) of baseline environmental conditions at the NPD site, and offsite in the Local and Regional Study Areas, where possible.	Resolved As: From CSA Standard N288.6 for radionuclides: (1) CSA N288.6 states that site characterization should include the background concentration (Clause 6.2.2.1 and Clause C.2 in Annex C). This was done at NPD based on the Phase I and Phase II Environmental Site Assessment (ESA) for the site (Golder 2017b). (2) For dose estimate, CSA N288.6 states “The radiological dose calculations and dose limits in this Standard are defined in terms of incremental dose, which is the dose resulting from contamination in question. Natural background radiation, including radon, is excluded from the dose limits and calculations” (Clause 6.3.4.2.2). Therefore, the NPD Ecological Risk Assessment (EcoRA) screens and assesses incremental radioactive dose associated with the project. (3) For exposure estimate of non-radioactive contaminants, CSA N288.6 states that “When all exposure pathways and background sources considered, if the [Hazard Quotient] HQ is below a value of 1.0, no potential exists for an adverse effect for the selected receptors. However, when an assessment considers select media, and there are no potential exposure pathways from other sources (e.g. natural background levels in water, food or air), the calculated HQ is compared to a more conservative value of 0.2. This is consistent with the approach taken by Ministry of the Environment in the development of the soil standards (MOE 2011). The same approach is referred to by HC (2004).” (Clause 6.5.2.3). The NPD EcoRA screens and assesses total (incremental from the project + baseline) contaminant concentrations (including Pb and Hg). Please note that the EcoRA was carried out for maximum exposure concentrations for both radioactive and non-radioactive contaminants. As such, the assessment bounds the concentrations at the NPD site, as well as the Local and Regional Study Areas. References: <i>Canadian Standards Association (CSA). 2022. CSA Standard N288.6-22. Environmental Risk Assessments at Nuclear Facilities.</i> <i>Golder Associates Limited. 2017b. Environmental Site Assessment Report – NPD Closure Project. 64-509410-REPT-006. Revision 0.</i> <i>Health Canada (HC). 2004. Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA). https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/contaminated-sites/federal-contaminated-site-risk-assessment-canada-part-guidance-human-health-preliminary-quantitative-risk-assessment-pqra-version-2-0.html</i> <i>Ontario Ministry of the Environment (MOE). 2011. Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act. 2011 July 01. https://www.ontario.ca/page/soil-ground-water-and-sediment-standards-use-under-part-xv1-environmental-protection-act.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
213	CNSC	Section 2.4.2 EcoRA Screening	p.2-16 to 2-18	Comment: It is unclear why a number of non-radiological hazardous substances were not considered in the assessment of exposure to workers (e.g., diesel exhaust and biological substances (mold spores)). Expectation to Address Comment: Please provide a rationale for excluding the above-noted COPCs from the assessment of exposure to workers.	Incorporated: Exhaust emissions from vehicles and equipment are assessed by the NPD Closure Project in the Decommissioning Safety Assessment (DecomSA) and in the Greenhouse Gas Assessment TSD. More specifically, Section 8 of the DecomSA TSD assesses Normal Operations. It is broken down into several subsections based on the main project activities. Atmospheric Environment effects are assessed for each main project activity. Appendix F of the DecomSA TSD presents the supporting detailed Air Quality Assessment, which includes assessing vehicle/equipment exhaust. Appendix F describes the activities, equipment estimates, emission estimates (exhaust and other emissions), dispersion modelling, and effects assessment. The level of detail presented in Appendix F has been increased in the updated 2021 DecomSA TSD. Section 5.2 of the DecomSA TSD outlines the hazardous contaminants assessed. A brief discussion of mold has been added to Section 5.2. Change to EcoRA TSD: Section 2.4.2 of the EcoRA TSD (the basis of the comment) has been updated (as needed) to reflect any change to the findings of the DecomSA. Change to DecomSA TSD: The DecomSA TSD has been updated to include a greater level of detail in the Air Quality Assessment, and, consideration of mold. References: <i>DecomSA TSD: Garisto, N., Kovacs, R., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i>
214	ECCC	Section 2.4.2 EcoRA Screening Also Applicable to Section 3.4 Exposure Point Concentrations (p.3-4 to 3-18)	p.2-16 to 2-38	Comment: The EcoRA seems to have used the same methodology for assessing radiological risk as for non-radiological risk. That is, individual radiological COPCs that did not exceed the “No Effects Concentration” levels were screened out of the EcoRA. This approach resulted in all radionuclides being screened out except for one (i.e., Ag-108m). Generally, this method is standard and acceptable for non-radiological COPCs since synergistic toxicological effects between chemical COPCs are difficult to ascertain. On the other hand, radiological dose is typically a function of all forms of ionizing radiation due to radioactive substances that “radiate” with common mechanisms. Therefore, radiological dose is typically calculated as an aggregation for all radiological COPCs, and expressed as a total dose for the purposes of assessing risk. In this EcoRA, all of the dominant radionuclides (e.g., tritium, C-14, Cl-36, Nb-59) were screened out. Therefore, the dose calculations in the EcoRA underrepresent the total potential radiological dose. The radiological risk assessment is therefore incomplete.	Resolved As: With respect to: “<i>Please include all dominant radiological COPCs in the calculation...</i>” Appendix C of the NPD Closure Project’s Ecological Risk Assessment (EcoRA) TSD includes screening tables showing the dominant radionuclides in the calculation of total radioactive dose and their cumulative fraction of the screening sum of fractions. For example, for the What-If – Mass Excavation scenario, 11 radionuclides are included (Am-241, C-14, Cl-36, Cs-135, H-3, Ni-59, Ni-63, Pu-239, Tc-99, Th-230, and U-238). They contribute over 97.67% of the total dose (Table C.16 of the EcoRA TSD). The screening criterion are: CNL (2019b), ERICA Tool (2019), US DOE (2019) and SENES (NWMO) (2008). With respect to: “<i>...in all three project phases...</i>” All three project phases are assessed: The Postclosure Safety Assessment (which includes both Institutional Control (IC) and beyond IC) bounds the Institutional Control phase by using the maximum concentration of each radionuclide, as well as, their location over both IC and post IC phases. The Decommissioning Execution phase was also included. References: <i>Canadian Nuclear Laboratories (CNL). 2019b. Environmental Risk Assessment Chalk River Laboratories. ENVP-509220-REPT-003, Revision. 0</i> <i>Environmental Media Concentrations, ERICA Tool, updated 2019 June 04.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Expectation to Address Comment: Please include all dominant radiological COPCs in the calculation of total radiation dose for all biota evaluated, in all three project phases, at relevant (ecological and regulatory) locations.	<i>SENES Consultants Limited. 2008. No-Effect Concentrations for Screening Assessment of Radiological Impacts on Non-Human Biota. Report prepared for NWMO. NWMO TR-2008-02.</i> <i>US DOE. 2019. A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota. DOE-STD-1153-2019.</i>
215	CNSC	Section 2.4.2 EcoRA Screening	p.2-17	Comment: Section 2.4.2 states that radionuclide concentrations in air “were converted” to corresponding soil concentrations using available partition coefficients (K _d values) and screened against available benchmarks (No-Effect Concentrations) for non-human biota. This statement is somewhat questionable as soil concentrations cannot be derived from air concentrations using K _d values only. In fact, a dynamic compartment model is often used for this purpose, which expresses changes of radionuclide concentrations in soil as the balance between the input of activity due to wet and dry deposition from the air, and losses due to various removal processes, including radioactive decay, erosion, leaching, volatilization and cropping (refer to Clause 6.3.2 in CSA N288.1-14, <i>Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities</i>). Given that the EcoRA does not appear to identify and discuss the soil model and the uncertainties associated with the model, the results of the radionuclide soil concentration screening, and validity of respective conclusions, are difficult to ascertain. Furthermore, the EcoRA is not in formal compliance with CSA N288.6-12, <i>Environmental risk assessments at class 1 nuclear facilities and uranium mines and mills</i> , which specifically states that “the ERA shall identify and discuss the soil model and the uncertainties associated with the model and data used in preparing the assessment” (refer to Clause 8.2.2). Expectation to Address Comment: The EcoRA TSD should identify and discuss the soil model used and the uncertainties associated with the model. It should also discuss the data used in preparing the assessment for consistency with CSA N288.6-12 and to support the results of the EcoRA screening for COPCs, as appropriate.	Incorporated: The NPD Closure Project acknowledges that the previous version of the Ecological Risk Assessment (EcoRA) TSD incorrectly made reference to partition coefficients. This has been corrected in the text. The following summarizes how the radionuclide concentrations in air were converted to soil concentrations. The radionuclide concentrations in air were first converted to corresponding soil concentrations using either air-to-soil transfer factors for loam for the CRL site (Cs-137 and Co-60) from N288.1-20 (CSA 2020) or in the case of tritium and carbon-14, using specific activity models from N288.1-20 (CSA 2020). Specific activity models are based on the concept of isotope exchange between tissues and ambient media. The air concentrations of chemicals (lead and mercury) were converted to corresponding soil concentrations using an air-to-soil transfer model. The N288.1-14 Model of HTO in the Environment is shown in Figure 2.3 of the EcoRA TSD with Section 2.4.2.1.1 of the EcoRA TSD describing the use of a specific activity model for tritium that accounts for its extreme mobility and tendency to readily exchange with hydrogen in water. The specific activity model for C-14 was used to determine the transfer of C-14 from air to plants and animals based on the air concentration, where the transfer also accounted for the contribution from soil (N288.1-20, Clause 6.4.9.1; CSA 2020). To determine the C-14 concentration in soil from the air concentration, an alternative approach described by Yu <i>et al.</i> (2001; as cited in IAEA 2009) was used. This is described in Section 2.4.2.1.2 of the EcoRA TSD. In addition to tritium and C-14, airborne releases of Co-60 and Cs-137 are also expected during some decommissioning scenarios. Corresponding concentrations in soil were calculated by applying air-to-soil transfer factors to the air concentrations. The air-to-soil transfer factors for loam for the CRL site were taken from CSA N288.1-20 (CSA 2020) and are summarized in Table 2.14 of the EcoRA TSD. As with the radionuclides, airborne releases of chemicals from the NPD facility can be transported through the air and deposited on the soil around the facility. Section 2.4.2.1.4 of the EcoRA TSD describes the method used to predict the concentration of lead and mercury in soil resulting from airborne releases. Lead and mercury concentrations in soil were converted to air concentrations, using the air-to-soil model as described in CSA N288.1-20 (CSA 2020), clause 6.3.3.1. Overall, the approach used to support the results of the EcoRA screening for COPCs is consistent with Clauses 7.2.5.3.1 and 7.2.5.3.3 of N288.6-22 (CSA 2022). See Section 2.4, as follows, and Sections 2.4.1.1 and 2.4.1.2 for further details: “Concentrations of radiological and non-radiological contaminants in environmental media were predicted in the Decommissioning Safety Assessment (DecomSA) Technical Supporting Document (TSD) and Postclosure Safety Assessment (PostSA) TSD for the Decommissioning and Postclosure Phases of the Project, respectively. The environmental data provided for each decommissioning and postclosure scenario were screened against applicable environmental quality criteria to identify radiological and non-radiological constituents of potential concern (COPCs) for inclusion in the EcoRA.” In line with N288.6-22 (CSA 2022), several conservative assumptions and parameter values were selected in relation to the COPC screening (Section 2.4) and exposure assessment (Section 3) in the EcoRA TSD:

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Section 2.4.1.1 of the EcoRA TSD identifies that during the Decommissioning phase “All contaminants emitted into air were assumed to deposit to soil from where potential impacts to the terrestrial environment were assessed in the EcoRA.” The model was run assuming that the entire release of tritium was in the form of tritiated water vapour (HTO), which is a conservative assumption (Section 2.4.2.1.1). With respect to lead and mercury, these parameters are naturally removed from the soil by many mechanisms including soil erosion, leaching and surface run-off. For this assessment, the only contaminant removal mechanism from soil that was considered was leaching, which is a conservative assumption (Section 2.4.2.1.4). In the post-closure phase (Section 2.4.1.2), it is noted that “For each scenario, the maximum concentration of each contaminant in each environmental medium that was predicted over the entire assessment period (10,000 years) was used in the screening process.” Thus, although the timing of each peak concentration differed between contaminants and environmental media, the use of these combined maximum concentrations for each scenario is a very conservative approach. Additionally, because all maximum contaminant concentrations in soil were predicted for the Garden Area (vs. concentrations predicted for Grazing Area soil), only Garden Area soil concentrations were screened and included in the EcoRA TSD. Section 6.0 of the EcoRA TSD discusses uncertainties and conservatism in the EcoRA. As noted in the CSA N288.6-22 (Clause 8, CSA 2022) standard, uncertainties exist in the EcoRA that need to be identified and evaluated for each stage of the risk assessment. Uncertainties will likely lead to an overestimation or underestimation of exposure, toxicity or risk and may occur in the following areas of the EcoRA: (a) Problem formulation, as a result of available ecological and toxicological information; (b) Exposure assessment, as a result of uncertainty in monitoring data and models; (c) Toxicity/effects assessment, due to the limited availability of data for some ecological species, life stages, or endpoints of interest, or extrapolation from laboratory to field conditions; and, (d) Risk characterization, due to uncertainties in exposure or toxicity, or uncertainties about the combined effects of multiple contaminants or physical stressors. In recognition of these uncertainties, conservative assumptions were used throughout the assessment to ensure that the potential for an undue effect would not be underestimated. Specifically, Section 6.2.1 of the EcoRA TSD discusses uncertainty with the exposure point concentrations used for COPC screening and subsequent exposure assessment. Table 6.1 of the EcoRA TSD summarizes uncertainties and identifies that the use of model predictions along with maximum concentrations to characterize exposures likely leads to and overestimate of exposures. Change to EcoRA TSD: Section 2 of the EcoRA TSD has been revised to correct the inconsistencies in the text and terminology (in particular, references to the term K_d) with respect to deriving contaminant soil concentrations. References: <i>Canadian Standards Association (CSA). 2020. Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities. CSA Standard N288.1-20.</i> <i>Canadian Standards Association (CSA) Group. 2022. N288.6-22 Environmental Risk Assessment at Class I Nuclear Facilities and Uranium Mines and Mills. June.</i> DecomSA TSD: <i>Garisto, N., Kovacs, R., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i> International Atomic Energy Agency (IAEA). 2009. <i>Quantification of Radionuclide Transfers in Terrestrial and Freshwater Environments for Radiological Assessments</i>, IAEA-TECDOC-1616, IAEA, Vienna.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. <i>Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> Yu, C., A.J. Zielen, J.J. Cheng, D.J. Lepoire, E. Gnanapragasam, S. Kamboj, J. Arnish, A. Wallo, III, W.A. Williams, and H. Peterson. 2001. <i>User’s Manual for RESRAD Version 6. Argonne National Laboratory, Argonne, IL.</i>
216	CNSC	Section 2.4.2 EcoRA Screening	p.2-17	Comment: The Decommissioning Safety Assessment model was used to predict radionuclide concentrations at each receptor location considered in the assessment. Similarly, the Postclosure Safety Assessment model was used to predict radionuclide concentrations over time in all affected environmental media, such as groundwater, soil, sediments and surface water, in each scenario considered. It is, however, unclear what model input parameters and assumptions were used in making these predictions and the resulting radionuclide concentrations used in the screening process. Expectation to address comment: Please provide information on the two aforementioned models used, including but not limited to input parameters, assumptions and uncertainties with respect to the predicted radionuclide concentrations used in the screening.	Resolved As: The scope of the Ecological Risk Assessment Technical Support Document (EcoRA TSD) was to assess risks to ecological receptors resulting from NPD Closure Project emissions during the various phases of the project, as estimated in the Decommissioning Safety Assessment (DecomSA) and Postclosure Safety Assessment (PostSA) TSDs. It was not an objective of the EcoRA TSD to scrutinize the predicted emissions, but rather to apply them in the risk assessment. For details on the input parameters and assumptions that were used in the safety assessment models, the reviewer is referred to the DecomSA TSD and Appendix E – Conceptual Models and Data of the PostSA TSD. References: DecomSA TSD: Garisto, N., Kovacs, R., and Tong, X. 2021. <i>Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i> PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. <i>Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
217	CNSC	Section 2.4.2 EcoRA Screening	p.2-17	Comment: CSA N288.1-14, <i>Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities</i> is referenced in Section 2.4.2, as well as in other sections of the EcoRA and other Technical Support Documents. Given the completion / publication dates of CNL’s EIS-related documents, it is not clear whether the applicable conclusions and supporting calculations based on CSA N288.1-14 methodology could be affected by recent updates to the standard (i.e., first update in May 2017 and second update in November 2017). Expectation to Address Comment: Please clarify whether the derived conclusions and supporting calculations in the EIS documentation (including the EcoRA) could be affected by recent updates to CSA N288.1-14.	Incorporated: The Ecological Risk Assessment Technical Support Document (EcoRA TSD) has been updated and utilizes version CSA N288.1-14 as outlined in Section 2.4.2 of the report. CNL notes that since the release of the EcoRA TSD in 2020 December, a new version of CSA N288.1 has been issued (CSA N288.1-20 <i>Guidelines for modelling radionuclide environmental transport, fate, and exposure associated with the normal operation of nuclear facilities</i>). CNL is planning an update to the EcoRA following receipt of any additional comments from the Federal, Provincial, Indigenous Review and will use the latest version of CSA N288.1. Changes to EcoRA: The air-to-soil model as described in CSA N288.1-14 (CSA 2018) was used for calculations in Section 2.4.2. CSA N288.1-14 values referenced in Section 3.5.1. References: <i>Canadian Standards Association (CSA). R2018. Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities. CSA Standard N288.1-14. 2014 March.</i>
218	ECCC	Section 2.4.2 EcoRA Screening Also applicable to Section 2.6 Conceptual Site	p.2-19	Comment: The EcoRA states that through modeling for a hypothetical pond in the area of the guard house, an estimation of HTO concentration is presented as a potential pathway for deer (ingestion of pond water). The pond is hypothetically defined as having a surface area of 0.5 hectares. However, further consideration of the hypothetical pond is omitted in Table 2.8 for the screening of HTO in the	Resolved As: For clarification, a stormwater management pond is not required for the project, since stormwater will be diverted to infiltration ditches. With regards to including the proposed wash out pit in the EcoRA for relevant receptor species such as amphibians and reptiles, during the decommissioning period, the wash out pit will be constantly disturbed as the water will be frequently decanted or drained, and thus biota will not establish there. Furthermore, mitigation measures or deterrents may be implemented if required to prevent wildlife from using the wash out pit during

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		Models (p.2-47 to 2-51)		normal decommissioning phase on the basis that the pond is not real. A wetland / pond about 300 m northeast from the site, and larger wetlands about 1 km from the NPD gatehouse, are present in the area and may become contaminated with HTO and other radionuclides. Furthermore, stormwater management ponds are proposed to control contaminants during decommissioning, and these may also become contaminated with HTO and other radionuclides. The EcoRA has not considered the hypothetical pond, the two existing wetlands in the area or the proposed stormwater management ponds as potential pathways to aquatic and terrestrial receptors. None of the conceptual site models include a wetland component with associated biota. These wetland complexes are likely habitat for many species of wildlife, including amphibians and reptiles. Expectation to Address Comment: Please consider factoring the hypothetical pond, the two wetland habitats and the proposed stormwater management ponds into the EcoRA for all relevant receptor species including amphibians and reptiles. Also, please include a wetland component in each of the conceptual site models that assess ecological risk.	decommissioning activities. As such, this pathway to receptors will not exist. For the postclosure period, the wash out pit will no longer exist. Regarding the hypothetical pond, this was added as a hypothetical calculation for HTO modeling following N288.1-20 guidance. As the hypothetical pond would be bounding as it is the closest to the facility and there was no impact; no assessment for receptor species was required. Section 2.4.2.1 of the EcoRA evaluates the concentration of tritium in the environment using release rates ranging from of 4.94 x 10³ Bq/s to 1.29 x 10⁷ Bq/s taken from the DecomSA TSD (Table 2.12 of the EcoRA TSD). The DecomSA scenarios only consider the atmospheric release of tritium, and as such waterborne releases were not considered in the model. As there are no waterborne releases, and the effects of atmospheric deposition on lakes and rivers is negligible (as per N288.1-14), the aquatic animals, aquatic plants, and sediment compartments, and all pathways associated with them can be screened out. The screening of tritium in the hypothetical pond is based on maximum tritium concentrations in air and thus bounds any tritium concentrations in wetlands further away from the NPD facility. With regards to the conceptual model, based on the screening of the wetlands in the Feature, Events and Processes (FEPs) which can be found in Appendix C of the PostSA TSD, the wetlands were excluded from the postclosure safety analysis. The screening analysis stated the following: <i>Wetland areas on the site are mainly found on the western half of the property. Three main deciduous swamp communities exist, one smaller community immediately southeast of Landfill 2 and two larger communities to the northwest of Landfill 2. <u>Discharge of contaminated groundwater will not occur to the wetland therefore it is not necessary to consider in the postclosure safety analysis.</u></i> Furthermore, for both the decommissioning and postclosure periods: • <i>These wetlands are at a higher elevation than NPDWF, and would not be impacted by surface water or groundwater flows from the NPDWF (EIS Section 8.3.2.1).</i> • <i>None of the activities of the project are expected to affect fish habitat; there will be no infilling, construction or blasting in the river, and no activities near the wetlands. (EIS Section 9.4.3.1).</i> References: DecomSA TSD: Garisto, N., Kovacs, R., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL. PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.
219	ECCC	Section 2.4.2 EcoRA Screening	p.2-19	Comment: Under normal conditions, as grout is pumped into the NPD facility, air from the building will be pushed out as the void volume in the room shrinks. Depending on how rapidly this occurs, there is a potential for dust and other airborne radioactive elements to be released from the NPD facility. The EcoRA states that the grout mixture would likely bind fine particulates, including radioactive particulates, and that localized dust would be bound by the rising grout. The EcoRA further describes how air velocities may be such that dust would not be mobilized out of the subsurface rooms filled with grout. Expectation to Address Comment:	Resolved As: Active ventilation will be used at several key times during grouting operations, primarily to deal with hydrogen generation, using standard 2000 cfm HEPA filtered fans. In the unlikely event contaminated particles will be entrained in air, the path of exit is through the HEPA filters. The expected grout injection rates (and subsequent air displacement rates) are estimated at up to 100 m³/hr. The Decommissioning Safety Assessment Technical Support Document (DecomSA TSD) evaluates the release of displaced air as the facility is filled with grout (Section 8.5.2.1). The DecomSA does not assume the grout will bind all the dust and makes the following conservative assumptions to assess the potential release of contaminated air from the facility: • The releases are not captured by the HEPA filtration system (since the ventilation system will be taken out of service by this time) and therefore the full amount of contamination is released to the environment.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Please provide a rationale to explain why air velocities are expected to remain below rates that would mobilize dust out of the rooms. Also, please provide an assessment of the likelihood that dust will be captured and bound by grout while it is being pumped into the NPD facility. This assessment should examine the rate of grout pumping and the relationship between displaced air volume and air velocity (which may vary depending on room configurations). Also, explain the physical processes and parameters (e.g., dust particle sizes and densities) that will result in localized dust being captured and bound by the liquid grout. For conservatism, include an additional scenario of contaminated dust release that assumes no binding of dust as a result of grout.	• The amount of air being displaced is equal to the volume of grout being poured (approximately 19,000 m³). This is a conservative assumption because some of the grout included in this volume will be used to fill the condenser and turbine pits, which are not enclosed areas, and thus would not have tritiated air present. • The rate that the grout is being poured, and therefore the rate that the air is being released, is based on the number of days spent grouting: ○ 139 total days are spent grouting; ○ It was assumed that 8 hours per day were spent pouring grout. This allowed for the total inventory to be divided by the total pour time providing a release rate. • The air being released is assumed to have lead and asbestos concentrations equal to the highest contaminated room. This is a conservative assumption it overestimates the average lead and asbestos concentrations in the facility. ○ The highest measured concentration of lead is 0.01 mg/m³. All measurements that were taken throughout the facility were below the MDL values of 0.01 mg/m³, and as such the MDL value is being used as the air concentration. This will overestimate the actual amount present. ○ The highest measured concentration of asbestos is 0.009 fibers/cm³, or 2.7E-04 mg/m³. This value corresponds to the highest measured airborne concentration of asbestos found through the facility, measured in room 607. The DecomSA also considers radioactive releases as a result of displaced air during grouting. For both radiological and non-radiological contaminants, air concentrations were estimated at worker receptor locations by applying the two-zone transfer model outlined in Section 6.1 of the DecomSA TSD. Section 8.5.2.6 of the DecomSA concludes that no undue effects on worker health are expected from either radiological or non-radiological contaminants. Contaminant concentrations in air were also considered in Section 2.4.2.1 of the Ecological Risk Assessment Technical Support Document (EcoRA TSD) and were found to be below applicable soil criteria for all scenarios including during grouting of the facility. Furthermore, CNL’s standard operating procedure for work in a radiologically contaminated environment is to monitor the expected hazard, remove personnel from the hazardous area and protect workers with the appropriate protective clothing and equipment. Continuous air monitors (CAMS) will be setup in locations where workers will be positioned. References: <i>DecomSA TSD: Garisto, N., Kovacs, R., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i>
220	ECCC	Section 2.4.2 EcoRA Screening, Table 2.14 Tritium Levels near Guardhouse	p.2-29	Comment: Under the forest fire scenario, Table 2.14 shows that the HTO concentration in the hypothetical pond and in soil would both exceed the “No Effects Concentration”. Table 2.15 shows HTO concentrations that are about an order of magnitude less than the	Incorporated: This section has been restructured in the Ecological Risk Assessment (EcoRA) TSD, and all tritium concentrations in the soil pore water and bulk soil appear in a single table (Table 2.13). Information on the tritium model used for the DecomSA as well as equations showing how porewater concentrations were converted to bulk (solid) soil are included in Section 2.4.2.1.1 of the updated EcoRA TSD.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				“No Effects Concentration” for both the forest fire and tornado scenarios, which resulted in tritium being screened out for both those scenarios. It is unclear why the HTO concentrations in these two tables are not the same. Expectation to Address Comment: Please review and consider revising the screening assessment for HTO under the forest fire and tornado scenarios for the hypothetical pond and in soil. Please update Tables 2.14 and 2.15 as needed, or alternatively, provide a rationale for the inconsistencies between these tables.	The screening assessment for HTO under the forest fire, tornado and stack collapse scenarios for the hypothetical pond and in soil does not need to be revised. Change to EcoRA TSD: The title of Table 2.13 (consolidated table) has been corrected to “Table 2.13 Tritium Levels in Environmental Components at Locations with Maximum Releases for Decommissioning Scenarios.” References: <i>DecomSA TSD: Garisto, N., Kovacs, R., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i>
221	ECCC	Section 2.4.2 EcoRA Screening	p.2-30	Comment: Radioactive COPC estimates for a major flood were calculated for the Pt. Stewart site. While the Pt. Stewart site may be appropriate for human health risk dose calculations, it is not appropriate for aquatic life (e.g., fish, waterfowl, aquatic plants). The closest site where aquatic life would be exposed to the maximum radioactive COPC should be factored into the risk assessment. For the project, the maximum exposure site would likely be on the NPD site or at the shoreline adjacent to the NPD site. The Pt. Stewart site is at a significant distance downstream of the NPD site. It is unclear how this distance may have influenced the risk based on the “No Effects Concentration” result for aquatic life. Expectation to Address Comment: Please update the risk assessment for radiological and non-radiological COPCs taking into consideration the stormwater / runoff at the shoreline near or adjacent to the NPD site before dilution.	Resolved As: As discussed in Section 8.2 of the Decommissioning Safety Assessment (DecomSA) TSD CNL will collect any accumulated rainwater or wash water not reused in the grout mixing plant using appropriate protective equipment and following CNL’s routine procedures for collecting liquids potentially containing radionuclides. Once collected, the liquid will be reviewed against criteria in CNL’s Environmental Protection process (Matasich 2021), which outlines appropriate collection and disposition routes depending on the results of analyses. The key aspect is that no un-assessed liquid effluent releases will occur as part of the decommissioning work. The NPD Closure Project acknowledges the necessity for monitoring at the shoreline near or adjacent to the NPD site and has identified a shoreline site at the NPD site that is considered to represent exposure to aquatic biota before any dilution of stormwater/ runoff can occur. The Draft Environmental Follow-up Monitoring Plan (McKee and Kovacs 2018) includes measurements of radiological and non-radiological contaminant levels at this location. Change to EIS: Section 12 (Follow-up Monitoring) of the EIS has been revised to include the shoreline sampling location. References: <i>Matasich, C. 2021. Acceptability Criteria for Routine and Non-Routine Discharge of Liquids at Canadian Nuclear Laboratories Sites, 900-509200-MCP-005. Revision 1.</i> <i>McKee, S. and Kovacs, R. 2018. Draft Environmental Follow-Up Monitoring Plan NPD Closure Project. 64-509200-PLA-005. Revision 1. Prepared by Arcadis for CNL.</i> <i>DecomSA TSD: Garisto, N., Kovacs, R., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i>
222	ECCC	Section 2.4.2 EcoRA Screening	p.2-35	Comment: The methodology used for evaluating the post-closure phase incorporates eight scenarios that cannot be compared, as they are not equivalent types of scenarios. For example, the “Seismic Event” and “Early Glaciation” scenarios are disruptive event scenarios, whereas scenarios 4 through 7 are variations in the closure methods (i.e., variations in how to design the project). The post-closure scenarios may have been better organized as a matrix, where the closure methods (i.e., Reactor Vault Backfill with Grout, Reactor Vault Backfill with Bentonite, Removal of Calandria, and	Incorporated: The comment is on the version of the EcoRA provided to the CNSC as part of CNL’s 2017 submission package: <i>Ecological Risk Assessment Report – NPD Closure Project</i> (Revision 0) (Tai et al, 2017). Since that version, the EcoRA has indeed been revised in 2020 (Revision 1). It is important to understand that the Postclosure Safety Assessment (PostSA) is the primary study which examines the performance and evolution of the site and facility post-closure. The PostSA provides detailed descriptions of the anticipated evolution and variants of that evolution. The 2nd Iteration of the PostSA (Arcadis and Quintessa 2017) was submitted as part of CNL’s 2017 submission package, along with the 2017 EcoRA. Appendix D of the 2017 EcoRA was based on the 2nd Iteration PostSA. The PostSA has also been revised in 2020, and the 2020 EcoRA is based on it. The scenarios derived in the PostSA have changed across iterations as more information became available and as CNL’s proposed decommissioning approach

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Barrier Wall) are assessed against each of the site evolution scenarios (i.e., normal evolution, seismic event, early glaciation, etc.). Furthermore, it is unclear how the “Discharge to Shore” scenario should be categorized, because it appears to relate to a major flooding event, but this cannot be confirmed as a result of the lack of information on this scenario in the EIS / EcoRA. Expectation to Address Comment: Please provide a revised EcoRA for the post-closure phase that incorporates comparable scenarios such as disruptive event scenarios and different closure methods. Also, provide additional information on the “Discharge to Shore” scenario so that it can be better understood and evaluated.	was further refined. As such, some scenarios – such as the variants exploring grouting or not grouting the reactor vault – no longer require consideration as CNL is no longer contemplating such decommissioning options. The methodology used in the 2017, 2020 and 2023 NPD PostSAs is based on guidance outlined in CNSC REGDOC 2.11.1 Volume III (CNSC, 2021a) and on recommendations of the IAEA ISAM programme (IAEA, 2004). By following this guidance material the 2017 and 2020 NPD PostSAs systematically derived a range of internally consistent potential future evolutions of the system (scenarios), together with a suite of calculation cases that examine the performance of the disposal system under other conditions of interest and explore its sensitivity to key uncertainties. It also included several defence-in-depth cases which examine the role played by select system components. Thus, when following the guidance material to derive the scenarios the outcome is not a matrix of scenarios examining all possible permutations of parameters and events. The central scenario that results from the ISAM approach is the Normal Evolution Scenario (NES) which is a reference description of the most likely, expected, evolution of the Facility and its surrounding environment. Other scenarios and cases can be compared to the NES in order to highlight their similarities and differences. The connection between the EcoRA and the PostSA is that predicted concentrations of radionuclides in the environmental components (e.g., Ottawa river or garden soil) from the PostSA are used with ecological profiles in the EcoRA to calculate the radiological dose to ecological receptors. Tables 5.1 to 5.7 of the EcoRA TSD show predicted doses for the range of scenarios (NES, sensitivity cases, disruptive events, defence-in-depth cases and what-if) considered in the PostSA TSD, or the post-closure phase. Both the 2017 EcoRA and the 2020 EcoRA assess ecological risks in the post-closure phase and also, the Decommissioning Execution phase. <i>In response to the request for additional information on the “Discharge to Shore” scenario:</i> The “Discharge to Shore” case was a “What If” case included in the 1st Iteration PostSA (Arcadis et al., 2017). This case was revised to become the “River Level Fall” case in both the 2nd iteration PostSA (Arcadis and Quintessa 2017),the 3rd iteration PostSA (Arcadis and Quintessa 2020) and the 4th iteration PostSA. In the 1st Iteration PostSA (Arcadis et al., 2017), the Discharge to Shore case focused on a key feature of the system as understood at that time, which was that contaminated groundwater was expected to be released directly to the river. As such, a situation in which groundwater were released <i>directly</i> to dry land offered valuable perspective on the significance of the location of the release. So, the Discharge to Shore case examined the issue by assuming that all contaminated groundwater was released to the shore. In the 2nd Iteration PostSA (Arcadis and Quintessa 2017), this case was updated and retitled to be the “River Level Fall” case. However, the objective of the case remains the same, i.e. to examine the impact of assuming that all contaminated groundwater is released to the shore, rather than directly to the river. In the 2nd Iteration PostSA (Arcadis and Quintessa 2017) the description of this case also posited potential drivers (regardless of how implausible they may be) that might produce the type of conditions involved in this case. For example, as a result of much reduced precipitation over a wide area, or due to periglacial conditions north of the site in the run up to glaciation (i.e., 100,000 years) reducing the flow to the river in its more northerly catchments. In the 3rd Iteration PostSA (PostSA TSD) (Arcadis and Quintessa 2020), additional climate information had become available (CNL 2017e; IPCC 2013) which predicted warmer and wetter conditions, rather than dryer conditions. These climate predictions were incorporated into the NES, and other cases that share common elements with the NES. Based on these predictions, future drought conditions are unlikely The 3rd and 4th iterations of the PostSA also incorporated a much more detailed representation of groundwater flow within and around the NPDDF, and with it, a significantly enhanced spatial model of these aspects. However, the objective of this case remains the same, i.e. to examine the impact of assuming that all contaminated groundwater is released to the shore.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					References: <i>Arcadis Canada Inc., Quintessa Ltd and Geofirma. (Arcadis et al). 2017. Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project. (1st Iteration). 64-508760-ASD-001. Revision 0. 2017 January 23. Prepared by Arcadis and Quintessa for CNL.</i> <i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). 2017. Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project. (2nd Iteration). 64-508760-ASD-003. Revision 0. 2017 September 28. Prepared by Arcadis and Quintessa for CNL.</i> <i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). 2020. Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project. (3rd Iteration). 64-508760-ASD-003. Revision 0. 2020 March 30. Prepared by Arcadis and Quintessa for CNL.</i> <i>Canadian Nuclear Laboratories (CNL). 2017e. Analysis of Surface Soil Samples from the Proposed Near Surface Disposal Facility (NSDF) Site. 232-121270-TD-004. Revision 0.</i> <i>Canadian Nuclear Safety Commission (CNSC). 2021a. REGDOC-2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. Canadian Nuclear Safety Commission, Version 2.</i> EcoRA TSD: <i>Garisto, N., Manolopoulos, H., Arbaban-Esfahani, E., and Tong, X. 2020. Ecological Risk Assessment. 64-509200-ASD-004. Revision 2. Prepared by Arcadis for CNL.</i> <i>Intergovernmental Panel on Climate Change (IPCC). 2013. Summary for Policy Makers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Stocker, T.F., Quin, D., Plattner, G.K., Tignor, M., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V., and Midgley, P.M. editors. Cambridge UK, New York, NY: Cambridge University Press. http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf</i> <i>International Atomic Energy Agency (IAEA). 2004. Improvement of Safety Assessment Methodologies for Near Surface Disposal Facilities. Volume I: Review and Enhancement of Safety Assessment Approaches and Tools. International Atomic Energy Agency IAEA-ISAM-1.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> <i>Tai, M., Manolopoulos, H., and Garisto, N. 2017. Ecological Risk Assessment. 64-509200-ASD-004. Revision 0. Prepared by Arcadis for Canadian Nuclear Laboratories.</i>
223	ECCC	Section 2.4.2 EcoRA Screening, Table 2.19		Comment: For the “Discharge to Shore” scenario, Table 2.19 shows that the shore sediment concentrations for C-14 and Cl-36 were predicted to be 1.00E+7 Bq/kg and 2.00E+06 Bq/kg, respectively. These predictions are greater than the “No Effects Concentrations” which the table lists as 6.08E+03 Bq/kg and 1.52E+05 Bq/kg, respectively. It is therefore not clear why C-14 and Cl-36 were screened out for sediment. Expectation to Address Comment: Please clarify whether or not C-14 and Cl-36 have appropriately been screened out of the “Discharge to Shore” scenario. If they	Incorporated: The NPD Closure Project acknowledges the confusion resulting from the changes in scenarios between different iterations. The Ecological Risk Assessment (EcoRA) TSD has been reorganized to better explain the scenarios and exposure point concentrations considered. With respect to C-14 and Cl-36: In the updated version of the EcoRA TSD, the radionuclides C-14 and Cl-36 had negligible concentrations and have been screened out. This change in results is due to a number of changes and improvements since the first iteration Postclosure Safety Assessment (PostSA), including for example: improved sorption coefficients for several radionuclides (including C-14 and Cl-36), refinements in inventory and updates to the scenarios. Change to EcoRA:

