WR-1 Federal and Provincial Environmental Impact Statement Information Request Responses
2022 December

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
					EIS	
					General	
1.	Canadian Nuclear Safety Commission (CNSC)	C. Cianci	EIS - All - General	N/A	**Comment:** The terminology in the Environmental Impact Statement (EIS) documentation to identify Indigenous peoples is not, in all cases, appropriately used. The use of the term "First Nations" is not interchangeable with the term "Indigenous peoples". When referring to both First Nation and Métis communities either indicate this explicitly or indicate "Indigenous communities". **Expectation to Address Comment:** Please review and revise the EIS documentation accordingly with the use of the appropriate terms.	**Incorporated:** The terminology in the Environmental Impact Statement (EIS; Golder 2022) used to identify Indigenous peoples was reviewed and revised, as necessary, to ensure the appropriate terms were being used. Throughout the EIS, the terms "Aboriginal", "Indigenous", "First Nations", and "Métis" have been used. Each have a specific meaning and are used in different situations. "The Canadian Constitution recognizes 3 groups of Aboriginal peoples: Indians (more commonly referred to as First Nations), Inuit and Métis. These are 3 distinct peoples with unique histories, languages, cultural practices and spiritual beliefs" (CIRNAC 2021). In recent years, the term "Indigenous" has become used more frequently. "Indigenous peoples is a collective name for the original peoples of North America and their descendants" (CIRNAC 2021). Different terms are used throughout the EIS, consistent with the source from which the term is drawn. The term "Indigenous" is often used and reflects the most recent language used by the federal government. **Change to EIS:** The EIS (Golder 2022) was revised to reflect the above response. **References:** *Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) 2021. Indigenous Peoples and Communities. June 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
2.	CNSC	C. Cianci S. Arnott	EIS - All - General	N/A	**Comment:** References in the EIS to the Métis [note: accent is required on the word 'Métis'] are often inaccurate and reflect a lack of understanding of the Métis history, the Métis Nation and its citizens. On p.xvii of the Executive Summary, for example, there is an erroneous statement: "The Project is located in the homeland of the Métis Nation, as represented by the Manitoba Métis Federation on Treaty 3 land." The numbered treaties were negotiated between the Crown and First Nations. Treaty 3 of 1873 was negotiated specifically between the Dominion of Canada and the Saulteaux Tribe of Ojibway Indians. **Expectation to Address Comment:** The EIS should clearly describe who the Métis people are, as a distinct peoples, and their history (i.e., in terms of not having a land base with the exception of northern Alberta). It may also be useful to provide some more detail and clarity regarding each pertinent treaty (i.e., Treaties 1, 3 and 5) and which First Nations are signatories to those treaties.	**Incorporated:** The Environmental Impact Statement (EIS; Golder 2022a) and EIS Executive Summary (Golder 2022b) were reviewed and revised, as necessary, to include an accent on the word 'Métis'. The EIS Executive Summary (Golder 2022b) was revised to correct the quoted erroneous statement. Section 6.8.1.5.2.2.1 of the EIS (Golder 2022a) was revised to include more detail on the Métis people and their history. Section 4.2.2 of the EIS (Golder 2022a) was added to provide an overview of which First Nations are signatories on which treaties; Appendix C of the Indigenous Engagement Report (IER; CNL 2022) provides more detail on the pertinent treaties. **Change to EIS:** Section 6.8.1.5.2.2.1 of the EIS (Golder 2022a) has been revised as follows to include more detail on the Métis people and their history: **"*Manitoba Métis Federation*** *Three Indigenous peoples are constitutionally recognized by the government in Canada, as per s.35 (2) of the Constitution Act, 1982. First Nations, Inuit and Métis. The term "Métis" is defined by the Métis National Council (MNC) as: "a person who self-identifies as Métis, is distinct from other Aboriginal peoples, is of historic Métis Nation Ancestry and who is accepted by the Métis Nation." (MNC 2022). The MNC is a federally recognized national administrative and representative body for the Métis Nation both nationally and internationally since 1983. Five democratically elected provincial organizations exist within Canada and are comprised of regional councils, community councils and Métis locals. The Manitoba Métis Federation is one of these provincial organizations, alongside the Métis Nation of Ontario, Métis Nation Saskatchewan, Métis Nation of Alberta and Métis Nation of British Columbia. The Manitoba Métis Federation is the democratically elected self-government representative of the Manitoba Métis also known as the Red River Métis, an "Aboriginal peoples' under Section 35 of the Constitution Act, 1982 and currently includes the Manitoba Métis Federation Inc., a non-share corporation incorporated pursuant to the laws of Manitoba. Founded in 1967, the Federation has over 650 staff across the province (MMF 2018a).* *The Manitoba Métis Federation represents and advance the interests of the Métis people of Manitoba and uses an electoral process where all formal positions are elected by Federation members in each designated Region or Local. Governance includes: a President, Board of Directors, regional associations or "Regions" and community-level "Locals". The President functions as the Federation leader and spokesperson and Chief Executive Officer. This position oversees day-to-day Federation operations and is elected through a province-wide election every four years. A Board of Directors, comprised of 23 democratically elected members, provides guidance, leadership and management toward Federation (and its subsidiaries) policies, objectives and strategic direction. Seven Regions across Manitoba are administered by a vice-president and two executive officers, who are also of the Federation's Board*

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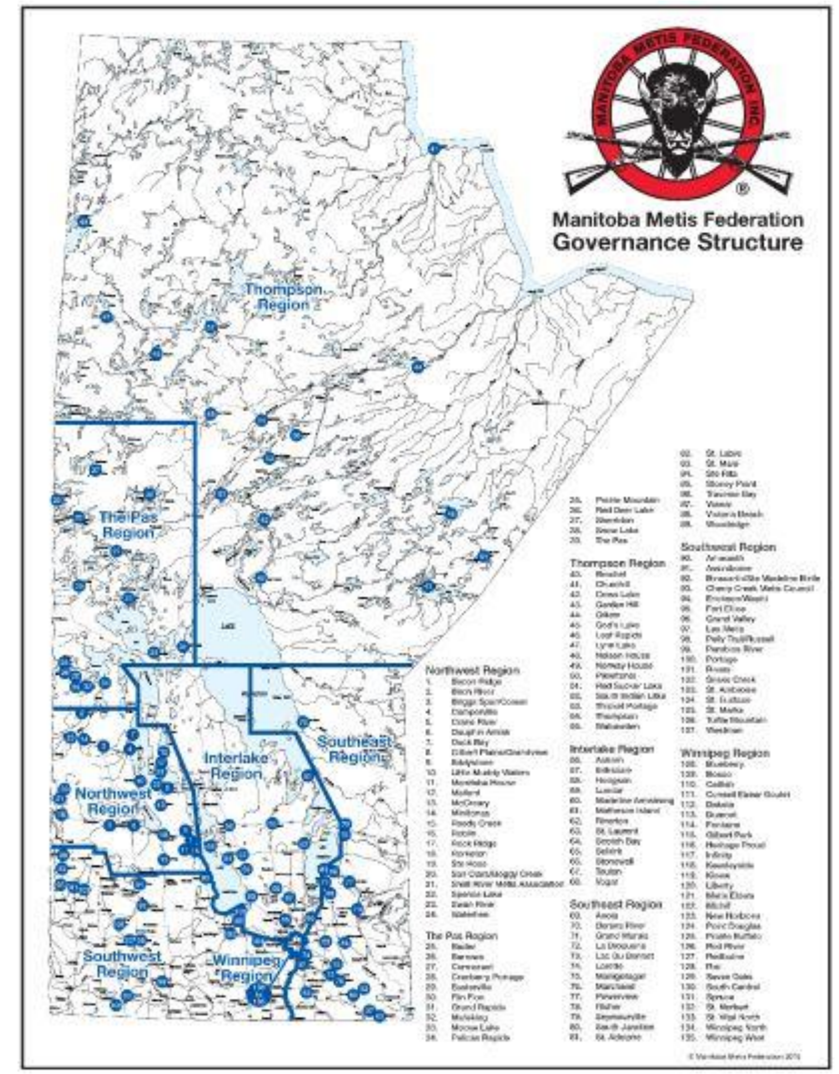
						of Directors, and who administer programs and services independently to their specific geographic area. Each Region comprises various Locals. These are administered by a chairperson, a vice-chairperson and a secretary-treasurer, and have a minimum of nine members which meet at least four times a year. Each Federation member belongs to a Local. Specific Locals determine the timing of election of their respective Local representatives, while regional officers are elected every four years (MMF 2018a). *The governance structure of the Manitoba Métis Federation is provided on Figure 6.8.1-5.*  **Figure 6.8.1-5: Manitoba Métis Federation Governance Structure** *The Manitoba Métis Community is widely dispersed throughout the province and highly mobile in regard to geographic extent of traditional resource use (Barkwell 2016). In 2012, the Government of Manitoba and the Manitoba Métis Federation signed an Agreement that provides for the recognition of Métis harvesting rights for food and domestic use in mutually agreed to regions of the province and which relies on the Manitoba Métis Federation's Métis Laws of the Harvest as the basis for the development of new provincial regulations to govern Métis harvesting (Government of Manitoba et al. 2012). The Agreement generally covered the southern area of Manitoba but also committed the parties to a collaborative process for examining Métis harvesting rights in other regions of the Province. That map is shown on Figure 6.8.1-2.* *Recognized Métis Natural Resource Harvesting Areas 36, 34 34B and 25A and Game Hunting Area 26 are situated in the vicinity of the WL [Whiteshell Laboratories] site (Manitoba Sustainable Development n.d.f). It should be noted that the WL site on the east side of the Winnipeg River appears to be not*