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				were incorrectly screened out, please update the risk assessment based on their inclusion.	The EcoRA has been reorganized to better explain the scenarios and exposure point concentrations considered (Section 3 and Section 6).
224	CNSC	Section 3.5.1 Radiological COPCs Also applicable to Appendix C	p.3-8	Comment: To calculate the radiological dose to terrestrial and aquatic organisms, a generally accepted approach was used, consistent with Clause 7.3.4 of CSA N.288.6-12, <i>Environmental risk assessments at class I nuclear facilities and uranium mines and mills</i>, and included (but was not limited to) the dose equations, radiation weighting factors, and dose coefficients published in scientific literature (e.g., Prohl, 2003, Amiro, 1997). However, it is unclear in Appendix C what assumptions and input parameters were used, as well as associated uncertainties, in the derivation of dose rates to biota. Expectation to Address Comment: Please provide a discussion of the assumptions used in dose calculations, including the associated uncertainties in the derivation of dose rates to biota.	Resolved As: Appendix B (formerly Appendix C) of the Ecological Risk Assessment (EcoRA) TSD presents sample calculations for estimating radiological and non-radiological doses to ecological receptors that were assessed in the EcoRA. For the radiological dose, sample calculations are presented for estimating the dose from Ag-108m to each aquatic and terrestrial receptor and each scenario from the Postclosure (PostSA) TSD that was assessed in the EcoRA. For the non-radiological dose, sample calculations are presented for estimating the dose from lead releases under the Normal Evolution scenario from the PostSA to each aquatic and terrestrial receptor that was assessed in the EcoRA. Information on the equations, assumptions and parameters that were used in each calculation are provided in the right-hand column of the calculations. Section 6 of the EcoRA TSD provides a general discussion of uncertainties and conservatism in the EcoRA. Specific uncertainties associated with the derivation of the dose rate would include uncertainties in the modelled / predicted environmental concentrations that were provided from the PostSA TSD; the use of transfer factors to estimate intake up the food chain from vegetation, invertebrates, small mammals and birds; the selection of dose coefficients for each ecological receptor based on guidance from (Prohl 2003) and (Amiro 1997); and, assumptions regarding receptor characteristics (e.g., home range, time spent on site, dietary characteristics, etc.). Change to EcoRA TSD: Section 6 has been updated to include more discussion on uncertainties as noted above. References: <i>Amiro, B.D. 1997. Radiological Dose Conversion Factors for Generic Non-Human Biota Used for Screening Potential Ecological Impacts. Journal of Environmental Radioactivity. 35:1, pp. 37–51.</i> <i>Pröhl, G. (Ed.). 2003. Dosimetric Models and Data for Assessing Radiation Exposures to Biota. FASSET Deliverable 3.</i> <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
225	CNSC	Section 5 Risk Characterization, Tables 5.1 and 5.2	p.5-3 to 5-4	Comment: In the radiological dose rate assessment of terrestrial and aquatic receptors, the ENEV values of 2.4 mGy/d and 9.6 mGy/d were used, respectively, as per the United Nations Scientific Committee on the Effects of Atomic Radiation Guidance (2008). While these screening values are appropriate for population-level effects, they are not appropriate for SARA-listed species where individual-level effects / protection are necessary. Therefore, the assessment for protected species may be less than conservative. Expectation to Address Comment: Please clarify how using the ENEV values in the radiological dose rate assessment, which are recommended for population-level protection, can provide adequate protection for individual SARA-listed terrestrial and aquatic species.	Incorporated: The updated Ecological Risk Assessment Technical Support Document (EcoRA TSD) for the NPD Closure Project has derived and used benchmarks specifically for SARA-listed species, as follows: • Table 4.1 of the EcoRA TSD presents the radiological dose benchmarks selected for both aquatic and terrestrial biota. The UNSCEAR (2008) benchmarks noted above were applied to non-Species at Risk (SAR) species. As there are no specific radiological benchmarks for SAR species, the UNSCEAR (2008) benchmarks were divided by a factor of 10 when applied to SAR species to provide an extra level of safety. • The use of no observed adverse effects levels (NOAELs) provides an extra margin of safety where potential risk to individuals may be of concern, although an exceedance of a NOAEL does not indicate that adverse effects will occur. For SAR receptors, toxicity reference values (TRVs) were selected based on no observed adverse effects concentrations (NOAECs)/NOAELs and 10% effect concentration (EC10s) where available. If a NOAEL or EC10 were not available for a chemical, an uncertainty factor of 10 was applied to TRVs derived based on the lowest observed adverse effects level (LOAEL) in order to derive TRVs (NOAEL) protective of species at individual levels.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Change to EcoRA TSD: Section 4.1 and 4.2 of the EcoRA TSD have been updated to include the above explanation. References: <i>United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). 2008. Sources and Effects of Ionizing Radiation. Annex E. Effects of Ionizing Radiation on Non-human Biota.</i>
226	ECCC	Appendix A, Ecological Profiles	p.A-1 to A-15	Comment: Ecological profiles provide all the dietary and biological characteristics that are used to model ecological risk (radiological and non-radiological) for a particular species. Appendix A of the EcoRA TSD describes many of the species selected as ecological receptors for inclusion in the assessment (e.g., Table 2.4). However, ecological profiles for each of the species, such as aquatic species, have not been provided. Expectation to Address Comment: Please provide the ecological profiles for all of the ecological receptors that were modelled. If standard ecological profiles are not available, or if the standard profiles were modified, then please describe the assumptions (with supporting rationale) used for calculating the radiological and non-radiological risks for aquatic species.	Incorporated: a) The NPD Closure Project has added new ecological profiles to Appendix A of the Ecological Risk Assessment (EcoRA) TSD, so that a profile exists for all of the ecological receptors that were modelled. New profiles added include Blanding’s Turtle, Northern River Otter, Red Fox, American Mink, Short-tailed Weasel and Moose. b) Standard ecological profiles were available for these receptors, as follows: - From FCSAP (Environment Canada 2012): Bald Eagle, Great Blue Heron, Mallard, Ruffed Grouse, Black Bear, Meadow Vole, Moose, Muskrat, Northern River Otter, White-tailed Deer, Red Fox, American Mink, Short-tailed Weasel; - From MOE (2011): Short-tailed Shrew; and - From U.S. EPA (1993): Green Frog, although assessed as a tadpole/fish to capture the most sensitive life stage and therefore is not explicitly modelled. Standard ecological profiles were not available for Blanding’s Turtle, Chimney Swift, Little Brown Myotis (bat), and Eastern Wolf. Parameters for these receptors were obtained from U.S. EPA (1993) (e.g., water and food intake rates) and online websites such as Animal Diversity, and species-specific websites. Conservative values were selected, in order to obtain a conservative risk estimate. Change to EcoRA TSD: Appendix A of the EcoRA TSD has been revised to reflect the response above. References: <i>Environment Canada 2012. Federal Contaminated Sites Action Plan (FCSAP). Ecological Risk Assessment Guidance. Module 3: Standardization of Wildlife Receptor Characteristics. March.</i> <i>Ontario Ministry of the Environment (MOE) 2011c. Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario. PIBS 7386e01. Prepared by Standards Development Branch. 15April.</i> <i>United States Environmental Protection Agency (U.S. EPA) 1993. Wildlife Exposure Factors Handbook, Vol.1. EPA/600/R-93. Office of Research and Development, Washington DC.</i>
227	ECCC	Appendix B, Dose Coefficients	p.B-1 to B-33	Comment: The dose coefficient tables list extensively both the internal dose and external dose coefficients (DCs) for all of the radionuclides expected to occur at the NPD site. The external DCs reported for C-14 for terrestrial biota show that an external DC was only included for the Bald Eagle. An external DC of “0” for C-14 was reported for all other terrestrial biota. It would be reasonable to	Resolved As: As noted in Section 3.5.1.3 of the Ecological Risk Assessment (EcoRA) TSD, radiation dose coefficients (DCs) were selected from the ERICA Tool (2019), which are adapted from FASSET (Prohl et al. 2003). For radionuclides that did not have DCs available in ERICA, they were infilled from ICRP (2016) and then Amiro (1997). DCs from Amiro (1997) are not weighted, so for alpha emitting radionuclides, a weighting factor of 10 was applied. In using the ERICA DCs, the ecological receptors were mapped to representative organisms in ERICA. The bald eagle specifically was mapped to Bird. For C-14/Bird, ERICA provides a DC of 2.59E-07 Gy/y per Bq/kg for

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																																																																																														
				consider that all other terrestrial biota would be exposed to beta radiation from C-14 externally, as is assumed for the Bald Eagle. This would be especially true for earthworms and terrestrial plants assessed, whose roots are in the soil. No additional explanation is provided to explain this inconsistent treatment of external DCs for terrestrial biota. Expectation to Address Comment: Please provide an external DC for C-14 for all other terrestrial biota that are assessed.	internal and 0 for external on or in soil. C-14 DCs from ERICA for all ecological species are shown in the table below (ERICA 2019). <table><tr><th rowspan="2">Ecological Receptor</th><th rowspan="2">Representative Receptor in ERICA</th><th>Internal</th><th>External On-soil</th><th>External In-soil</th><th>External Water</th></tr><tr><th colspan="4">(Gy/y per Bq/kg)</th></tr><tr><td>Aquatic Vegetation</td><td>Vascular Plant</td><td>2.41E-07</td><td>-</td><td>-</td><td>9.64E-09</td></tr><tr><td>Bald Eagle</td><td>Bird</td><td>2.59E-07</td><td>0.00E+00</td><td>-</td><td>-</td></tr><tr><td>Benthic Fish</td><td>Benthic fish</td><td>2.59E-07</td><td>-</td><td>0.00E+00</td><td>1.49E-10</td></tr><tr><td>Benthic Invertebrates</td><td>Benthic</td><td>2.50E-07</td><td>-</td><td>0.00E+00</td><td>7.89E-09</td></tr><tr><td>Berries</td><td>Terrestrial Plants</td><td>2.59E-07</td><td>0.00E+00</td><td>-</td><td>-</td></tr><tr><td>Black Bear</td><td>Mammal - Large</td><td>2.59E-07</td><td>0.00E+00</td><td>-</td><td>-</td></tr><tr><td>Blanding's Turtle</td><td>Reptile</td><td>2.56E-07</td><td>0.00E+00</td><td>-</td><td>1.72E-10</td></tr><tr><td>Little Brown Myotis (Bat)</td><td>Mammal - Small-Burrowing</td><td>2.59E-07</td><td>0.00E+00</td><td>-</td><td>-</td></tr><tr><td>Chimney Swift</td><td>Bird</td><td>2.59E-07</td><td>0.00E+00</td><td>-</td><td>-</td></tr><tr><td>Earthworm</td><td>Annelid</td><td>2.50E-07</td><td>-</td><td>0.00E+00</td><td>-</td></tr><tr><td>Eastern Wolf</td><td>Mammal - Large</td><td>2.59E-07</td><td>0.00E+00</td><td>-</td><td>-</td></tr><tr><td>Great Blue Heron</td><td>Bird</td><td>2.59E-07</td><td>0.00E+00</td><td>-</td><td>1.58E-10</td></tr><tr><td>Green Frog</td><td>Amphibian</td><td>2.50E-07</td><td>0.00E+00</td><td>-</td><td>5.17E-10</td></tr><tr><td>Mallard</td><td>Bird</td><td>2.59E-07</td><td>0.00E+00</td><td>-</td><td>1.58E-10</td></tr></table>	Ecological Receptor	Representative Receptor in ERICA	Internal	External On-soil	External In-soil	External Water	(Gy/y per Bq/kg)				Aquatic Vegetation	Vascular Plant	2.41E-07	-	-	9.64E-09	Bald Eagle	Bird	2.59E-07	0.00E+00	-	-	Benthic Fish	Benthic fish	2.59E-07	-	0.00E+00	1.49E-10	Benthic Invertebrates	Benthic	2.50E-07	-	0.00E+00	7.89E-09	Berries	Terrestrial Plants	2.59E-07	0.00E+00	-	-	Black Bear	Mammal - Large	2.59E-07	0.00E+00	-	-	Blanding's Turtle	Reptile	2.56E-07	0.00E+00	-	1.72E-10	Little Brown Myotis (Bat)	Mammal - Small-Burrowing	2.59E-07	0.00E+00	-	-	Chimney Swift	Bird	2.59E-07	0.00E+00	-	-	Earthworm	Annelid	2.50E-07	-	0.00E+00	-	Eastern Wolf	Mammal - Large	2.59E-07	0.00E+00	-	-	Great Blue Heron	Bird	2.59E-07	0.00E+00	-	1.58E-10	Green Frog	Amphibian	2.50E-07	0.00E+00	-	5.17E-10	Mallard	Bird	2.59E-07	0.00E+00	-	1.58E-10
Ecological Receptor	Representative Receptor in ERICA	Internal	External On-soil	External In-soil	External Water																																																																																														
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Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response					
					Meadow vole	Mammal - Small-Burrowing	2.59E-07	0.00E+00	-	-
					Moose	Mammal - Large	2.59E-07	0.00E+00	-	-
					Mushrooms	Terrestrial Plants	2.59E-07	0.00E+00	-	-
					Muskrat	Mammal	2.59E-07	0.00E+00	-	1.05E-10
					Northern River Otter	Mammal	2.59E-07	0.00E+00	-	1.05E-10
					Pelagic Fish	Pelagic fish	2.59E-07	-	-	1.58E-10
					Ruffed Grouse	Bird	2.59E-07	0.00E+00	-	-
					Short-tailed Shrew	Mammal - Small-Burrowing	2.59E-07	0.00E+00	0.00E+00	-
					Terr. Vegetation	Terrestrial Plants	2.59E-07	0.00E+00	-	-
					White-tailed Deer	Mammal - Large	2.59E-07	0.00E+00	-	-
Change to the EcoRA TSD:										
Section 3.5.1.3 (formerly Section 3.5.1.4) has been reorganized to better explain and display radiation dose coefficients selected for use in this ecological risk assessment.										
References:										
<i>Amiro, B.D. 1997. Radiological Dose Conversion Factors for Generic Non-Human Biota Used for Screening Potential Ecological Impacts. Journal of Environmental Radioactivity. 35:1, pp. 37–51.</i>										
<i>Canadian Standards Association (CSA). 2022. Environmental Risk Assessment at Nuclear facilities. CSA Standard N288.6-22.</i>										
<i>ERICA. 2019. ERICA Assessment Tool. Version 1.3.1, Released 2019 May 28.</i>										
<i>International Commission on Radiological Protection (ICRP). 2017. Dose coefficients for nonhuman biota environmentally exposed to radiation. ICRP Publication 136. Ann. ICRP 46(2).</i>										
<i>Pröhl, G. (Ed.). 2003. Dosimetric Models and Data for Assessing Radiation Exposures to Biota. FASSET Deliverable 3.</i>										

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
Greenhouse Gas Emissions Technical Supporting Document					
228	CNSC	Section 2.1 Scope of Activities Considered in the Analysis, Table 2.1	p.2-1	Comment: Section 3.4.2 (Associated Infrastructure) of the Project Description identifies possible temporary infrastructure that will need to be constructed to facilitate decommissioning of the NPD site. These activities include construction of mobile offices, washrooms and the possible construction of a temporary concrete batch mixing plant. These activities were not identified or discussed in the greenhouse gas (GHG) emissions assessment. Full characterization of possible sources of GHG emissions must be included in the assessment. If a particular source is identified to be negligible, then an explanation or justification should be provided. Expectation to Address Comment: Please provide an explanation or justification for why these project-related activities were not included in the GHG emissions assessment for the project.	Resolved As: Since the site access road is short, and the roads and parking lots are paved, road dust and tailpipe emissions from brief activities such as dropping off and assembling equipment and infrastructure (mobile office trailers, portable bathrooms, and batch plant equipment) are considered negligible.
229	CNSC	Section 2.2 Indirect GHG Emissions	p.2-2	Comment: The default values of the Green Concrete LCA Web Tool were used for transportation inputs and fuel options for pyroprocessing. These values are based on US average values. Section 2.2 did not include a discussion of the uncertainty that may be introduced by using these default values. Assessing the level of uncertainty for these two inputs is recommended given that transportation to the plant (concrete production) and cement pyroprocessing (cement production) are the two major indirect sources of GHG emissions. Expectation to Address Comment: Please provide an explanation of the level of uncertainty that may be introduced by using the default US parameters for transportation inputs and fuel options for pyroprocessing of the Web Tool.	Incorporated: The NPD Closure Project completed an analysis to test the sensitivity of the Green House Gas (GHG) emissions estimates to different inputs. The sensitivity analysis showed that regardless of the assumptions used to estimate the indirect GHG emissions, the project’s GHG emissions are negligible in comparison to Ontario’s total GHG emissions (i.e., less than 0.01%) and less than 0.4% of the Ontario total for cement production. Change to GHG TSD: The Greenhouse Gas Assessment TSD has been revised to include a new Appendix (A.2), containing the details of this sensitivity analysis.
230	CNSC	Section 2.3 Direct GHG Emissions	p.2-3	Comment: Reference is made to using the methodology outlined in the GHG Protocol for estimating direct GHG emissions. No reference was provided for this document. Expectation to Address Comment: Please provide a reference for the GHG Protocol used. Awareness of the methodology used in the assessment is necessary to properly verify the assessment.	Incorporated: The reference for the methodology in the Greenhouse Gas Emissions (GHG) TSD is the CNSC Draft Document: <i>Canadian Nuclear Safety Commission (CNSC). 2016d. Proposed CNSC Path Forward for Assessing Total GHG Production from Nuclear Facilities – Life cycle analysis for Environmental Assessments for the Canadian nuclear generation life cycle. Draft. Received 2016 July.</i> Change to GHG TSD: The Greenhouse Gas Assessment TSD has been revised to include a full citation for the CNSC (2016) Protocol.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
231	CNSC	Section 2.3 Direct GHG Emissions	p.2-4	Comment: Section 2.3 details the assumptions used to estimate direct GHG emissions from the proposed project. However, no justification or explanation is provided for the selection of these values and why they are deemed to be conservative in nature. For example, how was it determined that 19,000 m³ is a reasonable upper bound of concrete (grout) that will be needed or that the demolition and concrete batching activities will occur for 70 days per year? Expectation to Address Comment: Please provide further justification regarding the assumptions used in the direct GHG emissions assessment for the proposed project.	Resolved As: A 3D model of the facility was created based on available engineer drawings of the facility and direct measurements. The model calculated all empty space to be 19,000 m³. This does not account for equipment in these rooms nor building components that will be placed in the facility. Therefore, 19,000 m³ is bounding. Typical batch plants can produce at a rate of 50 to 180 m³/hour. Allowing time for repositioning equipment such as tremmie lines and pumpers, coordination with demolition, breakdowns, 10-hour work days and any other delays, the 70 days per year is very conservative. The numbers of trucks and trips is simply based on a standard truck carrying 6 m³ of materials and the total volume of materials expected to be delivered for grout, concrete and engineered cover. The number of cranes, excavators etc. are what a typical demolition site might use. The amount of acetylene is a conservative estimate assuming that some steel cutting will be required. A 40 hp diesel generator is typical for an industrial application like batch plants. All equipment emission values with referenced sources are contained in Appendix A.2. Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound.
232	CNSC	Appendix A, A.1 – Output and Input of Indirect GHG Emission Calculation Model	N/A	Comment: CNSC staff independently verified the outputs of the Green Concrete LCA Web Tool. CNSC staff used the same input parameters as those provided in section 2.2 of the GHG Emissions Report. CNSC staff verified the outputs of their assessment against the summary table of indirect emissions (Table 2-3). CNSC staff’s outputs for concrete production were consistent with those in Table 2-3. However, CNSC staff found discrepancies in the values for cement production (i.e., quarrying and cement pyroprocessing). Additionally, the graphical outputs for cement production were missing from the printouts for the LCA Web Tool. Expectation to Address Comment: Please verify the estimated GHG emissions for cement production (i.e., quarrying and cement pyroprocessing) and provide the graphical outputs for cement production for completeness and verification of the outputs obtained.	Incorporated As: The NPD Closure project verified the Green House Gas (GHG) emission calculations as part of the Quality Assurance Plan for preparation of the report. With respect to the missing graphics: The graphical outputs for cement production have been added to the GHG Emissions TSD. Change to GHG TSD: The Greenhouse Gas Assessment TSD has been revised to include the graphical outputs for cement production (in Appendix A.2).
233	ECCC	Appendix A-A.2 – Summary of Direct GHG Emission Calculations	N/A	Comment: CNL provides sample calculations for emissions estimates of air pollutants in Appendix A.2, but not in the Appendix F of the Decommissioning Safety Assessment (DecomSA) TSD. Of the air emission estimates for sources that are included, the ones	Incorporated: a) Air quality sample calculations for unpaved roads, crushing and screening and the concrete batch plant (for total suspended particles, PM₁₀, PM_{2.5}) have been added (Appendix F – Calculation Details). b) A discussion of assumptions made (e.g., silt content, control or mitigation efficiencies) has been added to Appendix F – Section F.3.5.2

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		Also applicable to the Decommissioning Safety Assessment Technical Supporting Document, Appendix F Air Quality Assessment for the NPD Project, Tables F-4, F-5 and F-6		for unpaved roads, crushing and screening and the concrete batch plant do not include details such as sample calculations, assumptions and emissions factors. Also, these calculations, assumptions and emission factors only cover some sources. Air emissions from these sources could result in adverse effects to air quality that may be of concern. In order to verify CNL’s statements about air emissions from the proposed project, additional information is requested to understand: • Each source of air pollution that was included in the emissions calculation • Each reference value used in the calculation • Any limitations or sources of uncertainty (e.g., from assumptions) Expectation to Address Comment: Please provide air quality sample calculations in Table F-6 (Appendix F) for unpaved roads, crushing and screening and the concrete batch plant (for total suspended particles, PM10, PM2.5). In addition, identify any assumptions made (e.g., silt content, control or mitigation efficiencies), include references used to calculate emissions, and incorporate all calculations related to air quality in Appendix F of the DecomSA TSD.	c) The references used to calculate emissions have been added to Appendix F – Section F.3.5.2 d) Calculations of emissions from all sources (Material Handling, Truck Idling, Stationary Equipment, Non-Road Equipment, Concrete Saw Cutting, Welder with Power from a Diesel Generator, Unpaved Road travel) have been added (Appendix F – Calculation Details). Changes to DecomSA TSD: Sections F.3.5.2 and Appendix F – Calculation Details of the DecomSA have been revised to reflect the response above.
Postclosure Safety Assessment Technical Supporting Document					
234	CNSC	General	General	Comment: CNSC staff’s assessment is that CNL has not demonstrated that the proposed safety case is robust, nor has it been well supported by scientific evidence. CNSC staff do not consider the proposed safety case to meet CNSC’s expectations as outlined in CNSC’s Guide G-320, <i>Assessing the Long-Term of Radioactive Waste Management</i>. In alignment with guidance provided in CNSC’s Guide G-320 (Section 5.0) and IAEA SSR-5, <i>Disposal of Radioactive Waste</i> (Section 1.26 and Requirement 3.0), a safety case consists of a safety assessment, complemented by a set of additional arguments that is used to give reasonable assurance that long-term waste management will be conducted in a manner that protects human health and the environment. In this respect, the flow and organization of information submitted to support the safety case is a crucial element that is necessary to provide reasonable assurance that the long-term management of waste will be adequately implemented. To clarify CNSC staff’s expectations, the safety case is considered to comprise of a suite of living documents, which are revised	Resolved As: A safety case for the in-situ disposal of the NPD facility will be submitted to the CNSC for evaluation as part of the NPD licence application. The safety case is not an input into the EIS or the TSDs but rather the output of the EIS and the TSDs are inputs for the safety case. The safety case will be in alignment with CNSC’s REGDOC 2.11.1 Volume III and IAEA SSR-5. The safety case will also consider other relevant guidance, such as IAEA Specific Safety Guide SSG-23 The Safety Case and Safety Assessment for the Disposal of Radioactive Waste.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				throughout the life of the project, prior to release from institutional control. The set of documents that comprise the safety case could be organized in many ways. An example of a possible organization is shown in Figure 1 (see Appendix 1 to this comment table below), in which the Preliminary Safety Assessment Report (PSAR) contains the arguments that support the safety case, and the supporting documentation provides the detailed assessment and the scientific evidence to support those arguments being made in the PSAR. Expectation to Address Comment: Please submit a safety case which meets CNSC staff’s expectations, in alignment with CNSC’s Guide G-320 and IAEA SSR-5, and take into consideration additional guidance provided in the comment above. CNSC staff should be engaged to provide additional guidance as necessary.	
235	ECCC	General	N/A	Comment: It is suggested that in an intrusion scenario, there would be a large dilution of the radioactive inventory as a result of the volume of uncontaminated material that needs to be removed. It is conceivable that radioactive materials, which are most concentrated at the bottom of the excavation, could be removed with relatively little dilution, once the overlying material has been excavated. Expectation to Address Comment: Please revise the intrusion scenario to account for a situation where there is “no dilution” of radioactive materials.	Resolved As: As per REGDOC-2.11.1 (CNSC 2021a), the NPD Closure Project assesses an intrusion scenario that looks at the potential of humans drilling, extracting and examining a core sample from the facility, potentially leading to internal or external exposures. This scenario assumes <i>no dilution</i> of the core sample. The “Intruder” is assumed to be directly exposed to 5 kg of contaminated material, retrieved from the Reactor Vault. The FEPs process was followed, and a Mass Excavation scenario was not triggered by the FEPs. However, the NPD Closure Project assesses a hypothetical Mass Excavation scenario as a What-If Case, even though not triggered, just for conservatism. This hypothetical scenario examines the potential effects of an extreme disruption that could occur to the NPDDF. It provides an indication of the limit to the dose that could occur due to such a situation. The case assumes that at some time after 100 y, the entire Facility is excavated and its contents, including all radionuclides, are dispersed in a small patch of surface soils. The entire inventory of contaminants present in the Facility is assumed to be mixed with garden soil. Without this mixing, there would be no crops growing on the concrete and grout materials excavated from the facility. References: <i>Canadian Nuclear Safety Commission (CNSC) 2021a, REGDOC 2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. Version 2.</i>
236	ECCC	General	N/A	Comment: Limited information is provided on the “worst case” scenarios used for the assessment of risks. An alternative method of assessing the risks of the proposed project would be to identify “worst case” scenarios, describe the conditions necessary for each “worst case” scenario to develop, and to assess the risks posed. Expectation to Address Comment:	Resolved As: Standard methods and internationally accepted approaches were used for assessing the risks of the proposed project. For the short-term decommissioning phase, this has included a systematic Hazard Identification process and an evaluation of risks from potential bounding accident scenarios (Section 7 of the DecomSA TSD). This methodology is based on hazard identification guidance from the Center for Chemical Process Safety (CCPS) of the American Institute of Chemical Engineers (AIChE) Guidelines for Chemical Process Quantitative Risk Analysis (CCPS 2000). It is also consistent with guidance presented in Weaver (2023), Hazard Identification and Analysis, and with general safety assessment guidance from the CSA (2014) N294-09 standard, <i>Decommissioning of Facilities Containing Nuclear Substances</i>.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Please update the scenarios to include “worst cases” scenarios, describe conditions necessary for their development, and describe the potential risks associated with these scenarios.	For the long-term postclosure phase, this has also followed standard methods including the IAEA ISAM methodology (IAEA 2004) and the CNSC REGDOC 2.11.1 (2021a). It has therefore included a systematic evaluation of Features, Events and Processes (FEPs) (Appendix C of the PostSA TSD) and based on this evaluation included disruptive event scenarios as well as very conservative hypothetical “what if” scenarios. The term worst case scenarios is not used in the PostSA. Worst case scenarios are considered as part of the disruptive event and What-If scenarios. Disruptive event scenarios are designed to address uncertainties that have arisen during the definition of scenarios and conceptual models; each is a variant on the normal evolution scenario and is described with scenario-specific assumptions. “What if” cases are illustrative calculations made for some deliberately extreme assumptions so as to understand the limits of safety performance. There is no regulatory requirement for worst case scenarios, based on CNSC REGDOC 2.11.1, Volume III, (2021a), which is the CNSC Regulatory Document on assessing the long-term safety of radioactive waste management. In conclusion: The systematic methodology and the inclusion of accident assessment (in the DecomSA TSD) and of disruptive and “what-if” scenarios in the PostSA TSD address all the regulatory requirements for evaluating unexpected occurrences beyond those included during the expected normal evolution of the system. References: <i>Canadian Nuclear Safety Commission (CNSC) 2021a, REGDOC 2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. Version 2.</i> <i>Canadian Standards Association (CSA). 2019. Decommissioning of Facilities Containing Nuclear Substances. N294-19.</i> <i>Center for Chemical Process Safety (CCPS). 2010. Guidelines for Chemical Process Quantitative Risk Analysis, Second Edition. ISBN 9780470935422.</i> DecomSA TSD: <i>Garisto, N., Kovacs, R., and Tong, X. 2021. Decommissioning Safety Assessment. 64-508760-ASD-002. Revision 2. Prepared by Arcadis for CNL.</i> <i>International Atomic Energy Agency (IAEA). 2004. Improvement of Safety Assessment Methodologies for Near Surface Disposal Facilities. Volume I: Review and Enhancement of Safety Assessment Approaches and Tools. International Atomic Energy Agency IAEA-ISAM-1.</i> <i>Weaver. 2023. Hazard Identification and Analysis, Management System Document, 900-508770-STD-002, Revision 2, August.</i> PostSA TSD: <i>Penfold, J., Thatcher, K. and Garisto, N. 2020. Postclosure Safety Assessment of the In-situ Decommissioning of the NPD. 64-508760-ASD-005. Revision 0. Prepared by Arcadis and Quintessa for CNL.</i>
237	CNSC	Section 2.0 Assessment Context	p.2-8	Comment: What is the timing of the peak dose / maximum impact, as required by CNSC’s Regulatory Policy P-290, <i>Managing Radioactive Waste</i> (which is quoted on p. 2-8)? The approach is stated to encompass the peak, yet it is not shown, and is not demonstrably linked to the waste inventory. The basis of the assessment timeframe and its link to the radioactive waste source term should be easy to assess (e.g., demonstrated with a figure). All long-term safety scenarios and	Incorporated: The time of peak dose for the normal evolution scenario, as discussed in the 4th iteration Postclosure Safety Assessment (PostSA TSD) Section 5.1.3, Section 6.1 and summarized in PostSA Table 6-1, is 12,000 y (PostSA TSD). All other scenarios have a time of peak dose much earlier (at about 2,500 years). The NPD Closure Project had previously selected 10,000 years as the assessment timeframe for the normal evolution based on results from the 3rd iteration of the PostSA (Arcadis and Quintessa, 2020). This timeframe aligns with the criteria set out in Section 7.4 of REGDOC 2.11.1 Volume III, Assessing the Long-term Safety of Radioactive Waste Management (CNSC 2021a). One of the main considerations was the time of the peak doses found in the previous iteration of the PostSA, where peak doses occurred relatively early at less than 5,000 years post-closure. However, in the 4th iteration PostSA, changes were made to the C-14 dose model for animals in order to remove overly conservative

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				evaluations depend on this component, which enables an understanding of the selected safety assessment timeframe. Expectation to address comment: Please clarify the basis of the assessment timeframe with respect to the source term.	assumptions (i.e., C-14 concentrations in animal products were previously determined mainly by the C-14 concentrations in animal drinking water). Due to this change, peak doses appear at about 12,000 years for the Normal Evolution Scenario, because the lower C-14 dose rates make Cl-36 the dominant dose contributor in the NES. However, given the similarity in dose at 10,000 and 12,000 years and the similarity between the selected timeframe and the time of the peak dose in the NES, the assessment timeframe of 10,000 years was not changed. Furthermore, dose rates are calculated for times up to 100,000 years in the PostSA. Details on the determination of the assessment timeframe and consideration of the new time of peak dose from the PostSA TSD (4th iteration) can be found in Appendix A of the PostSA TSD. The NPD Closure Project has prepared a discussion showing the hazard lifetime, to further link the basis of the assessment timeframe to the source term. It has been added to the PostSA TSD (Appendix A and Section A.3.4.2). The comparison also shows that within approximately 100 years the total activity concentration of the NPDDF will decay to be comparable to the 95th percentile activity concentration recorded at local uranium mineral deposits (OGS 1981) (Figure A-4 in PostSA TSD). For the reactor vault it can be seen that the steel offers ~30,000 y of protection by containing contaminants. Similarly, the Zircaloy offers over 100,000 y of protection. The corrosion rates used in the PostSA TSD for the NPD reactor have been reviewed and compared with values available in the technical literature and from anthropogenic analogue studies (Arcadis 2021). The thickness of metals in the reactor vault is presented in Figure A-6 in the PostSA TSD. Change to PostSA TSD: Appendix A of the PostSA TSD has been revised to include the total radioactivity concentration in NPD versus time (as discussed above), to support the assessment timeframe discussion. References: <i>Arcadis. 2021. NPD and WR1 In-Situ Disposal Projects Waste Form Synthesis Report, 64-508760-REPT-017, Revision 1.</i> <i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). 2020. Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project. (3rd Iteration). 64-508760-ASD-003. Revision 0. 2020 March 30. Prepared by Arcadis and Quintessa for CNL.</i> <i>Canadian Nuclear Laboratories (CNL). 2017e. Analysis of Surface Soil Samples from the Proposed Near Surface Disposal Facility (NSDF) Site. CNL No. 232-121270-TD-004. Revision 0.</i> <i>Ontario Geological Survey (OGS). 1981. Radioactive Mineral Deposits of the Pembroke-Renfrew Area. ISSN 0706-4551. ISBN 0-7743-4920-4</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
238	CNSC	Section 4.0 Scenarios, Calculation Cases, Models and Data Also applicable to Appendix E	N/A	Comment: Although a description of each scenario exists in Section 4, and model parameters are discussed in Appendix E, within the description of scenarios, the primary model parameters (i.e., hydraulic conductivity, degradation rates, waste form corrosion rates) are not explicitly provided for each scenario other than the NES. Furthermore, it is not always clear how specific Features, Events and Processes (FEPs) have been considered within the	Resolved As: The 4th Iteration of the Postclosure Safety Assessment (PostSA) has been revised to provide greater clarity on the Features, Events and Processes (FEPs) that have been incorporated into the various scenarios. Status of FEPs for the Normal Evolution of the NPDDF System are outlined in Table D-2 of the PostSA. Tables D-5 through D-12 identify the specific FEPs that were incorporated into each of the different scenarios. Specifically in response to the comment: a) Dominant transport pathways: Section E 2.2.1 of the PostSA provides a reference description of the Normal Evolution Scenario (NES) that includes discussion of the transport pathways. Sections E 2.2.2, E 2.2.3 and E 2.2.4 describe the transport pathways in the waste and facility, geosphere and biosphere, respectively. Following closure,

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																											
		Conceptual Models and Data		scenarios, including the NES, particularly their effect on model parameters (e.g., FEP 1.3.4 Periglacial Effects). Expectation to Address Comment: Please clarify the model parameters used for each scenario and demonstrate how the FEPs have been considered by providing a table which outlines the following: • A description of the dominant transport pathways from the source through the engineered and natural barriers, and the exposure pathways to the defined receptors, where these differ from the NES • A description of the release characteristics for each scenario • The model parameters • The FEPs considered, and how each FEP was considered within the scenario (i.e., effect on model parameters)	the NPD facility will gradually become saturated with groundwater at which time wastes will corrode and radionuclides and other contaminants will be released into the groundwater. Thus, the main contaminant release pathway to the biosphere during the postclosure phase is via groundwater, which is assumed to discharge to springs close to the shore and riverbed (or shoreline) sediments adjacent to the site from where contamination may pass into water in the Ottawa River. Contaminants released into the Ottawa River may sorb to sediments or be taken up by aquatic flora and fauna. Contaminants may also be transferred to land through crop irrigation (garden soil) with river water and animals drinking river water and then excreting it onto the land (grazing soil). Dominant transport pathways and the main exposure pathway for each of the scenarios is summarized in the Table 1 below including reference to applicable sub-section of the PostSA where further details may be found. Further a summary of the potential exposure pathways for each exposure group in included in Table E-7 of the PostSA TSD. Table 1 <table><tr><th>Scenario</th><th>Dominant Transport Pathways and Main Exposure Pathway</th><th>PostSA Reference</th></tr><tr><td>Normal Evolution</td><td>- transport: advective transport via groundwater, discharge to riverbed sediments, extraction of river water for domestic use - exposure: ingestion of animal products</td><td>Section G2.1.3</td></tr><tr><td>Sensitivity Cases</td><td colspan="2"></td></tr><tr><td>Measured Radionuclide Inventory</td><td>No change from NES</td><td>Section G3.1</td></tr><tr><td>Increased Radionuclide Inventory</td><td>No change from NES</td><td>Section G3.2</td></tr><tr><td>Reduced Near Field Sorption</td><td>- transport: advective transport via groundwater, discharge to riverbed sediments, extraction of river water for domestic use - exposure: ingestion of vegetables</td><td>Section G3.3</td></tr><tr><td>Reduced Far Field Sorption</td><td>No change from NES</td><td>Section G3.4</td></tr><tr><td>Reduced Sorption in Near-field and Far-field</td><td>- transport: advective transport via groundwater, use of contaminated soils for growing crops - exposure: ingestion of home grown produce</td><td>Section G3.5</td></tr><tr><td>Rapid Degradation</td><td>- transport: advective transport via groundwater, use of contaminated soils for growing crops - exposure: ingestion of home grown produce</td><td>Section G3.6</td></tr></table>	Scenario	Dominant Transport Pathways and Main Exposure Pathway	PostSA Reference	Normal Evolution	- transport: advective transport via groundwater, discharge to riverbed sediments, extraction of river water for domestic use - exposure: ingestion of animal products	Section G2.1.3	Sensitivity Cases			Measured Radionuclide Inventory	No change from NES	Section G3.1	Increased Radionuclide Inventory	No change from NES	Section G3.2	Reduced Near Field Sorption	- transport: advective transport via groundwater, discharge to riverbed sediments, extraction of river water for domestic use - exposure: ingestion of vegetables	Section G3.3	Reduced Far Field Sorption	No change from NES	Section G3.4	Reduced Sorption in Near-field and Far-field	- transport: advective transport via groundwater, use of contaminated soils for growing crops - exposure: ingestion of home grown produce	Section G3.5	Rapid Degradation	- transport: advective transport via groundwater, use of contaminated soils for growing crops - exposure: ingestion of home grown produce	Section G3.6
Scenario	Dominant Transport Pathways and Main Exposure Pathway	PostSA Reference																														
Normal Evolution	- transport: advective transport via groundwater, discharge to riverbed sediments, extraction of river water for domestic use - exposure: ingestion of animal products	Section G2.1.3																														
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Rapid Degradation	- transport: advective transport via groundwater, use of contaminated soils for growing crops - exposure: ingestion of home grown produce	Section G3.6																														

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response			
					Geosphere Bedrock Hydraulic Conductivity	- transport: advective transport via groundwater, use of contaminated soils for growing crops - exposure: ingestion of home grown produce	Section G3.7	
					Geosphere Overburden Hydraulic Conductivity	- transport: advective transport via groundwater, use of contaminated soils for growing crops - exposure: ingestion of home grown produce	Section G3.8	
					Increased Dilution in the River	- transport: advective transport via groundwater - exposure: ingestion of drinking water and external exposure	Section G3.9	
					Self-Sufficient Indigenous Receptor	No change from NES	Section G3.10	
					Disruptive Event Cases			
					Site Investigation	- transport: extraction of contaminated material directly from the facility (driller), use of contaminated soils for growing crops (site resident) - exposure: external exposure	Section G4.1	
					Surface Erosion	- transport: advective transport via groundwater, extraction of river water for domestic use - exposure: ingestion of plants and crops.	Section G4.2	
					Extreme Degradation of Engineered Structures	No change from NES	Section G4.3	
					Fault Zone Activation	No change from NES	Section G4.4	
					Excavation of Above-Bedrock Facility	- transport: entire facility excavated and contents dispersed in surface soils, use of contaminated soils for growing crops - exposure: ingestion of foodstuffs	Section G4.5	

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response			
						- transport: advective transport via groundwater, extraction of well water for domestic use		
					Overburden Well	- exposure: ingestion of foodstuffs	Section G4.6	
						- transport: advective transport via groundwater, extraction of well water for domestic use		
					Bedrock Well	- exposure: ingestion of foodstuffs	Section G4.7	
					Defence-In-Depth Cases			
					Role of Existing Facility Structure	- transport: advective transport via groundwater, discharge to riverbed sediments - exposure: external exposure	Section G5.1	
					Role of Grout	- transport: advective transport via groundwater, discharge to riverbed sediments - exposure: external exposure	Section G5.2	
					"What-if" Cases			
					Facility Mass Excavation	- transport: entire facility excavated and contents dispersed in surface soils, use of contaminated soils for growing crops - exposure: ingestion of foodstuffs	Section G6.1	
					River Level Fall	- transport: advective transport via groundwater, discharge to riverbank - exposure: external exposure	Section G6.2	
Undetected Fracture Zone	- transport: advective transport via groundwater, use of contaminated soils for growing crops - exposure: ingestion of home grown produce	Section G6.3						
b) Release characteristics: Section 5 of the PostSA provides a series of graphs that identify release characteristics for each scenario, such as peak dose, time of peak dose, dominant radionuclides and most exposed receptor. For example, Figure 5-23 shows the total concentration of radionuclides in garden soil in the NES compared to the total concentration of radionuclides in garden soil for the surface erosion sensitivity case. Similar graphs are presented for each of the sensitivity cases, disruptive event scenarios, defence-in-depth cases and what-if cases. A summary of this information is presented in Table 6-1 of the PostSA TSD.								

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																																				
					c) <i>Model parameters:</i> With regards to model parameter, the approach taken is to define the data set for the normal evolution scenario (NES), and then define only those parameters that change for the other scenarios. This information is presented specifically in Appendix E of the 3rd Iteration PostSA (Arcadis and Quintessa 2020). Key model parameters that have been changed in each of the scenarios along with the relevant sub-section of Appendix E are summarized in Table 2 below. For reference the time after closure at which each scenario or calculation case occurs is outlined in Table E-42 of the PostSA TSD. Table 2 <table><tr><th>Scenario</th><th>Model Parameters of Importance</th><th>PostSA Reference</th></tr><tr><td>Normal Evolution</td><td></td><td>Section E 3.9</td></tr><tr><td>Sensitivity Cases</td><td></td><td></td></tr><tr><td>Measured Radionuclide Inventory</td><td>Inventory inputs are changed. Uses measured data on radionuclide concentrations where possible, without any uncertainty factors.</td><td>Section E 3.9.1</td></tr><tr><td>Increased Radionuclide Inventory</td><td>Inventory inputs are changed. Uses the measured and modelled bounding inventory (i.e., the NES inventory) multiplied by a factor of two.</td><td>Section E 3.9.2</td></tr><tr><td>Reduced Near Field Sorption</td><td>Reference values used for grout and concrete are reduced.</td><td>Section E 3.9.3</td></tr><tr><td>Reduced Far Field Sorption</td><td>Reference values used for overburden and bedrock are reduced.</td><td>Section E 3.9.3</td></tr><tr><td>Reduced Sorption in Near-field and Far-field</td><td>Reference values used for grout and concrete, and for overburden and bedrock are reduced, respectively.</td><td>Section E 3.9.3</td></tr><tr><td>Rapid Degradation</td><td>Modelled assuming an instantaneous increase in the hydraulic conductivity of the concrete and grout materials to a ‘degraded’ value immediately after the end of the Institutional Control period.</td><td>Section E 3.9.4</td></tr><tr><td>Geosphere Bedrock Hydraulic Conductivity</td><td colspan="2">Increased hydraulic conductivity in bedrock compared to NES. The bedrock hydraulic conductivity is increased to the maximum measured value of 6.6 x 10⁻⁶ m/s.</td></tr><tr><td>Geosphere Overburden Hydraulic Conductivity</td><td>Increased hydraulic conductivity in the overburden fill material between the facility and the river, compared to NES. This case increases the fill conductivity by one order of magnitude greater than the calibrated value. The calibrated hydraulic conductivity of the fill is at the maximum of the expected fill conductivity range, 10⁻³ m/s. The conductivity of the fill in the high overburden hydraulic conductivity cases is 10⁻² m/s.</td><td>Section E 3.9.4</td></tr><tr><td>Increased Dilution in the River</td><td>Uses a lesser dilution factor than the one used in Normal Evolution Scenario.</td><td>Section E 3.9.5</td></tr></table>	Scenario	Model Parameters of Importance	PostSA Reference	Normal Evolution		Section E 3.9	Sensitivity Cases			Measured Radionuclide Inventory	Inventory inputs are changed. Uses measured data on radionuclide concentrations where possible, without any uncertainty factors.	Section E 3.9.1	Increased Radionuclide Inventory	Inventory inputs are changed. Uses the measured and modelled bounding inventory (i.e., the NES inventory) multiplied by a factor of two.	Section E 3.9.2	Reduced Near Field Sorption	Reference values used for grout and concrete are reduced.	Section E 3.9.3	Reduced Far Field Sorption	Reference values used for overburden and bedrock are reduced.	Section E 3.9.3	Reduced Sorption in Near-field and Far-field	Reference values used for grout and concrete, and for overburden and bedrock are reduced, respectively.	Section E 3.9.3	Rapid Degradation	Modelled assuming an instantaneous increase in the hydraulic conductivity of the concrete and grout materials to a ‘degraded’ value immediately after the end of the Institutional Control period.	Section E 3.9.4	Geosphere Bedrock Hydraulic Conductivity	Increased hydraulic conductivity in bedrock compared to NES. The bedrock hydraulic conductivity is increased to the maximum measured value of 6.6 x 10 ⁻⁶ m/s.		Geosphere Overburden Hydraulic Conductivity	Increased hydraulic conductivity in the overburden fill material between the facility and the river, compared to NES. This case increases the fill conductivity by one order of magnitude greater than the calibrated value. The calibrated hydraulic conductivity of the fill is at the maximum of the expected fill conductivity range, 10 ⁻³ m/s. The conductivity of the fill in the high overburden hydraulic conductivity cases is 10 ⁻² m/s.	Section E 3.9.4	Increased Dilution in the River	Uses a lesser dilution factor than the one used in Normal Evolution Scenario.	Section E 3.9.5
Scenario	Model Parameters of Importance	PostSA Reference																																							
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Increased Dilution in the River	Uses a lesser dilution factor than the one used in Normal Evolution Scenario.	Section E 3.9.5																																							

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					Self-Sufficient Indigenous Receptor	Dietary intake rates are changed. Exposure pathways and associated data for the self-sufficient Indigenous receptor group are derived from CSA [2022] and SENES [2014].	
					Disruptive Event Cases		
					Site Investigation	Exposure group characteristics are changed. Exposure duration is set to 12 hours and the external dose factor is defined as a point source. Assumes the driller retrieves a sample from the Reactor. An estimate of the mass of Zircaloy in the core sample was made with a 5 kg value of metal assumed retrieved which is a factor of 10 more conservative than would be expected. Waste material assumed left at the surface, discarded and in due course become mixed with soil.	Section E 3.10.1
					Surface Erosion	Concentration in the garden soil is changed. Concentration in the garden soil is increased to the concentration in the overburden.	Section E 3.10.2
					Extreme Degradation of Engineered Structures	Timing of different flow regimes (outlined in the Near-field Groundwater model) are changed. Flow regime 1 (undegraded facility with tile drains) operates from 0 y. Flow regime 2 (undegraded facility with no tile drains) operates from 100 y. Flow regime 5 (extremely degraded facility with tile drain failure) operates from 1000 y onwards.	
					Fault Zone Activation	Same as Extreme Degradation case but also creating a fracture zone represented using a higher conductivity in the bedrock between the facility and the river compared to that of the NES. Grout and concrete are extremely degraded (hydraulic conductivity of 1E-06 m/s).	Section E 3.10.4
					Excavation of Above-Bedrock Facility	The above-bedrock portion of the facility is excavated and mixed with soil and a mixing factor with surface soil.	Section E 3.10.5
					Overburden Well	Source of drinking water for the site resident is changed. In this case from a well located in the pipe trench instead of the river.	Section E 3.10.6
					CNL acknowledges the request to summarize all the above information in an additional table; however, this information is provided in Appendix D and E and G as noted above. Output files from the Amber model can be provided to the CNSC, from which detailed input parameter and results can be viewed.		

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
239	CNSC	Section 4.1.7 Sensitivity Calculations	p.4-9 to 4-10	Comment: The sensitivity analysis cases investigated are insufficient to bound the potential scenarios that the NPD facility may encounter or bound uncertainty in the input parameters or the conceptual model. The following points should be considered: • The sensitivity analysis investigating the inventory based on the reported measurement data is of value. However, it does not appear that a bounding reference inventory was considered in the sensitivity analysis that accounts for uncertainty. A bounding inventory should be considered in light of the low number of samples collected and the uncertainty related to the ORIGEN modeling. • Each sensitivity case only considers a single parameter at a time. It is considered best practice to combine sensitivity cases and co-vary multiple input parameters to fully bound potential scenarios. For example, co-variation of several hydraulic parameters investigated in the current sensitivity analysis would provide a more conservative approach than is currently provided. • Only five sensitivity cases are considered in the current safety assessment. Indeed, sensitivity cases that consider other key input parameters are not included. It would be beneficial if a more comprehensive approach to sensitivity analysis was performed that investigated the importance of the numerous assumptions contained in the safety assessment (e.g., the rate of cement degradation, variations in contaminant transport via diffusion and advection, etc.). Expectation to Address Comment: Please enhance the sensitivity analyses performed in the post-closure safety assessment to ensure that key parameters are sufficiently investigated and what the effect of parameter co-variance may be.	Incorporated: The NPD Closure Project has conducted a multivariate sensitivity analysis, as an Addendum to the second iteration Post Closure Safety Assessment Technical Support Document (PostSA TSD). The PostSA Addendum (Arcadis & Quintessa 2018) included a probabilistic analyses, which examined multi-variate influences on the results (complementing the one-at-a-time parameter sensitivity cases of the 2nd iteration); identified the potentially most important parameters (those that dose results are most sensitive to); and, took into account data uncertainties identified in the 2nd iteration. The results indicated that the highest calculated dose for any possible combination of parameter values was less than 0.1 mSv y⁻¹. This value is the result of the most extreme combination of values from the sampled parameter distributions. Despite the parameter distributions being defined conservatively (using wide ranges, and adopting a uniform distribution function that overestimates the likelihood of extreme values) even this result is more than a factor of two below the dose criterion. When account is taken of the conservative nature of the sensitivity analysis this represents a very considerable safety margin, as it shows that even using a combination of extreme assumptions the dose remains below the criterion. The whole range of calculated doses was very wide (1x10⁻⁷ mSv y⁻¹ being the minimum), illustrating the conservatively wide ranges that have been selected for the parameter values. References: <i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). 2018. Postclosure Safety Analysis Addendum. 64-508760-ASD-004 Revision 0.</i> <i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). 2020. Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project. (3rd Iteration). 64-508760-ASD-003. Revision 0. 2020 March 30. Prepared by Arcadis and Quintessa for CNL.</i>
240	CNSC	Section 4.2.2 Waste and Facility Model	p.4-13	Comment: Three phases are proposed to represent the degradation of concrete and grout. It is stated that “[s]tage I ends after around 100 flushes of the pore space; Stage II ends after 1000, and Stage III is complete after around 7500 flushes.” However, it is not clear how much time would be needed to achieve the number of pore flushes for each stage, and the hydraulic conductivities of the concrete and grout at the end of each stage. Expectation to Address Comment:	Incorporated: There are two mechanisms by which concrete and grout degrade, as described in Section E.2.2.2 (Appendix E) of the Postclosure Safety Assessment (PostSA) TSD. The first is chemical degradation which proceeds as water flushes through the material and affects density, porosity, diffusivity, sorption coefficients, solubility limits. The second is mechanical degradation caused by cracking due to rebar corrosion. Hydraulic conductivity is affected by both mechanisms, but cracking is faster than chemical degradation, so will dominate in the alteration of hydraulic conductivity. Hydraulic conductivity changes from “fresh” to “cracked” values after 1,000 y (see PostSA TSD Section E 2.2.2). <u>Physical Degradation (Cracking) and Hydraulic Conductivity</u>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																					
				Please specify the time scale corresponding to the number of flushes for each stage, and the hydraulic conductivities of the concrete and grout at the end of each stage.	The physical degradation is represented by switching between the groundwater modelling flows used in the AMBER model at specified times (which differ in some scenarios). The reference assumptions (Normal Evolution) are shown in Section E 3.4.9 of Appendix E of the PostSA report: - Flow regime 1 (undegraded facility with tile drains) operates from 0 y; - Flow regime 2 (undegraded facility with tile drain failure) operates from 100 y; and - Flow regime 4 (degraded facility with tile drain failure) operates from 1000 y. Hydraulic conductivity values used to calculate groundwater flows are given in Calder (2024b) and Calder (2024c) as follows: <table><tr><th>Material</th><th></th><th>Hydraulic Conductivity (m/y)</th><th>Hydraulic Conductivity (m/s)</th></tr><tr><td rowspan="3">Grout</td><td>Fresh, above bedrock</td><td>0.02</td><td>6.3E-10</td></tr><tr><td>Fresh, below bedrock</td><td>0.002</td><td>6.3E-11</td></tr><tr><td>Cracked</td><td>0.3</td><td>1E-08</td></tr><tr><td rowspan="2">NPDWF Vault Concrete</td><td>Fresh</td><td>0.0003</td><td>1E-11</td></tr><tr><td>Cracked</td><td>0.3</td><td>1E-08</td></tr></table> Groundwater flows are calculated using these hydraulic conductivities (Calder 2024c) to give flows through the NPD as described in Section E.3.4.7 and Section F.3.2.3 of the PostSA TSD. The flows are also used to calculate the amount of water through each compartment and therefore the number of flushes. The time at which cement and grout degradation begin is given in Appendix G, Tables G-3 and G-4 of the PostSA TSD. <u>Chemical Degradation</u> The “Berner” model is used for cement and a modified Berner model for grout, using the number of pore flushes to determine the duration of phases of chemical degradation of the concrete and grout. The timescales are shown in Appendix E, Section 3.4.4: “For structural concrete (based on Berner [1992]): - Stage I: 0 - 100 - Stage II: 100 - 1000 - Stage III: 1000 - 7450 - Stage IV (After Stage 3): > 7450 For BFS-PC grout (from Wilson 2020) these are subdivided so as to represent more subtle variation in pH: - Stages A: 0 to 106	Material		Hydraulic Conductivity (m/y)	Hydraulic Conductivity (m/s)	Grout	Fresh, above bedrock	0.02	6.3E-10	Fresh, below bedrock	0.002	6.3E-11	Cracked	0.3	1E-08	NPDWF Vault Concrete	Fresh	0.0003	1E-11	Cracked	0.3	1E-08
Material		Hydraulic Conductivity (m/y)	Hydraulic Conductivity (m/s)																							
Grout	Fresh, above bedrock	0.02	6.3E-10																							
	Fresh, below bedrock	0.002	6.3E-11																							
	Cracked	0.3	1E-08																							
NPDWF Vault Concrete	Fresh	0.0003	1E-11																							
	Cracked	0.3	1E-08																							

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																									
					• Stage B: 107 to 227 • Stage C: 228 to 643 • Stage D: 644 to 1978 • Stage E: 1979 to 4386 • Stage F: > 4386” Stages A – D correspond with Stages I-III, Stage E corresponds to Stage IV, and Stage F corresponds to background conditions. In the PostSA the transitions in values that depend on these stages (e.g. sorption) is modelled as being instantaneous at the end of each stage. The timescale is calculated by the AMBER model directly, based on the total (integrated) water flow through each model compartment at a given time. The approach is described in Section F.3.2.2, reproduced below. <i>“As cement (in grout and concrete) degrades its properties change and this can affect the mobility of radionuclides. It is therefore necessary to model the degradation of the cements present. As discussed by Berner [1992] and Wilson [2020], the chemical degradation of cements and grout can be represented with a simple 3 or 4-stage model with the duration of each stage being related to the number of pore flushes (n_{flush}) of the cement body.</i> $n_{flush} = \frac{Q_{NPD,tot}}{V_{Comp}}t$ <i>Where V_{Comp} (m^3) is the total pore volume within a compartment (representing a room or a wall) and $Q_{NPD,tot}$ is the total net flow through it (in $m^3\ y^1$). In Berner’s model, for generic cements Stage 1 is complete after 100 flushes, Stage 2 after 1000 and Stage 3 after 7450 flushes. For BFS-PC grout, Wilson [2020] concludes that Stages 1 and 2 will not occur and that Stage 3 conditions will last for 1978 flushes, with a further Stage 4 concluding after 4386 flushes. These values are assigned to $n_{Stage(N)}$, allowing the Stage N that is active at any given time to be determined by comparing n_{flush} to $n_{Stage(N)}$. The values for parameters that are dependent on cement degradation are then assumed to transition from the value for each stage based on n_{flush} and $n_{Stage(N)}$.”</i> The results of this calculation, for the Normal Evolution Scenario, are presented in Section G 2.1.1. This presents the total flow rate through each room (derived from the Groundwater Flow modelling results) and the total volume of each room in Table G-2. The corresponding timescales for each chemical degradation stage are presented in Table G-3 (concrete) and Table G-4 (grout). These are reproduced below. Table G-2 Total Flow Rate through Each Room in the NPDDF <table><tr><th>Room</th><th>Modelled Volume (m^3)</th><th>Undegraded, Tile Drains Functioning, $m^3\ y^{-1}$ (0 – 100 y)</th><th>Undegraded, Tile Drains Not Functioning, $m^3\ y^{-1}$ (100 – 1000 y)</th><th>Degraded, Tile Drains Not Functioning, $m^3\ y^{-1}$ (>1000 y)</th></tr><tr><td>Above Bedrock</td><td></td><td></td><td></td><td></td></tr><tr><td>Fuel Storage Room</td><td>2239</td><td>0.013</td><td>0.058</td><td>4.3</td></tr><tr><td>Fueling Room</td><td>2488</td><td>0.032</td><td>0.087</td><td>8.8</td></tr><tr><td>Boiler Room</td><td>1838</td><td>0.0033</td><td>0.065</td><td>2.9</td></tr></table>	Room	Modelled Volume (m^3)	Undegraded, Tile Drains Functioning, $m^3\ y^{-1}$ (0 – 100 y)	Undegraded, Tile Drains Not Functioning, $m^3\ y^{-1}$ (100 – 1000 y)	Degraded, Tile Drains Not Functioning, $m^3\ y^{-1}$ (>1000 y)	Above Bedrock					Fuel Storage Room	2239	0.013	0.058	4.3	Fueling Room	2488	0.032	0.087	8.8	Boiler Room	1838	0.0033	0.065	2.9
Room	Modelled Volume (m^3)	Undegraded, Tile Drains Functioning, $m^3\ y^{-1}$ (0 – 100 y)	Undegraded, Tile Drains Not Functioning, $m^3\ y^{-1}$ (100 – 1000 y)	Degraded, Tile Drains Not Functioning, $m^3\ y^{-1}$ (>1000 y)																										
Above Bedrock																														
Fuel Storage Room	2239	0.013	0.058	4.3																										
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Boiler Room	1838	0.0033	0.065	2.9																										

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response						
					Turbine Room	4592	0.041	0.12	15		
					Below Bedrock						
					Fuel Storage Room	1905	0.039	0.046	7.1		
					Reactor Vault	1880	0.029	0.032	5.0		
					East of Reactor Vault	122	0.029	0.024	3.8		
					West of Reactor Vault	129	0.007	0.009	1.6		
					Dump Tank Pipe Room	201	0.0055	0.0058	1.0		
					Boiler Room	2691	0.066	0.093	12		
					Boiler Room (deep)	642	0.028	0.028	4.5		
					Table G-3 Time at Which Concrete Degradation Stages Begin						
					Room	Stage I	Stage II	Stage III	Stage IV		
					Above Bedrock						
					Fuel Storage Room	0	25,000	>100,000	>100,000		
					Fueling Room	0	15,000	>100,000	>100,000		
					Boiler Room	0	30,000	>100,000	>100,000		
					Turbine Room	0	15,000	>100,000	>100,000		
					Below Bedrock						
					Fuel Storage Room	0	12,000	>100,000	>100,000		
					Reactor Vault	0	15,000	>100,000	>100,000		
					East of Reactor Vault	0	3,250	25,000	>100,000		
					West of Reactor Vault	0	7,000	60,000	>100,000		
					Dump Tank Pipe Room	0	8,750	80,000	>100,000		
					Boiler Room	0	9,900	90,000	>100,000		
					Boiler Room (deep)	0	7,000	60,000	>100,000		
					Table G-4 Time at Which Grout Degradation Stages Begin						
					Room	Stage A	Stage B	Stage C	Stage D	Stage E	Stage F
					Above Bedrock						

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response						
					Fuel Storage Room	0	25,000	60,000	>100,000	>100,000	80,000
					Fuelling Room	0	15,000	30,000	90,000	>100,000	80,000
					Boiler Room	0	30,000	70,000	>100,000	>100,000	90,000
					Turbine Room	0	15,000	30,000	90,000	>100,000	100,000
					Below Bedrock						
					Fuel Storage Room	0	15,000	30,000	80,000	>100,000	>100,000
					Reactor Vault	0	15,000	30,000	80,000	>100,000	>100,000
					East of Reactor Vault	0	3,250	6,000	15,000	50,000	>100,000
					West of Reactor Vault	0	8,000	15,000	40,000	>100,000	>100,000
					Dump Tank Pipe Room	0	9,200	20,000	60,000	>100,000	>100,000
					Boiler Room	0	12,000	25,000	60,000	>100,000	>100,000
					Boiler Room (deep)	0	7,000	15,000	40,000	>100,000	>100,000
					The data in Table G-2 can be combined with the number of pore flushes (E 3.4.4) to verify the timescales for degradation, but <i>note that the reported times given in Tables G.3 and G.4 represent the model output time immediately after a transition, rather than the exact time that the transition occurs.</i> Change to PostSA TSD: Sections E 2.2.2, E 3.4.7, F 3.2.3 and Table G-3 of the PostSA TSD have been updated based on the new data from the Groundwater Modelling TSD and Calder (2024c). References: <i>Groundwater Modelling TSD:</i> Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL. Calder, N. 2024c. Near-field groundwater model at the site of the proposed decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-013. Revision 1. Prepared by Arcadis and Geofirma for CNL.						

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
241	CNSC	Section 5.1 Normal Evolution Scenario, Table 5-2	p.5-6	Comment: Carbon-14 has a remarkably high sorption coefficient to concrete structures (2 to 5 m³/kg) for a relatively inert element. As such, resulting doses to the environment are quite low. Expectation to Address Comment: Please explain how Carbon-14 is one of the most sorbed elements in this proposed project.	Resolved As: The distribution coefficient (Kd) values used for C-14 in the grout are discussed in Appendix E Section 3.4.11 of the Postclosure Safety Assessment (PostSA) TSD, and are based on published values, taken from Ochs et al. (2016). Additionally, these values are supported by Wang et al. (2009), which reports Kd values for C-14 of: • Stage I: 2 m³/kg • Stage II: 5 m³/kg • Stage III: 2 m³/kg The Kd values used for all contaminants in the PostSA are shown in Appendix E of the PostSA TSD, with concrete values in Table E-27. It can be seen that, while C-14 does have Kd values that are higher than some other elements, it is not the most sorbing contaminant. Zirconium for example has Kd values ranging from 0.5 m³/kg to 100 m³/kg, Nb has Kd values of 50 m³/kg, and Th, U, Np, and Pu all have Kd values as high as 30 m³/kg, all of which are much higher than the Kd values assigned to C-14. References: <i>Ochs M, Mallants D and Wang L. 2016. Radionuclide and Metal Sorption on Cement and Concrete. Topics in Safety, Risk, Reliability and Quality, Volume 29.</i> <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> <i>Wang, L., Martens, E., Jacques, D., Decanniere, P., Berry, J., and Mallants, D. 2009. "Review of sorption values for the cementitious near field of a near surface radioactive waste disposal facility," Rep. No. NIRAS-MP5-03/NIROND-TR-2008-23E. ONDRAF/NIRAS, Mol, Brussels.</i>
242	Health Canada	Section 5.1.3 Doses to Humans	p.5-18 to 5-21	Comment: There is no evidence provided to demonstrate that the exposure group profiles are reflective of actual land and resource use by Indigenous people, including assumptions about food consumption rates. Expectation to Address Comment: Please clarify whether the exposure profiles are based on site-specific data (e.g., food consumption surveys), and if not, how the assumptions were made.	Resolved As: As part of the Postclosure Safety Assessment TSD, a new Indigenous receptor was modelled intended to represent traditional Indigenous lifestyles. Site-specific data (e.g., food consumption surveys) were not used for the exposure profile for this receptor. The exposure profile was developed based on an Aboriginal Lifestyle Characterization completed for the NWMO (SENES, 2014). This study considered traditional Indigenous lifestyles pre-contact and therefore the exposure characteristics outlined for this hypothetical receptor are quite conservative. Engagement to date with Indigenous Nations, communities, and organizations has not suggested that these assumptions are incorrect. Engagement activities with Indigenous Nations, communities, and organizations will continue to seek information related to local food consumption. As a result of Indigenous feedback, the PostSA Normal Evolution Scenario examines an Indigenous receptor intended to represent traditional Indigenous lifestyles, based on a new study of the diet and harvest of the Algonquins of Pikwàkanagàn First Nation (AOPFN) (Fediuk et al., 2021) which shows that today, members are more likely to supplement their diet with additional groceries purchased from local shops. The Indigenous receptor does not live on the NPD site but uses the land surrounding the facility for some traditional activities (such as hunting, fishing, and harvesting of wild plants). As noted, this receptor has a diet that includes harvested and gathered food (from the area around the site) as well as purchased foodstuffs (based on AOPFN diet and harvest study). Another Indigenous receptor, which is referred to as the Self-Sufficient Indigenous Receptor (based on SENES (2014) and which has

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					more conservative exposure characteristics than the AOPFN receptor, is also considered in a Sensitivity Case analysed in the 4th Iteration PostSA. The doses seen by the indigenous receptor and the self-sufficient receptor are less than the doses seen by the most exposed receptor (Resident (Infant)) and show the impacts to a very conservatively characterized receptor where the sensitivity case considers a selfsufficient Indigenous receptor whose exposure characteristics bound the dietary and lifestyle of Indigenous Nations and communities in the area. References: <i>Fediuk, Karen, Ginger Gibson, and Firelight Research Inc. Diet and Harvest Study. Confidential Report Specific to Canadian Nuclear Laboratories Nuclear Power Demonstration Decommissioning Project. Submitted to the Algonquins of Pikwàkanagàn First Nation. 2021 August 10.</i> PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL. <i>SENES Consultants Limited (2014) – Aboriginal Lifestyle Characterization. Prepared for Nuclear Waste Management Organization. NWMO TR-2014-13. SENES Reference No. 350696. June.</i>
243	ECCC	Section 5.3 Defence-in-Depth Calculation Cases	p.5-33	Comment: The assumptions and model inputs for the various models used to develop the “Role of Grout” scenario have not been clearly outlined, which are needed in order to review the completeness of modeling methodology. Expectation to Address Comment: Please identify the inputs, assumptions, limitations and inferences for the various models used to develop the “Role of Grout” scenario.	Resolved As: The reference approach is to grout-fill the below-grade rooms. Appendix D (Scenarios) of the 4th Iteration PostSA TSD provides details on each scenario (PostSA TSD). The section covering Defence-in-Depth scenarios explains that in the “Role of Grout” Scenario, “<i>In order to provide a quantitative indication of the significance of it as a substrate, this calculation case examines the performance of the NPDWF with the grout absent from all rooms. Instead, these rooms are free to resaturate and fill with water into which contaminants can dissolve without being retarded by sorption effects. All other aspects of the model are the same as the Normal Evolution Scenario</i>”. Thus, the main aspect examined by this scenario is the grout’s influence on sorption. Appendix E, Section E 3.11.2 (Models & Data) of the 3rd Iteration PostSA TSD (Arcadis and Quintessa 2020) includes a sub-section which specifically outlines the parameters and values used in the Role of Grout scenario (following the PostSA’s general approach to models and data, which outlines parameters and values for the Normal Evolution Scenario, then for subsequent scenarios, specifies only those parameters and values that <i>differ</i> from the NES). Change to PostSA TSD: The ‘Role of Grout’ Scenarios now captured under a Defense-in-Depth scenario (Appendix D, Section 6.2). Parameters used for the scenario can be found in Appendix E, Section E.3.11.2. Reference <i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). 2020. Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project. (3rd Iteration). 64-508760-ASD-003. Revision 0. 2020 March 30. Prepared by Arcadis and Quintessa for CNL.</i> PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.
244	CNSC	Section 5.5.3 Well in Contaminated Plume	p.5-46	Comment: “What if” scenarios are considered to be based on extreme assumptions and are not considered to be plausible. Given that	Resolved As: Many downstream communities, including Deep River, Petawawa and Pembroke, utilize the Ottawa River for their municipal drinking water supply; therefore, the NPD Closure Project anticipated there would be public concern over

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response				
		Also applicable to the main EIS, Section 9.8.3 Identification of Residual Effects, p.9-110		wells are used by people living in the same region as the NPD site, more credibility should be given to this scenario. Expectation to Address Comment: Please justify classifying the “well in contaminated plume” as a “what if” scenario, or provide more credibility to this case by considering it in the NES.	the project’s effect on surface water quality. Since the larger surrounding population utilize the Ottawa River, and to pre-emptively address public concerns, the NPD Closure Project establishes the future domestic water source in the Normal Evolution Scenario as the Ottawa River directly adjacent to the NPD site, as opposed to an onsite groundwater well. The rationale for classifying the “well in contaminated plume” as a “what-if” scenario was primarily due to features of siting a drinking well immediately in the groundwater plume leaving the facility, which were not considered to be plausible. There is a very steep slope between the facility and the Ottawa River; therefore, drilling a drinking well in this terrain would be impractical. Further, the groundwater plume leaving the facility is relatively shallow, in comparison to most drinking wells in the area which take water from much deeper formations (i.e. ~150 feet). Therefore, installing a drinking well directly at that depth was deemed a very improbable situation. In the 4th iteration of the PostSA two disruptive events have been considered that wells in the contaminated plume. These are a shallow well drawing water from the overburden and a deeper well drawing water from the bedrock. For the overburden well the peak dose is estimated to be 1E-04 mSv/y and for the bedrock well the peak dose is 3E-02 mSv/y. Therefore, even if the well scenario was considered as a Normal Evolution Scenario, the resulting max dose of 0.03 mSv/y (occurring at 1,300 years after closure) is still six times less than the dose criterion of 0.25 mSv/y.				
245	Health Canada	Appendix A 5.4 Criteria for Non-Radioactive Contaminants	p.A-9	Comment: Appendix A states: “[p]otential impacts from non-radioactive elements or chemical species are assessed for both all scenarios and calculation cases in environmental media relevant to human health and environmental protection. The relevant environmental quality standard criteria for soil, sediment and water are designed to protect against adverse effects from exposure by food chain...” It is unclear whether this assumption is supported by scientific evidence or how all environmental quality standards apply to the country foods consumption pathway, since not all criteria are designed to be protective of human health. Similarly, Section 8.3.5 (EIS) indicates that sample concentrations in sediment exceeded criteria, but the discussion does not specify whether the criteria are protective of aquatic life or human health. The CCME criteria used in Table 8.3-10 are based on the protection of freshwater aquatic life, while the MOECC Table 1 criteria uses a mix of values based on the protection of aquatic biota and human health. The use of these values for screening may therefore underestimate the risks to human health. In addition, shore sediment values were screened based on MOECC sediment criteria designed to protect aquatic ecosystem health. Health Canada has published supplemental guidance on the evaluation of human exposure to chemicals in sediments. Please refer to Health Canada’s <i>Guidance on Contaminated Sediments</i>, and <i>Federal Contaminated Site Risk Assessment in Canada: Supplemental Guidance on Human Health Risk Assessment of Contaminated Sediments: Direct Contact Pathway (2017) for</i>	Resolved As: Following Section 6.2.5.5 of CSA 288.6 guidance document the provincial and federal guidelines and background concentrations were considered for the screening of contaminants. Section 6.2.5.5 of CSA 288.6 outlines that “<i>the screening of contaminants and physical stressors can involve comparison of measured or modelled amounts of contaminants or physical stressors to appropriate regulatory criteria, screening criteria or background concentrations. The screening of contaminants should follow the guidance outlined by Health Canada (HC 2004 and 2010). Screening criteria adopted from other agencies should be reviewed and adjusted if necessary.</i>” On-site and off-site residents, hunters and Indigenous receptors were identified as human exposure groups under normal evolution scenario as part of biosphere in the Postclosure Safety Assessment. Lead was identified as the sole non-radionuclide contaminant in the biosphere. The following exposure pathways were considered for each receptor groups.				
					Pathway	Site Resident	Hunter	Indigenous	Offsite Resident
					Drinking river water	☐	☐	☐	☐
					Ingestion of garden produce, including honey	☐			
					Ingestion of livestock produce	☐			
					Ingestion of fish and shellfish from the river	☐	☐	☐	
					Ingestion of game (deer, geese and ducks)		☐	☐	
					Incidental ingestion of soil from garden and grazing area	☐			
Incidental ingestion of sediment from the shoreline	☐	☐	☐						

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response							
				<i>assessing human health risks from exposure to contaminated sediment for direct contact pathways.</i> The Supplemental Guidance is available upon request. Expectation to Address Comment: Please demonstrate that the specific EQS criteria selected for each COPC is suitable for the protection of human health in the manner in which they are used. Alternatively, an appropriate value can be calculated based on site-specific evidence to support the conclusions drawn in the EIS. In addition, provide additional rationale to support the use of EQS criteria in lieu of a detailed HHRA / assessment of uptake into biota. Ensure that all applicable exposure pathways for the human receptors are considered and clearly discussed. It would also be appropriate to consider sediment stability and the hydrological regime of the area in order to identify and evaluate the disturbance and dispersal of contaminated sediment, as this will support assessment of potential health risks.	External irradiation during time spent on the garden and in the grazing area	☐						
					External irradiation due to time spent on the shore	☐	☐	☐				
					External irradiation from immersion in bath of river water	☐		☐	☐			
					External irradiation due to immersion in the river whilst swimming	☐	☐	☐	☐			
					Incidental ingestion of river water whilst swimming	☐	☐	☐	☐			
					Inhalation in the garden and grazing area	☐						
					Inhalation during time spent on the shore and swimming	☐	☐	☐				
					As shown above, one or more groups of human receptors are indirectly exposed to contaminants in soil, groundwater, surface water and sediment via food ingestion exposure pathway. Food groups considered in the current assessment are garden produce, livestock produce, fish, shellfish, and game animals.							
					The EQS (federal and provincial guidelines /screening criteria for protection of human health exposure to lead) are as follow:							
					<table><tr><th>Environmen tal media</th><th>Federal/Provincial guidelines screening values</th><th>Criteria for Lead</th></tr><tr><td rowspan="2">Soil</td><td>CCME Canadian Soil Quality Guidelines (SQG) for the Protection of Environmental and Human Health. Lead. 1999.</td><td>SQG_{HH} = 140 mg/kg for agricultural, residential/parkla nd land uses. See Note 1</td></tr><tr><td>Ontario Ministry of the Environment Conservation and Parks (MECP). Table 8 Site Condition Standards (SCS) for Use within 30 m of a Water Body in a Non-Potable Ground Water Condition. Coarse textured soil.</td><td>Table 8 SCS under an agricultural land use = 45 mg/kg See Note 2</td></tr></table>					Environmen tal media	Federal/Provincial guidelines screening values	Criteria for Lead
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Soil	CCME Canadian Soil Quality Guidelines (SQG) for the Protection of Environmental and Human Health. Lead. 1999.	SQG _{HH} = 140 mg/kg for agricultural, residential/parkla nd land uses. See Note 1										
	Ontario Ministry of the Environment Conservation and Parks (MECP). Table 8 Site Condition Standards (SCS) for Use within 30 m of a Water Body in a Non-Potable Ground Water Condition. Coarse textured soil.	Table 8 SCS under an agricultural land use = 45 mg/kg See Note 2										

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response				
							Ontario Ministry of the Environment Conservation and Parks (MECP). Table 1 Full Depth Background Site Condition Standards, residential/ Parkland/ Institutional/ Industrial/ Commercial/Community Property Use.	Table 1 SCS under an agricultural land use = 45	
						Groundwater	HC Guidelines for Canadian Drinking Water Quality (HC DWQG) Summary Table. Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment, 2019 June.	DWQG for lead is 0.005 mg/L	
							Ontario Ministry of the Environment Conservation and Parks (MECP). Table 1 Full Depth Background Site Condition Standards, residential / Parkland / Institutional / Industrial / Commercial / Community Property Use.	Table 1 SCS for lead in groundwater is 1.9 µg/L.	
						Surface water	Provincial water quality objectives (PWQO's) (1994).	PWQO for lead = 0.001 mg/L for hardness <30 mg/L (this was the minimum reported PWQO)	

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response				
								See Note 3	
							HC Guidelines for Canadian Drinking Water Quality (HC DWQG) Summary Table. Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment, June 2019.	DWQG for lead is 0.005 mg/L See Note 4	
							Ministère de l'Environnement et de la Lutte contre les changements climatiques	Surface Water Quality Criteria for the protection of aquatic organisms (chronic exposure) for lead is 0.00017 mg/L (water hardness of 10 mg/L CaCO3)	
						Sediment	No human health-based sediment guidelines are available by HC. See Note 5		
							The MECP background sediment standards in Table 1 SCS See Note 6		
						Note 1 - This value is driven by guideline protective of soil ingestion.			
Note 2 - The Table 8 SCS for lead was defaulted to Ontario background concentration for this parameter to be protective of both human and ecological health.									
Note 3 - These water quality criteria are protective of aquatic life as recreational uses of surface water bodies.									
Note 4 - Surface water is used as a source of drinking water.									