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						in the Recognized Métis Harvesting Area but is in an area labelled as the "Recognized Métis Harvesting Area – Expansion Area" (Figure 6.8.1-4), or provincial Game Hunting Area 26 also known as Manigotagan. Although the WL site is located in an area that the Province of Manitoba has not recognized as a Métis harvesting area (MMF 2018b), CNL acknowledges that the Métis have existing, asserted, and/or harvesting rights in the vicinity of the Project. *According to the Métis Law of the Harvest, Métis harvesters may harvest throughout Recognized Métis Harvesting Area on all unoccupied provincial Crown Lands in Manitoba and occupied provincial Crown lands, including provincial parks, wherever First Nation Members are allowed to harvest; and on any privately owned lands in Manitoba on which that Métis Harvester has been given permission by the owner or occupant, or reserve lands with permission of Band Council (MMF 2013).* *According to the Métis Law of the Harvest (MMF 2013), harvest includes hunting, trapping, fishing and gathering for food and domestic use, including sharing, social and ceremonial purposes, of fish, big-game, small game, furbearers, game-bird (upland and migratory), berries, mushrooms, medicinal and other plants including wild rice and firewood or timber. Plant harvesting has been undertaken for food, crafts and medicines and has included birch, cedar, dandelion, milkweed, berries, wood products, roots, nuts and mushrooms. These activities were typically undertaken in the summer months and are known to occur in areas southwest of the Project. During the public and Indigenous engagement process, the Manitoba Métis Federation noted that their citizens' place of residence did not always correlate with their resource use areas, as the population is mobile, and land use tends to be associated with where an individual learned to harvest. As such, their citizens often travel to other locations across the province when undertaking harvesting activities, which reflects the location in which they learned (e.g., where their grandfather taught them).* *A traditional knowledge and land use study, titled Whiteshell Reactor #1 Decommissioning Manitoba Métis Traditional Knowledge, Land Use and Occupancy Study"(TKLUOS) was prepared by Shared Values Solutions (SVS 2019) for the Manitoba Métis Federation specifically for the proposed Project. A total of ten Métis harvesters were surveyed for the study resulting in the identification of 424 locations of Land Use and Occupancy Values (LUOs). Two study areas were used, the first is a study area that includes 100 m on either side of the Winnipeg River from Seven Sisters Generating Station to the mouth of the Winnipeg River, Lac du Bonnet and the Lee River. The second is a 25 km radial study area around the WR-1 [Whiteshell Reactor 1]. A total of 192 LUOs were mapped within 25 km of the WL site and 75 were within 100 m of the WL site. The LOUs included: access routes; fishing locations; trapping/snaring locations; gathering; commercial guide or land use; Traditional Ecological Knowledge; changes to the environment; hunting; demographic; cultural; and, other land-use (i.e., ice fishing huts). Values were collected temporally by organizing values by the last 10 years; 10 years prior; or both. These uses could occur over the entire individual's life.* *The Red River Métis citizens interviewed described land use activities within a 25 km area around the WL site, including access routes, hunting, fishing, trapping, and commercial guiding or other commercial land use locations. In addition, Red River Métis citizens noted sites of cultural significance. One Red River Métis citizen noted that the WL Site is excellent deer habitat and that they have seen deer on the riverbank at the site.* *Within the LSA [Local Study Area], Red River Métis citizens noted areas where they have fished pickerel/walleye, goldeye, and mooneye; gathered firewood; harvested blueberries, cranberries, pin cherries, and saskatoon berries. They also noted a boat launch. No hunting or trapping sites were documented in the LSA. In the RSA [Regional Study Area], Métis citizens documented numerous fishing spots along the Winnipeg River downstream of the Project. Species fished include sauger, pickerel/walleye, jackfish/northern pike, sturgeon, and perch. Métis citizens also noted areas where they had hunted duck, grouse, and partridge in the RSA. In the RSA, cultural sites documented by Métis citizens include multiple boat launches, an important landscape feature, and a recreational area for tubing (SVS 2019).* *The TKLUOS (SVS 2019) provides an overview of the types of traditional knowledge, land use and occupancy values that were collected in the interviews with Métis knowledge holders. This information included the following: current and childhood residences; hunting and trapping sites; fishing locations, including species and temporal scope of fishing activity; gathering of plants for food, medicinal plants and natural materials, including use of gathered materials; commercial fishing, trapping and other land uses for income; culture and heritage resources, sacred sites, archaeological sites, areas of economic importance, other special sites and contemporary gathering places; locations of overnight sites including cabins, other types of structures and camping sites; land and water access routes; Traditional Ecological Knowledge, including locations of fish spawning areas, seasonal mammal habitats and migration routes, bird habitat, wetlands, salt licks, important plant habitat and other significant ecological features; thoughts, perceptions, concerns and unanswered questions about the Project; and, hopes for the future of the Manitoba Métis Community.* *The TKLUOS (SVS 2019) noted that:* *"it can be said with confidence that members of the Manitoba Métis Community rely on and use the lands and waters around the WR-1 site for various cultural and traditional purposes, including actively exercising their s. 35 harvesting and other Aboriginal rights." (p.2)* *The TKLUOS (SVS 2019) goes on to comment that* *"Despite the noted limitations set out in this report, SVS is of the position that the study provides a reasonable representation of the Manitoba Métis Community patterns of LUO within the study areas." (p.24)*