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Note 5 - As per HC (2017b) guidance, sediment concentrations can be screened against available human health-based soil quality guidelines in situations where only direct contact of contaminants is expected. Still, the soil quality guidelines may not be applicable for exposure scenarios where regular visit of the site and performing high contact activities (as identified in the Table 1 of HC 2017b guidance document) are involved. In such circumstances, the screening against background concentrations can be applied as an alternative. Lead: Table 1 SCS under an agricultural land use is 45 mg/kg. Note 6 - The MOE background sediment standards in Table 1 are set to Lowest Effect Levels (MOE 2011). The MECP Table 1 background concentrations for sediment are considered to provide a level of human health and ecosystem protection consistent with background and protective of sensitive ecosystems. MOE Table 1 SCS = 31 mg/kg. The background sediment concentration for lead is 23 mg/kg (MOE 2008) which is based on analysis of Great Lakes pre-colonial sediment horizon. The criteria used for screening lead in groundwater, surface water, soil and sediment are presented in Table A-2 in the PostSA. It is acknowledged that the food consumption was not taken into consideration in the development of the above noted guidelines / screening criteria and as such none of the above noted screening values guidelines are protective of food exposure pathway. The lead concentrations in each environmental media were predicted under various scenarios (PostSA, Appendix G, Table G-14). It should be noted that the modeled lead concentrations in each environmental media are considerably (i.e., several orders of magnitude) lower than the current background levels. Therefore, the human exposure to lead under pre-defined exposure scenarios in the future (until 10,000 years) will unlikely exceed the levels that general public are currently exposed to in the background environment via all exposure pathways including food ingestion. Therefore, a detailed quantitative HHRA for exposure to lead is not warranted at this time and a comparison of modeled concentrations with background levels are considered to be sufficiently protective of human health. The sediment stability and hydrogeological regimes have been considered in river shore modeling scenario. The predicted concentration of lead at the river shore was 4E-05 mg/kg at 10,000 years (Table G-14), with a peak of 4E-05 mg/kg at 12,000 years. The predicted concentration is several orders of magnitude less than adopted sediment background levels and as discussed above the exposure to lead via this scenario does not likely exceed the current background exposure of general public to lead. References: <i>Canadian Standards Association (CSA). 2022. Environmental Risk Assessment at Nuclear facilities. CSA Standard N288.6-22. 2022.</i> <i>Health Canada (HC). 2004. Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA). https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/contaminated-sites/federal-contaminated-site-risk-assessment-canada-part-guidance-human-health-preliminary-quantitative-risk-assessment-pqra-version-2-0.html</i> <i>Health Canada (HC). 2010. Federal Contaminated Site Risk Assessment in Canada, Part V: Guidance on Human Health Detailed Quantitative Risk Assessment for Chemicals (DQRA Chem). https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/contaminated-sites/federal-contaminated-site-risk-assessment-canada-part-guidance-human-health-detailed-quantitative-risk-assessment-chemicals-dqrachem-health-canada.html</i> <i>Health Canada (HC). 2017b. Federal Contaminated Sites Risk Assessment in Canada, Supplemental Guidance on Human Health Risk Assessment of Contaminated Sediments: Direct Contact Pathway. 2017 March.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/contaminated-sites/supplemental-guidance-human-health-risk-assessment-contaminated-sediments-direct-contact-pathway.html Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC). 2020. Surface Water Quality Criteria. Accessed online at: http://www.environnement.gouv.qc.ca/eau/criteres_eau/index.asp. Ministry of Environment and Energy (MOEE). 1994b. Water Management - Policies, Guidelines and Provincial Water Quality Objectives of the Ministry of Environment and Energy. 1994 July. Ontario Ministry of Environment, (MOE). 2008. Guidelines for Identifying, Assessing and Managing Contaminated Sediments in Ontario: An Integrated Approach. 2008 May. Ontario Ministry of Environment, (MOE). 2011. Soil, ground water and sediment standards for use under Part XV.1 of the Environmental Protection Act. Ministry of Environment.
246	ECCC	Appendix B System Description, B 3.4 Uncertainties	p. B-23	Comment: Section B 3.4 states: “Measurement data are also not available for Ag-108m, a particularly important radionuclide. Some radionuclides also appear to have been underestimated when calculated by modelling, most notably tritium and C-14 in concrete and steels.” Failure to assess and accurately predict radiological dose from parameters such as Ag-108m, tritium or C-14, could result in adverse effects on the surrounding environment, such as water quality, sediment quality, and impacts on aquatic biota. Expectation to Address Comment: Please describe the risks associated with not having measurement data for Ag-108m and the risks associated with underestimating the radionuclides in the models, including for tritium and C-14. Furthermore, please explain how these uncertainties will be addressed.	Incorporated: In response to regulatory comments over the application of the ORIGEN model at the Nuclear Power Demonstration Waste Facility (NPDWF), Canadian Nuclear Laboratories (CNL) has repeated the calculation of activity in reactor components from first principles using modern codes and libraries and includes a detailed examination of potential impurities and uncertainties in the material compositions. Documented in Edwards & Adams (2019), this re-calculation has been applied to the Post-closure Safety Assessment (PostSA) Technical Supporting Document (TSD) and has resulted in a changed radiological inventory as well as a revised discussion on the associated uncertainty. The revised calculation shows that the total activation product inventory estimated using Edwards and Adams (2019) (7.51E+13 Bq) is conservative in comparison to the total activation product inventory estimated by sample results alone (2.07E+13 Bq) in NMNTI (2017). The modelled activation product inventory of the NPD reactor components appears to be largely conservative for the aluminium and zircaloy reactor components (with the exception of some radionuclides where sample data is used in preference for conservatism). Tritium was overestimated in the aluminium components by Edwards and Adams (2019) and underestimated in the concrete. The total tritium inventory estimated by sampling results was approximately 20 times lower than Edwards and Adams (2019). Except in the case of tritium where there is confidence in the use of the lower results by sample, the higher activity of either the sampled or calculated results have been used to form a composite total activity and provides the most conservative source term. Edwards and Adams (2019) underestimates C-14 by 4 orders of magnitude in the bioshield concrete. This discrepancy is potentially due to errors in the starting N-14 composition or impurities in reactor materials. However, the total C-14 inventory estimated by Edwards and Adams (2019) is still approximately 20 times higher than the total inventory determined by sampling results. Overall, whilst there remain uncertainties in the inventory, stemming from the modelling results, the measurements strongly suggest that the modelled inventory is significantly conservative. The inventory used takes into account these uncertainties from the modelling estimates together with the measured results to form a conservative, composite reference inventory.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Change to the PostSA: Appendix B, Section 3 and Appendix E, Section 3.3 have been updated to incorporate the findings from Edwards & Adams. References: <i>Edwards & Adams. 2019. Calculations of the Current NPD Reactor Vault Activation Source Term, 64-505100-ANL-001. Revision 0.</i> <i>New Millennium Nuclear Technologies Incorporated (NMNTI), 2017. Final Report for the Characterisation of the NPD Reactor using TruPro® Technology. NMNTICNLFR01, May 2017.CNL NO. 509410-REPT-004 Rev 0</i>
247	CNSC	Appendix C Features, Events and Processes	General	Comment: There are several FEPs that were either screened out with insufficient justification or where their impact does not appear to have been fully considered. Here is a list of FEPs with an explanation of what aspect(s) require further clarification: • FEP # 1.2.12 Hydrological/Hydrogeological Response to Geological Changes: It does not appear to consider the possibility of an increase in river levels or regional groundwater levels due to climate change. • FEP # 2.1.1.1 Radionuclide Content: It is noted that this FEP can be assessed as a sensitivity case, which was done. However, the sensitivity case only assessed the effect of the lower limit of the waste inventory and did not consider the upper limit of waste inventory uncertainty. • FEP # 2.3.4.7 Complexation [Waste Form]: The exclusion of complexing from consideration in the NES is insufficiently justified. It is stated that there will not be a source of complexants in the reactor vault. However, this statement does not appear to consider the possibility of carbonate and hydroxide as complexants from water passage through the concrete shield prior to it reaching the reactor vault, where they could then form new species with radionuclides that either retard or enhance mobility. • FEP # 2.3.4.8 Colloid Formation [Waste Form], FEP # 3.2.4.8 Colloid Formation [Facility] and FEP # 3.3.1.7 Colloid Transport [Facility]: The exclusion of colloids as a transport mechanism from the NES is insufficiently justified. It is not clear why up and down gradient hydrologic properties or cement will filter colloids, which are known to be highly conservative and can travel through low permeability and porosity materials. • FEP # 2.4.2 Gas-Mediated Release: CNL states that, although gas may be generated from a number of processes,	Incorporated: a) With respect to FEP 1.2.12, Hydrological/ Hydrogeological Response to Geological Changes: Regional groundwater levels as a result of climate change is addressed in the recent PostSA TSD update. The normal evolution scenario takes climate change into effect and is described in a new subsection added in Appendix D (D 3.1). The river level is not likely to change sufficiently to result in flooding of the facility. There is a significant slope and height difference between the facility and the river. The NPD Closure Project has carried forward updated scenarios and results into the EIS update. Resolved As: b) With respect to FEP # 2.1.1.1, Radionuclide Content: Uncertainties in the radionuclide content of the facility are adequately addressed. An upper inventory limit was examined in the 1st iteration of the PostSA; since then, measurement data and other lines of evidence are available to support the conservative reference inventory presented in the PostSA. The Normal Evolution Scenario used in the 3rd iteration of the PostSA (Arcadis and Quintessa 2020) is based on a reference radionuclide inventory that is derived using the higher value derived from modelling or sample analyses, ultimately producing estimates that include various conservatisms and are intended to be bounding. So, in order to gain perspective on the uncertainties in the radionuclide inventory, another sensitivity case was analyzed in the 3rd iteration of the PostSA using only measured data of radionuclide concentrations, without any uncertainty factors, where possible. For the 4th iteration of the PostSA the radionuclide inventory used in the NES is only measured data on radionuclide concentrations, without any uncertainty factors, where possible. So, in order to gain perspective on the uncertainties in the radionuclide inventory, the modelled radionuclide inventory used in this case is based on modelling and sample analyses, ultimately producing estimates that include various conservatisms and are intended to be bounding. In order to further gain perspective on uncertainties in the radionuclide inventory, a sensitivity case considers a radionuclide inventory twice that of the modelled inventory used in the above sensitivity case. c) With respect to FEP # 2.3.4.7, Complexation [Waste Form]: A conservative approach was followed for all radionuclides by assuming infinite solubility. Lead (Pb) – for which solubility was explicitly accounted for – was examined with respect to complexation. d) With respect to FEP # 2.3.4.8 Colloid Formation [Waste Form], FEP # 3.2.4.8 Colloid Formation [Facility] and FEP # 3.3.1.7 Colloid Transport [Facility]: The formation of colloids in the waste at the NPD facility is unlikely because colloids typically form from clay minerals, organic and bio-organic molecules and these are not present at the NPD facility in significant amounts. Furthermore, colloids, which occur naturally in groundwater, could not enter the NPD facility with groundwater (e.g. due to grout), be introduced with grout material, or be produced in the repository during degradation of the wastes or

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				“the potential for gas generation is relatively low as the main sources of gas (corroding metals) will produce gas slowly and as such the gas is likely to become dissolved in groundwater gas”. Based on this, gas migration has been screened out as a FEP. However, no data (i.e., scientific evidence) has been provided to quantify the rates of gas generation and dissolution in groundwater to support these statements. Expectations to Address Comment: Please address the outstanding concerns related the aforementioned FEPs. For FEP # 2.4.2 (Gas-Mediated Release), please provide a quantitative assessment to support the decision to screen out gas-mediated release as a FEP. This may include calculating the expected rate of gas generation (from waste inventory and corrosion rates) and its dissolution in groundwater.	erosion of the grout. The low hydraulic conductivity of the Facility will also prevent any significant colloidal transport. Finally, examining uncertainties in sorption coefficients (see Appendix G 3.3 of the PostSA TSD) provides a perspective on the implications of more rapid transport for radionuclides potentially sorbed to natural colloids. This sensitivity analysis resulted in peak doses that remain much below criteria. e) With respect to FEP # 2.4.2 Gas-Mediated Release: There are two aspects of gas mediated release to be considered: a) related to organic degradation processes; and, b) corrosion processes, most notably (for the NPD facility) iron (steel), lead and aluminium. Briefly, • The potential for gas generation by organic degradation is very limited at the NPD facility because the amount of organics present is very limited. • The corrosion rates of lead are expected to be low and the corrosion rate of steel and Zircaloy are expected to be even lower. The corrosion rates of aluminum are rapid compared to those of the other metals in the presence of grout. Given the high potential for Al corrosion and the high rates expected in the presence of grout, the corrosion of Al will occur predominantly during decommissioning, and during initial resaturation of the facility with water that has been conditioned by cementitious materials. Therefore, significant gas generation due to Al corrosion will not occur after in the postclosure phase. Change to PostSA: A new sub-section has been added into D 3.1 of Appendix D to describe how climate change has been incorporated into the normal evolution. References <i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). 2020. Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project. (3rd Iteration). 64-508760-ASD-003. Revision 0. 2020 March 30. Prepared by Arcadis and Quintessa for CNL.</i>
248	CNSC	Appendix C Features, Events and Processes Also applicable to Appendix D Scenarios and Calculation Cases, p.D-6	p.C-103	Comment: As defined in CNSC’s Guide G-320, <i>Assessing the Long-Term of Radioactive Waste Management</i>, “[a] normal evolution scenario should be based on reasonable extrapolation of present day site features and receptor lifestyles. It should include expected evolution of the site and degradation of the waste disposal system (gradual or total loss of barrier function) as it ages.” The proposed NES is not considered to be in alignment with CNSC’s Guide G-320, for the following reasons: • The presence of a shear zone is presented in the Updated Groundwater Modeling Report. Yet, large-scale discontinuities are screened out of the NES, as CNL claims that the bedrock at the site contains only minor fractures and little weathering. The shear zone, identified at the NPD site, must be considered as an integral component of the NES.	Incorporated: The comment identifies 5 topics as part of the ‘expectations to address the comment’. A response is provided for each of these 5 topics below. <u>TOPIC #1: presence of the shear zone</u> The suggestion of a shear zone was initially noted in a borehole study preceding design, where unexplained water losses occurred during bedrock coring. A shear zone was postulated as a possible explanation. This was investigated during the 2018 field season, when the NPD Closure Project performed Geologic Characterization activities (Geofirma 2019). The 2019 shallow bedrock investigations show no evidence of a 90 m-wide, east-west striking, south-dipping shear zone or similar major structural features in the vicinity of the NPD Waste Facility (NPDWF). A review of borehole core logs, geophysical logs and straddle-packer testing shows that there is no evidence to support the existence of the hypothesized 90 m-wide shear zone at the NPD site and the NPDWF (Geosynthesis TSD). Inspection of bedrock excavation photographs and a review of 2019 shallow bedrock drilling and logging indicates the suspected shear zone is not present at the reactor building excavation or in the vicinity of the NPDWF. The bedrock structural data from 2019 drilling and logging shows that overall rock quality and fracture spacing decrease with proximity to the Ottawa River. Such decreasing rock quality with proximity to the Ottawa River is most likely

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				• Seismicity: Seismicity was screened out from the NES as CNL states that the facility is in a region with a low probability of earthquakes that cause structural damage, and seismicity is covered by a DES that considers damage to engineered structures. However, the site lies within a zone of moderate seismic hazard; therefore, the impact of seismicity on the facility should be included in the design and/or assessed in the NES corresponding to the defined safety assessment timeframe (50,000 years), over which the seismic hazard is expected to be higher – and should be included as a FEP. - o In order to meet the intent of CNSC’s Guide G-320, consideration of a design-basis seismic event occurring, and the associated impacts on the performance of the EBS components (e.g., degradation rates, porosity, hydraulic conductivity), its influence on the existing shear zone (i.e., reactivation of the fracture network), and other geological features should form an integral component of the NES. • Performance of the engineered barrier system: Significant uncertainty exists within the key model parameters (i.e., hydraulic conductivity and degradation rates) of barrier performance (i.e., grout, foundation). - o It appears that CNL is using a number of material properties associated with porous concrete for the grout (i.e., hydraulic conductivity, diffusion properties, dry bulk density, degradation, and porosity) based on Savage and Stenhouse (2002). It is not clear within the Postclosure Safety Assessment TSD if the type of grout has been selected, and what the hydraulic and mechanical properties of the selected grout are. The parameters used are therefore not well justified for the purpose of the Postclosure Safety Assessment. - o No evidence could be found to verify / support that the foundation concrete used at the NPD facility holds similar properties to those adopted from Savage and Stenhouse (2002). Furthermore, the values in this report make reference to other studies. It is not clear which studies have been used, and whether the material properties assessed for concrete in those studies hold in this assessment. Furthermore, information could not be located on the existing state of the building foundation. - o In the absence of scientific evidence, a level of conservatism in the performance of the EBS, that is	due to borehole proximity to the major Mattawa Fault that defines the alignment of the Ottawa River. The Geosynthesis TSD was prepared utilizing the results of the Geoscientific Characterization work to present available site-specific, local, and regional geoscientific data and information as part of defining the geological, hydrogeological, and geomechanical frameworks for the NPD site. In keeping with the conclusions of the Geoscientific Characterization Report and the Geosynthesis Report, both the Post Closure Safety Assessment Technical Support Document (PostSA TSD) and the Groundwater Modeling Report (Calder 2024b) were updated to remove the reference to the potential shear zone. <u>TOPIC #2: Seismicity; Re-activation of the shear zone as a result of a seismic event.</u> The presence of a shear zone was ruled out in the Geosynthesis TSD based on data provided in the Geoscientific Characterization report (Geofirma 2019). In order to more quantitatively assess a seismic event, the NPD Closure Project has prepared a Seismic Assessment for NPD (CNL 2019a) where three earthquakes were considered for the NPD Disposal Facility (NPDDF). They are a 1/2,250 yr event, for comparison to the Design Basis Earthquake (DBE) at the Chalk River site, a 1/10,000 yr event, considered as the DBE for the NPD site and thus part of the Normal Evolution Scenario, and a 1/50,000 yr event, which will be used as a Disruptive Event Scenario. The seismic analysis (CNL 2019a) for the normal evolution NPD DBE indicated that there will be some cracking and displacement of the portion of the facility located above bedrock; all structures below the bedrock level will be undamaged. Damage to the portion of the structure above bedrock increases with the energy of the event, but in all cases the assessment concluded there would be no damage to the portion of the structure below bedrock. The impacts to the entire NPDDF from external events, including seismic events, are detailed in the PostSA. The EIS concludes no residual effects for any of the scenarios analyzed. <u>TOPIC #3: conservatism within the key model parameters of barrier performance, commensurate with the level of uncertainty that exists with the properties of the final grout formulation and existing integrity of the building foundation.</u> The grout formulation to be used for infill of the existing NPD reactor facility has been finalized, and is captured in a specification (Aikens 2019c). Testing has confirmed the relevant properties of this formulation (Golder 2020), and the properties of the existing concrete of the NPD facility (AECOM 2018), and these parameters have been accounted for and included in the Post Closure Safety Assessment Technical Support Document (PostSA TSD). A conservative assessment of the chemical environment provided by the grout is analyzed and the role of grout and the concrete structure is tested through its removal in a sensitivity cases in Section 5.4.2 of the 3rd iteration PostSA (Arcadis and Quintessa 2020). Furthermore, the NPD Closure Project has prepared a Cementitious Materials Synthesis Report (Arcadis 2018), which provides additional information such as: • Material compositions; • Rationale for selection of the particular grout formula; • A summary of the properties of materials (e.g. pH buffering effects, sorption capacity, etc.) and their relevance to PostSA calculations; • Information on degradation processes, and processes relevant for the facility; • Natural analogues; • Implications of cementitious materials evolution on contaminant behaviour; and • Implications of cementitious materials / alkalinity on metal corrosion.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				commensurate with the level uncertainty, should be applied to the NES and justified. Given the lack of evidence provided on the current specifications of the grout type(s) to be used in the decommissioning of the NPD facility, and lack of characterization of hydraulic and mechanical properties and current integrity of the existing building foundation, it may be more appropriate to assume complete degradation of these barriers over the reference timeframe in the NES, unless additional evidence to support the assumptions used can be provided. • Geosphere performance: Geology in the Postclosure Safety Assessment (p. 3-9) is not presented in enough detail for this project (i.e., just over 200 words were used to describe the stability, regional geology, local geology, rock type with no references, no maps, and no geological model). Supporting information in Appendix B is limited: the bedrock geology map provided is for the entire province of Ontario, and a diagram from Wikipedia (Figure 6-3) is provided for tectonic setting. Please note that Wikipedia is not suitable as a lone reference for this information – the scientific literature must be consulted. It is not clear how the expected evolution of the site, in particularly the geosphere, has been accounted for within the NES. CNL should provide supporting evidence to demonstrate that the site geology and its anticipated evolution in the reference timeframe is being considered in the NES, and that geosphere characteristics have been properly documented in supporting material. • The NES should include the existence of a seismically active fault / shear zone at the project site. This also highlights the need for a seismic hazard assessment. By extension, information on the shear zone must be provided in the main EIS and the Postclosure Safety Assessment. Expectation to Address Comment: Please reassess the proposed NES and take into consideration the following: i) the presence of the shear zone (potential for reactivation over, relationship to seismicity); ii) seismicity; iii) conservatism within the key model parameters of barrier performance, commensurate with the level of uncertainty that exists with the properties of the final grout formulation and existing integrity of the building foundation; and iv) adequate characterization of the current geology and its evolution within the reference timeframe. Please provide a synthesis of the geological environment for the NPD site, including regional geological setting and site-specific characterization. Related components that should support this	<u>TOPIC #4: adequate characterization of the current geology and its evolution within the reference timeframe</u> In response to hydrogeological uncertainties, the NPD Closure Project has completed a Geosynthesis Report (Geosynthesis TSD). The Geosynthesis TSD provides an important presentation and integration of site geological, hydrogeological and geomechanical data and information within the broader context of regional geoscientific data and information and the detailed data and information available for the nearby Chalk River Laboratories (CRL) site - which has been subject to extensive and detailed geoscientific characterization for waste management purposes for over 40 years. The information assembled includes readily available sources of data on the regional geological setting and overburden and bedrock geological mapping (e.g., GSC and OGS preliminary and final mapping) to develop a regional understanding of geological history and evolution for the area. The Geosynthesis Report also involves a Bedrock Fracture Assessment/Lineament Analyses – which interprets existing air photo and remote sensing data to characterize bedrock fractures from surface indications. The requirements of CNSC REGDOC-2.9.1 were taken into consideration when undertaking the geosynthesis work. Conclusions from the Geosynthesis Report and results from the geological site characterization (Geofirma 2019) have been incorporated into the PostSA. <u>TOPIC #5: provide specific data to establish corrosion rates and constrain releases from the source term.</u> As mentioned above, the NPD Closure Project has prepared a Cementitious Materials Synthesis Report (Arcadis 2018), which provides additional information on the implications of the evolution of cementitious materials on contaminant behavior, such as on metal corrosion. The following statement was already included in Appendix E, Section E 2.2.1 of the PostSA TSD which helps define the effect of the cementitious environment on contaminant transport out of the facility: <i>“Radionuclide releases from neutron-activated metal wastes in the Reactor Vault occur by corrosion once the NPDDF has resaturated. Contamination in other materials in the NPDDF, where located below the water table, is assumed to be instantly available once resaturation has occurred provided the aqueous solubility limit is not reached. Contaminants in solution may then migrate by diffusion and, as the concrete structure degrades, by advection. For a period, the porewater will be alkaline due to the conditioning effect of the cement. Contaminants will sorb to the cement and their migration will be retarded. Groundwater will gradually leach cement constituents and degrade the concrete and grout, increasing its permeability and ultimately reducing the pH to near neutral.”</i> Corrosion rate data are presented in Appendix E Section E 3.3.6 of the PostSA TSD which includes corrosion rates for each metal in the environment to which they will be subjected throughout the post closure phase: aerobic conditions for both neutral and high pH, and anaerobic conditions for both neutral and high pH. Although aluminum corrosion rates are provided, it is conservatively assumed that aluminum instantaneously dissolves when the facility reaches saturation. Additionally, corrosion rates are applied to surface area of a given metal, and the PostSA TSD assumes all metals have a material thickness of 3 mm resulting in a very conservative surface area to which corrosion can take place. All of the materials are much greater than 3 mm thick. Congruent and instant releases have been taken into account in the PostSA TSD as noted above, both by defining corrosion rates and instantaneous release assumptions, as well as contaminant migration mechanisms both through the facility and the environment. Change to EIS: Section 8.5 of the EIS has been revised to include information from the Geosynthesis Report and the Geoscientific Characterization Report.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				synthesis include: regional geological history and setting, structural geology and tectonics, petrology, a seismic hazard assessment (that incorporates the geological information and seismic sources), geomorphology, site-specific geology, fracture frequency in shallow bedrock, and bedrock weathering profile. Furthermore, please provide specific data to establish corrosion rates and constrain releases from the source term. This should take into account congruent release and potential instantaneous release.	References: <i>AECOM. 2018b. Structural Analysis of Existing NPD Facility – Final Report, 64-508120-ASD-001, July.</i> <i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). 2020. Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project. (3rd Iteration). 64-508760-ASD-003. Revision 0. 2020 March 30. Prepared by Arcadis and Quintessa for CNL.</i> <i>Arcadis. 2018, Cementitious Materials Synthesis Report – NPD Closure Project. 64-508760-REPT-008. Revision 0.</i> <i>Johnson, D. 2022c. Specification – Grout Formula and Properties, 64-508300-SP-001, November.</i> <i>Geofirma Engineering Ltd. 2019. Geoscientific Characterization of the NPD Site. 64-509410-REPT-012. Revision 0.</i> Geosynthesis TSD: <i>Raven, K., Sterling, S. and Calder, N. 2022. 2021 Update to Geosynthesis Nuclear Power Demonstration Closure Project Rolphton, Ontario. 64-509410-REPT-010. Revision 2. Prepared by Arcadis and Geofirma for CNL.</i> <i>Golder 2020. NPD Task Work Order 3 – Final Summary Report for Laboratory Testing Program on Fresh and Cured Properties of Bulk and Low pH Grout, 64-508120-REPT-005, November.</i> Groundwater Modelling TSD: <i>Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> <i>Zhang, Y. 2021. NPD Underground Structure Seismic Assessment, 64-20000-ASD-001. Revision 2.</i>
249	CNSC	Appendix E Conceptual Models and Data, Section E 2.2.4 Biosphere, Figure E-9	p.E-23	Comment: Not all pathways described in CSA N288.1-14, <i>Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities</i> are considered. Figure E-9 should include all relevant pathways shown in Figure 1 of CSA N288.1-14. Specific pathways that were excluded are: atmosphere to soil, forage, animal produce, and plant produce; and surface water to soil, forage, animal produce, and plant produce. Expectation to Address Comment: With regards to Figure E-9 and the assessment of doses to humans, please consider all pathways described in CSA N288.1-14. For any pathways excluded, either provide adequate justification for screening out, or include the pathways in dose assessments.	Resolved As: The environmental transfer and exposure pathways considered in CSA N288.1-14 (CSA 2014) are shown below for reference. The representation of these pathways is then discussed in turn. <u>Atmospheric Pathways</u> There is a lack of any significant sources of gaseous radionuclides from the NPD Disposal Facility (NPDDF) directly. This is because there are no materials present that could give rise to gaseous radionuclides, or the rate of evolution of these contaminants (e.g. gaseous forms H-3) either occurs while the NPDDF is under Institutional Control or is so slow that there is no appreciable accumulation of gaseous radionuclides. Furthermore, releases to the open air will be dispersed rapidly and very highly diluted. There is no atmospheric source to deposit onto soils (P12; irrigation is included and discussed below). Volatilisation (P21) has been modelled but applies only a small number of radionuclides and can be shown to be trivial (e.g. the calculated peak release of C-14 by volatilisation from river water into which radionuclides are released from NPDDF is 0.2 Bq/y). Resuspension of contaminants into airborne dust (P31 and P13) from soil and sediment was screened out from consideration as it presents a tertiary source of exposure (water is primary and soil is secondary) in which contaminant concentrations will be much lower than the primary and/or secondary source. Uptake of contaminants in air (a tertiary source) by animals and plants has been considered to be insignificant compared with the uptake from contaminated water and soils (primary and secondary sources):

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					• P14 - Deposition on plant surface from air – has been assumed to be insignificant compared with the direct uptake from soil and interception by water (which are the primary sources of contamination for the plant). • P14 – Inhalation of contaminants in air by animals - assumed to be insignificant compared with the direct uptake from ingestion of soil while grazing, ingestion of plants, and drinking river water (which are the primary sources of contamination for the animal). Exposure to humans from contaminants in air has only been considered in terms of inhalation: • P(i)19 – People on contaminated soil or sediment are assumed to inhale contaminants in air whilst present on it. • P(e)19 – External irradiation from resuspended dust is not considered as the concentrations in the soil from which it is resuspended are very much higher than associated with the dust in the air. <u>Surface Water/Groundwater Pathways</u> The primary release of contaminants to the biosphere is into river water and sediment. The water is then assumed to be used for irrigation of soil in which plants can grow and animals feed. A variant calculation considers irrigation of soil with well-water. As such, the model does include surface water (and groundwater) to soil, forage, animal produce, and plant produce. Specifically, the following pathways are all included directly in the model. • P23 – Contamination soil by irrigation (garden soil irrigated using river water or well water depending on scenario, grazing soil is “irrigated” by animals excreted by river water that has been drunk); • P32 – Infiltration of irrigation water (also takes account of infiltration of rainfall); • P34 – Uptake (soil->plant) (crops in the “garden” and pasture in the “grazing” land); • P24 – Direct contamination of plant surface by irrigation (crops only); • P25 – Water ingestion by animals (river water or well water depending on scenario); • P35 – Soil ingestion by animals (soil from grazing land); • P45 – Plant ingestion by animals (pasture in grazing land); • P26 – Uptake from water by aquatic animals (from river water); • P27 – Uptake from water by aquatic plants (from river water); and • P28 – Sorption to sediments. <u>Human Exposure Pathways</u> Human receptors are assumed to be exposed to contaminated soil and water by external irradiation, to ingest contaminated soil and water, and ingest locally produced foods. The following pathways are considered in the model: • P(e)29 – External radiation in water (while swimming); • P(i)29 – Ingestion of contaminants in water (river water or well water); • P(e)39 – External radiation by contaminants in soil (garden, grazing);

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					• P(i)39 – Inhalation of contaminants released from soil (garden and grazing land); • P49 – Ingestion of plants (crops from garden); • P59 – Ingestion of animals (domesticated and wild foods); • P69 – Ingestion of fish; • P(e)39 – External radiation by river sediments (while swimming and fishing); and • P89(i) – Ingestion of aquatic sediment (while fishing). <u>Pathways Excluded from the Model</u> The following environmental pathways are excluded in the model: • P65 – Aquatic animal ingestion by animals – Cows, pigs, sheep etc. are not assumed to ingest wild aquatic animals. Wild foods (deer, rabbit, goose, and duck) are assumed to be herbivores. • P75 – Aquatic plant ingestion by animals - Cows, pigs, sheep etc. are not assumed to ingest aquatic plants. Wild foods are assumed either not to feed on aquatic plants (deer, rabbit) or are assumed to obtain the majority of uptake directly from water (goose, duck). • P85 – Aquatic sediment ingestion by animals - Cows, pigs, sheep etc. are not assumed to ingest river sediment. Wild foods are not assumed to ingest river sediment (deer, rabbit) or are assumed to obtain majority of uptake directly from water (goose, duck). In addition, the following pathways are identified in N-288.1-14 but not modelled in N-288.1-14 or the NPD facility model: • P76 – Uptake from water sediment by aquatic animals – included in aquatic concentration factors (as per N288.1-14); • P86 – Ingestion of aquatic plants by aquatic animals – included in aquatic concentration factors (as per N288.1-14); and • P87 – Uptake from sediments by aquatic plants – included in aquatic concentration factors (as per N288.1-14). The following human exposure pathways were also excluded from the NPD facility model: • P79 – Ingestion of aquatic plants – there are assumed to be plentiful crops grown in contaminated soil such that people do not ingest any aquatic plants. References: <i>Canadian Standards Association (CSA). R2019. Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities. CSA Standard N288.1-14. 2014 March.</i>
250	CNSC	Appendix E Conceptual Models and Data, Section E 3.1	p.E-33	Comment: When screening the radionuclide inventory to reduce the number of radionuclides being considered to those that are relevant for the post-closure phase, C-14 was calculated to result in the highest	Resolved As: The highest dose to the Site Resident exposure group is to an infant. The exposure is dominated by Cl-36 (peak at 12,000 y) and C-14 (peak at 1500 years), (Figure G-28 of the PostSA (Arcadis (2023))). Peak C-14 doses, by-pathway, for the on-site resident infant, are shown below from the 4 th Iteration Postclosure Safety Assessment

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																																																																																																														
		Contaminants of Interest, Table E-5		ingestion dose. It is surprising that C-14 was not identified as one of the major contributors to dose in the dose calculations. Expectation to Address Comment: Please provide the maximum estimated dose during the post-closure phase from intakes of C-14 from ingestion of plants and animals.	(PostSA) (Arcadis and Quintessa 2023). Doses for other receptors (offsite receptors, recreational hunter receptors, and self-sufficient Indigenous receptors) are several orders of magnitude lower. Summary of Dose (mSv y⁻¹) to the Infant Site Resident for the Different Pathways Through Time <table><tr><th>Time (y)</th><th>Ingestion of Crops</th><th>Ingestion of Honey</th><th>Ingestion of Animals</th><th>Ingestion of Fish</th><th>Ingestion of Water</th><th>Ingestion of Soil</th><th>External from Soil</th><th>External from Water</th><th>Inhalation of Gas</th><th>Total</th></tr><tr><td>100</td><td>2E-07</td><td>2E-09</td><td>8E-08</td><td>2E-10</td><td>6E-08</td><td><1E-10</td><td>1E-10</td><td><1E-10</td><td><1E-10</td><td>4E-07</td></tr><tr><td>300</td><td>7E-07</td><td>1E-08</td><td>2E-07</td><td>8E-09</td><td>1E-08</td><td><1E-10</td><td>2E-09</td><td><1E-10</td><td><1E-10</td><td>1E-06</td></tr><tr><td>1000</td><td>9E-06</td><td>2E-07</td><td>2E-06</td><td>9E-08</td><td>1E-07</td><td>2E-10</td><td>2E-08</td><td><1E-10</td><td><1E-10</td><td>1E-05</td></tr><tr><td>3000</td><td>3E-05</td><td>2E-07</td><td>6E-06</td><td>8E-08</td><td>1E-07</td><td>1E-08</td><td>2E-07</td><td><1E-10</td><td>5E-10</td><td>4E-05</td></tr><tr><td>10000</td><td>6E-05</td><td>3E-07</td><td>1E-05</td><td>1E-08</td><td>6E-08</td><td>2E-08</td><td>3E-07</td><td><1E-10</td><td>6E-10</td><td>8E-05</td></tr><tr><td>30000</td><td>4E-05</td><td>2E-07</td><td>7E-06</td><td>1E-09</td><td>2E-08</td><td>2E-08</td><td>2E-07</td><td><1E-10</td><td>8E-11</td><td>4E-05</td></tr><tr><td>50000</td><td>3E-05</td><td>1E-07</td><td>5E-06</td><td>3E-10</td><td>2E-08</td><td>2E-08</td><td>3E-07</td><td><1E-10</td><td>9E-12</td><td>3E-05</td></tr><tr><td>Max. (mSv y⁻¹)</td><td>6E-05</td><td>5E-07</td><td>1E-05</td><td>3E-07</td><td>3E-07</td><td>5E-08</td><td>4E-07</td><td>2E-12</td><td>6E-10</td><td>8E-05</td></tr><tr><td>Time of Peak (y)</td><td>12000</td><td>1500</td><td>12000</td><td>1500</td><td>1500</td><td>100000</td><td>100000</td><td>1800</td><td>6000</td><td>12000</td></tr></table> Carbon-14 is indeed a key contributing radionuclide. The peak <i>total</i> dose to the Site Infant is 8E-5 mSv/y, occurring at 12,000 years after closure, and it is dominated by Cl-36 (see PostSA Figure G-28). Of the total dose, C-14 contributes ~1E-5 mSv/y, peaking at 1500 years after closure. Ingestion of crops is the main pathway contributing the C-14 dose. Other radionuclides other than Cl-36 contribute less than 5E-7 mSv/y to the total dose. C-14 is important as this radionuclide is very effectively taken in via the food chain owing to its behavior being the same as stable carbon, which constitutes a substantial component of living tissues. Although C-14 is quite strongly retained in the facility as a result of the cementitious materials, it is mobile in groundwater and the surface environment, where it accumulates in living organisms. Additional details on releases and doses can be found in the latest Iteration of the PostSA. References: <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>	Time (y)	Ingestion of Crops	Ingestion of Honey	Ingestion of Animals	Ingestion of Fish	Ingestion of Water	Ingestion of Soil	External from Soil	External from Water	Inhalation of Gas	Total	100	2E-07	2E-09	8E-08	2E-10	6E-08	<1E-10	1E-10	<1E-10	<1E-10	4E-07	300	7E-07	1E-08	2E-07	8E-09	1E-08	<1E-10	2E-09	<1E-10	<1E-10	1E-06	1000	9E-06	2E-07	2E-06	9E-08	1E-07	2E-10	2E-08	<1E-10	<1E-10	1E-05	3000	3E-05	2E-07	6E-06	8E-08	1E-07	1E-08	2E-07	<1E-10	5E-10	4E-05	10000	6E-05	3E-07	1E-05	1E-08	6E-08	2E-08	3E-07	<1E-10	6E-10	8E-05	30000	4E-05	2E-07	7E-06	1E-09	2E-08	2E-08	2E-07	<1E-10	8E-11	4E-05	50000	3E-05	1E-07	5E-06	3E-10	2E-08	2E-08	3E-07	<1E-10	9E-12	3E-05	Max. (mSv y⁻¹)	6E-05	5E-07	1E-05	3E-07	3E-07	5E-08	4E-07	2E-12	6E-10	8E-05	Time of Peak (y)	12000	1500	12000	1500	1500	100000	100000	1800	6000	12000
Time (y)	Ingestion of Crops	Ingestion of Honey	Ingestion of Animals	Ingestion of Fish	Ingestion of Water	Ingestion of Soil	External from Soil	External from Water	Inhalation of Gas	Total																																																																																																									
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251	CNSC	Appendix E Conceptual Models and Data	p.E-59 to E-60	Comment: One major barrier for NPD is the reactor core components. Mean corrosion rates of aluminum, carbon, stainless steel and zircaloy, under aerobic and anaerobic conditions, are provided in Table E-15 (p. E-60) with reported values of 15,300, 0.1, 0.1 and 0.01 µm/year. These corrosion rates were taken directly from the 2010	Resolved As: Metallic wastes, including various carbon steel, stainless steel, and zirconium alloys, account for the majority of the radionuclide inventory. The rate of release of this inventory is expected to be low because of the passive nature of the metals and because of the grouting of the facilities with cementitious materials, which results in slow corrosion rates due to the resulting alkaline conditions in the cement pore water. Because of the importance of the waste forms in																																																																																																														

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				data report supporting the Ontario Power Generation (OPG) Deep Geologic Repository Project. This report suggests upper bound values of 5 and 1 µm/year under aerobic and anaerobic conditions for carbon and stainless steel. For zirconium alloys, the upper bound corrosion rate reported is 0.05 µm/year. The references reported in this report are at least 8 years old. Expectation to Address Comment: Considering the importance of the reactor core components as barrier to radionuclides transport: • Please provide an updated literature review of corrosion rates and describe any research done by CNL to decrease uncertainties regarding corrosion rates. For instance, what is the current corrosion assessment of the reactor core components? • Based on this information, please discuss the need for a corrosion research program that would help reduce uncertainty regarding corrosion. • Please provide justification for relying on 2010 data by presenting a variant scenario with upper bound corrosion rates, and by considering an instant release scenario.	ensuring safety, a Waste Form Synthesis Report has been produced that contains additional information justifying the expected long-term performance of these waste form, (Arcadis 2021). The purpose of the Waste Form Synthesis Report (Arcadis 2021), is to review the expected corrosion behaviour of various metallic waste forms included in the PostSA. The specific metallic wastes considered were carbon steel, stainless steel, and zirconium alloys. Information is taken from a number of sources, including: • General scientific literature; • Specific studies from international nuclear waste management programs, and • The study of anthropogenic analogues. The possibility of enhanced corrosion rates due to the presence of radiation and of galvanic coupling of dissimilar metals are also considered, as is the question of whether activation products are released congruently with corrosion of the waste form. Finally, the corrosion rates used for the NPD and WR-1 postclosure safety assessments are compared to those used in similar international assessments for low and intermediate-level waste (LILW) facilities. The main concern raised about the corrosion rates used in the project’s Post Closure Safety Assessment Technical Support Document (PostSA TSD) is that they are based on studies that are eight years old. For a traditional field such as materials corrosion, the age of the reference to technical data is irrelevant as the data/results do not change without a change in either the test environment, material studied, or sample (surface) preparation. In fact, there are so many studies of corrosion rates published for some of these materials (e.g. carbon steel and stainless steels) that there is little incentive for new studies of the general corrosion rate. The authors of the 2010 data report supporting the Ontario Power Generation (OPG) Deep Geologic Repository Project are subject matter experts thus extremely competent in distilling the relevant information from the vast amount of literature. To provide a specific example, there were some 60 or more studies of carbon steel corrosion under anoxic conditions in alkaline conditions published prior to 2012. From the studies reported, an expert estimate of the upper limit for uniform corrosion is about 0.2 µm/yr for alkaline conditions. Although there is some recent data available, there are few new studies being performed as the corrosion rate of carbon steel is so low that it is of little practical significance. For example, a study by (Newman et al. 2015) of the corrosion of carbon steel in grout yields a general corrosion rate of <5 nm/yr at 50 °C. Given the large amount of literature on carbon steel and stainless steel corrosion under reducing conditions the corrosion rates used in the PostSA TSD has a technical basis with very little uncertainty thus does not warrant a corrosion research program. Aluminum corrosion has been well studied and the results of Hironaga and Mahara provide details of aluminum corrosion behavior, showing that the values adopted in the Nuclear Power Demonstration (NPD) safety assessment are reasonable. Although Table E-19 presents corrosion rates for aluminum, the activated aluminum is conservatively assumed to dissolve instantly within the NES of the PostSA TSD. Regarding Zircaloy corrosion, the rate of 0.01 µm/yr is certainly an upper limit value for both oxidizing and reducing conditions. Some recent measurements by (Kato et al. 2014) show that the rate is below this value after a few hundred days. On p.14 of (Herm et al. 2017) it can be seen that the corrosion rate of Zircaloy (unirradiated and irradiated) continues to decrease with time, reaching values of 1 to 5 nm/yr after 2 years. Additionally, the PostSA TSD assumes a material thickness of 3 mm for all metals, which is thinner than all metals in their current condition, and this thickness is used to calculate the material surface area and consequently the rate of release of activation products due to corrosion. The assumed metal thickness of 3 mm is therefore conservative. Based on the above information, CNL does not feel that a corrosion research program is warranted to help reduce the uncertainty of corrosion rates.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					The request for instant release scenarios may be driven by some conservative assumptions made about Zircaloy fuel cladding within other safety assessments. Some studies done in Japan raised the concern that C-14 in the oxide film of Zircaloy cladding might be released relatively quickly compared to the C-14 released from the cladding as the Zircaloy slowly corrodes. Up to 20% “instant release” of the total inventory of C-14 in the cladding was assumed because of the limited data available. This issue is discussed in some detail by (Gras 2014) in a report from the EU CAST Project. A later study from the same project (Herm et al. 2017) concluded based on long-term measurements that the fraction of the total inventory of C-14 in the Zircaloy released from PWR fuel cladding was 0.03% in one year and from BWR cladding was 0.003% over 6 years (see Figure 6, p.18). This suggests that the earlier assumption of a large instant release fraction was quite unrealistic. (Coleman et al. 1989) have shown that the oxide thickness of Zircaloy pressure tubes from NPD is 10-60 µm, about the same as that of the oxide on fuel rods. Given that Zircaloy cladding and pressure tubes have comparable oxide thickness, it appears that an assumption of instant release of C-14 for safety assessment might prudently consider a maximum value of about 0.1%, but a higher value is not supported by the data available. Regarding other reactor metals, aside from aluminum, there is little technical basis for an “instant release” from an oxide film for these materials, as there is typically a much more limited oxide film present. Variants of the corrosion rates for carbon steel, stainless steel and Zircaloy were examined in the PostSA TSD under the defense in depth scenario of “role of waste form”. The approach within this variant scenario examines the consequences if the corrosion rates were ten times greater than assumed in the Normal Evolution scenario. The results indicated that although the corrosion rate is increased by a factor of 10, the highest increase in total flux of radionuclide is less than a factor of 3. This demonstrates that it is not only the rate of metal corrosion that determines the rate of release of key radionuclides but the sorption in the grout is important for certain radionuclides as well. References: <i>Arcadis. 2021. NPD and WR1 In-Situ Disposal Projects Waste Form Synthesis Report, 64-508760-REPT-017, Revision 1.</i> <i>Coleman, C. E., Cheadle, B. A., Causey, A. R., Chow, P. C. K., Davies, P. H., McManus, M. D., Rodgers, D. K., Sagat, S., and van Drunen, G., "Evaluation of Zircaloy-2 Pressure Tubes from NPD," Zirconium in the Nuclear Industry: Eighth International Symposium, ASTM STP 1023, L. F. P. Van Swam and C. M. Eucken, Eds., 1989. American Society for Testing and Materials, Philadelphia, pp.35-49.</i> <i>Gras, J-M. 2014. State of the art of ¹⁴C in Zircaloy and Zr alloys - ¹⁴C release from zirconium alloy hulls, EU CAST Project Report D3.1. (available at https://www.projectcast.eu/publications).</i> <i>M. Hironaga and Y. Mahara, The assessment of hydrogen gas generation from corrosion of aluminum and iron in cement Abiko Research Laboratory Report No, U97109, CRIEPI.</i> <i>Michel Herm, Tomofumi Sakuragi, Ernesto González-Robles, Melanie Böttle, Nikolaus Müller, Elke Bohnert, Ron Dagan, Stefano Caruso, Bernhard Kienzler, Volker Metz. 2017. Final report on 14C release and speciation from Zircaloy (D3.15), EU CAST Project. (Available at https://www.projectcast.eu/publications).</i> <i>Newman, R.C., Wang, S. & Senior, N. (2015): Understanding and quantifying the corrosion of carbon steel in grouts relevant to the Swiss L/ILW repository. Nagra Arbeitsbericht, NAB 15-17.</i> <i>Osamu Kato, Hiromi Tanabe, Tomofumi Sakuragi, Tsutomu Nishimura, and Tsuyoshi Tateishi. 2014. Corrosion Tests of Zircaloy Hull Waste to Confirm Applicability of Corrosion Model and to Evaluate Influence Factors on Corrosion Rate under Geological Disposal Conditions, Mater. Res. Soc. Symp. Proc. Vol. 1 5 © 2014 Materials Research Society DOI: 10.1557/opl.2014.646.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. <i>Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
252	CNSC	Appendix E Conceptual Models and Data	p.E-59 to E-60	Comment: There is no information about the current corrosion rate of the reactor components, nor is there information on rebar corrosion. As this reactor has been at the NPD site for at least 50 years, what is the current corrosion state of the reactor, and how was the rebar corrosion considered for concrete structures? Expectation to Address Comment: Please provide current corrosion estimates for the different reactor components and concrete structures, and determine the impact of these estimates on the Normal and Disruptive Event Scenarios.	Resolved As: <u>Concrete structures</u> A Life Management Plan (Milman 2004) is in place for the NPD facility. This includes the frequency for periodic inspection of every five years along with criteria for the inspections. The Life Management Plan is based on the system adopted from, Naus, D. J. et al, “Report on Ageing of Nuclear Power Plant Reinforced Concrete Structures”, Oak Ridge National Laboratory, NUREG/CR-6424, 1996 and ACI 349.3, R2, “Evaluation of Existing Nuclear Safety-Related Concrete Structures”, 2002. Independent inspections were conducted in 2002, 2007, 2014 and 2019. Results of the 2019 report (Aly 2019) largely conclude areas of concrete degradation have progressed only slightly from the findings in the previous inspection (Liu 2014), and no imminent hazard or safety issues were noted. The previous inspection (Liu 2014) concluded that aside from suggested paint protection of exposed structural steel and ladders to prevent further corrosion, as well as maintenance of the above grade superstructure, the concrete structure itself appeared to be in acceptable condition. The 2019 Life Management Plan inspection also included the ventilation stack as well as the pressure relief duct, and the report also indicated that these concrete structures were in satisfactory condition. Findings from a structural assessment of the NPD structure (AECOM 2018) indicated evidence of cracking but no cracks of concern. A few areas of exposed reinforcing steel were noted, and such steel has experienced surface corrosion, but was not noted to be a structural concern. Filling the void spaces with grout will provide a high-pH environment, expected to slow corrosion of any exposed reinforcing steel. The Postclosure Safety Assessment (PostSA) modeled concrete degradation through an Equivalent Porous Medium method, and made conservative assumptions on concrete degradation following the work of Berner (Berner 1992). The PostSA assumed the concrete was stable for 100 years following closure, an assumption validated by the NPD Structural Analysis (AECOM 2018), and to linearly degrade from its current condition to fully degraded by 1,000 years post closure. Limited exposure of reinforcing steel has occurred as a result of coring work for a structural analysis. The exposed reinforcement, recovered with the cores, showed no signs of corrosion or other degradation. Additional discussion of the concrete degradation mechanism are provided in the Cementitious Materials Synthesis Report (Arcadis 2018). <u>Reactor Components</u> Metallic wastes, including various carbon steel, stainless steel, and zirconium alloys, account for the majority of the radionuclide inventory. The corrosion rates of these metals is expected to be low because of the passive nature of the metals and because of the grouting of the facilities with cementitious materials, which results in slow corrosion rates due to the resulting alkaline conditions in the cement pore water. Because of the importance of the waste forms in ensuring safety, a Waste Form Synthesis Report has been produced that contains additional information justifying the expected long-term performance of these waste forms, (Arcadis 2021). The purpose of the Waste Form Synthesis Report (Arcadis 2021), is to review the expected corrosion behaviour of various metallic waste forms included in the PostSA. The specific metallic wastes considered were carbon steel, stainless steel, and zirconium alloys. Information is taken from a number of sources, including:

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					• General scientific literature; • Specific studies from international nuclear waste management programs, and • The study of anthropogenic analogues. The possibility of enhanced corrosion rates due to the presence of radiation and of galvanic coupling of dissimilar metals are also considered, as is the question of whether activation products are released congruently with corrosion of the waste form. Finally, the corrosion rates used for the NPD and WR-1 postclosure safety assessments are compared to those used in similar international assessments for low and intermediate-level waste (LILW) facilities. As for current corrosion estimates for the reactor components, there are three materials for consideration: zircaloy pressure tubes, aluminum calandria, and stainless steel end fittings. 1. The zircaloy pressure tube extent of corrosion was measured both near end of reactor operation in 2 pressure tubes (Rodgers et al. 1985), and just before reactor shutdown in one pressure tube (Coleman et al. 1989). In both instances the maximum corrosion measured on the inside of the pressure tube was 65 µm and 60 µm respectively, showing close agreement in corrosion rates during reactor operation. The maximum corrosion measured on the annulus gas side was 16 µm (Rodgers et al. 1985), giving a total maximum corrosion of 81 µm. Given an initial pressure tube thickness of 4.14 mm, this results in a pressure tube thickness of 4.06 mm. 2. Although Table E-19 presents corrosion rates for aluminum, the activated aluminum is conservatively assumed to dissolve instantly within the normal evolution scenario of the Post Closure Safety assessment. 3. The stainless steel end fittings have not been quantitatively measured for corrosion, however remote visual inspection was performed of the reactor face, including end shield closure plugs (Simova et al. 2016). This report indicates that careful examination of the closure plugs shows little degradation due to corrosion. The PostSA model assumes a material thickness of 3 mm for all metals, which is thinner than all metals in their current condition, and this thickness is used to calculate the material surface area and consequently the rate of release of activation products due to corrosion. The assumed metal thickness of 3 mm is therefore conservative, and the current corrosion state of these reactor components does not have an impact on either the normal evolution or disruptive event scenarios. It should be noted that the corrosion on the pressure tubes (Rodgers et al. 1985, Coleman et al. 1989) was representative of corrosion rates during reactor operation, in an environment of high temperature, high pressure, highly turbulent and high rates of water flow, and high radiation fields. In addition, the CNL Safety Engineering group prepared a report (Karam 2021) examining the safety barriers for the proposed in-situ disposal of the NPDWF. Among other things, this report examined the corrosion rates used in the PostSA and compared them to rates in literature, and determined the rates were conservative for the conditions analyzed. References: <i>A.Liu 2014. Periodic Evaluation of Nuclear Power Demonstration Structures, 64-20000-INR-002.</i> <i>Aly. 2019. Periodic Evaluation of Nuclear Power Demonstration Structures, 64-20000-INR-003, December.Arcadis. 2021. NPD and WR1 In-Situ Disposal Projects Waste Form Synthesis Report, 64-508760-REPT-017, Revision 1.</i> <i>Arcadis. 2018, Cementitious Materials Synthesis Report – NPD Closure Project. 64-508760-REPT-008. Revision 0.</i> <i>Berner U.R. 1992. Evolution of Porewater Chemistry during Degradation of Cement in a Radioactive Waste Repository Environment. Waste Management 12. 201-219.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Coleman, C. E., Cheadle, B. A., Causey, A. R., Chow, P. C. K., Davies, P. H., McManus, M. D., Rodgers, D. K., Sagat, S., and van Drunen, G., 1989. "Evaluation of Zircaloy-2 Pressure Tubes from NPD," Zirconium in the Nuclear Industry: Eighth International Symposium, ASTM STP 1023, L. F. P. Van Swam and C. M. Eucken, Eds., American Society for Testing and Materials, Philadelphia, pp.35-49.</i> <i>Karam. 2021. Review of Safety Classification and Design Rules for In-Situ Decommissioning of NPD, 64-03620-REPT-001, Revision 1.</i> <i>Milman I. 2004. Life Management Program for NPD Structures. 64-20000-680-001. Revision 0.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> <i>Rodgers, D.K., Ibrahim, E.F., Cheadle, B.A., 1985. The examination of the Pressure Tubes Removed from NPD Channels G05 and G07. Pp 4</i> <i>Simova, E., Stoev, K., Rochefort, P.A., MacDonald, D., Lefebvre, C., Beaudry, M. 2016. 64-508340-046-000 “Remote Visual Examination and Radiation Measurement of NPD Reactor Vault East Wing”, December.</i>
253	CNSC	Appendix G Detailed Results, Section G 2.3 Doses to Human Receptors	p.G-30 to G-35	Comment: The dose estimates provided for human receptors in Section G 2.3 are broken down by the five radionuclides contributing most to dose. However, in order for CNSC staff to verify these dose estimates, doses should also be broken down by radionuclides and exposure pathways. Expectation to Address Comment: Please provide the post-closure dose estimates for receptors broken down by different pathways (e.g., ingestion of soil, ingestion of deer, ingestion of fish, inhalation, groundshine, etc.).	Incorporated: The 4th iteration Postclosure Safety Assessment (PostSA) TSD (Arcadis and Quintessa 2024) provides detailed results for infant resident, adult hunter and adult of the Indigenous Algonquins of Pikwàkanagàn First Nation with doses listed by pathway through time and also listed by radionuclide in each pathway. The following tables provide these results: • Table G-18 Summary of Dose (mSv y⁻¹) to the Infant Site Resident for the Five Radionuclides Contributing Most to the Dose; • Table G 19 - Summary of Dose (mSv y⁻¹) to the Infant Site Resident for the Different Pathways Through Time; • Table G-20 - Summary of Dose (mSv y⁻¹) to the Adult Hunter for the Five Radionuclides Contributing Most to the Dose; • Table G-21 - Summary of Dose (mSv y⁻¹) to an Adult Hunter for the Different Pathways Through Time; • Table G-22 - Summary of Dose (mSv y⁻¹) to an Adult of the Indigenous Receptor Group - the Five Radionuclides Contributing Most to the Dose; and • Table G-23 - Summary of Dose (mSv y⁻¹) to an Adult of the Indigenous Algonquins of Pikwàkanagàn First Nation for the Different Pathways Through Time. Change to PostSA TSD: The Detailed Results Appendix (G) of the PostSA TSD has been revised to reflect the response above. References: PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
Stakeholder Engagement Technical Supporting Document					
254	CNSC	General	General	Comment: CNL has provided a summary of public questions and concerns raised about the project during outreach activities. They have also provided a dispositioning table in their supporting documentation in response to those questions. However, there appears to be outstanding questions from the public that have not been answered by CNL, some dating as far back as 2016. The dispositioning table indicates that there is a proposed response that has been prepared, but no indication that it was sent. Expectation to Address Comment: The final EIS must demonstrate that all information requests from the public have been responded to and are closed.	Incorporated As: The EIS demonstrates that all open information requests requiring a formal response have been closed through reference to the Stakeholder Engagement Report (SER). Change to EIS: A reference to a tracking table of formal comments and a summary to the project’s responses has been included in Section 7.3. Note: The order of EIS sections has been changed in the 2024 EIS with Indigenous Engagement coming first in Section 6 followed by Stakeholder Engagement in Section 7. This change reflects the importance and priority of CNL’s relationship with Indigenous peoples. Change to SER TSD: A tracking table of formal comment and the project’s response has been included in the SER (Appendix T).
255	CNSC	General	General	Comment: CNL provided copies of media coverage, but there is no analysis of the coverage. Expectation to Address Comment: CNSC would like to see more information about the general nature and tone of the articles, and whether media coverage has increased over the life of this project.	Resolved As: The purpose of including media coverage in the EIS was to demonstrate the effectiveness or outcome of Canadian Nuclear Laboratories’ (CNL) efforts at sharing project information and informing stakeholders on the project via a particular channel – the media. A description of the efforts made to share information is a requirement of the <i>Generic EIS Guidelines</i> (pg. 14) and informing the public on the project is a requirement of REGDOC 3.2.1: <i>Public Information and Disclosure</i>. For the proponent to analyse the perceived tone of a media article would be very subjective and not address any requirement of the <i>Generic EIS Guidelines</i> or REGDOC-99.3, <i>Public Information and Disclosure</i>. Change to SER TSD: Information on media coverage over the span of the project has been included in Section 3.15. References: <i>Canadian Nuclear Safety Commission (CNSC). 2016a. Generic Guidelines for the Preparation of an Environmental Impact Statement, May.</i> <i>Canadian Nuclear Safety Commission (CNSC). 2018a. REGDOC-3.2.1, Public Information and Disclosure, May.</i>
Supplementary Documentation					
Alkaline Plume Modeling Report					
256	ECCC	Alkaline Plume Modeling Report Also applicable to the Lead Solubility Limits Report, p. 3-2 and 3-6	General	Comment: A key premise of the safety case for this project is the ability of the grout-based monolith to retard the release of contaminants (radiological and non-radiological) through the long-term. Failure of this approach to containment could result in adverse effects on the surrounding environment, including on water quality, air quality and biota such as migratory birds.	Incorporated: <u>1. Grout Composition and Rationale:</u> CNL established a contract with Savannah River National Solutions (SRNS) to help develop grout formulas based on existing grouts that have been used in the field for in-situ disposal of nuclear reactors. Working with SRNS, CNL developed key performance requirements that the grout needed to meet such as good flow characteristics, zero bleed and no segregation. Based on these performance requirements and their assessment of the NPD facility, SRNS proposed a formula that had been used to grout the P and R Reactors at the DOE’s Savannah River site. With this information, CNL developed grout requirements and laboratory test parameters that were used to develop the final grout formula. The final grout formula that CNL will be using and its properties are defined in the grout specification (Johnson 2022c). It is important to note that CNL is proceeding with

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response																		
		Also applicable to the Postclosure Safety Assessment Technical Supporting Document, p. 5-2, 5-5, 5-7, 5-38		There are many uncertainties that can affect predictions about the long-term evolution of the grouted monolith and the resulting release of radiological and non-radiological contaminants. Some examples are provided below. Grout Formulation: The composition of the grout is a critical factor to retardation of the release of contaminants, since it will govern the physical and chemical behaviour, and evolution over time, of the solidified grout. The final grout formulation proposed for the NPD Closure Project is not clear. Any change in grout formulation will affect its chemical and physical evolution over the time frames of the proposed project. The EIS, TSDs and verbal communications of NPD staff have revealed inconsistencies regarding the grout formulation proposed and the formulation assumed for the various models. The only assumptions about grout composition that can be considered valid for the EA are those based on the actual composition of the grout that is ultimately used at the NPD site. - In the Alkaline Plume Modeling Report, simulations are based on Portland cement. However, the Lead Solubility Limits Report states: “The grout has a very high fly ash (FA) to Portland Cement (PC) ratio”. During the November 7, 2017 site visit, NPD site staff said that the actual grout formulation likely would not contain fly ash due to a lack of local availability, and that other ingredients would need to be substituted. - Considering the limitations outlined on page 9 of the Alkaline Plume Modeling Report regarding the chemistry modeling, this document is an analysis of limited chemistry for a concrete formulation that is not being proposed for the monolith and does not factor cracks in concrete, amongst other factors (see below) that may have a bearing on the long-term evolution of the grout-filled monolith. - Since the Lead Solubility Limits Report is based upon a different formulation of grout than the one described in the Alkaline Plume Modeling Report, the modeling results and conclusions may not be relevant for the proposed Project. If page 3-2 does describe the final grout composition, the rationale for not applying this information consistently to the Alkaline Plume Modeling Report is unclear, especially since conclusions from individual reports affect the assumptions made in others. - Page 3-6 of the Lead Solubility Limits Report states: “The solubility of native lead is significantly lower than lead oxide under higher Eh hyperalkaline conditions.” The Alkaline Plume Modeling Report does not predict such conditions;	only one grout formula now for the nuclear area. Early design concepts proposed two grout formulations, with one specifically being a low pH grout for the high volumes of lead in the Fuelling Machine Room. Taking into consideration additional modelling completed with greater definition of the lead containing structures in the Fuelling Machine Room, CNL determined that a low pH grout was not required to reduce the solubility of lead and expected releases from the disposal facility (Arcadis <i>et al.</i> 2019). The following table presents the final grout formula to be used at NPD. <table><tr><th>Materials</th><th>Standard Reference</th><th>Quantity (kg/m³) water to binder ratio of 0.90</th></tr><tr><td>Type 90/10 Cement (90% BFS/10% OPC) note 1</td><td>ASTM C595</td><td>386</td></tr><tr><td>Sand (quartz)</td><td>ASTM C33</td><td>1375.0</td></tr><tr><td>Water</td><td>ASTM C94/CSA A23.1-14</td><td>346.2</td></tr><tr><td>SIKA Visco Crete 2100</td><td>ASTM C494 B&F</td><td>4.681</td></tr><tr><td>Diutan Gum based VMA</td><td>ASTM C94</td><td>0.299</td></tr></table> Note 1: BFS – Blast Furnace Slag, OPC – Type I/II Portland Cement (Johnson 2022c) <u>2. Laboratory Studies:</u> CNL established a contract with Golder Associates Ltd to verify that the grout formulation proposed by SRNS could be reproduced using materials locally available to the NPD site. Golder has significant experience in developing grout formulations for large grout fill applications such as abandoned mines. A grout test and verification plan was created, which consisted of test parameters and acceptance criteria for the fresh and cured grout properties. The test plan and the results from the laboratory are presented in the Phase 2 Grout Testing Summary (English 2022). Based on the results from the laboratory tests, CNL finalized the grout formula, which is provided above. <u>3. Grout Degradation process:</u> The NPD Closure Project has prepared a <u>Cementitious Materials Synthesis Report</u> (Arcadis 2018) to assess the various concrete/grout degradation processes and respond specifically to this comment (#202). The report summarizes the materials used at the NPD facility, along with an overview of scientific understanding of such materials, their possible evolution and implications for performance assessment models and calculations. This compilation of literature and studies supports the parameters and scenarios evaluated within the Post Closure Safety Assessment Technical Support Document (PostSA TSD) or associated models with a focus on relevance to the NPD Closure Project. At the time of preparation of this report, the NPD Closure Project was considered two grout formulations for the nuclear area, one of which was a low pH grout. Since this time, the NPD Closure Project has determined that only one grout formula is required as discussed above. CNL has also prepared a	Materials	Standard Reference	Quantity (kg/m³) water to binder ratio of 0.90	Type 90/10 Cement (90% BFS/10% OPC) note 1	ASTM C595	386	Sand (quartz)	ASTM C33	1375.0	Water	ASTM C94/CSA A23.1-14	346.2	SIKA Visco Crete 2100	ASTM C494 B&F	4.681	Diutan Gum based VMA	ASTM C94	0.299
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Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				therefore, the relevance of this statement is unclear. Furthermore, if the fly ash based grout is used, the alkalinity is greatly reduced. - There is no indication that laboratory testing of the final grout composition has been completed. Testing would provide information about the physical and chemical behaviour of the grout, and how it will interact with groundwater. However, such data may only help to understand short-term behaviour of the grout, and extrapolations of such data on a timescale of tens-of-thousands of years are highly uncertain. Physical and Chemical Factors That May Affect the Evolution of the Monolith: Physical and chemical evolution influence each other, and cannot be considered separately. Physical factors listed below will have an effect on the chemical evolution of the monolith and upon groundwater chemistry. - Cracks in the monolith can be induced / enlarged through mechanisms, such as seismic events, tree roots, freeze-thaw cycles, enlargement of cracks via groundwater flow, etc. - Cement constituents being slowly leached will increase porosity, allowing groundwater to flow more easily. Seepage volumes will increase. - Once the proposed project is completed and the monolith experiences normal evolution over the lengthy time frames described, substantial cracks will develop and enlarge in the grout within the monolith. Cracks will increase the rate and volume of groundwater flow through the monolith to levels greater than those currently modeled. Increased groundwater flows may reduce the alkalinity of the groundwater flowing through the monolith, to levels lower than those currently modeled. The 2-dimensional model does not simulate these cracks in the grout or their effects. Due to the unique and distinct physical and chemical properties of cracked grout and its influence on other substances, a cracked grout scenario is unique and not captured by the grout or ungrouted scenarios presented. Without understanding the potential risks associated with a cracked grout scenario, it is difficult to assess the results and conclusions of the EIS. - Considering the lack of aggregate in the grout blend (as compared to concretes), the grout may be more susceptible to large scale and/or systemic cracking. These cracks would then be more susceptible to widening from water flows, as well as through other mechanisms.	geochemical model for the grout evolution that show how pH may change over time as a function of number of pore flushes. This data was used to inform further development of safety assessment models and calculations (Arcadis and Quintessa 2024). <u>4. Incorporate the following scenarios into the modeling:</u> <i>Cracked grout</i> The 4th Iteration of the PostSA TSD looks at grout cracking in the normal evolution, as well as, in disruptive events. Section E2.2.1 describes how grout cracking is addressed during normal evolution as a result of seismic events and how it is modelled. <i>Rapid grout degradation</i> Rapid grout degradation has been assessed as a sensitivity case in the PostSA. As discussed in Section 5.2.4 of the PostSA, this scenario assumes that the grout is fully degraded at 100 years as opposed to the normal evolution timeline of 1,000 years. <i>Breach of pipes and equipment (e.g., via cracking, corrosion, etc.) with subsequent groundwater flows through these followed by interaction with surface-contaminant radionuclides, in addition to corrosion-related radionuclides.</i> In the PostSA, all loose contamination within pipes, tanks and equipment is conservatively assumed to be instantaneously released once the area the piping, tanks or equipment resides is saturated. The release of contaminants is not dependant on the systems being cracked or corroded. The release of corrosion related radionuclides is also not dependant on breaching of pipes or equipment, it is simply based on the corrosion rates of the type of material (e.g., steel), which again is assumed to be susceptible to corrosion once it is resaturated. <u>5. Influence and uncertainty associated with the presence of sulphate-reducing and other species of bacteria:</u> Scenarios for the PostSA are systematically developed based on a review of Features, Events and Processes (FEPs) that are applicable to the NPD Disposal Facility. Microbially-assisted corrosion (MIC) is relevant to radionuclide release through accelerating of corrosion and was considered as part of the FEPs review. FEP # 3.2.5.2 - Microbially/biologically mediated processes (Section C 5.2.5.2) was screened out as a relevant FEP because microbial growth was not deemed to be significant due to lack of nutrients in the Facility. With regards to sulphate-reducing bacteria, the PostSA refers to sulphate concentrations being moderate, so some sulphate is assumed available. However, expected grout porewater with a pH of approximately 12.5 would effectively suppress sulphate-reducing bacteria activity (King (2009), Humphreys <i>et al.</i> (2009)). It is not possible to say that microbes would not survive, but they would not thrive under these conditions (see Leupin <i>et al.</i> (2016) and King (2009)). In studies related to low and intermediate level waste disposal, the use of cementitious backfill has been argued as a technique to avoid MIC. Metals such as carbon steel and stainless steel are passive at pH values above 10 (stainless steel remains passive at neutral pH). In passive systems, film breakdown can occur leading to pitting corrosion, but this normally requires elevated chloride concentrations (not typical of the cement porewater) or MIC, which would be suppressed by the high pH. Note that Zircaloy is not susceptible to MIC so the passive zirconium oxide film is not susceptible to breakdown in the alkaline pH range or in neutral pH groundwater. Regarding the consequences of MIC, the radionuclides are distributed uniformly throughout the metals. For radionuclide release to be significantly accelerated, the general corrosion rate would have to increase, which will not occur under passive conditions. If film breakdown does occur (e.g. if there were high chloride concentrations), the pitting factor would increase as the corrosion proceeds, but this would only occur in a few sites, with most of the