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						A summary of the specific issues raised by the MMF and specific responses by CNL can be found in Appendix 4.0-1 of Section 4." The following provides an excerpt from Section 4.2.2 of the EIS (Golder 2022a) on which First Nations are signatories to which treaties: *"A list of the Indigenous Nations with a potential interest in the Project was identified by CNL and included in the IER. Identification of the First Nations and the Red River Métis was based on consultation with the CNSC, through CNL's previous Indigenous engagements, and through the use of publicly available sources of information including:* • *First Nation and the Red River Métis and organization websites;* • *the Aboriginal and Treaty Rights Information System (ATRIS; Government of Canada and INAC 2016); and* • *Crown-Indigenous Relations and Northern Affairs Canada First Nation community profiles.* *The list was based on the identified potential or established Indigenous or treaty rights of the First Nations and the Red River Métis in the vicinity of the Project and is provided in Table 4.2.2-1 along with a brief rationale for inclusion. The inclusion of specific Nations considers the nature of the established and/or claimed rights and potential effects on those rights caused by the proposed Project based on a preliminary assessment of existing and available information. As such, the working list is subject to change based on information and dialogue with the identified First Nations, the Red River Métis, and Indigenous organizations. A map of the First Nations and treaty areas is provided on Figure 4.2-1, while Figure 4.2-2 shows recognized areas for Red River Métis' natural resource harvesting, and Figure 4.2-3 shows the expansion of the recognized Métis harvesting area.*

Table 4.2.2-1: The Indigenous Nations Identified as Having Potential Interest in the Project

First Nations, the Red River Métis and/or Representative Organizations	*Identification Rationale and Proximity to WL Site**
Sagkeeng First Nation (Treaty No. 1 and 3)	▪ *Asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site.* ▪ *Occupy one reserve located 52 kilometres (km) north of the WL site, and downstream along the Winnipeg River.* ▪ *Existing relationship and interest in the WL site.*
Brokenhead Ojibway Nation (Treaty No. 1)	▪ *Asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site.* ▪ *Occupy three reserves: 44 km northwest, 55 km northwest and 73 km southwest of the WL site respectively.* ▪ *Interest expressed comments on Project Description.*
Red River Métis represented by the Manitoba Métis Federation	▪ *The Manitoba Métis Federation is the official democratic and self-governing political representative for the Red River Métis Community. The Manitoba Métis Federation is considered the government of the Red River Métis. Potential asserted and/or established Métis harvesting rights in the vicinity of the WL site.* ▪ *Interest expressed comments on Project Description.*
Black River First Nation (Treaty No. 5)	▪ *Asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site.* ▪ *Occupy one reserve 75 km north of the WL site.*

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						Hollow Water First Nation (Anishinaabe (Ojibwa)) (Treaty No. 5)	▪ *Asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL Site.* ▪ *Occupy one reserve, 113 km north of the WL site.*
						Shoal Lake No. 40 (Treaty No. 3)	▪ *Potential asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site.* ▪ *Treaty No. 3 territory includes parts of eastern Manitoba, including the WL site.* ▪ *Occupy three reserves: 94 km southeast, 110 km southeast and 140 km southeast of the WL site, respectively.*
						Iskatewizaagegan No. 39 Independent First Nation (Shoal Lake No. 39 First Nation) (Treaty No. 3)	▪ *Potential asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site.* ▪ *Treaty No. 3 territory includes parts of eastern Manitoba, including the WL site.* ▪ *Occupy four reserves: 93 km southeast, 102 km southeast, 110 km southeast and 140 km southeast of the WL site, respectively.*
						Northwest Angle No. 33 (Treaty No. 3)	▪ *Potential asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site.* ▪ *Treaty No. 3 territory includes parts of eastern Manitoba, including the WL site.* ▪ *Occupy three reserves: 111 km southeast, 140 km southeast and 176 km southeast of the WL site, respectively.*
						Wabaseemoong Independent Nations (also known as Wabaseemoong Independent Nations of One Man Lake, Swan Lake and White Dog) (Treaty No. 3)	▪ *Potential asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site.* ▪ *Treaty No. 3 territory includes parts of eastern Manitoba, including the WL site.* ▪ *Occupy four reserves: 80 km east, 85 km east, 95 km east and 140 km southeast of the WL site, respectively.*
						Grand Council of Treaty 3 (specific to this Project includes: Shoal Lake No. 40 First Nation, Iskatewizaagegan No. 39 Independent First Nation (Shoal Lake No. 39 First Nation), Northwest Angle No. 33, Wabaseemoong Independent Nations, and Sagkeeng First Nation)	▪ *Umbrella treaty organization which represents 28 First Nations and 5 with potential interest in the Project.* ▪ *Treaty 3 territory includes parts of eastern Manitoba, including the WL site.*

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						<table><tr><td>*Chiefs of Ontario (specific to this Project includes: Shoal Lake No. 40 First Nation, Iskatewizaagegan No. 39 Independent First Nation (Shoal Lake No. 39 First Nation), Northwest Angle No. 33, and Wabaseemoong Independent Nations)*</td><td>▪ *First Nations umbrella organization that represents 133 First Nations and 4 with potential interest in the Project.*</td></tr></table> ** Two applications were used in the calculation of distances (Arc GIS 10.4 and Google Earth Pro). Distances were measured as a straight line from the WL site to the approximate centre of each reserve.* **Change to EIS Executive Summary:** The EIS Executive Summary (Golder 2022b) was revised as follows to correct the quoted erroneous statement: *"The Project is located on Treaty 3 land, while the overall Whiteshell Laboratories site that extends west of the Winnipeg River falls on Treaty 1 land. Communities that form part of Treaties 1, 3 and 5 have historical and current land use ties with the area. Anishinaabe and Ojibway communities with historical traditional territories that have expressed interest in the Project include the Sagkeeng and Brokenhead First Nations in Treaty 1; Black River and Hollow Water First Nations in Treaty 5; and Shoal Lake No. 40, Iskatewizaagegan No. 39 Independent First Nation (Shoal Lake No. 39 First Nation), Northwest Angle No. 33 and Wabaseemoong Independent Nations in Treaty 3.* *The Project is also located in the homeland of the Red River Métis. The Red River Métis community members live in the region around the Whiteshell Laboratories site and may use the lands nearby for traditional activities."* **References:** *Barkwell 2016. The Métis Homeland: Its Settlements and Communities. 2016.* *CNL 2022. Whiteshell Laboratories WR-1 Reactor Decommissioning Indigenous Engagement Report. WLDP-26000-REPT-002. Revision 8. December 2022.* *Golder 2022a. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Golder 2022b. Environmental Impact Statement for the In Situ Decommissioning of WR-1 at the Whiteshell Laboratories - Executive Summary. WLDP-26000-ENA-002. Revision 4. December 2022.* *Government of Canada and INAC 2016. Indigenous Peoples and Communities. 2016.* *Government of Manitoba et al. 2012. Province Partners with Manitoba Métis Federation to Uphold Métis Harvesting Rights, Natural Resource Conservation. September 2012.* *Manitoba Sustainable Development n.d.f. Recognized Areas for Métis Natural Resource Harvesting.* *MMF 2013. Métis Laws of the Harvest: Guide to Métis Hunting, Fishing, Trapping and Gathering. Revision 3. 2013.* *MMF 2018a. Manitoba Métis Federation. 2018.* *MMF 2018b. Expansion of the Recognized Métis Harvesting Area. September 2018.* *MNC 2022. Métis Nation. 2022.* *SVS 2019. Whiteshell Reactor #1 Decommissioning: Manitoba Métis Traditional Knowledge, Land Use, and Occupancy Study. January 2019.*
3.	CNSC	All	EIS - All - 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	**Incorporated:** The Environmental Impact Statement (EIS; Golder 2022) was reviewed and revised, as necessary, to confirm that references to existing information are correct and as specific as possible (reference to a section number in the document versus just to the document itself). The general approach was to summarize the relevant information in the EIS and then reference the source, rather than indicating the location of the information without that

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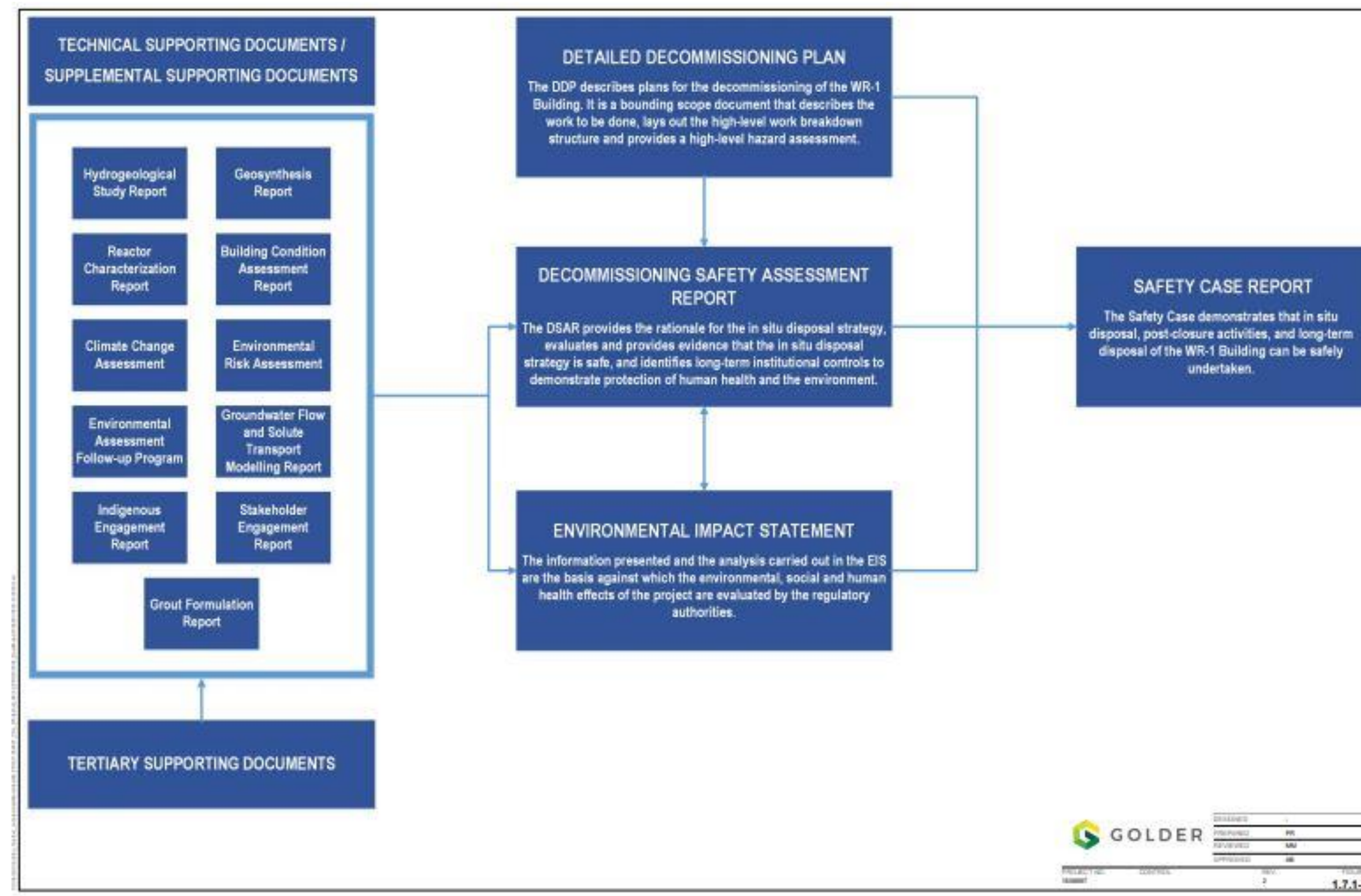
					information, a brief summary or narrative which explains the purpose of referencing each supporting document as well as any relevant information it contains (e.g., data, methodology, conclusions drawn) should be provided in the EIS. It was not always clear which sections of a referenced document were relevant to the discussion in the EIS. **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 Generic EIS Guidelines (p.6), where existing documents are referenced, the EIS should: Specify which portion of the information or data in the document applies to the WR-1 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.	information being present in the EIS. As stated by the reviewer, for the documents referenced and where necessary, additional information was included to: specify which portion of the information is applicable to the WR-1 project (section number included in the reference) and explain how the information applies as well as any assumptions, limitations, or differences. **Change to EIS:** Figure 1.7.1-1 was added to the EIS (Golder 2022) to detail the main submission documents as well as the main technical supporting documents. The figure shows the general hierarchy of the documents and how they support each other. The figure is provided below for reference.  **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
4.	CNSC	C. Cianci	EIS - All - General	N/A	**Comment:** As required under paragraph 5(1)(c) of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012), the EIS should describe the effects of any changes the project may cause to the environment, with respect to Aboriginal peoples, on	**Incorporated:** Section 6.0 of the Environmental Impact Statement (EIS; Golder 2022) was revised to include a subsection for each valued component (VC) providing Indigenous interests and concerns related to that VC along with whether each interest or concern was: added to the assessment, already encompassed by the assessment, or not included in the assessment, as well as the supporting rationale. Each VC underwent a residual effect analysis, was classified, and

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					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. While Section 6.8 Land and Resource Use of the EIS provides specific discussion and analysis of the effects on physical and cultural heritage sites and current use of lands and resources for traditional purposes as they pertain to Aboriginal peoples, there is no specific and distinct discussion in the EIS 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 valued components (VCs) related to Aboriginal health identified in either Section 6.7 Human and Ecological Health nor Section 6.9 Socio-Economic Environment of the EIS. **Expectation to Address Comment:** Please include in the EIS, a stand-alone section, which 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.	had its significance determined. Residual adverse effects were identified for air quality, hydrogeology, surface water quality, and human and ecological health. Residual adverse effects to air quality and human and ecological health were assessed to be not significant. Determination of significance was not completed for hydrogeology and surface water quality as these VCs do not have an assessment endpoint; rather, the results of the assessment for these VCs were considered in the evaluation of significance for other VCs, where applicable. The conclusions of the residual effects analyses apply to the interests and concerns raised by the engaged Indigenous Nations, which were encompassed by the assessment. In other words, there are no predicted effects on the health and socio-economic condition of Indigenous peoples resulting from changes the project may cause to the environment and hence, discussion of effects on the health and socio-economic condition of Indigenous peoples are limited. Effects to the health of the Indigenous peoples were assessed in the EIS by incorporating a Harvester receptor in the closure and post-closure assessment models discussed in Section 6.7.1.7 of the EIS. Harvesters represent Indigenous and traditional users of the area who may be exposed through harvesting of country foods. CNL conducted an Indigenous food intake survey (CNL 2018) completed by members of the Sagkeeng First Nation to understand the types and quantities of local food consumed. CNL also partnered with the Manitoba Métis Federation (SVS 2019) to conduct Harvester food intake surveys with Manitoba Métis Citizens that harvest in the area of the Whiteshell Laboratories site. To align with the overall compartmentalization of the EIS assessment, impacts on Indigenous peoples (as well as Indigenous VCs, concerns and interests) are discussed in each portion of the assessment and are highlighted within Sections 6.1 through 6.9, instead of all in a single section as requested. **Change to EIS:** Section 6.0 of the EIS (Golder 2022) was revised to include a subsection on Indigenous interests and concerns for each VC. **References:** *CNL 2018. Aboriginal Food Intake Survey. Memo from Jesse Gordon to Brian Wilcox. WLDP-26000-021-000. Revision 0. September 2018.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *SVS 2019. Whiteshell Reactor #1 Decommissioning: Manitoba Métis Traditional Knowledge, Land Use, and Occupancy Study. January 2019.*
5.	Health Canada (HC)		EIS - All - General	N/A	**Comment:** Some citations for Ecometrix publications do not specify which 2017 publication is being referenced. **Expectation to Address Comment:** Specify which 2017 Ecometrix publication is being referenced throughout the EIS.	**Incorporated:** The citations being referred to in the comment are on Figures 6.4.2-2 and 6.4.2-3 of the 2017 Environmental Impact Statement (EIS; Golder et al. 2017). These figure references were meant to indicate that the hydroelectric dam locations and sampling locations were provided by EcoMetrix in 2017, not that they came from a 2017 EcoMetrix reference. This has been clarified in the revised EIS (Golder 2022). **Change to EIS:** Figures 6.4.2-2 and 6.4.2-3 of the EIS (Golder 2022) were revised as follows to clarify that the hydroelectric dam locations and sampling locations were provided by EcoMetrix, not that they came from an EcoMetrix reference: Figure 6.4.2-2 - "HYDROELECTRIC DAM LOCATION - HYDROELECTRIC DAM LOCATIONS PROVIDED BY ECOMETRIX" Figure 6.4.2-3 - "SAMPLING LOCATIONS PROVIDED BY ECOMETRIX" **References:** *Golder et al. 2017. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 1. September 2017.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
6.	Environment and Climate Change Canada (ECCC)		EIS - All - General	N/A	**Comment:** The *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report* (AECL, March 2001) is not appended to the EIS. The report is referenced in a number of sections of the EIS but not included in the appendices. **Expectation to Address Comment:** Provide the	**Resolved As:** The Comprehensive Study Report (CSR; AECL 2001) has been provided (3 volumes) electronically on the CNL File Transfer Protocol (FTP) site to enable distribution to/access by Canadian Nuclear Safety Commission (CNSC) staff and Federal reviewers. The CSR will not be appended to the Environmental Impact Statement (EIS; Golder 2022). CNSC confirmed receipt of the CSR documents on the FTP site on 2018 January 21.