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				- The development of large cracks in the monolith can lead to faster leaching of contaminants relative to the rate of leaching of alkalinity, thereby changing the geochemistry in ways that have not been considered in the modeling. Since flow through large cracks may dominate the overall flow through the monolith, a much different geochemical regime may exist than is currently considered in the modeling. The importance of the development of cracks in the grout has been virtually ignored by the modeling. Chemical factors listed below will have an effect on the physical evolution of the monolith and the quantity of groundwater that will pass through the monolith. The Postclosure Safety Assessment TSD states (on p. 5-2): “As the pH falls back to neutral elements such as Ni and Zr become much more mobile and so are rapidly released from the Reactor Vault into the Boiler Room and other downstream rooms.” This statement is very important in the context of the assumptions made about modeled alkalinity and pH levels. The modeling of contaminant solubility assumes high pH and alkalinity, largely on the basis of a Portland cement formulation, despite the fact that a lower pH grout is being proposed (final formulation not established). Contaminant mobility may be greater as a result of using a lower pH grout formulation. However, there are other factors that may result in lower pH and lower alkalinity conditions that have not been considered in the modeling / assessment, which raises serious doubts about the current modeling and increases the degree of uncertainty associated with the model outputs, as follows: - Assumptions about the amount of alkalinity that will be available from the leaching of the grout may be invalid. Alkalinity might be much lower than assumed as a result of the grout surfaces becoming coated by iron and/or other metals that may precipitate out from the influent groundwater or from corrosion products generated by corrosion reactions within the monolith. Considering the complex geochemistry that will evolve in the monolith over time, there may be other geochemical reactions that may reduce alkalinity, or have other effects upon the solubility of contaminants. The current modeling, which is based on the geochemistry of the incoming groundwater, is a gross over-simplification of the actual geochemical conditions that will exist within the monolith. - Influent groundwater might be more acidic in the future than is currently measured. For example, conifer needles can create acidic groundwater conditions. After the Institutional Controls	surface still being passivated and corroding very slowly. As a result, there would not be much effect on radionuclide release rates. Note that buffering of pH from portlandite is at pH 12.5 and after it is exhausted, the CSH compounds buffer at pH of 10-11. The pH may then gradually drop, which would lead to an acceleration of general corrosion by a factor of 100, to values around 0.1 µm/a for carbon steel but would still stay basic. Low pH is not credible for the NPD system. <u>6. Corrosion:</u> A corrosion sensitivity case was conducted in the 3rd iteration PostSA TSD (Arcadis and Quintessa 2020) Section 5.4.1, where variants of the corrosion rates for carbon steel, stainless steel and Zircaloy were examined in the PostSA TSD under the defense in depth scenario of “role of waste form”. The approach within this scenario examines the consequences if the corrosion rates were 10 times greater than assumed in the Normal Evolution scenario. The results indicated that although the corrosion rate is increased by a factor of 10, the highest increase in total flux of radionuclide is less than a factor of 3. This demonstrates that it is not only the rate of metal corrosion that determines the rate of release of key radionuclides but the sorption in the grout is important for certain radionuclides as well. <u>7. Risks from pH and Seepage Rate:</u> The limited extent of the alkaline plume and the limited risks from pH and seepage is shown in the Alkaline Plume Report (Wilson 2020a). The alkaline plume study shows essentially no alkaline plume forming for at least 100,000 years post closure. Text will be added to the EIS to reflect this understanding. <u>8. Re-run models with consideration to: the final grout composition, cracked grout conditions, presence of bacteria, lower pH and alkalinity, and the additional geochemical complexities incurred by corrosion products in the groundwater:</u> The final grout composition has been reflected in the 4th Iteration of the PostSA, as well as the grout cracking conditions as noted above. The PostSA also considers the results of the Alkaline Plume Report (Wilson 2020a), however, as described above influence of bacteria was screened out as a FEP for the disposal facility and therefore, is not considered in the PostSA. The geochemistry of the porewater is already taken into account in the Kd values and solubility values (e.g., for Pb. For other contaminants, solubilities have been neglected, a cautious approximation). All the parameters used in the calculations, including the normal evolution scenario parameters are identified in Appendix E of the PostSA TSD (Conceptual Models and Data). The variability or uncertainty associated with the parameters is discussed. <u>9. Assess radiological risk using improved models. Identify the time periods where radiological risk is highest:</u> The PostSA uses the AMBER model (Quintessa 2017), a state of the art compartmental model, specifically designed for postclosure safety assessment of radioactive waste disposal facilities. AMBER has a proven international and Canadian (e.g. OPG’s DGR) track record for postclosure safety assessments and a strong quality assurance status (e.g. see Medri (2015), Thomson <i>et al.</i> (2008), Walke <i>et al.</i> (2011), and further references in Appendix A of the PostSA). AMBER has a wide international user base, with over 90 organizations in more than 35 countries owning licences. There are in excess of 120 publications describing postclosure safety assessments in which AMBER has been applied (PostSA TSD), including several international code inter-comparison exercises (e.g. BIOMOVs II (1996); Limer <i>et al.</i> (2012); Olyslaegers <i>et al.</i> (2005)). The CNSC (AECB) has participated in the BIOMOVs II comparison. The PostSA TSD does assess the radiological risks to receptors, including peak dose for several different scenarios. The complexity of the models is commensurate with the associated risk and with regulatory requirements. PostSA Table 6-1 provides a summary of the results including peak dose.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Period, when human intervention is no longer occurring at the site, a coniferous forest might develop over the site thereby lowering the pH in groundwater at the NPD site. • The geochemical modeling is very simplistic and does not reflect the complex geochemistry that will exist in the groundwater flowing through the monolith. In particular, corrosion products will create additional geochemical complexity that does not appear to have been incorporated into any of the models. For example, it is not clear if the geochemistry of corrosion was modeled to determine if it would affect the solubility of lead, or other parameters of concern. It is also not clear if there are any anion-cation exchange reactions and bacteria-induced reactions that could enhance the solubility of lead or other parameters of concern. • There may be kinetic constraints on theoretical thermodynamic reactions that prevent or hinder geochemical reactions from going to completion. Other Considerations • Bacteria can alter geochemistry and geochemical reactions within the monolith. The assumption that sulphate-reducing bacteria will not be present (see Lead Solubility Limits Report, p. 3-6) is unsupported. Corrosion of metals and cracks in the grout may create conditions that are favourable to such bacteria. The presence of these, and potentially other bacteria, is not described and is a source of uncertainty for the geochemical evolution of the groundwater, and the physical integrity of the grout over the timeframes relevant to the proposed project. • The safety case for radionuclides is premised on a gradual release of radionuclides from the monolith over extended periods of time (in the order of 100,000 years). Miscalculation in the physical and chemical evolution of the monolith could result in earlier and larger releases, which may have more serious effects than currently modeled. • Some of the radionuclide inventory is from contaminated surfaces. Release of these radionuclides will not be controlled by corrosion rates. Any breach of the pipes and calandria (e.g., through development of cracks, corrosion) will allow these radionuclides to be released relatively rapidly (compared to corrosion controlled releases). • Corrosion may occur more quickly due to complex geochemistry that will develop, and/or from increased seepage rates, lower pH, etc.	<u>10. Provide a full assessment of all the factors that may affect the solubility of lead and other parameters of concern:</u> Lead solubility was assessed in detail in the Lead Solubilities Report (Wilson 2020b). Factors that may affect the solubility of lead include: ☐ Contact water composition –contact with cement into account. ☐ pH ☐ Eh – This is assumed to be oxidizing, which is a conservative assumption ☐ T – The sensitivity analysis conducted in the PostSA indicated that at higher temperatures, an additional degree of caution is introduced into the solubility limits, which are ultimately used in the safety assessment calculations. <u>11. Describe the uncertainties they raise with respect to the lead solubility modeling:</u> Lead solubility was assessed in detail in the Report entitled: Scoping Calculations for Lead Solubility (Wilson 2020b): • A range of groundwater compositions, pH and Eh values were used to model lead solubility; • The values used in the PostSA TSD are selected and supported in Section 5 of Wilson (2020b); and • More specifically, solubility values were selected to reflect different stages of cement degradation (because of the relationship between cement degradation and pH and the relationship between pH and lead solubility). This was done adopting cautious assumptions with respect of the rate of release of lead to the environment. Section E.3.4.11 of the PostSA provides the various solubility limits for lead in structures and grout. In summary, these calculations suggest that during the early phases of cement degradation, some lead may dissolve, but it is expected that much of it will precipitate out of solution as cement-equilibrated water mixes with groundwater and the pH decreases. Also, the ongoing degradation of cement will tend to decrease the cement porewater pH over time. The solubility calculations show that dissolved lead concentrations decrease sharply as pH decreases. Thus, the approach used in the PostSA is conservative. <u>12. Provide a more conservative estimate of the upper boundary for lead concentration that could occur:</u> Lead solubility was assessed in detail in Wilson (2020b). As discussed in item (11) above, the approach used in the PostSA is already conservative. <u>13. Describe the methodology used to create the estimate, including any laboratory tests and modeling:</u> The methodology is outlined in Wilson (2020b). The methodology is based on thermodynamic principles. <u>14. Note any limitations, assumptions or inferences associated with the estimate:</u> The main assumption was the use of thermodynamic modelling to estimate lead solubilities. This is a commonly used approach in safety assessments in general and in postclosure safety assessments in particular. This assumption is particularly suitable for long-term predictions. Change to EIS: Sections 4 and 9 of the EIS have been revised to reflect the results of the updated PostSA TSD. In addition, the following text has been added to Section 4.5, Section 9.3.3.3 and Section 9.5.3: “The alkaline plume study shows essentially no alkaline plume forming for at least 100,000 years post closure.” References: <i>Johnson, D. 2022c. CNL Specification, “Grout Formula and Properties”, 64-508300-SP-001, Revision.1.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				- The extremely long timeframes and lack of comparable existing projects both contribute to additional uncertainty to the modeling. - The EIS (p. 9-60) states that the maximum concentration of lead (0.0046 mg/L) will occur 70,000 years after decommissioning. This estimate appears to be based on the NES. As noted in other comments, ECCC has raised many questions about the validity of the modeling results. In light of all uncertainties, a more conservative evaluation of an upper bound lead concentration would be to model the lead as if it was uncontained and was being leached by the existing ambient groundwater. Laboratory tests can be undertaken to help develop this upper bound concentration. Expectation to Address Comment: It is recommended that CNL carry out the following: - Confirm and provide the final grout composition that will be used for the proposed project, along with a rationale - Conduct laboratory studies on the final grout composition that will be used to create the monolith in order to obtain data to support the long-term grout degradation modeling - Provide a description of the grout degradation processes for each stage and the condition of the grout that defines each end-state - Incorporate the following scenarios into the modeling: - Cracked grout - Rapid grout degradation - Breach of pipes and equipment (e.g., via cracking, corrosion, etc.) with subsequent groundwater flows through these followed by interaction with surface-contaminant radionuclides, in addition to corrosion-related radionuclides - Acknowledge and describe the influence and uncertainty associated with the presence of sulphate-reducing and other species of bacteria - Evaluate scenarios for various rates of corrosion associated with each of the specific materials present, while considering the complex geochemistry that will exist, and indicate which radionuclides are associated with each material - Update text to show that risks associated with pH and seepage rate are understood and incorporated - Re-run models with consideration to: the final grout composition, cracked grout conditions, presence of bacteria, lower pH and alkalinity, and the additional geochemical complexities incurred by corrosion products in the groundwater. Furthermore, explain how these are included in	<i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). 2020. Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project. (3rd Iteration). 64-508760-ASD-003. Revision 0. 2020 March 30. Prepared by Arcadis and Quintessa for CNL.</i> <i>Arcadis. 2018, Cementitious Materials Synthesis Report – NPD Closure Project. 64-508760-REPT-008. Revision 0.</i> <i>Arcadis, Quintessa and Geofirma 2019. Scoping Calculations for Grouting Options and Refined Representation of Fuelling Room. CNL Report 64-508760-REPT-010. April.</i> <i>BIOMOVs II. 1996. Biosphere Modelling for Dose Assessments of Radioactive Waste Repositories: Final Report of the Complementary Studies Group. BIOMOVs II Technical Report No. 12, published on behalf of the BIOMOVs II Steering Committee by the Swedish Radiation Protection Institute, Sweden.</i> <i>English, M. 2022, NPD Phase 2 Bulkfill Testing Summary Memo, 64-508120-REPT-003 Revision 2.</i> <i>Humphreys, P., N., J.M. West, R. Metcalfe. 2009. Microbial effects on repository performance, Quintessa report QRS-1387Q-1.</i> <i>King, F. 2009. Microbiologically Influenced Corrosion of Nuclear Waste Containers, Corrosion, 65, 4, 233-251.</i> <i>Leupin et al. 2016. An assessment of the possible fate of gas generated in a repository for low- and intermediate-level waste, Nagra Technical Report NTB 16-05.</i> <i>Limer, L.M.C., Albrecht, A., Hormann, V., Gallerand, M-O., Medri, C., Pérez-Sánchez, D., Smith, K., Smith, G. and Thorne, M. 2012. Improving Confidence in Long-term Dose Assessments for U-238 Series Radionuclides. Report prepared within the BIOPROTA International Cooperation Programme.</i> <i>Medri, C. 2015. Human Intrusion Model for the Mark II Container in Crystalline and Sedimentary Rock Environments: HIMv2.1. Nuclear Waste Management Organization report TR-2015-04, Toronto, Canada.</i> <i>Olyslaegers, G., Zeevaert, T., Pinedo, P., Simon, I., Pröhl, G., Kowe, R., Chen, Q., Mobbs, S., Bergström, U., Hallberg, B., Katona, K., Eged, K. and Kanya, B. 2005. A Comparative Radiological Assessment of Five European Biosphere Systems in the Context of Potential Contamination of Well Water from the Hypothetical Disposal of Radioactive Waste. Journal of Radiological Protection 25(4), p. 375.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> <i>Quintessa. 2017. AMBER 6.2 User Guide.</i> <i>Thomson, G., Miller, A., Smith, G. and Jackson, J. 2008. Radionuclide release calculations for SAR-08. Svensk Kärnbränslehantering AB (SKB) report R-08-14, Stockholm, Sweden.</i> <i>Walke, R., Little, R., Ramlakan, A. and Towler, G. 2011. Postclosure Safety Assessment: Analysis of the Normal Evolution Scenario. Quintessa Ltd. report for the Nuclear Waste Management Organization, NWMO report DGR TR 2011-26 R000. Toronto, Canada.</i> <i>Wilson, J. 2020a. Alkaline Plume Modelling. Technical Supporting Document to the Postclosure Safety Analysis of the NPD Project. 64-508760-REPT-015. Revision 0.</i> <i>Wilson, J. 2020b. Scoping Calculations for Lead Solubility Limits. 64-508760-REPT-016. Revision 0.</i> <i>Wilson, J. 2020c. Grout Flushing Models. 64-508760-REPT-009. Revision 1.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				the models, along with any assumptions, limitations or inferences made and based on these additional simulations, identify the parameters that may vary in the NES, and provide an estimate of the variability for each. - Assess radiological risk using improved models. Identify the time periods where radiological risk is highest. - Provide a full assessment of all the factors that may affect the solubility of lead and other parameters of concern - Describe the uncertainties they raise with respect to the lead solubility modeling - Provide a more conservative estimate of the upper boundary for lead concentration that could occur - Describe the methodology used to create the estimate, including any laboratory tests and modeling - Note any limitations, assumptions or inferences associated with the estimate	
Calculated Radioactive Inventory of NPD					
257	CNSC	General	General	Comment: The ORIGEN code, which was used in 1988 to determine the radionuclide inventory of numerous components of the NPD facility, may not be suitable for estimating the waste inventory proposed by CNL, or may require use of an updated code and updated neutron cross section libraries. Here are a few points to consider: - ORIGEN typically pertains to fuel irradiation or removed fuel elements (Hermann et. al., 1998). It has also been shown that the ORIGEN code reaches a limitation that could result in an underestimate of neutron activation product activities making it inappropriate for use on reactor pressure vessels and shielding (Von Gunten et. al., 1999, Alexander et.al., 2011), which is the application it is being applied to for NPD. CNL should comment on the applicability of ORIGEN to these types of materials. - The ORIGEN code may underestimate the activity of fission products and actinides due to impurities in the materials, unless these impurities are accounted for. In light of this potential source of error, are the results produced by ORIGEN sufficiently conservative and bounding? - As a result of the findings of Van Gunten and others, the ORIGEN code has been updated several times to reduce uncertainties related to the production of fission products.	Resolved As: Canadian Nuclear Laboratories (CNL) had previously performed a partial verification of Smith (1988) in Trottier & Edwards (2012) using similar methods. However, in response to concerns raised, CNL has repeated the calculation of activity in reactor components from first principles using modern codes and libraries and a detailed examination of potential impurities and uncertainties in the material compositions. As documented in Edwards & Adams (2019) a Monte Carlo N-Particle (MCNP)5 1.40 calculation was carried out for the entire reactor using a continuous energy Evaluated Nuclear Data File (ENDF) ENDF/B-VII.0 library, then binned into 238 groups to weight the cross sections in a 238 group ENDF/B-VII.0 library distributed with SCALE 6.1, ORNL 2011. The fissile material source in this calculation was an inner and outer core sets of fuel channels whose average-burnup composition, as calculated using an 89 energy group calculation in WIMS-AECL 3.1, Jonkmans 2006, was used along with the power history from Smith (1988). This method determines the reaction rates in the pressure and calandria tubes to very high precision, and the use of a single neutronics code carrying the flux from fuel to concrete guarantees that the calculation of reaction rate is consistent across the core and through the vault. During this new calculation, comparisons were made to the results of the new modeling approach with the work completed by W.M. Smith, (Smith 1988) using that work as an independent verification of the current one. IAEA (1998) acknowledges ORIGEN as one of the computer codes most often used to perform the calculation of neutron induced activity within reactor materials. ORIGEN is capable of tracking a large number of isotopes through specified irradiation and decay times, thus accounting for the creation and depletion of radionuclides throughout the reactor’s operating lifetime. Although the user must describe the materials to be irradiated, the irradiation history which it has experienced and the data library that supplies the basic nuclear cross section data with which the code performs its calculations, the actual mathematical approach used by ORIGEN is robust and well-verified as noted. ORIGEN 6.1, with recent multi-group libraries, is a direct successor to a long line of ORIGEN codes having considerable validation and verification history, and is still seen as the best choice for the depletion part of the calculation. As noted, pre-built reaction rate libraries distributed with ORIGEN are all applicable to fuel and will be inaccurate for producing reaction rates in reactor components, as both thermal spectrum shape, and the weighting of

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Since 1988, neutron cross sections libraries have also been updated for numerous isotopes. This has been observed to be the primary source of error in the ORIGEN code, yet it does not appear to have been considered in the inventory provided for NPD (Hermann et. al., 1998). Has the inventory used by CNL considered these sources of error and is it sufficiently conservative? Has CNL considered these potential issues in the use of the ORIGEN code to derive a large proportion of their waste inventory for NPD? Expectation to Address Comment: Considering the aforementioned points, CNL should provide a justification for why the ORIGEN code is suitable for estimating the waste inventory for the NPD facility, what the effect of material impurities may be on the waste inventory, and why the version of the code and neutron cross section libraries used are still appropriate. References: Hermann, O. W., and R. M. Westfall. <i>ORIGEN-S: Scale System Module to Calculate Fuel Depletion, Actinide Transmutation, Fission Product Buildup and Decay, and Associated Radiation Source Terms</i>. 1998. Von Gunten, A., et al. <i>Radiological Characterization and Conditioning of Operational Waste from the Reactor Pressure Vessel</i>. Proceedings KONTEC 99: 306-317. Alexander, W. Russell, and Linda McKinley, eds. <i>Deep Geological Disposal of Radioactive Waste</i>. Vol. 9. Elsevier, 2011.	both fast and intermediate energy reactions, relative to thermal, will be different away from the core. However, ORIGEN has always had methods (using the code COUPLE which is also part of the SCALE (ORNL 2011) code system containing ORIGEN) to reweight its cross section libraries for different fuel types or non-fuel regions of the reactor and has been used for activation of reactor components before, Journal of Nuclear Science and Technology 2011 or Pretzsch et al, for two recent examples). In CNL’s new calculation, Edwards & Adams (2019), ORIGEN-S is still used as the principal depletion code, but the effective three group reaction rates are now computed by using the fluxes in 238 energy groups, as calculated by MCNP, and then having the library processing code COUPLE use them as weights for a 238 group ENDF/B-VII.0-based cross section library, V7-238 (last updated 2012/09/17), supplied with SCALE 6.1. This input preparation makes ORIGEN 6.1 into a very effective activity calculator, particularly for reactor components which are subjected to fluxes which have been mostly smoothed out (by interaction with the coolant and moderator) and are neutronically non-absorptive so that the interaction of resonances in the materials, or between resonances in the materials and in the fuel, can be expected to be small so that multi-group calculations can be done without correction factors. 1-D and 2-D models were used in <i>Smith 1988</i> largely because of computer limitations. Computer power is sufficient today to allow geometry-neutral Monte Carlo solutions for a 3-D model of a whole reactor core, in cases where the 3-D nature of the transport problem justifies the difficulty of such an analysis. Hence, the 1-D calculation of ANISN has been replaced by the 3-D calculation here. ORIGEN is technically a 0-D code, but it functions here as essentially an adjunct to the MCNP flux calculation and the combination is 3-D. WIMS-AECL remains a 2-D code, so axial variation of flux along fuel channels due to burnup changes is not considered, but the computation of an equilibrium burnup distribution considerably complicates the overall problem and the result (variations along the channel of ±30% or so) can be replaced by the average for calculations of activity in all but very obscure cases. In the new calculation, Edwards & Adams (2019, CNL uses ORIGEN-S and COUPLE from SCALE 6.1 and MCNP5 1.40. None of these codes are the ‘most recent’ but the calculation methods employed by these codes have not changed since they were issued and the fact that they are not the latest versions has allowed time for experience with the codes, and the accumulation of validation and verification work. SCALE 6.1.3 was released in 2014. Current versions of SCALE, based on SCALE 6.2, are primarily concerned with major shift in code architecture to allow the SCALE modules to be scalable from within other codes. This represents no change in the fundamental calculation method, but does introduce scope for bugs and it was felt that SCALE 6.1, the direct inheritor of 60 years of validation and verification work, would be a better choice. Similarly, for MCNP, version MCNP5 1.40 represents the end of a long line of development of the Monte Carlo algorithm and has been extensively validated at CNL and elsewhere. Its further development (since 2005) has been to increase the potential scope of problems to be tackled with MCNP to include burnup (MCNP 6) and exotic particles (MCNP X) neither of which is necessary in this application. The version of WIMS-AECL used for this application to determine the fuel composition for the MCNP model, WIMS 3.1, is the latest version of WIMS-AECL. It was released in 2006 and development of the code has been frozen since then. All the codes used ENDF/B-VII because this library has been extensively validated for Canadian Deuterium Reactor (CANDU) applications. ENDF/B-VIII, released February of 2019, has not yet generated significant interest in the CANDU community as it is not expected to change calculations noticeably. Smith (1988) did consider impurities (this may not have been obvious as they were not necessarily described as such) in the various reactor components. As pointed out, initial impurities are crucial in some scopes, such as the production of very long lived radioisotopes, and also the production of some of the more problematic, mobile, radioisotopes such as Carbon-14. The list of impurities in each material from the calculation, <i>Smith 1988</i> is not exhaustive, and contains no uncertainties, but these problems have been addressed in new calculation, Edwards & Adams (2019). This reference reports on more detailed research into the potential composition of each kind of material used in reactor components, (two types of stainless steel, SS410 and 17-4, a mild carbon steel, Zircaloy-2, aluminum 5052 and aluminum 5154,) and assigns a probably range of variance to each component. The initial

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					isotopes in Smith 1988) appear to roughly correspond to the maximum level of the most important impurities, making it a conservative estimate of activation. The new report identifies the basis for the compositions that have been used in the ORIGEN calculations for reactor component activation. Materials used for reactor components were found in a variety of NPD documents, with additional research done to identify detailed material compositions, including impurities and their uncertainty distribution. The effects of the possible range of impurities were analyzed in the ORIGEN-S activation calculations, where small impurities may have significant effect. The primary source of uncertainty in the activation calculation for NPD would appear to be the large variation in the potential amounts of some key elements present initially in the materials, such as cobalt, chlorine and nitrogen. Other sources of uncertainty, such as the total power developed in all the channels, may be subject to some uncertainty but there is no reason to assume that it is not very small (relative to the factors of 2 and higher in the impurities) and that it does not have an essentially linear effect on the activation results. With the careful consideration of composition uncertainty in Edwards & Adams (2019). CNL feels that it has established reasonably conservative ranges on the maximum values of the resulting activations, as well as best-estimate values. To establish the bounding cases, the user generally runs the analysis code with the worst-case parameters in all respects. In <i>Smith 1988</i>, for example, which was intended to establish a bounding upper estimate for total inventory, uncertainties in impurity fractions were included by using the maximum value of each. Since most of the long-lived (i.e. > 30 years) components of the waste arise from impurity activation, this creates a bounding analysis. In addition, peak fluxes (axially and radially) were assumed at the calandria boundaries for extension into the end region and side walls – a very conservative assumption. Those assumptions were sufficiently conservative that adding (positive) uncertainty to the bounding envelope was impossible. Conversely, Edwards & Adams (2019) includes both a best-estimate analysis with calculations for nominal input parameters, with the uncertainty indicated by calculations for the expected upper bound of the key input parameters. The estimated impurity values were the focus of uncertainty estimation for the NPD activation analysis, since in this case they are the dominant source of uncertainty in the induced activity. Comparison of the calculation of induced activity with the results of measurements on samples may also help develop a better understanding of the overall uncertainty allowance that is appropriate for the estimated inventory of radionuclides. References: <i>Edwards & Adams. 2019. Calculations of the Current NPD Reactor Vault Activation Source Term, 64-505100-ANL-001, February.</i> <i>International Atomic Energy Agency (IAEA). 1998, International Atomic Energy Agency, Radiological Characterization of Shut Down Nuclear Reactors for Decommissioning Purposes, Technical Reports Series No. 389.</i> <i>Jonkmans. 2006. WIMS-AECL User’s Manual, Revision 1, August.</i> <i>Journal of Nuclear Science and Technology. 2011. vol. 48 No. 7, p 1087-1093.</i> <i>ORNL. 2011, Scale: A Comprehensive Modeling and Simulation Suite for Nuclear Safety Analysis and Design, ORNL/TM-2005/39, Version 6.1, Oak Ridge National Laboratory, Oak Ridge, Tennessee, June.</i> <i>Pretzsch et al, Neutron Activation of Reactor Components during Operational Lifetime of a NPP, IAEA-CN-155-062.</i> <i>Smith. 1988. Calculated Radioactive Inventory of NPD, 64-01631-021, April.</i> <i>Trottier & Edwards. 2012. Verification of the W.M. Smith Memorandum “Calculated Radioactive Inventory of NPD”, 64-505100-401-000, December.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
Characterization Report for the NPD Reactor					
258	CNSC	General	General	Comment: It is critical to the post-closure safety assessment and EIS that the data collected by sampling verify the results of the ORIGEN model. However, CNL has tested a limited number of samples for waste characterization of the NPD reactor components to verify the ORIGEN code results. The number of samples is insufficient to fully bound the potential variability (e.g., Calculated Radioactive Inventory of NPD). In particular, only three samples of steel casing, three of calandria ALCAN outer and inner, one of calandria tube aluminum, and two of the Zircaloy pressure tubes were collected. The results of these samples also show significant variability for some nuclides between Holes 1, 2, and 3. Indeed, it is acknowledged in several places in the document that inconsistencies were observed for various reasons, such as material impurities, that were not accounted for in ORIGEN. Therefore, it is of great importance that sufficient sampling is performed to constrain any shortcomings of the model. Expectation to Address Comment: Please justify how the limited number of samples collected is sufficient to verify and conservatively bound the model calculations on inventory. Furthermore, consider the need for further sampling of the NPD reactor components, such as end fittings and shielding, to ensure that the input data to the post-closure safety assessment is sufficiently conservative and bounding.	Resolved As: The objective of the NPD reactor sampling was to obtain three samples of each reactor material at distinct radial locations for comparison to the inventory calculated in <i>Smith 1988</i>. The approximated magnitude of any difference was then to be compared with an acceptable tolerance in the uncertainty of the total source term (based on the 2nd iteration Postclosure Safety Assessment (PostSA), (Arcadis and Quintessa 2017). The outcome of this comparison and effect on the safety assessment bounding scenarios then would provide the necessary safety case inputs or identify the need for further sampling. Canadian Nuclear Laboratories (CNL) successfully obtained, and sent the following for radiochemical analysis: • 81 samples of concrete bioshield (11 samples selected for full analysis); • 3 samples of steel liner; • 7 samples of aluminum vessel; and • 2 samples of zircaloy pressure tube. The sampling location with the highest inventory was utilized to calculate the total measured inventory (NMNTI 2017). Upon evaluation the analysis results and comparison to the calculated inventory (Smith 1988), measured concentrations of the critical or dominant long-lived radionuclides in the environment were an order of magnitude below this inventory, thus based on the established characterization approach CNL’s decision was that further sample collection is not warranted. Although the number of pressure tube samples collected in the 2017 campaign did not meet the intended target, there are additional lines of evidence that provide confidence in the compiled reference inventory as the upper bound, including: • Comparison of previous examinations of pressure tubes remove from the NPD reactor provide specific activities for Cobalt-60 (Co-60) (Rodgers et al. 1985); • Comparison of radiation fields within the reactor vault and modeled radiation fields (Hersak 2014); and • Comparison of gamma spectral measurements within the reactor vault and Co-60 calculated inventory (Rocheftort et al. 2016). As noted above, the statistical approach utilized by NPD included using a relative percentile difference test in order to provide basic validation for the activation calculation model (Smith 1988). Basing the characterization of the NPD reactor on statistical quantity-based sampling designs (i.e. upper confidence level approaches) would result in unnecessary increases in operational hazards and associated costs. Reliance on neutron flux modelling as part of reactor characterization is appropriate as the concentrations of radionuclides produced is directly dependent on underlying material properties and neutron physics which are well understood. Uncertainties in the models are addressed using methods other than radiochemical verification including in-situ radiation field and gamma spectroscopy as well as verification with other models as discussed above. CNL’s approach is in line with the International Atomic Energy Agency (IAEA) Safety Report Series no. 95 (IAEA 2019).

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					References: <i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). (2017). Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project (2nd Iteration). 64-508760-ASD-003 Revision 0. Prepared by Arcadis and Quintessa for CNL.</i> <i>Hersak 2014, Memorandum to R. Parsonage, “Calculated Radiation Fields near the Face of the NPD Reactor”, 64-31000-401-000, March.</i> <i>International Atomic Energy Agency (IAEA). 2019, International Atomic Energy Agency, Methodologies for Assessing the Induced Activation Source Term for use in Decommissioning Applications, Safety Report Series No. 95.</i> <i>New Millennium Nuclear Technologies International, Inc. (NMNTI). 2017. Final Report for the Characterization of NPD Reactor Using Tru-Pro[®] Technology. 64-509410-REPT-004. Revision 0. Prepared by NMNTI for CNL.</i> <i>Rocheftort et al. 2016. Inspection Report from Remote Visual Examination and Radiation Measurement of NPD Reactor Vault West Wing, 64-508340-046-000, March.</i> <i>Rodgers et al. 1985, The Examination of the Pressure Tubes Removed from NPD Channels G05 and G07, CRNL-2597-13, January.</i> <i>Smith. 1988. Calculated Radioactive Inventory of NPD, 64-01631-021, April.</i>
259	CNSC	General	General	Comment: The pressure tubes within the reactor core appear to be the main contributor to the total radiological inventory. However, only one sample was taken inside these pressure tubes, while another sample was taken closer to the outside and had understandably lower activity. Consequently, it is not possible to quantify the variability in radionuclide activity inside the pressure tubes, and it is not possible to adequately bound the assessment. CNL did present ORIGEN calculations to provide evidence of the conservativeness of the inventory estimates, but CNSC staff is of the opinion that direct measurements have more weight than model estimates. Expectation to Address Comment: Please justify why only one measurement of radionuclides in the pressure tubes is considered adequate to support the pre-closure and post-closure safety assessment for this proposed project.	Resolved As: The objective of the NPD reactor sampling was to obtain three samples of each reactor material at distinct radial locations for comparison to the inventory calculated in Smith (1988). The approximated magnitude of any difference was then to be compared with an acceptable tolerance in the uncertainty of the total source term (based on the 2nd iteration Postclosure Safety Assessment (PostSA), Arcadis and Quintessa 2017 results). The outcome of this comparison and effect on the safety assessment bounding scenarios then would provide the necessary safety case inputs or identify the need for further sampling. Canadian Nuclear Laboratories (CNL) successfully obtained, and sent the following for radiochemical analysis: • 81 samples of concrete bioshield (11 samples selected for full analysis); • 3 samples of steel liner; • 7 samples of aluminum vessel; and • 2 samples of zircaloy pressure tube. The sampling location with the highest inventory was utilized to calculate the total measured inventory (NMNTI 2017). Upon evaluation the analysis results and comparison to the calculated inventory (Smith 1988), measured concentrations of the critical or dominant long-lived radionuclides in the environment were an order of magnitude below this inventory, thus based on the established characterization approach CNL’s decision was that further sample collection is not warranted. Although the number of pressure tube samples collected in the 2017 campaign did not meet the intended target, there are additional lines of evidence that provide confidence in the compiled reference inventory as the upper bound, including:

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					• Comparison of previous examinations of pressure tubes remove from the NPD reactor provide specific activities for Cobalt-60 (Co-60) (Rodgers et al. 1985); • Comparison of radiation fields within the reactor vault and modeled radiation fields (Hersak 2014); and • Comparison of gamma spectral measurements within the reactor vault and Co-60 calculated inventory (Rochefort et al. 2016). As noted above, the statistical approach utilized by NPD included using a relative percentile difference test in order to provide basic validation for the activation calculation model (Smith 1988). Basing the characterization of the NPD reactor on statistical quantity-based sampling designs (i.e. upper confidence level approaches) would result in unnecessary increases in operational hazards and associated costs. Reliance on neutron flux modelling as part of reactor characterization is appropriate as the concentrations of radionuclides produced is directly dependent on underlying material properties and neutron physics which are well understood. Uncertainties in the models are addressed using methods other than radiochemical verification including in-situ radiation field and gamma spectroscopy as well as verification with other models as discussed above. CNL’s approach is in line with the International Atomic Energy Agency (IAEA) Safety Report Series no. 95 (IAEA 2019). References: <i>Arcadis Canada Inc. and Quintessa Ltd. (Arcadis & Quintessa). (2017). Postclosure Safety Analysis Technical Supporting Document – Nuclear Power Demonstration Closure Project (2nd Iteration). 64-508760-ASD-003 Revision 0. Prepared by Arcadis and Quintessa for CNL.</i> <i>Hersak 2014, Memorandum to R. Parsonage, “Calculated Radiation Fields near the Face of the NPD Reactor”, 64-31000-401-000, March.</i> <i>International Atomic Energy Agency (IAEA). 2019, International Atomic Energy Agency, Methodologies for Assessing the Induced Activation Source Term for use in Decommissioning Applications, Safety Report Series No. 95.</i> <i>New Millennium Nuclear Technologies International, Inc. (NMNTI). 2017. Final Report for the Characterization of NPD Reactor Using Tru-Pro[®] Technology. 64-509410-REPT-004. Revision 0. Prepared by NMNTI for CNL.</i> <i>Rochefort et al. 2016. Inspection Report from Remote Visual Examination and Radiation Measurement of NPD Reactor Vault West Wing, 64-508340-046-000, March.</i> <i>Rodgers et al. 1985. The Examination of the Pressure Tubes Removed from NPD Channels G05 and G07, CRNL-2597-13, January.</i> <i>Smith. 1988. Calculated Radioactive Inventory of NPD, 64-01631-021, April.</i>
260	CNSC	General	General	Comment: CNL drilled 4 holes through the reactor core for radiological and non-radiological characterization purposes. CNL plugged the drill holes with a steel nut and threaded plug. Expectation to Address Comment: Please indicate if these these drill holes can have an impact on the post-closure safety assessment.	Resolved As: To clarify Canadian Nuclear Laboratories (CNL) drilled three holes from the irradiated fuel bay, through the bioshield, cell liner, and through the calandria, a fourth sampling location was attempted but was abandoned prior to penetrating into the reactor vault. In one location drilling continued through a calandria tube and a pressure tube. All four 15 mm diameter holes were closed with an expansion type plug placed in the concrete bioshield from the irradiated fuel bay. The grout to be used to fill the irradiated fuel bay is the same grout to be applied to the reactor vault, therefore grout flowing from one room to the other has no consequence since it is planned that the entire reactor vault is filled with grout.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					The reactor vault is assumed to resaturate in 20-25 years and these drill holes will not have an impact on the resaturation timelines.
261	CNSC	Section 7.0 Analytical Instruments – Off-site Analysis	p.35	Comment: CNL indicates that Ag-108m was measured, but the measurements were not shown in the results section of the report. Yet, Ag-108m is reported in the EIS. Expectation to Address Comment: Please provide the detailed measurements of Ag-108m in the reactor core for activation and fission products.	Resolved As: For clarification, analysis for silver-108m (Ag-108m) was performed by gamma spectroscopy for all samples of reactor material. The detailed analysis results are provided in the appendices of the NPD Reactor Characterization Report (NMNTI 2017). All of the analysis results were below the Minimum Detectable Concentration thus not reported in the results section of the report. The Ag-108m radioactivity reported in the EIS utilized the activity of Ag-108m calculated by ORIGEN modeling (Edwards & Adams 2019). The adoption of the calculated value over that of the measured activity for the purpose of the Postclosure Safety Assessment (PostSA), is considered the prudent position given the importance of this radionuclide and its environmental mobility. References: <i>Edwards & Adams. 2019. Calculations of the Current NPD Reactor Vault Activation Source Term, 64-505100-ANL-001, Revision 0.</i> <i>New Millennium Nuclear Technologies International, Inc. (NMNTI). 2017. Final Report for the Characterization of NPD Reactor Using Tru-Pro® Technology. 64-509410-REPT-004. Revision 0. Prepared by NMNTI for CNL.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
262	CNSC	Section 8.2 NPD Reactor Radionuclides Analysed, Table 37	p.62	Comment: Table 37 provides the total activity of alpha, beta and gamma emitting radionuclides in Bq/g. CNL adds up the activities in Bq/g to obtain the total activity estimate in each hole. Expectation to Address Comment: Please explain why activities in Bq/g are added up instead of calculating a mean activity and multiplying by the mass of the different reactor component to obtain total activity estimates.	Resolved As: The activities in Bequerels per gram (Bq g⁻¹) are being summed to provide the worst case activation scenario. The comparison taking place in Table 37 of the characterization report (NMNTI 2017), is to determine which of the three holes has the highest reported radioactivity. As Hole 1 demonstrated the highest activity results, it was therefore the worst-case scenario with the highest radioactivity and thus used to calculate the summation of radionuclide activities with the respective calculated component masses to obtain total activity estimates. The alternate method of calculating the mean radioactivity among the three holes and then multiplying by the mass of the different reactor component to obtain the total radioactivity estimates would not have been as conservative. References: <i>New Millennium Nuclear Technologies International, Inc. (NMNTI). 2017. Final Report for the Characterization of NPD Reactor Using Tru-Pro® Technology. 64-509410-REPT-004. Revision 0. Prepared by NMNTI for CNL.</i>
263	CNSC	Section 10.4 Verification of the Calandria Tube Inventory	p.69	Comment: CNL claims that the ORIGEN code makes conservative overestimates of total radiological activity. However, the calculations are associated with many assumptions. For instance, the calculations assumed a fuel burnup of 2,400 MWd/tonne and a constant power of 86 kW. Expectation to Address Comment: Please justify why the fuel burnup and constant power values yield conservative estimate for the radiological inventory.	Resolved As: The calculation of calandria tube activation depends on the total neutron fluence in the tubes and the power history of the fuel. For calculations of activity 30 years after irradiation, only very long-lived variations (over decades) in power are important. The activation of long-lived radionuclides will be linearly proportional (or less) to total fluence, so high power regions and low power regions in the reactor average out and a reactor average power is a suitable parameter to use here to which to normalize activation calculations. The flux in the calandria tube was calculated using a WIMS-CRNL (Jonkmans 2006) model of the fuel and its environs. As fuel burns up (under the constant power assumption) the flux everywhere in and inside the calandria tube rises to compensate for the loss of fissile material in the fuel. Thus, the assumption of 2400 MWd/kg (Megawatt-days per kilogram) burnup, observed to be the NPD maximum burnup, is simply a conservative

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					assumption – an assumption that each calandria tube was uniformly and continually exposed to the maximum total flux produced in a fuel irradiation and therefore more long-lived radionuclides produced. References: <i>Jonkmans. 2006. WIMS-AECL User’s Manual, Revision 1, August.</i>
Updated Groundwater Modeling Report					
264	MOECC	General	General	Comment: An overlying and significant concern with the numerical groundwater modeling is the inability of the model to match the actual flow rates observed in the tile drains. Matching modeled and existing data is essential to validating any model. Failure on the part of the model to match the drain flow rates indicates that the model is not able to accurately represent the physical conditions of the site, and indicates that the model has not been validated. Based on the issues identified, the predicted discharge concentrations are subject to significant potential error and uncertainty. Additional comments related to the outputs of the groundwater modeling results are not likely warranted until the model has been improved and validated. Expectation to Address Comment: Please match the modeled data with the actual flow rates observed in the tile drains in order to validate the groundwater model.	Resolved As: Matching the model data to actual flow rates observed in the tile drains was achieved in the 2024 version of the groundwater flow model (Calder 2024b). Based on the existing measurements of tile drain flow, the average tile drain flow rate was established to be 7.5 L/s, with a steady-state flow estimate of 7.1 L/s (Section 2.3 in Calder 2024b). The calibrated model obtained a tile drain flow rate of 7.0 L/s (Section 3.2 in Calder 2024b). As described in Section 3.1.6 of Calder (2024b): “Over the evolution of the groundwater models, the site characterization work and geosynthesis, it has been demonstrated that: a) The magnitude of tile drain flow rate measurements are reasonable, based on alternate measurement methods and historical observations. Tile drain flows are discussed in detail within Section 2.3. b) Water in tile drain 1 originates from the overburden. Other sources of water to the tile drains are limited. This is determined from geochemistry, as noted in Section 2.3 and the Geosynthesis Report (Raven et al. 2022). c) The water balance for a groundwater model that only assumes a topographically driven overburden groundwater system has an insufficient amount of water to obtain the observed tile drain 1 flow rates. In a topographically-only driven overburden groundwater system at the NPD site, groundwater moves from topographic highs in the south-west towards the river in the north-east and the groundwater catchment area is similar to the surface water catchment. The surface water catchment containing the NPD facility is a smaller area than the total area modelled in the current groundwater model. For this smaller catchment area, the sum of annual recharge over the catchment area (10 mm/yr over approximately 8.5E5 m² of till overburden and 400 mm/yr over approximately 1.6E5 m² of sand overburden results in 2.3 L/s, an overestimation as most of the sand area is downgradient of the tile drain) is significantly less than the annual average tile drain 1 flow rate (7.0 L/s). Based on this water balance, an alternate means of obtaining overburden groundwater must be available, in addition to topographically driven overburden groundwater. d) The overburden is heterogeneous, particularly in the sand and gravel and till near the river, with expected layers of raised permeable washed alluvial-fluvial gravel occurring subparallel to the shoreline.” The reasonableness of the tile drain flow rates is discussed in Section 2.3 of Calder (2024b). References: Groundwater Modelling TSD: <i>Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i> Geosynthesis TSD: <i>Raven, K., Sterling, S. and Calder, N. 2022. 2021 Update to Geosynthesis Nuclear Power Demonstration Closure Project Rolphton, Ontario. 64-509410-REPT-010. Revision 2. Prepared by Arcadis and Geofirma for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
265	MOECC	General	General	Comment: The presence of tile drains and other underground utilities (as well as backfill materials) that may act as preferential pathways and result in the direct discharge of impacted groundwater to the Ottawa River is particularly concerning. The current assessment has not adequately identified and assessed these preferential pathways. Expectation to Address Comment: CNL should strongly consider removing all potential preferential pathways.	Resolved As: A detailed groundwater flow model has been produced based on the proposed configuration following the decommissioning phase and the results of this are described in the Postclosure Safety Assessment (PostSA) TSD (Section 4.2.3). The potential for tile drains and the process outfall to act as preferential pathways has been fully evaluated in the groundwater modeling. Even if the pipes were removed the area will be backfilled with material that is similar to the relatively permeable fill material. Process piping that could serve as preferential pathways to the Ottawa River are to be grouted along their entire length. Direct discharge of groundwater to the river by this route will no longer be possible. Section 4.3.2 of the groundwater flow model evaluated the failure of the tile drains (Calder 2024b). For an extreme comparison elements previously assigned the tile drain properties were assigned fill properties. Failure of the tile drains results in springs developing along the steep face of the bluff downgradient of the facility. The existence of springs with tile drain failure is consistent with observations along this bluff prior to construction of the facility. These springs are identified in initial simulations as nodes where the groundwater table exceeds the ground surface, and in final simulations, seepages nodes are defined at these locations. Groundwater flows in the vicinity of the NPD facility are predominantly at the base of the overburden. The hydrogeology is controlled by the relatively permeable overburden material overlying substantially lower permeability bedrock. Removing the tile drains or process effluent pipe is not necessary given the fact that the alternate pathway through the overburden is very permeable. Further the tile drains should remain in place as they act to divert groundwater around the facility. This reduces the amount of groundwater that would enter the facility especially during the Institutional Control period increasing the time it takes for the concrete to saturate. This in turn will delay the release of short lived and mobile radionuclides such as tritium. References: <i>Groundwater Modelling TSD: Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i> <i>PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
266	MOECC	General	General	Comment: Significant concerns have been identified with respect to the lack of subsurface investigations conducted in support of the proposed project. The level of investigation required to assess subsurface conditions should be commensurate with the complexity of the physical conditions and the complexity and risk associated with the project. However, the conducted investigations are extremely deficient. Adequate subsurface assessment is required to ensure that an accurate conceptual site model is developed, and to ensure that physical properties are accurately determined. The following deficiencies have been noted in the assessment of subsurface conditions. Bedrock Unit: The assessment of the bedrock unit is grossly inadequate. A small number of wells were competed in the	Incorporated: The NPD Closure Project has conducted further assessments since this comment was received. This includes: • Additional site characterization (Geofirma 2019); • Geosynthesis TSD (consistent with REGDOC 2.9.1); and • Updated Groundwater Model (Calder 2024b). The results of the above extensive studies have improved the NPD Closure Project’s understanding of: • Bedrock Unit: Additional holes were drilled in the bedrock unit. An extensive analysis of site and regional bedrock data can be found in Section 2.4 and Section 3.4.5 of the Geosynthesis TSD. The Updated Groundwater Model bases the shallow bedrock properties on the description and analyses within the Geosynthesis. • Shear Zone: Based on an examination of the pre- and post- construction bedrock surfaces, photographs of the NPD excavation, bedrock outcrop mapping and 2019 shallow bedrock drilling and coring, all detailed in Section 2.4.6 of the Geosynthesis, the Geosynthesis concludes “The available data on fracture occurrence do not indicate