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					Whiteshell Laboratories Decommissioning Project Comprehensive Study Report as part of the EIS supporting documentation.	**Change to EIS:** No changes were required to the EIS as a result of this comment. **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project – Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
7.	Manitoba Sustainable Development (MSD)		EIS - Community and Aboriginal Traditional Knowledge	10-1	**Comment:** In comparison with a draft Table of Contents dated February 2017, the section Community and Aboriginal Traditional Knowledge on p.10-1 seems to be missing. The page features Section 11.0 (Assessment of Effects of the Environment on the Project) but is identified as Section 10.0. **Expectation to Address Comment:** Clarify whether this section has been removed or moved to another section.	**Resolved As:** The section "Community and Aboriginal Traditional Knowledge" was removed as a stand-alone section. Instead, traditional knowledge information has been incorporated into the discipline-specific sections (6.2 to 6.9) of the Environmental Impact Statement (EIS; Golder 2022) in "Indigenous Engagement Feedback – Key Interests and Concerns" subsections as well as "Description of the Environment" and "Residual Effects Analysis" subsections as applicable. This approach provides for a more complete assessment of residual effects. Indigenous traditional knowledge received during engagement activities is also captured in Section 4.0 of the EIS. **Change to EIS:** No changes were required to the EIS as a result of this comment. **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
					Executive Summary	
8.	CNSC	C. Cianci	EIS - Whiteshell Labs Site Background	ii	**Comment:** The following sentence of the Executive Summary indicates [emphasis added]: "CNL is an **enduring entity** that includes all the staff". The term "enduring entity" is not explained or defined. **Expectation to Address Comment:** Please define the term "enduring entity" in the documentation for clarity purposes.	**Resolved As:** On 2014 November 3, as part of its preparation to transition to a government-owned, contractor-operated management model, Atomic Energy of Canada Limited (AECL) operationalized Canadian Nuclear Laboratories (CNL) as a wholly owned subsidiary, responsible for the AECL laboratories' operations and employees. Following the contract award to Canadian National Energy Alliance (CNEA) for the operation of the AECL sites, the shares of CNL were transferred to CNEA. CNL is the enduring, or long lasting, entity that maintains, through the transition to the private sector, the knowledge and expertise, management systems, workforce, and regulatory authorizations and obligations necessary to safely and effectively operate the AECL sites. The Environmental Impact Statement (EIS; Golder 2022a) and the EIS Executive Summary (Golder 2022b) have been revised to remove the term "enduring entity". **Change to EIS Executive Summary:** The "Whiteshell Laboratories" section of the EIS Executive Summary (Golder 2022b) was revised as follows to remove the term "enduring entity": *"Whiteshell Laboratories is a government-owned and contractor-operated facility. The site, including all assets and liabilities, is owned by Atomic Energy of Canada Limited, a federal government Crown corporation. Atomic Energy of Canada Limited contracted Canadian Nuclear Laboratories to operate the facility and perform the decommissioning work."* **References:** *Golder 2022a. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Golder 2022b. Environmental Impact Statement for the In Situ Decommissioning of WR-1 at the Whiteshell Laboratories - Executive Summary. WLDP-26000-ENA-002. Revision 4. December 2022.*

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9.	CNSC	C. Cianci	EIS - Aboriginal Engagement Activities	xii	**Comment:** While CNL has provided a summary of the actions taken to address feedback received from Indigenous communities, CNL has not included a complete summary of the responses provided to address the concerns and issues raised by the identified Indigenous groups (which is an information requirement of the Executive Summary as per CNSC's *Generic EIS Guidelines*, p.8). In particular, beyond the action of developing specific material for future presentations, information is missing regarding CNL's specific responses to Indigenous communities which address their questions or concerns (e.g., how any waste moved off-site would be transported, how the grout would maintain integrity over the long term). **Expectation to Address Comment:** Please provide a complete summary of CNL's responses to each of the concerns and issues raised by the identified Indigenous	**Incorporated:** The Executive Summary of the Environmental Impact Assessment (EIS, Golder 2022) was updated with a revised section on Indigenous Engagement, which includes a summary of key interests and concerns raised by the engaged Indigenous Nations and CNL responses to those interests and concerns. The detailed summary of the responses provided by CNL to address concerns and issued raised by each of the engaged Indigenous Nations is documented in Section 1.3 of Appendix 4.0-1 to Section 4.0 of the EIS, along with a complete record of engagement. CNL provided a summary of the aspects of the project of concern to Indigenous Nations and why they are significant in terms of effects under section 5(1) (c) of Canadian Environmental Assessment Act, 2012 (CEAA 2012) and/or impacts to Indigenous and/or treaty rights, and has provided CNL responses to each of these concerns and has conducted a verification process to ensure the information accurately represents the community's views on the Project. Appendix B of the Indigenous Engagement Report (IER; CNL 2022) provides a complete record of the Indigenous Nations' comments on the EIS, along with CNL responses to those comments, and any two-way communications and validation by Indigenous Nations related to addressing those comments carried out to date. **Change to EIS:** A summarized set of key interests and concerns, as well as summary of CNL responses to those interests and concerns were added to the Executive summary of the Environmental Impact Assessment (EIS, Golder 2022), under the sub-heading "Indigenous Engagement", as shown below: *"Feedback Canadian Nuclear Laboratories has received during engagement with Indigenous Nations has been considered during the environmental assessment process. Key themes of the issues and concerns provided through feedback received to date on the Project and Canadian Nuclear Laboratories' response to the feedback are summarized below. Canadian Nuclear Laboratories remains committed to addressing outstanding issues and concerns through ongoing discussions and initiatives developed in collaboration with respective nations.* ***Relationship Building*** *To help facilitate greater engagement with Sagkeeng First Nation, Canadian Nuclear Laboratories, Sagkeeng First Nation, and Atomic Energy of Canada Limited have established a Technical Working Group to resolve outstanding concerns and work collaboratively on areas of interest by developing and implementing initiatives that will help address Sagkeeng First Nation's concerns on the Project. The Technical Working Group meets monthly to support ongoing, constructive dialogue to develop and implement initiatives that were identified by Sagkeeng to help address some of their concerns related to the Project. These initiatives include a community-based monitoring program, leadership table, and community liaison committee. The Technical Working Group has also formalized a contribution agreement to provide funding for the first year of activities that will form the basis of a long-term relationship agreement. Canadian Nuclear Laboratories provides capacity to employ a Community Liaison that works closely to exchange information between Canadian Nuclear Laboratories and community members.* *The Manitoba Métis Federation and Canadian Nuclear Laboratories have invested in the development of a positive and collaborative relationship since 2017. Canadian Nuclear Laboratories and the Manitoba Métis Federation have been working together to develop a multi-year relationship agreement that will help to mitigate the Red River Métis' concerns on the Project and ensure the Red River Métis are represented and involved in environmental monitoring, communication initiatives, and other key initiatives.* *Canadian Nuclear Laboratories, Black River First Nation, and Hollow Water First Nation signed a Relationship Agreement to support greater community involvement in the Project. The relationship agreement supports the establishment of a community liaison committee, a community liaison position, support to participate in the Indigenous Advisory Committee and provide capacity support to ensure the Nations can continue to participate in discussions on future land use of the Whiteshell Laboratories site.* ***The In Situ Disposal Approach*** *Sagkeeng First Nation and the Manitoba Métis Federation have raised concerns about the in situ disposal approach and have stated their preference for complete removal of the Whiteshell Reactor 1 facility from the site. The First Nations and the Manitoba Métis Federation expressed an interest in understanding how the grouted encapsulation would maintain its integrity into the future. The Manitoba Métis Federation and Sagkeeng First Nation have stated that the risks from in situ disposal will still be present and would have the potential to adversely impact them and their ability to exercise their rights. Brokenhead Ojibway Nation, Hollow Water First Nation and Black River First Nation expressed interest in understanding how in situ disposal was chosen as the preferred decommissioning method for the Whiteshell Reactor 1.* *Canadian Nuclear Laboratories provided information on how the different engineered barriers of the in situ disposal design ensure the waste is properly contained and isolated from the environment. Canadian Nuclear Laboratories also explained that immediate dismantling of Whiteshell Reactor 1 does not guarantee its immediate removal from site, primarily because alternatives do not exist for disposal of the waste. Recognizing that environmental*

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						protection and the integrity of the in situ disposal design will continue to be an area of interest for the communities, Canadian Nuclear Laboratories has put in place engagement mechanisms to discuss and make efforts to address residual areas of concern. ***Alternative Means Assessment*** *Sagkeeng First Nation continues to have strong reservations with in situ disposal and the way in which Canadian Nuclear Laboratories conducted its Alternative Means Assessment. Sagkeeng First Nation's most preferred decommissioning method for the Whiteshell Reactor 1 is immediate full removal and Sagkeeng First Nation's least preferred decommissioning method is in situ disposal. Canadian Nuclear Laboratories included in the Environmental Impact Statement a summary of Sagkeeng First Nation's Alternative Means Assessment and explained how Canadian Nuclear Laboratories has considered and used the report. Canadian Nuclear Laboratories respects the importance of this issue to Sagkeeng First Nation and subsequently supported Sagkeeng First Nation to undertake their own Alternative Means Assessment; one that assessed and measured the alternatives based only on Sagkeeng First Nation values.* ***Psychosocial Impacts*** *Sagkeeng First Nation and the Manitoba Métis Federation have expressed concerns that the Whiteshell Reactor 1 in situ disposal option is likely to have incremental adverse psychosocial effects on their membership and citizens, greater than those from other alternative decommissioning means. Canadian Nuclear Laboratories and Atomic Energy of Canada Limited recognized the findings of Sagkeeng First Nation's Psychosocial Impact Assessment Report; more specifically, that the current proposal for in situ disposal is Sagkeeng First Nation's least preferred option from a psychosocial impact perspective. Canadian Nuclear Laboratories is committed to working collaboratively with Sagkeeng First Nation and the Manitoba Métis Federation on developing and implementing the initiatives that will help address their concerns in this area.* ***Waste Management*** *The First Nations and Manitoba Métis Federation were interested to know how much radioactive waste would remain on the Whiteshell Laboratories site, which material will be sent to Chalk River Laboratories for disposal, and how it will be transported. In response, Canadian Nuclear Laboratories informed Sagkeeng First Nation that all waste materials (radioactive and non-radioactive) are sorted, verified, and transported using licensed containers, depending on the waste type, to a licensed hazardous waste management facility. Canadian Nuclear Laboratories also explained that radioactive material has been transported between Canadian Nuclear Laboratories' Whiteshell Laboratories site and Chalk River Laboratories site for many decades without a single radiological incident. Transportation of radioactive materials is a highly regulated activity that must meet the stringent requirements of both Transport Canada and the Canadian Nuclear Safety Commission.* ***Historical Siting and Operations of the Whiteshell Laboratories Site*** *The First Nations and the Manitoba Métis Federation identified concerns regarding the lack of engagement during the siting and operations of the Whiteshell Laboratories site which began in the early 1960s. While this is out of scope of the Whiteshell Reactor 1 assessment, Canadian Nuclear Laboratories and Sagkeeng First Nation are working through a subcommittee to incorporate this concern in the Environmental Impact Statement. Regarding Sagkeeng First Nation's concern on historical cumulative effects, Canadian Nuclear Laboratories has incorporated feedback from Sagkeeng First Nation regarding historical siting issues where possible and agreed that this topic will be discussed at the technical working group.* ***Valued Components*** *Canadian Nuclear Laboratories reviewed and considered information collected through public and Indigenous engagement activities with Sagkeeng First Nation, the Manitoba Métis Federation, Brokenhead Ojibway Nation, Black River First Nation, Hollow Water First Nation, and Wabaseemoong Independent Nations in the selection of valued components. In addition, four Traditional Knowledge and Land Use Studies for the Whiteshell Laboratories site were completed by First Nations and the Red River Métis and shared Canadian Nuclear Laboratories for inclusion in the Environmental Impact Statement.* *Sagkeeng First Nation suggests that the draft Environmental Impact Statement has neglected to consider the full scope of Sagkeeng First Nation's valued components within its assessment, which are necessary for the continued practice of Sagkeeng First Nation culture and livelihoods.* *Canadian Nuclear Laboratories developed and verified a list of valued components for each community based on their Traditional Knowledge and Land Use Studies and feedback during engagement. These valued components were used to validate the Project's valued components. Where information was provided by the First Nations and the Red River Métis, Canadian Nuclear Laboratories included a list of relevant Indigenous Valued Components and demonstrated how they were considered in the discipline assessment. Most of the valued components identified through Indigenous and public engagement activities are already represented by the valued components selected for the environmental assessment.* ***Winnipeg River*** *The communities indicate that the Winnipeg River is an important location for traditional land and resource use and therefore is of primary concern to First Nations and the Red River Métis. Canadian Nuclear Laboratories indicated that the Winnipeg River was included as a valued component, and potential*