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				bedrock unit and have short screens that have been arbitrarily placed. In assessing fractured rock, it is essential to identify and assess fractures. This testing would include the completion of packer testing and/or the use of alternative suitable methods. Shear Zone: The shear zone has been described as a zone of increased fracture density and is an important physical feature to contaminant migration at the site. However, limited investigation of the shear zone has been conducted and its properties and significance are very poorly understood. Additional investigation of the shear zone is required. Appropriate drilling and testing should be conducted to definitively identify the shear zone and its properties. Also, the statement from the Updated Groundwater Monitoring Report that BH16-2A/B intersects the shear zone is speculative. The hydraulic conductivity values measured in these monitoring wells do not support the presence of a shear zone. Vertical Connections & Gradients: Limited knowledge exists with respect to the vertical connections which exist between the various hydrogeological units. The vertical connections between the overburden and bedrock units should have been investigated to determine the degree of vertical connection present, and to determine if the bedrock unit is confined. Understanding if the bedrock unit is confined or unconfined is essential to the development of the conceptual physical model. Vertical connections should be investigated by collecting and interpreting groundwater data from suitably completed monitoring wells and other relevant lines of evidence. The continuous collection of groundwater elevations using dedicated data loggers for a suitable period of time is highly recommended to address this issue. Hydraulic Properties: Limited assessment of the hydraulic properties of the various hydrogeological units has been conducted and is not sufficient to assess the conditions and variability in the various units. Expectation to Address Comment: Please address the above questions and comments.	the presence of major fault or shear zone in the bedrock of the NPDWF” (Section 2.4.6.6). Based on this conclusion, the Updated Groundwater Model does not consider a shear zone. - Vertical connections and gradients: Vertical connections and gradients are discussed in Section 3.6 of the Geosynthesis. In particular, Figure 3.9 in the Geosynthesis shows water elevation profiles in four shallow bedrock holes. - Hydraulic Properties: The Geosynthesis provides additional analysis of hydraulic properties, including data collected in 2019, in Section 3.4. The Updated Groundwater Model bases hydraulic properties on those described in the Geosynthesis. The results have been incorporated into the updated Postclosure Safety Assessment and carried forward into the EIS, as follows: the NPD Closure Project has updated the Baseline Characterization in the EIS to include a summary of the findings of the Geosynthesis Report. In addition, the Effects Assessment in the EIS has been updated to incorporate the results of the updated Postclosure Safety Assessment (which incorporates the updated Groundwater Model). Change to EIS: Sections 2.6.4, 8.5, 9.5 and 12 of the EIS have been revised to reflect the response above. References: <i>Geofirma Engineering Ltd. 2019. Geoscientific Characterization of the NPD Site. 64-509410-REPT-012. Revision 0.</i> <i>Geosynthesis TSD: Raven, K., Sterling, S. and Calder, N. 2022. 2021 Update to Geosynthesis Nuclear Power Demonstration Closure Project Rolphton, Ontario. 64-509410-REPT-010. Revision 2. Prepared by Arcadis and Geofirma for CNL.</i> <i>Groundwater Modelling TSD: Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i>
267	CNSC	General Also applicable to the Resaturation Modeling Report and the Postclosure Safety Assessment Technical	General	Comment: Several issues were identified with the groundwater model. Model calibration: It is well recognized in groundwater modeling that both groundwater head and flux targets should be routinely used during history matching. In the model calibration, the history matching of groundwater head is reasonably good, but the simulated flux in two locations (i.e., flow rate into tile drain and seepage rate into the NPD facility) has significant discrepancy with the actual measurements. The flow rate into the tile drain is around	Incorporated: The NPD Closure Project has prepared a Geosynthesis Report (Geosynthesis TSD), which integrates data obtained during the NPD Closure Project Site Characterization (Geofirma 2019), historical site characterization and regional characterization data. The information from reports has been used to update the Groundwater Model for the NPD Site. #1 – Model Calibration: The NPD Closure Project has addressed model calibration challenges in the Updated Groundwater Model Report (Calder 2024b). The updated groundwater model calibration provides a good match to both groundwater head targets

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
		Supporting Document		10 L/s (p. 2-9), while the simulated flow rate is 1.3 L/s for calibration in case 1 and 3.6 L/s for calibration in case 2 (p. 4-3). The seepage rate into the NPD facility is around 10 m³/year (Resaturation Modeling Report, p. 12), while the simulated groundwater flow rate into the NPD facility is around 1.9 m³/year (p. 4-6). It is noted that attempt to change the hydraulic conductivities of the stratigraphic units together with the recharge rate has been made in order to match the history flux without much success. The Groundwater Modeling Report (p. 5-1) indicated that a much larger catchment area may be needed to match the measured tile drain flows, but it is not clear if a larger model domain has been attempted in the modeling exercise. Has a watershed / sub-watershed delineation been conducted to facilitate the selection of the model domain? Groundwater level measurements: The measured groundwater level should be provided in a table in the Groundwater Modeling Report. Overburden: It is not clear how the depth of the overburden is determined, and what the distribution of overburden depth is around the NPD site. Recharge: It is not clearly stated in the Groundwater Modeling Report what the recharge rate is for calibration in case 2. Shear Zone: The Groundwater Modeling Report states (on p. 2-10) that “ [t]he shear zone is expected to represent a zone with a high density of major fractures.” Figure 2-7 shows the suggested shear zone location. The shear zone seems to be a significant structure for groundwater flow and contaminant transport; however, it is not well characterized and not even represented in the base case model. Weathered bedrock: The fractured nature of the bedrock is noted in the Groundwater Modeling Report (p. 2-9), as well as in the Postclosure Safety Assessment TSD (p. 4-14). However, the fractured nature of the bedrock is not well characterized. It is not clear if it is considered in the groundwater modeling. Tile drain: The tile drain around the building is perforated, except for the section beyond Manhole 2 towards the river (p. 2-5). It is understood that the flow in the tile drain is an open channel flow instead of a pipe flow. The tile drain is represented in the modeling by a zone with high hydraulic conductivity. Is it more appropriate to use a seepage face boundary condition along the section of the perforated tile drain to represent the tile drain? Would it have any impact on the simulated flow rate through the tile drain?	and the tile drain flux target. Calibration objectives include water levels and the tile drain flow rate. Details of the site -specific calibration data used is provided in Section 3.1.6 of the Groundwater Modelling Report (Calder 2024b). Calibration methodology is described in Section 4.1 of the Groundwater Modelling Report (Calder 2024b). Standard calibration statistics are shown in Figure 3-10. Parameters used in calibration are described in Section 3.2 and listed in Table 3-2. Seepage rates into the facility are not a reasonable calibration point for the groundwater model. Groundwater flow into a grouted and saturated facility, as simulated with the groundwater flow model, is very different from the amount of water entering a completely unsaturated, empty facility. For example, the head gradients are very different. However, the previous Resaturation Report (Calder 2020) does examine a case of flow into an empty, unsaturated facility, and the resaturation model does obtain a good comparison against sump rates. In the resaturation model, the seepage into the facility is used to calibrate the hydraulic conductivity of the concrete walls of the facility. #2 - Model domain and boundaries: The model domain was selected to encompass the watershed draining towards the edge of the Ottawa River near the facility, from topographic highs to the Ottawa River. It also encompassed the watershed to the west of the facility, in order to incorporate hydrogeologic features providing flow towards the facility (based on the updated hydrogeologic conceptual model in the Geosynthesis TSD. Larger domains, extended further east of the facility, were evaluated but did not change the amount of water reaching the facility. In response to comment feedback, the 2024 Groundwater Model Report (Calder 2024b) includes an improved description of the model domain boundary. The delineation of the watershed in which the facility is situated was also improved, to improve justification of and confidence in the model domain boundary. #3 - Groundwater level measurements: Groundwater level measurements were provided in several graphical formats. However, the 2024 Groundwater Model Report (Calder 2024b) includes a table with the values used in calibration (Appendix A). #4 - Overburden depths: Overburden depths are inferred from the difference between bedrock and ground surface. Bedrock depths were obtained from borehole data and excavation drawings. Overburden depths upgradient of the site were assumed to be similar to those near the facility. In addition to updated groundwater modelling, the NPD Closure Project has also prepared and submitted to the CNSC an Updated Geosynthesis Report (Geosynthesis TSD). The scope of the Geosynthesis TSD is described in greater detail below - under response item #6. Information gathered in parallel for the Geosynthesis TSD has proven useful for the groundwater model. #5 - Recharge: The NPD Closure Project re-assessed recharge estimates as part of the project’s Groundwater Model (Calder 2024b). This accounts for any findings from the model domain boundary definition (as discussed earlier). The method used to estimate the groundwater recharge rate was re-examined, as well as the estimate for till conductivity, which limits the amount of recharge that can be applied over a large portion of the domain. Additional explanation of recharge was also added to the updated groundwater model. Note that there is no longer a second calibration case.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				Pipe trench: It seems that the pipe trench is represented in the groundwater model as a zone with different hydraulic conductivities. However, its properties are not clearly specified. Thickness of the NPD wall: The Groundwater Modeling Report (p. 3-7) states that “the thickness of the NPD walls is not accurate. As the focus of the groundwater model is flow into the NPD and rather than flow through the NPD, this dimension was not adhered to in order to keep the model size manageable”. With the thickness of the wall different from the actual dimension, should effective hydraulic conductivity values be assigned to the NPD walls in order to simulate the groundwater seepage into the facility? Expectation to Address Comment: Address the above questions and comments, with an emphasis on the following: • Further efforts should be pursued to make the history match of both head and flux reasonably well • A justification should be provided for the modeling domain and boundary conditions • A justification should be provided for the exclusion of the shear zone and fractured nature of the bedrock in the base case model	#6 - <i>Shear zone:</i> The shear zone was included in an earlier version of the groundwater flow model, based on a description of the shear zone in Appendix 10 of Canadian General Electric Company Ltd. (1962). Section 2.4.6 of the Geosynthesis TSD provides a detailed presentation of data and analyses in regards to the potential for a shear zone to exist - as identified by Canadian General Electric Company Ltd. (1962), including an analysis of the pre- and post- construction bedrock surfaces, an examination of photographs from the NPD excavations, 2019 bedrock outcrop mapping, and 2019 shallow bedrock drilling and coring. The analyses in the Geosynthesis TSD concludes that “<i>Borehole natural fracture frequency and RQD measurements indicate shallow bedrock that is moderately fractured and of fair to good rock quality, with an observed increase in fracturing and decrease in RQD with proximity to the Ottawa River. The available data on fracture occurrence do not indicate the presence of major fault or shear zone in the bedrock of the NPDWF.</i>” As the Geosynthesis TSD concluded that there is no shear zone at the NPDDF site, a shear zone was not included in subsequent analyses and scenarios, including the Groundwater Modelling (Calder 2024b). #7 - <i>Weathered bedrock:</i> Since the first groundwater models, a thorough description of the shallow bedrock system and the properties relevant to a groundwater model is provided in Section 3.4.5 of the Geosynthesis Report (the 2019 Updated Geosynthesis TSD). This description is based on previous data, regional data and site characterization data conducted in 2019 (Geofirma 2019). The groundwater model (most recently, the 2024 Groundwater Modelling (Calder 2024b)) uses parameter values consistent with the geosynthesis. #8 - <i>Tile drain:</i> The seepage face approach was investigated as part of the groundwater model update (Calder 2024b). The tile drain’s implementation within the model will be described with seepage face boundary conditions instead of high permeability element. The different approach to modelling the tile drain had no impact on model results. #9 – <i>Pipe trench:</i> The pipe trench contains fill, and as consequence, has the properties of fill. Within the Groundwater Model (Calder 2024b), property assignments were shown in the plan view to help emphasize this. The fill within the groundwater model is described in Section 3.1.3.5, and property values provided in Table 3-1, of the Groundwater Modelling Report (Calder 2024b). #9 - <i>Thickness of NPD walls:</i> The Groundwater Modelling Report (Calder 2024b) includes further discretization of the facility walls within the model. Improving the model’s discretization allows for better representation of the facility’s existing concrete walls. This removes one particular uncertainty within the model, and therefore improves general perceived confidence in its predictions. However, further discretization of the walls did not have a significant effect on results, given the low permeability of the concrete wall and grout materials, and an effective hydraulic conductivity case is not warranted. The results of the Updated Groundwater Model have been incorporated into the PostSA TSD. Changes to Groundwater Modeling Report: Changes have been made to Sections 3.2, 3.3, 3.4 and Appendix A.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					References: <i>Calder, N. 2020. Resaturation Modelling at the site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-005, Revision 2, March 28, 2020. Prepared by Arcadis and Geofirma for CNL.</i> <i>Geofirma Engineering Ltd. 2019. Geoscientific Characterization of the NPD Site. 64-509410-REPT-012. Revision 0.</i> Geosynthesis TSD: <i>Raven, K., Sterling, S. and Calder, N. 2022. 2021 Update to Geosynthesis Nuclear Power Demonstration Closure Project Rolphton, Ontario. 64-509410-REPT-010. Revision 2. Prepared by Arcadis and Geofirma for CNL.</i> Groundwater Modelling TSD: <i>Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i>
268	ECCC	General Also applicable to the Postclosure Safety Assessment Technical Supporting Document, p. 4-15 Also applicable to the Resaturation Technical Supporting Document, p. 6	General	Comment: There are issues with the baseline hydrogeological information that subsequently decrease the validity of the hydrogeological model that is based on them, as outlined below. For page 2-7 and Table 2-1: • The calibration methodology, statistics, and final calibrated values are not fully provided nor sufficiently explained. Also, it is not clear how Figure 3-3 (Cumulative Distribution of Measured Sand Hydraulic Conductivity, Compared to Calibrated Groundwater Model) was used by CNL to develop a hydraulic conductivity estimate for the on-site sand layer. • The 1988 values of hydraulic conductivity (K) look uncharacteristically low for those overburden types. The 1988 values appear questionable when compared to the values for the wells sampled in 2017. • The first paragraph on page 2-7 states that the wells that are screened across both sand and shallow bedrock are assumed to represent the hydraulic conductivity of the sand. This is an invalid assumption that biases the measured K-values to appear less conductive for the sand units. This is evidenced by the reported K-values which appear to be uncharacteristically low and also lower than the 2017 measurements made in sand only (i.e., no bedrock component). • The model appears to be based on only three K-values for bedrock, which does not make for a robust dataset, especially considering the importance of this model. Furthermore, there is no information as to what depth these K-values were measured at. A more detailed campaign of drilling and testing the bedrock should be undertaken. For page 2-10:	Incorporated: The NPD Closure Project has prepared the following studies: • Groundwater Modelling Report (Calder 2024b), which includes updates to model domain boundaries, recharge and catchment, model calibration, and documentation; • Updated Resaturation Model (Calder 2020); • Geosynthesis Report (Geosynthesis TSD), which involves an important presentation and integration of site geological, hydrogeological and geomechanical data and information within the broader context of regional geoscientific data and information; and • Geoscientific Characterization of the NPD Site (Geofirma 2019). The following was included in the Groundwater Model report (in the same order as the original comments): • Calibration methodology is further described, and calibration statistics are provided in Figure 3-10. Final calibrated parameters are provided in Table 3-3. Sand conductivity was a calibrated parameter as discussed in the third paragraph of Section 3.2, and compared to measured values in Figure 3-13; • Overburden hydraulic conductivities were further investigated within the Geosynthesis (Section 3.3 and 3.4). Note that the 1988 values are within range of other measurements (see Figure 2-6 in the Groundwater Model report), and two have associated uncertainty, as they are indicated to be a minimum or order of magnitude estimate; • Hydraulic conductivities for wells that span overburden and bedrock were corrected to represent only the sand. It should be noted that the correction was small relative to the range in conductivities measured (e.g. BH9-01 will have a sand conductivity of 3E-7, instead of 2E-7); • Additional data has been obtained for the shallow bedrock, as described in Section 3.3.2 of the Geosynthesis. This data has been incorporated within the Updated Groundwater Model; • Section 2.4.6 of the Geosynthesis examines pre- and post- construction bedrock surfaces, photos of the NPD excavation, 2019 bedrock outcrop mapping and 2019 shallow bedrock drilling and coring, and concludes “The available data on fracture occurrence do not indicate the presence of major fault or shear zone in the bedrock of the NPDWF. “Consequently, the shear zone is not considered in the Updated Groundwater Model; • Hydraulic conductivities in the fill are limited, and the uncertainty of this parameter is addressed with a sensitivity case (Section 5.2 in the Groundwater Model Report); • Further measurements of the till were obtained in 2019, and are described in Section 3.3.2 of the Geosynthesis. The Updated Groundwater Model makes use of the till description and parameterization within the Geosynthesis;

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				- Considering the potential importance of the shear zone to understanding groundwater flows into and out of the monolith, reliance upon only one data point for the shear zone also brings into question the robustness of the data supporting the model. Furthermore, the one K-value reported has only been inferred to represent the shear zone. A more detailed campaign of drilling and testing the shear zone should be undertaken. - The easterly strike of the shear zone is important because it can channel groundwater towards the Ottawa River. - Based on the inferred location, the shear zone underlies more than half of the NPD building. - It is stated: “The appendix of the Final Hazards Report also refers to a void in S-3, a possible seam in hole S-11, and water losses observed in both S-3 and S-11” and “The shear zone is expected to represent a zone with a high density of major fractures.” Due to the lack of a detailed geotechnical and hydrogeological assessment of the shear zone, it is not clear what the importance of these voids and seams may be. It appears that an inference is being made that these are associated with the shear zone. For page 3-5: - The hydraulic conductivity of the fill material is based upon a single measurement, and the test method has not been described. For page 3-6: - It is stated: “Till was not adjusted during calibration as no calibration points exist within the till to provide a strong basis for calibration of this parameter.” This statement also points to the fact that the groundwater model is based upon very limited site-specific data. For page 2-11: - It is stated: “The difference in hydraulic conductivity measurements in the bedrock (BH16-02A and BH-16-02B) can be explained by the presence of the shear zone. With a shear zone at this suggested location and dip, the shallow hydraulic conductivity measurement is outside the shear zone, and the deep hydraulic conductivity measurement is located within the shear zone.” There is a lack of complete and detailed information in the EIS to properly substantiate this	- The majority of groundwater flow does occur through the overburden. Based on groundwater flows provided in Table 4-2, flow through the bedrock represents 0.4% of total flow near the NPD; and - The resaturation modelling was updated to reflect new data and analysis in the Geosynthesis and Updated Groundwater Model Report. The updated Postclosure Safety Assessment (PostSA) includes information from the above studies. The NPD Closure Project has also updated the Baseline Characterization and Effects sections of the EIS, as well as the mitigation measures and follow-up monitoring sections, to include information from the above studies and the updated PostSA. Changes to Groundwater Modeling Report: Sections 3.2, 3.3, 3.4, 4.1, 4.4.5 have been revised to reflect the response above. Change to EIS: Sections 2.6.4, 3.3, 3.6.2, 8.5, 9.5 and 12 have been revised to reflect the response above. References: <i>Calder, N. 2020. Update to Resaturation Modelling for the Proposed In-Situ Disposal of the Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-011. Revision 2. Prepared by Arcadis and Geofirma for CNL.</i> <i>Geofirma Engineering Ltd. 2019. Geoscientific Characterization of the NPD Site. 64-509410-REPT-012. Revision 0.</i> Geosynthesis TSD: <i>Raven, K., Sterling, S. and Calder, N. 2022. 2021 Update to Geosynthesis Nuclear Power Demonstration Closure Project Rolphton, Ontario. 64-509410-REPT-010. Revision 2. Prepared by Arcadis and Geofirma for CNL</i> Groundwater Modelling TSD: <i>Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				conclusion, such as the location and hydrogeological behavior of the shear zone. These are very important observations that warrant further hydrogeological investigation of the shear zone in order to collect representative data. Also, the groundwater model should incorporate the shear zone into the NES, not as a separate sensitivity scenario, because all other disruptive scenarios and/or sensitivity scenarios will be affected by the presence of the shear zone. Page 4-15 of the Postclosure Safety Assessment TSD incorrectly implies that all groundwater flow from the monolith will be through overburden. Groundwater can also flow through bedrock, including the shear zone. In addition, hydraulic conductivity and porosity values from the CRL site are assumed to be the same for bedrock and overburden sands at the NPD site. Hydraulic conductivity and porosity values for the fill material are estimated based on published ranges. Considering the importance of the groundwater model as it relates to groundwater flows into and out of the monolith, and for contaminant movement down-gradient of the monolith, a robust data set for hydrogeological parameters is needed to support the groundwater model. This data should be collected on-site, and should include samples at the shear zone. Page 6 of the Resaturation Modeling Report states: “The tighter hydraulic conductivity in the shallow bedrock relative to the deep bedrock is unexplained.” This rationale does not provide a sufficient level of certainty or site-specific detail required to support subsequent modeling and predictions about long-term performance and risks of the proposed project. Hydraulic conductivities need to be explained in detail for the project site in order to provide a valid basis for the various modeling exercises that are critical to understand the long term performance of the monolith, potential risks, and proposed mitigation. Expectation to Address Comment: Please update the baseline data to include: all borehole logs, a description of tests performed to calculate K-values, all hydraulic conductivity data, and the geometric mean K for each hydrogeologic unit. Provide more accurate hydraulic conductivity values for the overburden, especially for sand units, for example by conducting a more detailed campaign of drilling and testing the overburden. Consider excluding the 1988 K-values from the model dataset unless it can be demonstrated that the measured K-values are valid.	

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				In addition, please complete further site assessments to confirm in detail the location of the shear zone. Conduct further hydrogeological investigation of the entire site, including the shear zone, and collect representative data. Summarize this investigation in the EIS along with a rationale for the investigative approach used and any limitations, assumptions or inferences. Update the EIS to describe the assessments completed and provide a more detailed description of the shear zone including location and hydrogeological behaviour. Re-run the normal evolution, disruptive and sensitivity scenarios of the groundwater model to reflect the presence of the shear zone and the hydrogeological data collected. Update and re-run any other models that rely on hydrogeological data. Provide the groundwater model calibration methodology, calibration statistics, and final calibrated values (e.g., hydraulic conductivity, recharge rate, etc.) for all parameters. Given a number of deficiencies with the groundwater flow model and related assumptions and data inputs have been raised, please revise the Resaturation Modeling Report to reflect updates to the groundwater flow model. Furthermore, articulate any limitations, assumptions or inferences made in the groundwater flow model that are relevant to the Resaturation Modeling Report.	
269	CNSC	Section 2.0 Background Also applicable to the Postclosure Safety Assessment Technical Supporting Document, Appendix C, p. C-104	p.2-1	Comment: Releases during the Institutional Controls and Post-Institutional Controls phases are stated to be delayed and gradual, but do not appear to consider the existence of faults / shear zones / fractures that are likely to exist at the NPD site. This is not consistent with the shear zone that is part of CNL’s Updated Groundwater Modeling Report. The existence of a shear zone on the NPD site needs proper characterization. This important information is buried within (and perhaps only presented in) this report. Though it is described as a significant feature on the site, its location and dimensions are approximated from a 1966 Canadian General Electric Company Ltd report that was not provided, and is an admittedly incomplete reference. Further references related to the geological investigation are “currently not available”. This highlights the necessity for characterization and verification work on the NPD site. On pages 2-1 and 2-10 of the Updated Groundwater Modeling Report, the following key factors are presented, or statements made: - Faulting in the bedrock is “not infrequent” - A shear zone was recorded at the NPD site (though its exact location is not clear)	Resolved As: Geological site characterization work was conducted at NPD in 2018 (Geofirma 2019) to better define the baseline geological information for the site, specifically the bedrock, and confirm the existence or absence of a shear zone. A Geosynthesis report was prepared and includes this characterization work (Geosynthesis TSD). The shear zone was included in an earlier version of the groundwater flow model, based on a description of the shear zone in Appendix 10 of Canadian General Electric Company Ltd. (1962). Section 2.4.6 of the Geosynthesis TSD provides a detailed presentation of data and analysis in regards to the potential for a shear zone as identified by Canadian General Electric Company Ltd. (1962), including an analysis of the pre- and post- construction bedrock surfaces, an examination of photographs from the NPD excavations, 2019 bedrock outcrop mapping, and 2019 shallow bedrock drilling and coring. The analysis concludes “Borehole natural fracture frequency and RQD measurements indicate shallow bedrock that is moderately fractured and of fair to good rock quality, with an observed increase in fracturing and decrease in RQD with proximity to the Ottawa River. The available data on fracture occurrence do not indicate the presence of major fault or shear zone in the bedrock of the NPDWF.” As the Geosynthesis TSD concluded that there is no shear zone at the NPDWF site, a shear zone was not included in subsequent analyses and scenarios, including the 2024 groundwater flow modelling (Calder 2024b) and the Normal Evolution Scenario. References: <i>Canadian General Electric Company Limited, 1962. Nuclear Power Demonstration Generating Station, Final Hazards Report Part 1, Appendix 10 – Geological Report, 64-00000-041-000-0126.</i> <i>Geofirma Engineering Ltd. 2019. Geoscientific Characterization of the NPD Site. 64-509410-REPT-012. Revision 0.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				- Diamond drilling (1966 report) indicates that the bedrock is sheared over ~300 feet - The suggested location of the shear zone (in Figure 2-7) implies that it is an important feature at the site The existence of the shear zone is also inconsistent with the FEP selection rationale provided in the Post-Closure Safety Assessment TSD (Appendix C, p. C-104). The FEP analysis screens out the possibility of an undetected fault or fracture zone. This is entirely at odds with what is described in the Updated Groundwater Modeling Report, a discrepancy that must be rectified. The introduction of the on-site shear zone within the Updated Groundwater Modeling Report raises concerns about CNL’s approach and consistency between important submissions that are supposed to both document the baseline site characteristics and model the long-term evolution of the proposed project. Expectation to Address Comment: - Characterization work is required at the NPD site, especially to verify the location and characteristics of the shear zone stated to contain numerous fracture sets. - The influence of the shear zone on project-related releases needs to be presented and evaluated. This is the type of information that needs to be presented on the baseline geological environment (e.g., structural geology, site characterization). - Please explain why the shear zone is not considered as part of the “base case” for the updated groundwater model. - The Normal Evolution Scenario (in the Postclosure Safety Assessment TSD) must consider the presence of the shear zone at the site.	Geosynthesis TSD: Raven, K., Sterling, S. and Calder, N. 2022. 2021 Update to Geosynthesis Nuclear Power Demonstration Closure Project Rolphton, Ontario. 64-509410-REPT-010. Revision 2. Prepared by Arcadis and Geofirma for CNL. Groundwater Modelling TSD: Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.
270	MOECC	Section 2.0 Background	p.2-1	Comment: Groundwater springs were previously reported along the northern slope. It is unclear if these springs still exist or if they may reoccur in the future. The presence of groundwater springs would allow contaminated groundwater to short-circuit to the river via overland flow. Expectation to Address Comment: Please consider the identified groundwater springs in the existing assessment.	Resolved As: The Groundwater Model Report (Calder 2024b) now states that these springs were historical, and do not exist at this time. It should be noted that the Groundwater Model Report found the springs are predicted to return once the tile drains are no longer functional (Section 4.3.2). The 4th Iteration Postclosure Safety Assessment (PostSA) TSD incorporates these new groundwater modelling results. References: Groundwater Modelling TSD: Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL. PostSA TSD: Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
271	ECCC	Section 3.2 Model Domain and Discretization Also applicable to the Resaturation Modeling Report, p.4	p.3-2	Comment: The topographic resolution of 20 meters is not sufficient resolution to articulate the factors and details of importance to the proposed project. Expectation to Address Comment: A higher resolution topographic map should be developed (and included in the Updated Groundwater Modeling Report TSD and Resaturation Modeling Report), based on, and as a component of, an overall comprehensive geotechnical and hydrogeological assessment of the NPD site. In addition, please apply the updated topographic data to the affected models.	Incorporated: The NPD Closure Project has prepared a Groundwater Modelling Report and a Geosynthesis Report, described as follows: <u>Groundwater Modelling Report</u> The Groundwater Modelling Report has been updated (Calder 2024b) in response to this (and other) comments. The updates focus on: ☐ A description of the topography that acknowledges that while a 20 m digital elevation model (DEM) was used over a large portion of the model domain, the area of interest near the facility also used excavation plans and building drawings to inform the topography. ☐ Increasing model discretization to improve fidelity to concrete wall thickness; ☐ Improving the description/mapping of the model domain boundary, including delineation of the watershed using software with DEM capability to determine flow directions and catchment boundaries; • Re-calibrating the model; • Re-running sensitivity cases in light of new groundwater model calibration; and, • Improved documentation (among other changes the report will be updated to acknowledge that detailed maps, drawings and boreholes were also used in developing the ground surface of the model). <u>Geosynthesis Report</u> Acknowledging the need for an overall comprehensive geotechnical study, the NPD Closure Project has prepared a Site Characterization Report (Geofirma 2019) and a Geosynthesis Report (Geosynthesis TSD). The Geosynthesis TSD provides an important presentation and integration of site geological, hydrogeological and geomechanical data and information collected as part of the Site Characterization Report within the broader context of regional geoscientific data. The Resaturation Modeling Report has been updated with the improved groundwater modeling. Changes to Groundwater Modeling Report: Changes have been made to Sections 3.2, 3.3 and 3.4 as noted in the response above. Change to EIS: Section 8.5 of the EIS has been revised to include information from the Geosynthesis Report. Section 9 of the EIS has been revised to include updated PostSA results, following incorporation of the updated Groundwater Model into the PostSA. References: <i>Geofirma Engineering Ltd. 2019. Geoscientific Characterization of the NPD Site. 64-509410-REPT-012. Revision 0.</i> Geosynthesis TSD: <i>Raven, K., Sterling, S. and Calder, N. 2022. 2021 Update to Geosynthesis Nuclear Power Demonstration Closure Project Rolphton, Ontario. 64-509410-REPT-010. Revision 2. Prepared by Arcadis and Geofirma for CNL</i> Groundwater Modelling TSD: <i>Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
272	CNSC	Section 3.3. Material Properties, Table 3-1 Also applicable to the Postclosure Safety Analysis Technical Supporting Document	p.3-6	Comment: The concrete of the NPD facility has a hydraulic conductivity value of 10^{-10} m/s for the NES (Table 3-1), and 10^{-8} m/s and 10^{-6} m/s when considering the degradation of the NPD facility concrete and grout (p. 4-11). Table 3-1 indicates that the grout and concrete wall have different hydraulic conductivity values. However, the change of hydraulic conductivities over time for both concrete and grout is not clearly specified. The Postclosure Safety Analysis TSD indicates (on p. 5-26) that the hydraulic conductivities of the concrete change from 0.003 m/year to 3 m/year when considering the degradation of the engineered barrier. The hydraulic conductivity value for the degraded concrete in the NES is assumed to be 0.3 m/year. It is not clear if the groundwater modeling results for all these scenarios are presented in the Groundwater Modeling Report. Expectation to Address Comment: The groundwater modeling results for the scenarios considered in the Postclosure Safety Analysis TSD should be presented in the Groundwater Modeling Report.	Incorporated: Table 3-1 of the Groundwater Modelling Report shows that the hydraulic conductivity of the “grout” is 6×10^{-11} m/s and the hydraulic conductivity of the “concrete wall[s]” is 3×10^{-11} m/s. The degraded value for both of these materials is assumed to be 10^{-8} m/s and the severely degraded value is 10^{-6} m/s, as discussed in Section 4 (Calder 2024b). CNL has prepared a near-field model (Calder 2024c) to properly assess the flow of water through the various rooms of the NPD Facility during normal evolution scenario including consideration of concrete/grout degradation and tile drain failure. This report identifies the groundwater flows that are used in Post Closure Safety Assessment Technical Support Document (PostSA TSD) (Section E3.4.7). References: <i>Calder, N. 2024c. Near-field groundwater model at the site of the proposed decommissioned Rolphoton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-013. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i> Groundwater Modelling TSD: <i>Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphoton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i>
273	ECCC	Section 3.4 Boundary and Initial Conditions	p.3-6 to 3-8	Comment: Page 3-8 states: “In order to prevent flooding, recharge was reduced to 20 mm/year for a till conductivity of 3×10^{-6} m/s.” This rate of recharge seems rather low for tills that lack a significant clay component (i.e., the tills are described as “silty to sandy tills”). Assuming that the till is indeed Unit 5a (the text does not clarify this), it is important to get a valid recharge rate considering this unit is upgradient of the NPD facility and will dictate how much water flows towards the NPD facility. The calibration of one hydrogeologic unit can have implications for the calibration of other hydrogeologically connected units. Page 3-6 indicates that “till was not adjusted during calibration as no calibration points exist within the till to provide a strong basis for calibration of this parameter.” It is possible that the mismatch might be attributable to both the calibration exercise and the lack of site-specific data for the till unit. Without adequate information regarding the calibration methodology and statistics, it is difficult to evaluate whether calibrated values are accurate. It is not clear if other information can be used to verify that the calibrated recharge rates are appropriate. The inability of the groundwater model to match the flow rates in the tile drains may be a result of inappropriately	Incorporated: The comment identifies 5 items for response. A response is provided for each of these 5 items, below. Overall, the NPD Closure Project has prepared an updated Groundwater Modelling Report (Calder 2024b) as part of the disposition of this comment (and others). Further details are given below. <u>Topic #1 and # 2: Till – Clarification and Hydraulic Conductivity:</u> The NPD Closure Project has prepared a Geosynthesis Report (Geosynthesis TSD), which integrates data obtained during the NPD Closure Project Site Characterization (Geofirma 2019), historical site characterization and regional characterization data. Six new measurements of till conductivity were obtained during the NPD Site Characterization, as detailed in Section 3.3.2 of the Geosynthesis Report. A description of the tills and the recommended parameter values for till are provided in Sections 3.4.3 and 3.4.4 of the Geosynthesis TSD. The till used in the Groundwater Modelling Report (Calder 2024b) is based on the description and values recommended in the Geosynthesis report. The property assignments to the groundwater model are detailed in Section 3.1.3.8 of the Groundwater Modelling Report, and reported in Table 3-1. The location of the till was based on borehole information, from the NPD Site Characterization as well as older site characterization data. The till is generally consistent with the OGS 5a unit described by Gadd (1963). <u>Topic #3: Recharge for till unit:</u> Till recharge was not included in the automatic calibration, but was in effect manually calibrated to prevent flooding of the ground surface that is known not to occur. Note that the lower hydraulic conductivity of the till, based on site measurements as described above, results in a lower value of infiltration.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				calibrated values; however, this was not considered in the report. More water would enter the tile drains if the till unit had a higher recharge rate. The validity of a calibration exercise that uses a limited dataset is questionable (one can obtain reasonable calibration statistics against the limited dataset, and yet it may still be a poor representation of the actual site hydrogeology). Additional site-specific measurements of hydraulic conductivity would improve the modeling and result in a better match between measured and calibrated values. Expectation to Address Comment: It is recommended that CNL carry out the following: • Clarify that the till unit described is the one shown as Unit 5a in Figure 2-1. • Collect additional site-specific measurements of hydraulic conductivity to create a more robust dataset that describes the site in detail. • Calculate a valid recharge rate for till Unit 5a and recalculate other hydrogeologically connected units, where needed. Field investigations could assist in the calculation of a valid recharge rate. • Calibrate the model against a more robust site-specific dataset. • Describe and justify the groundwater model calibration methodology, statistics, and other information used to verify the calibrated recharge rates.	While calibration of different units can indeed have impact on other non-calibrated units, the starting point was not far from calibration, and consequently, the amount of water that can be injected into the till is not expected to change substantially. However, it is indeed crucial to obtain a valid recharge rate. The recharge rate over the entire model was re-evaluated in order to improve the model calibration. The effect of recharge rates on tile drain flow rates has been acknowledged and investigated over the course of the several iterations of the groundwater model. Recharge estimates have also been re-assessed over the course of the model development. Additional explanation of recharge was added to the Groundwater Modelling Report in Section 3.1.4. <u>Topics #4 & 5: Calibration:</u> Calibration objectives include water levels and the tile drain flow rate. Details of the site-specific calibration data used is provided in Section 3.5 of the Updated Groundwater Modelling Report. Calibration methodology is described in Section 4.1 of the Groundwater Modelling Report. Standard calibration statistics are shown in Figure 5-2. Parameters used in calibration are described in Section 4.1 and listed in Table 3-2. Recharge rates are not calibrated (other than manual calibration of the till recharge rate, as described above). Change to Updated Groundwater Modeling Report: Table 2-1, Sections 3.1.3, 3.4, 3.5 and 4.1 have been updated to add additional information as per above. References: <i>Gadd, N.R. 1963. Surficial Geology, Chalk River, Ontario-Quebec, Geological Survey of Canada Map 1132A, (scale 1:63,360).</i> <i>Geofirma Engineering Ltd. 2019. Geoscientific Characterization of the NPD Site. 64-509410-REPT-012. Revision 0.</i> Geosynthesis TSD: <i>Raven, K., Sterling, S. and Calder, N. 2022. 2021 Update to Geosynthesis Nuclear Power Demonstration Closure Project Rolphton, Ontario. 64-509410-REPT-010. Revision 2. Prepared by Arcadis and Geofirma for CNL.</i> Groundwater Modelling TSD: <i>Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i>
274	ECCC	Section 3.4 Boundary and Initial Conditions	p.3-7	Comment: Section 3.4 states: “...the thickness of the NPD walls is not accurate. As the focus of the groundwater model is flow into the NPD and rather than flow through the NPD, this dimension was not adhered to in order to keep the model size manageable”. Expectation to Address Comment: Please explain the implications of this simplification in terms of accuracy of effects prediction.	Incorporated: The NPD Closure Project has prepared an updated Groundwater Modelling Report (Calder 2024b) in response to this comment (and others). The update of the groundwater model includes further discretization (refinement) of the facility near the walls, allowing the wall thickness to be described with improved fidelity. The report no longer includes the statement “the thickness of the NPD walls is not accurate “, as the improved discretization provides walls with reasonable accuracy without any simplifications. This removes one particular uncertainty within the model, and therefore improves general perceived confidence in its predictions. However, further discretization of the walls is not anticipated to have a significant effect on results, given the low permeability of the concrete wall and grout materials. Change to the GW Modelling Report: Section 3.1.4 has been updated to reflect the disposition above.