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						effects on it are considered in the Environmental Impact Statement. Canadian Nuclear Laboratories has also committed to work with all communities to better understand their concerns over the Canadian Nuclear Laboratories monitoring program, interest in participating in the current and future, Canadian Nuclear Laboratories or Indigenous led monitoring programs, and to incorporate Traditional knowledge into existing programs and develop approaches that encourage the building of trust in the monitoring activities. ***Accidents and Malfunctions*** *The First Nations and the Manitoba Métis Federation expressed concerns about past releases to the environment from the Whiteshell Laboratories site and the potential for future releases of hazardous and radioactive material into the Winnipeg River.* *Canadian Nuclear Laboratories provided information on the topic of accidents to communities and explained that radioactivity levels in Whiteshell Reactor 1 are similar to other reactors that have gone through the in situ disposal process. When the facility was shut down in 1985, all fuel and liquids were safely removed from the reactor, and what remains in place today are the structural components of the reactor. With respect to the rest of the Whiteshell Laboratories site, all radioactive waste at the site is safely and securely stored in the site's Waste Management Area. Any events that occurred in the past were reported to the Canadian Nuclear Safety Commission.* *Recognizing that accidents and malfunctions will continue to be an area of interest for the communities, Canadian Nuclear Laboratories has put in place a forum to discuss and further address this area of interest. Without close engagement within the communities since 2019, it is unlikely that most community members are aware of the available information that Canadian Nuclear Laboratories has produced regarding historical releases. Further work is needed to translate and share this information with community members. Canadian Nuclear Laboratories will continue to engage the communities on this matter.* ***Incorporation of Traditional Knowledge*** *The First Nations and the Manitoba Métis Federation noted the importance of incorporating traditional and cultural perspectives into the Project and identified specific traditional uses in proximity to the Project study area and the larger Whiteshell Laboratories site. The Manitoba Métis Federation indicated that Métis-specific knowledge of the region does not necessarily exist in written documents and needed to be obtained first-hand. Canadian Nuclear Laboratories with support from the Canadian Nuclear Safety Commission, funded the completion of four Traditional Knowledge and Land Use Studies (i.e., the Sagkeeng First Nation, the Manitoba Métis Federation, the Wabaseemong Independent Nations, and the Black River First Nation, Brokenhead Ojibway Nation and Hollow Water First Nation). Canadian Nuclear Laboratories has incorporated information from the Traditional Knowledge and Land Use Studies into the draft Environmental Impact Statement. Canadian Nuclear Laboratories also partnered with Sagkeeng First Nation and funded the Manitoba Métis Federation to complete traditional food consumption studies helping Canadian Nuclear Laboratories confirm that the Harvester model is a conservative model for modern day Indigenous people that rely on harvesting for some of their food.* ***Business and Employment Opportunities*** *The First Nations and the Manitoba Métis Federation were interested to know more about Canadian Nuclear Laboratories' procurement policies and potential economic participation opportunities associated with the Project and the overall Whiteshell Laboratories Closure Project, including employment and contracting qualifications. Priority employment and contracts and capacity building were identified as an important concern and area of interest for First Nations and the Red River Métis. Sagkeeng First Nation also raised the possibility of a certain percentage of the work going to Indigenous companies. Brokenhead Ojibway Nation, Hollow Water First Nation, Black River First Nation and Wabaseemoong Independent Nations expressed concern that they would not be competitive with larger businesses in the tender process.* *To help address these concerns, Canadian Nuclear Laboratories worked to enhance options to better match these Nation's capabilities with their contracting needs including adding provisions to its procurement process that encourages the use of Indigenous-owned businesses or businesses that employ Indigenous People. Canadian Nuclear Laboratories discussed the need for better information sharing regarding the procurement and contracting opportunities and asked for specific capabilities that communities have related to the Project. To help facilitate information sharing, capabilities, and opportunities, Canadian Nuclear Laboratories also hosted three "Industry Days" events to connect businesses with participating First Nations and the Red River Métis.* ***Future Land Use and Tenure for the Whiteshell Laboratories Site*** *The First Nations and Manitoba Métis Federation were interested in knowing if the land currently occupied by the Whiteshell Laboratories site would be available for other uses in the future. Sagkeeng First Nation also requested that all site clean-up and release criteria and deviation of the desired end-state(s) for the Whiteshell Reactor Disposal Facility be developed collaboratively with Sagkeeng First Nation . In addition, Sagkeeng First Nation requested to be more involved in the drafting and implementation of plans for the duration of decommissioning and into the institutional control period.* *Canadian Nuclear Laboratories is committed to engaging bilaterally with Sagkeeng First Nation and other First Nations, the Manitoba Métis Federation, local communities, and stakeholders to co-develop future land use objectives, as well as engage on the end-state of the Whiteshell Laboratories site as*

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						part of Whiteshell Laboratories Closure Project. Canadian Nuclear Laboratories also provided information on the community regeneration partnership that was formed to develop both nuclear and non-nuclear opportunities for the Whiteshell Laboratories site after the site is decommissioned. Canadian Nuclear Laboratories participates in and supports the partnership and has invited each Indigenous Nation to join. ***Participation in Environmental Monitoring*** *The First Nations and Red River Métis expressed an interest in learning about future monitoring of the site. In particular, the First Nations and Red River Métis would like to see more opportunities for participation in environmental monitoring program development and implementation, beyond simply observation. Sagkeeng First Nation also expressed concerns about the lack of Traditional knowledge input into the environmental monitoring program and explained that Indigenous environmental monitoring was a critical element of Sagkeeng First Nation stewardship and Indigenous-led risk communication with members.* *Canadian Nuclear Laboratories has committed to work with all communities to better understand their concerns over the monitoring program, interest in participating in the monitoring programs, and to incorporate Traditional knowledge into existing programs and develop approaches that encourage the building of trust in the monitoring activities. Canadian Nuclear Laboratories committed to supporting long-term Indigenous monitoring and taking a distinctions based approached working bi-laterally with each Nation to ensure their interest in environmental monitoring are met.* ***Summary of Indigenous Concerns*** *The feedback from Indigenous Nations on issues and concerns has been incorporated into the Environmental Impact Statement where applicable. Canadian Nuclear Laboratories has taken steps to verify that issues and concerns expressed by First Nations and the Manitoba Métis Federation have been correctly documented and that information provided by the Nation are correctly described and captured in the revised Environmental Impact Statement and supporting documents. Canadian Nuclear Laboratories appreciates all feedback received to date on the Project and remains committed to continuing discussions with First Nations and the Manitoba Métis Federation after submission of the updated Environmental Impact Statement, throughout the remaining environmental assessment steps, and during the remediation of the Whiteshell Laboratories site.* *As Canadian Nuclear Laboratories is undertaking closure of the Whiteshell Laboratories site in addition to the Project, it is important to the First Nations, the Manitoba Métis Federation and Canadian Nuclear Laboratories that these relationships endure, grow, and adapt to future activities. Canadian Nuclear Laboratories is working to create mechanisms to develop and implement initiatives that will help address each Nation's unique interests and concerns related to the Project and the Whiteshell Laboratories Closure Project overall."* Section 1.3 of Appendix 4.0-1 to Section 4.0 of the EIS was updated to include a summary of key issues and concerns raised by each engaged Indigenous community. These summaries also include CNL's responses, any impacts to the environmental assessment, and the validation status of the issues or concerns. **Change to IER:** Appendix B of the IER was updated to provide a complete a record of Indigenous Nations' comments on the EIS, along with CNL responses and two-way communication and validation activities related to those comments. **References:** *CNL 2022. Whiteshell Laboratories WR-1 Reactor Decommissioning Indigenous Engagement Report. WLDP-26000-REPT-002. Revision 8. December 2022.* *CEAA 2012. Canadian Environmental Assessment Act, 2012. S.C. 2012, c. 19, s. 52. July 2012.*
10.	CNSC	C. Cianci	EIS - Public and Stakeholder Engagement Activities	xiv	**Comment:** Although CNL has provided a summary of key issues and concerns raised, these are limited to those identified in open houses, rather than all public and stakeholder engagement activities carried out to date. In addition, CNL has not included a summary of the responses provided to address the issues raised (which is an information requirement of the Executive Summary as per CNSC's *Generic EIS Guidelines*, p.8). **Expectation to Address Comment:** Please provide a summary of key concerns and issues raised and CNL's responses to each of the concerns	**Incorporated:** The Environmental Impact Statement (EIS) Executive Summary (Golder 2022) sub-section on "Public Engagement" was revised to provide a summary of key concerns and issues raised and CNL's responses to the concerns and issues raised during all public and stakeholder engagement activities as required by the CNSC's Generic EIS Guidelines (CNSC 2016).A more detailed summary of CNL's responses to comments and concerns raised during public engagement activities completed to date are provided in Section 5.3.1 of the Environmental Impact Statement (EIS). **Change to EIS:** The following text (in italics) was included in the Public Engagement Section of the Executive Summary: ***"Public Engagement*** *Engagement with the public and stakeholder representatives is a key component of the environmental assessment process. Canadian Nuclear Laboratories operates a Public Information Program to inform the public (i.e., general public, as well as stakeholder representatives) about ongoing activities at*