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					References: <i>Groundwater Modelling TSD: Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphoton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i>
Resaturation Modeling Report					
275	ECCC	Section 3.3 Material Properties (of the 2017 Resaturation Report)	p.10	Comment: The actual length of the Pressure Relief Duct is not clear. Expectation to Address Comment: Please verify the length of the Pressure Relief Duct, and any other relevant structural details, and update both models.	Incorporated: The Pressure Relief Duct is one part of a two-part structure, with the second component being the Pressure Relief Pit. According to facility drawings (No. 201-E-281 and 201-E-284), the dimensions for the Pressure Relief Duct are 3.6m H x 2.7m W x 17.9m L and the dimensions for the Pressure Relief Pit are 12.1m H x 4.5m W x 13.7m L. Both structures are constructed from poured concrete with a rebar skeletal structure. The Pressure Relief Duct, which is physically sealed from the facility, leads from the east wall of the facility to the Pressure Relief Pit. The Pressure Relief Pit is open directly to atmosphere. The Pressure Relief Pit will be filled and grouted at the end of decommissioning and will be covered by the engineered cover (Johnson 2022a). The structures have been adequately considered within the resaturation and groundwater models (including their updated versions). (See for example Section 3.1.3.8 and Figure 3-5 of the Groundwater Modelling Report (Sgro 2023b). The resaturation report (Sgro, 2023) mentions the range of drawings used to obtain facility dimensions, including 201-E-281 and 201-E-284. Change to EIS: Section 3.3.1 of the EIS has been revised to reflect the relevant text above, with a reference to AECL (1961). Section 13 now includes the full citation. Note: In Federal and Provincial Comment Responses and as much as possible in the EIS, CNL will use the term engineered cover to depict the multi-layered earth and geotextile cover that will overlie the decommissioned facility. This choice of terminology is to provide distinction from the generic term ‘engineered barriers’ used to describe other components of the NPD Disposal Facility (e.g., waste form, Reactor Vault walls, exterior concrete walls, etc.). Throughout the wider NPD Closure Project documentation, the engineered cover may alternatively be referred to as “Engineered Barrier”, earth cover, engineered mound, or earth mound. References: <i>Johnson D. 2022a. Detailed Decommissioning Plan Nuclear Power Demonstration Waste Facility. 64-508310-DDP-001. Revision 3.</i> <i>Atomic Energy of Canada Limited (AECL). 1961. Drawing DM-210.0.4 Revision. Buildings, Structure, and Shielding – Plan at elev 407. 1961 February 01.</i> <i>Sgro, N. 2023. 2023 Resaturation Modelling for the Proposed Decommissioned Rolphoton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-005, Revision 3.0. February 28, 2024. Prepared by Arcadis and Geofirma for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
276	ECCC	General Also applicable to the Postclosure Safety Assessment Technical Supporting Document, p. 4-15 Also applicable to the Resaturation Technical Supporting Document, p. 6	General	Comment: There are issues with the baseline hydrogeological information that subsequently decrease the validity of the hydrogeological model that is based on them, as outlined below. For page 2-7 and Table 2-1: • The calibration methodology, statistics, and final calibrated values are not fully provided nor sufficiently explained. Also, it is not clear how Figure 3-3 (Cumulative Distribution of Measured Sand Hydraulic Conductivity, Compared to Calibrated Groundwater Model) was used by CNL to develop a hydraulic conductivity estimate for the on-site sand layer. • The 1988 values of hydraulic conductivity (K) look uncharacteristically low for those overburden types. The 1988 values appear questionable when compared to the values for the wells sampled in 2017. • The first paragraph on page 2-7 states that the wells that are screened across both sand and shallow bedrock are assumed to represent the hydraulic conductivity of the sand. This is an invalid assumption that biases the measured K-values to appear less conductive for the sand units. This is evidenced by the reported K-values which appear to be uncharacteristically low and also lower than the 2017 measurements made in sand only (i.e., no bedrock component). • The model appears to be based on only three K-values for bedrock, which does not make for a robust dataset, especially considering the importance of this model. Furthermore, there is no information as to what depth these K-values were measured at. A more detailed campaign of drilling and testing the bedrock should be undertaken. For page 2-10: • Considering the potential importance of the shear zone to understanding groundwater flows into and out of the monolith, reliance upon only one data point for the shear zone also brings into question the robustness of the data supporting the model. Furthermore, the one K-value reported has only been inferred to represent the shear zone. A more detailed campaign of drilling and testing the shear zone should be undertaken. - o The easterly strike of the shear zone is important because it can channel groundwater towards the Ottawa River.	Incorporated: In response to this comment (and others), the NPD Closure Project has prepared and undertaken the following studies: • Groundwater Modelling Report (Calder 2024b), which includes updates to model domain boundaries, recharge and catchment, model calibration, and documentation; • Geoscientific characterization (Geofirma 2019) including fieldwork in late 2018 and early 2019 to obtain a more extensive understanding of the bedrock conditions; and • Geosynthesis TSD, which involves an important presentation and integration of site geological, hydrogeological and geomechanical data and information within the broader context of regional geoscientific data and information and the detailed data and information available for the nearby Chalk River Laboratories (CRL) site. The Geosynthesis Report also involves a Bedrock Fracture Assessment/Lineament Analyses – which interprets existing air photo and remote sensing data to characterize bedrock fractures from surface indications. The updated Postclosure Safety Assessment (PostSA) includes information from the above studies. The NPD Closure Project has also updated the Baseline Characterization and Effects sections of the EIS, as well as the mitigation measures and follow-up monitoring sections, to include information from the above studies and the updated PostSA. Information is provided below for each of the three main topic areas (a) hydrogeologic properties, (b) shear zone and (c) update to resaturation modelling. <i>(a) hydrogeologic properties</i> The NPD Closure Project has prepared a Geosynthesis Report (Geosynthesis TSD), which integrates data obtained during the NPD Closure Project Site Characterization (Geofirma 2019), historical site characterization and regional characterization data. Six new measurements of till conductivity were obtained during the NPD Site Characterization, as detailed in Section 3.3.2 of the Geosynthesis TSD. A description of the tills and the recommended parameter values for till are provided in Sections 3.4.3 and 3.4.4 of the Geosynthesis TSD. The till used in the Groundwater Modelling Report (Calder 2024b) is based on the description and values recommended in the Geosynthesis TSD. The property assignments to the groundwater model are detailed in Section 3.1.3.8 of the Updated Groundwater Modelling Report, and reported in Table 2-1. The location of the till was based on borehole information, from the NPD Site Characterization as well as older site characterization data. <i>(b) shear zone</i> The suggestion of a shear zone was initially noted in a borehole study preceding design, where unexplained water losses occurred during bedrock coring. A shear zone was postulated as a possible explanation. This was investigated during the 2018 field season, when the NPD Closure Project performed Geologic Characterization activities (Geofirma 2019). The 2019 shallow bedrock investigations show no evidence of a 90 m-wide, east-west striking, south-dipping shear zone or similar major structural features in the vicinity of the NPD Waste Facility (NPDWF). A review of borehole core logs, geophysical logs and straddle-packer testing shows that there is no evidence to support the existence of the hypothesized 90 m-wide shear zone at the NPD site and the NPDWF (Geosynthesis TSD). Inspection of bedrock excavation photographs and a review of 2019 shallow bedrock drilling and logging indicates the suspected shear zone is not present at the reactor building excavation or in the vicinity of the NPDWF. <i>(c) update to resaturation modelling</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				- o Based on the inferred location, the shear zone underlies more than half of the NPD building. • It is stated: “The appendix of the Final Hazards Report also refers to a void in hole S-3, a possible seam in hole S-11, and water losses observed in both S-3 and S-11” and “The shear zone is expected to represent a zone with a high density of major fractures.” Due to the lack of a detailed geotechnical and hydrogeological assessment of the shear zone, it is not clear what the importance of these voids and seams may be. It appears that an inference is being made that these are associated with the shear zone. For page 3-5: • The hydraulic conductivity of the fill material is based upon a single measurement, and the test method has not been described. For page 3-6: • It is stated: “Till was not adjusted during calibration as no calibration points exist within the till to provide a strong basis for calibration of this parameter.” This statement also points to the fact that the groundwater model is based upon very limited site-specific data. For page 2-11: • It is stated: “The difference in hydraulic conductivity measurements in the bedrock (BH16-02A and BH-16-02B) can be explained by the presence of the shear zone. With a shear zone at this suggested location and dip, the shallow hydraulic conductivity measurement is outside the shear zone, and the deep hydraulic conductivity measurement is located within the shear zone.” There is a lack of complete and detailed information in the EIS to properly substantiate this conclusion, such as the location and hydrogeological behavior of the shear zone. These are very important observations that warrant further hydrogeological investigation of the shear zone in order to collect representative data. Also, the groundwater model should incorporate the shear zone into the NES, not as a separate sensitivity scenario, because all other disruptive scenarios and/or sensitivity scenarios will be affected by the presence of the shear zone. Page 4-15 of the Postclosure Safety Assessment TSD incorrectly implies that all groundwater flow from the monolith will be	The Groundwater Modelling Report has been updated (Calder 2024b and c) in response to this (and other) comments. The updates focus on: • A description of the topography that acknowledges that while a 20 m digital elevation model (DEM) was used over a large portion of the model domain, the area of interest near the facility also used excavation plans and building drawings to inform the topography; • Increasing model discretization to improve fidelity to concrete wall thickness; • Improving the description/mapping of the model domain boundary, including delineation of the watershed using software with DEM capability to determine flow directions and catchment boundaries; • Re-calibrating the model; • Re-running sensitivity cases in light of new groundwater model calibration; and, • Improved documentation (among other changes the report will be updated to acknowledge that detailed maps, drawings and boreholes were also used in developing the ground surface of the model). Subsequently this has resulted in changes in the resaturation modelling (Sgro, 2023) e.g., use of final calibrated hydraulic conductivities, updated material properties, and changes in infiltration rate from Calder 2024b. Change to EIS: As noted above updated baseline characterization and effects results are presented in the revised EIS (Sections 2.6.4, 3.3, 3.6.2, 8.5, 9.5 and 12). References: <i>Calder, N. 2024c. Near-field groundwater model at the site of the proposed decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-013. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i> <i>Sgro, N. 2023. 2023 Resaturation Modelling for the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-005 Revision 3.0. February 28, 2024. Prepared by Arcadis and Geofirma for CNL.</i> Groundwater Modelling TSD: <i>Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i> <i>Geofirma Engineering Ltd. 2019. Geoscientific Characterization of the NPD Site. 64-509410-REPT-012. Revision 0.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> Geosynthesis TSD: <i>Raven, K., Sterling, S. and Calder, N. 2022. 2021 Update to Geosynthesis Nuclear Power Demonstration Closure Project Rolphton, Ontario. 64-509410-REPT-010. Revision 2. Prepared by Arcadis and Geofirma for CNL.</i>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				through overburden. Groundwater can also flow through bedrock, including the shear zone. In addition, hydraulic conductivity and porosity values from the CRL site are assumed to be the same for bedrock and overburden sands at the NPD site. Hydraulic conductivity and porosity values for the fill material are estimated based on published ranges. Considering the importance of the groundwater model as it relates to groundwater flows into and out of the monolith, and for contaminant movement down-gradient of the monolith, a robust data set for hydrogeological parameters is needed to support the groundwater model. This data should be collected on-site, and should include samples at the shear zone. Page 6 of the Resaturation Modeling Report states: “The tighter hydraulic conductivity in the shallow bedrock relative to the deep bedrock is unexplained.” This rationale does not provide a sufficient level of certainty or site-specific detail required to support subsequent modeling and predictions about long-term performance and risks of the proposed project. Hydraulic conductivities need to be explained in detail for the project site in order to provide a valid basis for the various modeling exercises that are critical to understand the long term performance of the monolith, potential risks, and proposed mitigation. Expectation to Address Comment: Please update the baseline data to include: all borehole logs, a description of tests performed to calculate K-values, all hydraulic conductivity data, and the geometric mean K for each hydrogeologic unit. Provide more accurate hydraulic conductivity values for the overburden, especially for sand units, for example by conducting a more detailed campaign of drilling and testing the overburden. Consider excluding the 1988 K-values from the model dataset unless it can be demonstrated that the measured K-values are valid. In addition, please complete further site assessments to confirm in detail the location of the shear zone. Conduct further hydrogeological investigation of the entire site, including the shear zone, and collect representative data. Summarize this investigation in the EIS along with a rationale for the investigative approach used and any limitations, assumptions or inferences. Update the EIS to describe the assessments completed and provide a more detailed description of the shear zone including location and hydrogeological behaviour. Re-run the normal evolution, disruptive and sensitivity scenarios of the groundwater model to reflect the presence of the shear zone and the hydrogeological data collected. Update and re-run any other models that rely on	

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
				hydrogeological data. Provide the groundwater model calibration methodology, calibration statistics, and final calibrated values (e.g., hydraulic conductivity, recharge rate, etc.) for all parameters. Given a number of deficiencies with the groundwater flow model and related assumptions and data inputs have been raised, please revise the Resaturation Modeling Report to reflect updates to the groundwater flow model. Furthermore, articulate any limitations, assumptions or inferences made in the groundwater flow model that are relevant to the Resaturation Modeling Report.	
277	CNSC	Section 3.4 Boundary and Initial Conditions	p.11	Comment: The Restoration Modeling Report states (on p.11) that “[t]he boundary conditions at the sides of the model domain are interpolated from the groundwater flow model with no tile drains”. It is not clear if specified flow or specified head boundary conditions were used in the model. A short pressure relief duct was represented in the resaturation model, but not in the groundwater flow model (p.10). What is the impact of the exclusion of the pressure relief duct in the groundwater model? The Resturation Modeling Report also states (on p.41) that “[r]echarge over the building and its engineered cap and cover are simplified to a constant value equivalent to the estimated annual recharge into the sand (220 mm/yr). Once this recharge has percolated through the engineered cap and cover, approximately 1 mm/yr of recharge percolates into the facility for the base case.” This statement is confusing, and should be clearly explained. Expectation to Address Comment: Please revise accordingly.	Incorporated: Specified head boundaries were used in the model. The first iteration of the groundwater model (Calder 2016) used a longer version of the pressure relief duct, as identified on some early design drawings. The discrepancy was identified and updated in all subsequent models, including the resaturation model. Both the latest 2024 version of the groundwater flow model (Calder 2024b) and the resaturation model (Sgro, 2023) use the correct and shorter version of the pressure relief duct. Change to Resaturation Model Report: The statements in the Resaturation Modeling Report (Sgro, 2023) were revised so that it refers to infiltration and not recharge where appropriate. Specifically: In Section 2.5: “Infiltration was applied to the ground surface of the model, which includes the surface of the engineered cap. Infiltration is defined as the amount of water infiltrating the ground surface, equivalent to precipitation minus evapotranspiration and runoff. The same amount of infiltration was used as the groundwater flow model over sand, 400 mm/yr. The infiltration applied is an annual average, and does not vary with time.” In Section 3.1.1: “One of the main differences between this work and the previous resaturation models is the new cover modelling. Previous resaturation models included covers that were flat and did not effectively direct excess water away from the cover, resulting in increased infiltration into the facility at rates of approximately 1 mm/yr. The sloped design of the new cover substantially reduces infiltration into the building to approximately 10⁻⁵ mm/yr. As a result, the resaturation process is now dominated by flows through the bedrock and overburden.” Section 5: “Infiltration over the facility and its engineered cap and cover is a constant value equivalent to the estimated annual infiltration into the sand (400 mm/yr). Once this infiltration has percolated through the engineered cap and cover, infiltration into the facility is calculated for each scenario to be used as input for the groundwater and near field models. For the NES cases, the maximum infiltration into the facility was 1.8x10⁻⁴ mm/yr for the degraded facility (NES 1000+ years) where no concrete cap is present. None of the cases had infiltration greater” References: <i>Calder, N. 2016. Ground Water Modelling at the Site of the Proposed Decommissioned Rolphton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-001. Revision 0.</i>

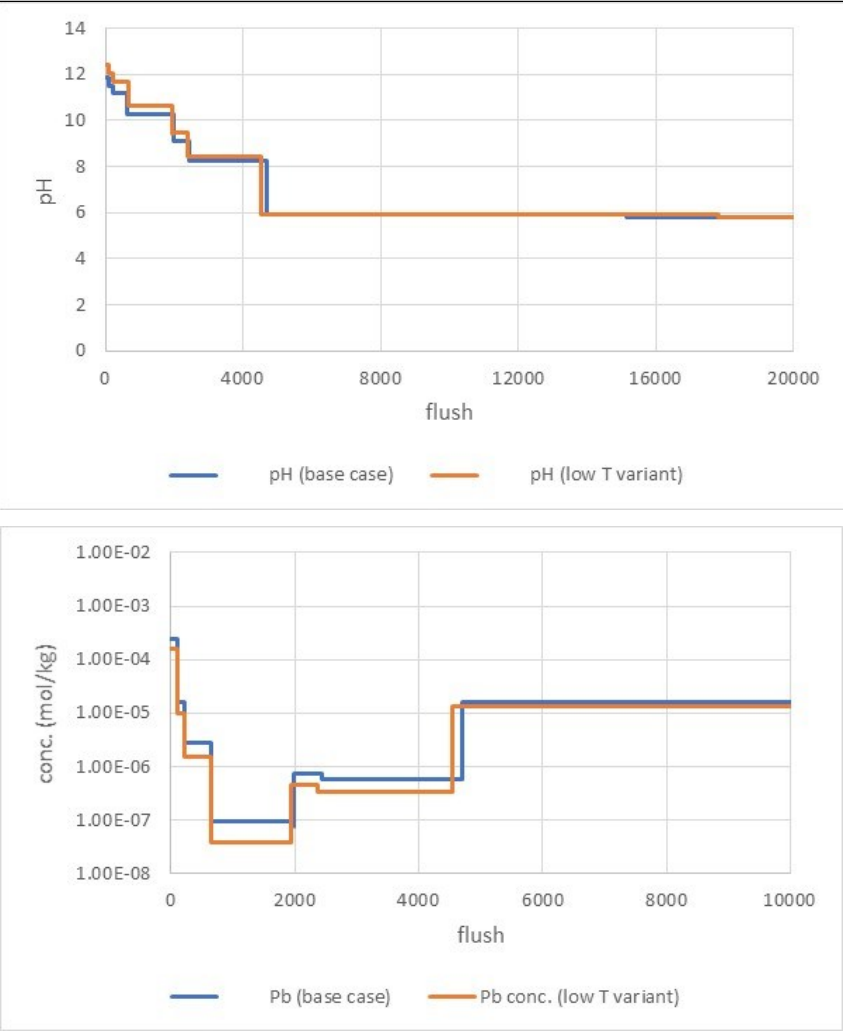
Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					<i>Sgro, N. 2023. 2023 Resaturation Modelling for the Proposed Decommissioned Rolphoton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-005 Revision 3.0. February 28, 2024. Prepared by Arcadis and Geofirma for CNL.</i> Groundwater Modelling TSD: <i>Calder, N. 2024b. Groundwater Modelling at the Site of the Proposed Decommissioned Rolphoton Nuclear Power Demonstration (NPD) Reactor. 64-508760-REPT-012. Revision 1. Prepared by Arcadis and Geofirma for CNL.</i>
Lead Solubility – Limits Report					
278	ECCC	Lead Solubility Limits Report Section 2 Modelling of Lead Mineral Solubility Also applicable to Section 3.3 Solubility Limit Calculations, p.3-20 and to the Alkaline Plume Modeling Report (p.14)	p.2-1	Comment: The Lead Solubility Limits Report and Alkaline Plume Modeling Report appear to assume that alkaline conditions will be the norm, and so the reports are focused on assessing the solubility of lead under those conditions. Acidic conditions are possible, yet there is very limited discussion of such a scenario. Groundwater composition may change over time. For example, there is a high probability that coniferous forest may develop over the site in the post-closure phase and that the pH of the water may become more acidic as a result of the acidic coniferous needles. The reports fail to consider this as a possibility, and therefore, provide no assessment of alkalinity or lead concentrations that may develop under acidic pH conditions. This possibility, along with other plausible scenarios of early leaching of alkalinity (even more likely with lower pH grout composition) or of alkalinity being suppressed, such as by the coating of grout surfaces with corrosion products, could lead to the development of very different geochemical reactions that may result in higher leachability of lead. Expectation to Address Comment: Please revise the Lead Solubility Limits Report and the Alkaline Plume Modeling Report to model scenarios with acidic pH.	Resolved As: There are two lines of argument to suggest that it is very unlikely that strongly-acidic conditions will evolve in the facility and hence the Lead Solubility and Alkaline Plume Modeling reports do not need to be update to include models with acidic pH. First, the presence of pine forest does not necessarily result in strongly acidic groundwater. In addition to root respiration processes, microbial activity and composition of rainfall, the pH of soil will be influenced by weathering of minerals (tending to result in a degree of acid neutralization, probably at deeper soil horizons) and residence time of water. Second, the lead solubility study considered a wide range of pH from 5.8 through to alkaline and strongly alkaline conditions. pH of 5.8 is representative of the groundwater. Higher pH is representative of water that has been conditioned by low alkalinity cement, partially degraded Portland cement and fresh Portland cement. Although lead solids controlling dissolved concentrations in groundwater are more soluble (approximately 10-15 times) under strongly acidic conditions compared with mildly acidic conditions (see Figure 1 below), the lead sources present at the facility will be in contact with water that has been conditioned with cementitious grout. The pH of grout near the lead source material is likely to evolve over time as it undergoes leaching and carbonation (calcium carbonate precipitation). After extensive carbonation, pH will depend on carbonate equilibria (calcite buffering) with corresponding pH values being near neutral or mildly alkaline, depending on prevailing pCO2. For example, using PHREEQC (Parkhurst and Appelo 2013) and the Thermoddem database (BRGM 2018) equilibrating pure water with calcite at log pCO2 = -1.9 (Wilson 2017) results in a pH of 7.2 at 25 °C, or 7.3 at 10 °C (1 bar pressure). Therefore, the pH of water that can be expected to come into contact with lead in the facility is within the range of calculations that have been carried out, and concentrations of lead released to solution in the facility are unlikely to be greater than those calculated for the ambient groundwater in the area. Figure 1. Activity diagram showing solubility of lead minerals as a function of pH in model NPD groundwater

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					Note: ($\log a \text{Cl}^- = -3.45$; $\log a \text{Na}^+ = -3.48$; $\log a \text{SO}_4^{2-} = -4.17$; $\log a \text{Mg}^{2+} = -4.14$; $\log a \text{NO}_3^- = -5.28$); $\log f\text{O}_{2(\text{g})} = -7.4$; $\log f\text{CO}_{2(\text{g})} = -2.13$. Anglesite is PbSO_4, cerussite is PbCO_3, hydrocerussite is $\text{Pb}_3(\text{CO}_3)_2(\text{OH})_2$, plumbonacrite is $\text{Pb}_{10}\text{O}(\text{OH})_6(\text{CO}_3)_6$ and plattnerite is PbO_2 (Wilson 2020) References: BRGM (2017) <i>Thermoddem (v1.1)</i> http://thermoddem.brgm.fr/. Parkhurst, D.L and C.A.J. Appelo (2013) <i>Description of Input and Examples for PHREEQC Version 3—A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and Inverse Geochemical Calculations. Chapter 43 of Section A, Groundwater Book 6, Modeling Techniques. U.S. Department of the Interior, U.S. Geological Survey.</i> Wilson, J. 2020. <i>Scoping Calculations for Lead Solubility Limits. 64-508760-REPT-016. Revision 0.</i> Wilson, J. 2017. <i>Lead Solubility Limits Report. 64-508760-REPT-003. Revision 0.</i>
279	ECCC	Section 3.1 Model Water Compositions	p.3-1	Comment: Section 3.1 states: “An aqueous speciation calculation using the SpecE8 (Section 2.3) suggests that there is a significant charge imbalance of 11.4 % associated with the MT- 5 -I composition (Table 2-1)”. Expectation to Address Comment: Please explain the theoretical effect of this calculation or imbalance upon the model and its conclusions of the inability to correct the charge imbalance. Furthermore, discuss the following: • The implications of the charge imbalance with respect to the geochemical modeling, particularly for timescales modelled (e.g., 70,000 years). • The uncertainties that arise from this imbalance	Resolved As: <u>Approach</u> Measured groundwater data were used to construct model groundwater compositions using aqueous speciation software (Wilson 2020a). The aim of this was to produce a broad range of representative water compositions with which to calculate lead solubility limits for the NPD Post Closure Safety Assessment Technical Support Document (PostSA TSD). The modelling required consideration of possible redox conditions and controls, pH, and major ion concentrations. The groundwater water composition of sample MT- 5 -I was taken as being typical of the NPD site, with major ion data suggesting a lack of contamination from road salt in this particular sample (Killey 2014). The redox state of the water was not measured, but it is stated by Killey (2014) that relatively high Eh (oxidizing) conditions are likely to be present. The pH range measured at the well head ranges from ~5.7 to ~7. An aqueous speciation calculation using the SpecE8 module of Geochemist’s Workbench (Bethke 2008) and the thermodynamic database “Thermoddem” (v1.1, BRGM 2017) suggested that there is a significant charge imbalance associated with the MT- 5 -I composition (~11%) using the reported pH value (Wilson 2017). The initial calculated solubility limits for lead in facility and the geosphere were made using the reported groundwater composition, but with charge

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				Additional uncertainties that may be incurred if groundwater chemistry changes through time These discussions should also factor the additional complexities arising from corrosion products in groundwater.	balance being achieved by adjusting Na⁺ concentration. The charge balance correction results in a Na⁺ concentration reducing by a factor of ~2. An overall (stoichiometric) charge imbalance of ~5% for routine groundwater analysis is generally considered “reasonable” (e.g. Deutsch 1997). The calculated charge imbalance generated by the speciation software represents a combination of analytical error (solute concentrations and pH) and (to a limited degree) the inherent uncertainty in the thermodynamic data and mean ion activity coefficients used in the speciation modelling. The charge imbalance calculated for the model groundwater is somewhat greater than that typically expected for a simple “routine” water analysis (based on simpler cation/anion balance), which probably reflects the conditions imposed in the model (and to some extent may be exacerbated by the dilute and “unbuffered” nature of the water). It is relatively common in aqueous speciation calculations to adjust the concentration of a major ion to achieve charge neutrality and this utility is included in aqueous speciation software (e.g. Bethke 2008; Parkhurst and Appelo 2013). At NPD, concentrations of solutes measured at the site show some variation (with the issue of road salt contamination). The measured pH of 5.86 will be subject to some degree of error (and natural variation, given potential variability in pCO₂ which reflects microbial activity). Note that reported pH measured on site is reported to vary from 5.7 to 7. The speciation calculation has been replicated but with the charge imbalance being corrected by adjusting H⁺ concentration. This results in a pH of 6.37. Therefore, correcting the charge balance by allowing H⁺ concentration to be adjusted produces a pH that is within the range reported in situ. <u>Implications of Approach: Lead Solubility</u> Given that the model groundwater composition was used primarily to calculate lead solubility limits for the geosphere (Wilson 2020a), the approach of using a relatively low pH value introduces a degree of caution in PostSA calculations as lead solids tend to be more soluble under lower pH conditions in the absence of cementitious materials. The reduction in Na⁺ concentration by ~0.5 will slightly reduce the ionic strength of the water, but the main influence on calculated lead solubilities is pH. In the presence of cementitious materials, solubility limits were initially generated for a wide range of water compositions to reflect different assumptions surrounding pH and redox buffering, and the degree of cement degradation (Wilson 2020a). In the cement-equilibrated model water compositions, pH was adjusted to achieve charge balance as different cement solids where equilibrated with groundwater (thereby resulting in no charge imbalance). Variation in calculated lead solubility limits would be expected under different pH conditions (concentrations varying by approximately an order of magnitude per pH unit under some conditions, Wilson 2020a), but a wide range of possible values was considered, and the values initially used in the PostSA calculations were chosen to support model scenarios and assumptions, with an overall view of being cautious, but not overly pessimistic. The lead solubility calculations given by Wilson (2020a) consider the grout flushing models, which provide concentrations (and pH) as a function of number of pore volume flushes (Wilson 2020b). In the initial calculations and the grout flushing model, it was assumed that ambient temperature was 25 °C. As with the assumption of pH being towards the lower end of the range measured in situ, this assumption also results in a degree of conservatism in that mineral solubility tends to increase with temperature under mildly acidic to neutral pH conditions. The effect of temperature on lead solubility calculation was considered in an additional grout-flushing calculation. In summary, the calculated charge imbalance associated with the measured water composition used to model lead solubility has no significant impact on the PostSA calculations. The main control on lead solubility is pH, and the model groundwater composition has a pH that is towards the lower end of the range measured in situ, thereby producing a relatively higher lead concentration. <u>Implications of Approach: Metal Corrosion Rates</u>

Reference Number	Federal / Provincial Department	Section, Table or Figure	Pg. #	Information Request or Summary of Comment	CNL Response
					With respect to metal corrosion, the rates will depend on prevailing pH conditions, which in turn, depend on the evolution of cementitious materials. The porewater pH of the cementitious materials depends on the evolution of hydrated cement solids, especially Calcium-Aluminium-Silicate-Hydrate (C-A-S-H) gel (Wilson 2020b). In general, corrosion rates for metals are specified for either cementitious or non-cementitious conditions. A small difference in pH (<1 unit for example) will make no difference in the conceptual understanding of corrosion within the evolution of the system. Therefore, the approach taken for charge balancing in model groundwater compositions has no effect on corrosion representation in the PostSA. <u>Implications of Approach: Alkaline Plume Modelling</u> The alkaline plume modelling is essentially unaffected by the charge imbalance in the reported groundwater composition. The model was specified to determined likelihood for the development of a hyperalkaline plume downstream of the facility. The pH assumed in the groundwater present was broadly representative of the lower end of the range measured in the region. A higher pH assumption for the soil/fill water (generated by charge balance being corrected by pH adjustment) would tend to dilute the alkalinity slightly less effectively, thereby reducing the degree of caution inherent in the model. However, the model has a degree of conservatism associated with it, in that the potential for alkaline pH neutralisation by soil/fill minerals is not accounted for. The alkaline plume modelling suggests that the development of an alkaline plume downstream can only occur when the hydraulic conductivity of the soil/fill is several orders of magnitude lower than the specified (reference) value. The model includes a degree of conservatism regarding the potential for plume generation, in that neutralisation of alkaline water by soil / fill mineral dissolution is not represented. Small variations in groundwater composition that could arise from different model groundwater assumptions is unlikely to have any impact on the overall conclusions of the alkaline plume modelling. <u>Implications of Groundwater Variability</u> As previously noted, the pH of the groundwater on site has been found to vary from ~5.7 to 7. This no doubt reflects the lack of a strong buffer, with the relatively dilute water generally being mildly acidic, reflecting the mildly acidic nature of rainwater and the presence of microbes in soils/sediments, which tends to elevate pCO₂ to values greater than those associated with the atmosphere. A pH value towards the lower end of the measured range is used to introduce a degree of caution into calculated lead concentrations. The pH could change over assessment timescales (many thousands of years), but without a strong source of acidity being identified during future times, a significantly lower pH than that measured at the current time seems unlikely. The model groundwater composition has a pCO₂ of ~10-1.9 bar (atmospheric value is ~10-3.5 bar). The facility itself could influence water chemistry downstream of flow, but as the plume modelling suggests, the release of alkaline water from grout leaching is unlikely to be great enough to change pH downstream to any great extent. It seems likely that fluxes of lead (and other ions released from metal corrosion) into the soil / fill “downstream” are unlikely to be high enough to influence water chemistry significantly, given the relatively high hydraulic conductivity of the soil / fill compared with the facility, even with degraded concrete walls and grout infill. Minor fluctuations in the chemical composition of infiltrating water is very unlikely to result in changes in grout porewater pH, as this is controlled by the dissolution of hydrated cement solids. Over time, the pH of the grout porewater will reduce as it is leached (and cement degrades), and changes in infiltrating water pH could affect the rate of leaching to some degree. However, the spatial and temporal complexity of this process will be complex, with coupling between chemical, hydrological and mechanical processes. Therefore, a simpler “flushing” representation using a representative groundwater is considered sufficient for the PostSA.

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					References: <i>Bethke, C.M. 2008. Geochemical and Biogeochemical Reaction Modeling. Cambridge University Press, Cambridge.</i> <i>BRGM. 2017. Thermoddem. http://thermoddem.brgm.fr/</i> <i>Deutsch, W.J. 1997. Groundwater Geochemistry. Fundamentals and Applications to Contamination. Lewis Publishers, London.</i> <i>Parkhurst, D.L and C.A.J. Appelo. 2013. Description of Input and Examples for PHREEQC Version 3—A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and Inverse Geochemical Calculations. Chapter 43 of Section A, Groundwater Book 6, Modeling Techniques. U.S. Department of the Interior, U.S. Geological Survey.</i> PostSA TSD: <i>Penfold, J., Zagorščak, R. and Bruffell, L. 2023. Postclosure Safety Assessment of the In-situ Disposal of the NPD. 4th Iteration, Revision 0. 64-508760-ASD-005. Prepared by Arcadis and Quintessa for CNL.</i> <i>Wilson, J. 2020a. Scoping Calculations for Lead Solubility Limits. 64-508760-REPT-016. Revision 0.</i> <i>Wilson, J. 2020b. Grout Flushing Models. 64-508760-REPT-009. Revision 1.</i>
280	ECCC	Section 3.2 Thermodynamic Stability of Lead Minerals	p. 3-5	Comment: Geochemical reactions can be materially affected by temperatures. While the report includes geochemical reactions and rates based on a 25° C prediction, a 15° C difference is common at the project site location (i.e., year-round groundwater temperatures of 8-12° C are likely). This is a substantial temperature variation and requires a correction factor to be applied to the theoretical thermodynamic reactions. Furthermore, thermodynamics can predict what is stable under certain conditions, but they cannot predict whether potential chemical reactions will actually go to completion. Some reactions may require longer timescales than those considered for the proposed project. Expectation to Address Comment: Please update the Lead Solubility Limits Report to include temperature correction in the modeling. Furthermore, explain how reaction rates would affect the overall modeling and conclusions made and identify any limitations, assumptions or inferences associated with the modeling and its inputs.	Resolved As: In the flushing models used to determine grout porewater pH and lead solubility limits (Wilson 2020) it was assumed that the temperature (T) was 25°C and pressure (P) was 1 bar. These are the “standard” thermodynamic T/P conditions adopted in many thermodynamic databases, and it was considered that a slightly higher temperature than that present at the site would not introduce a large error in the solubility calculations (given that ranges of possible concentrations vary over several orders of magnitude). The approach taken is similar to that used in calculations to support other safety assessments (e.g. Duro et al. 2010; Wersin et al. 2014). Geochemical databases often include data (equilibrium constants, “log K”) at other temperatures (where data are available), and codes such as Geochemist’s Workbench (Bethke 2008) and PHREEQC (Parkhurst and Appelo 2013) allow calculations at T ≠ 25 °C, using different T-dependent functions to fit equilibrium constants. In some cases, a lack of standard molal thermodynamic data results in values being approximated or not given at T ≠ 25 °C. The issue has been raised as to how different calculated lead solubility limits may be if it is assumed that the temperature at NPD is lower (typically 8-12 °C). The grout flushing report (Wilson 2020c) has been updated to include a “low temperature variant” case, with T = 10°C. In brief, the lower T assumption results in a slightly higher initial pH (see Figure 1 below), but with “stepped” transitions occurring in a similar manner as in the 25°C simulation. Lead concentrations calculated at 25°C are between 1.2 and 2.5 higher than at 10°C (Figure 1). The assumption of a higher T therefore results in degree of conservatism, in that the effect of T variation on lead mineral solubility is accounted for and a reasonable “upper” value is therefore applied in safety assessment calculations. Figure 1: pH and lead concentrations calculated in Blast Furnace Slag – Portland Cement grout flushing simulations at 10 °C and 25 °C (Wilson 2020c).

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					 References: <i>Bethke, C.M. (2008). Geochemical and Biogeochemical Reaction Modeling. Cambridge University Press, Cambridge.</i> <i>Duro, L., V. Montoya, E. Colàs, E., D. García (2010). Groundwater equilibration and radionuclide solubility calculations. NWMO TR-2010-02. Nuclear Waste Management Organization, Toronto, Canada.</i> <i>Parkhurst, D.L and C.A.J. Appelo. 2013. Description of Input and Examples for PHREEQC Version 3—A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and Inverse Geochemical Calculations. Chapter 43 of Section A, Groundwater Book 6, Modeling Techniques. U.S. Department of the Interior, U.S. Geological Survey.</i> <i>Wersin, P., M. Kiczka, D. Rosch, M. Ochs, D. Trudel (2014). Safety Case for the Disposal of Spent Nuclear Fuel at Olkiluoto Radionuclide Solubility Limits and Migration Parameters for the Backfill. Posiva Report 2012-40. Posiva Oy, Olkiluoto, Finland.</i> <i>Wilson, J. 2020c. Grout Flushing Models. 64-508760-REPT-009. Revision 1.</i>