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					and issues raised during public and stakeholder engagement activities carried out to date.	*Canadian Nuclear Laboratories sites and the potential effects of these activities on the public. Engagement activities for the Project have been completed under the guidance of this program. This Public Information Program forms the basis of communication efforts with the public and helps to direct the establishment of long-term, mutually beneficial working relationships with the communities in proximity to Canadian Nuclear Laboratories sites. Engagement activities for the Project have been completed in accordance with this program.* *The public engagement and communications activities have included numerous presentations, webinars and Q&A sessions, publicly available reports and brochures, information sessions around the region with one on one discussions and questions, technical workshops and use of social media. Public feedback continues to give valuable insight into what issues are important to stakeholders, enabling the Project team to respond to and incorporate the issues of the local community and the broader public into the planning and the Environmental Impact Statement. Key topics of the feedback received to date on the Project and Canadian Nuclear Laboratories' response to the feedback (using a variety of engagement methods and activities) are summarized below.* ***Regulatory Process*** *During engagement sessions, members of the public requested more information on updated timing for the review process, submittal, and commission hearing. During these sessions, members of the public were advised that the environmental assessment process requires Canadian Nuclear Laboratories to generate a thorough analysis of effects on the environment from the Project, including an Environmental Impact Statement, a decommissioning safety assessment and a post-closure safety assessment that are submitted to the Canadian Nuclear Safety Commission. All information will be available to the public and will include a meaningful public and Indigenous engagement process. The proposed Project can only proceed if it receives regulatory approvals to demonstrate safety to the environment and people.* *Canadian Nuclear Laboratories is currently working with the Canadian Nuclear Safety Commission to establish a revised schedule for final regulatory submittals, including the submission date for the final Environmental Impact Statement. Canadian Nuclear Laboratories has received comment submissions from members of the public and regulatory bodies on the draft Environmental Impact Statement. Presently Canadian Nuclear Laboratories is responding to those submissions and, subject to their acceptance by the Canadian Nuclear Safety Commission, Canadian Nuclear Laboratories will update and finalize the Environmental Impact Statement. The adjustment to the schedule is being made to allow Canadian Nuclear Laboratories to appropriately address these comments and for the Canadian Nuclear Safety Commission staff to subsequently conduct a fulsome assessment of Canadian Nuclear Laboratories' proposal.* ***Alternative Means Assessment*** *Canadian Nuclear Laboratories presented the alternatives that were both technically and economically feasible at all the public engagements and explained to the members of the public that these options were assessed for their environmental effect, socio-economic effect, and human health effects.* *Members of the public asked Canadian Nuclear Laboratories to provide further detail on how the in situ disposal method was chosen for the Project. In accordance with guidance from the Canadian Environmental Assessment Agency, the original Environmental Impact Statement included qualitative assessments of the options considered. In response to requests, Canadian Nuclear Laboratories revised the assessment of alternatives for clarity, and to incorporate feedback from the public, the First Nations and the Red River Métis. The updated assessment clarifies the differences between the alternatives and explains the risks relative to each alternative. Based on this assessment, in situ disposal is Canadian Nuclear Laboratories' preferred option and is of low risk to the public and the environment when compared to the limits established by Canada's nuclear regulator, the Canadian Nuclear Safety Commission.* *Complete removal of the Whiteshell Reactor 1 was the decommissioning method described in the Comprehensive Study Report approved by the Canadian Nuclear Safety Commission in 2002. Since then, Canadian Nuclear Laboratories has continued to re-evaluate that plan considering international best practice to reduce deferment periods. The Canadian regulations have adopted specific conditions for when in situ disposal of a legacy facility would be acceptable, the conditions of which the Project meets. The in situ disposal option is a safe decommissioning option for the reactor with respect to the environment, workers and the public and has been used successfully for over six decades in other parts of the world.* ***Lessons Learned*** *Members of the public wanted assurance from Canadian Nuclear Laboratories that the Project was properly incorporating available lessons learned from other similar work already conducted and work done at the Whiteshell Laboratories site. Canadian Nuclear Laboratories has gathered data and lessons learned where available on other in situ projects. In addition, Canadian Nuclear Laboratories has participated in several learning workshops with technical experts that have performed in situ disposal and has used services and advisement from organizations that have performed the in situ method. Development of the grout formulation incorporated lessons learned from the Savannah River National Laboratory's reactors in situ grouting. Lessons learned documents from previous decommissioning work, including operating experience were reviewed as part of assessing the potential for accidents and malfunctions. Canadian Nuclear Laboratories recognizes the incredible depth of research on waste storage that was carried out at the Whiteshell*

Laboratories site and has been incorporating that research into the assessment for the Project. Gathering and incorporating Lessons Learned will be an important part of the detailed work planning activities prior to starting the work.

Design and Engineering Details

Many questions from the public were about the design of the Project. When Canadian Nuclear Laboratories submitted the draft Environmental Impact Statement, it had completed a preliminary conceptual design. Since then, the design process has continued to progress, and more refined designs have been prepared for the re-submission of the updated Environmental Impact Statement. The final detailed design will equal or surpass the performance of the conceptual design that was assessed in the Environmental Impact Statement.

Canadian Nuclear Laboratories also received questions about the International Atomic Energy Association's safety standard for decommissioning, which states that in-situ disposal is not a suitable option for all nuclear facilities and should be considered only under certain conditions. Canadian Nuclear Laboratories agrees with this assessment, and Canadian Nuclear Laboratories determined the Whiteshell Reactor 1 has features that make it suitable for long-term disposal such as: it is located below grade, it does not contain significant quantities of long-lived isotopes, and it can be monitored post-closure during the institutional control period.

The Canadian regulations (Canadian Nuclear Safety Commission Regulatory Document REGDOC 2.11.2 Decommissioning and Canadian Standards Association Standard N294 Decommissioning of facilities containing nuclear substances) have adopted specific conditions for when in situ disposal of a legacy facility would be acceptable, the conditions of which the Project meets. Canadian Nuclear Laboratories is following International Atomic Energy Association safety standards for the decommissioning of the facility and more importantly is also following the International Atomic Energy Association safety standards for waste disposal, since the facility – in its end state – would be classified as a disposal site.

Effectiveness of the Grout

Since Canadian Nuclear Laboratories has identified in situ disposal as the preferred option for decommissioning the Whiteshell Reactor 1 facility, the use of grout to fill the building below-grade has prompted many questions from the public on the topics of grout properties, installation process and long-term durability. Canadian Nuclear Laboratories has developed specially-formulated grout based on the requirements of the Whiteshell Reactor Disposal Facility. A similar grout design process (where an existing formula was adapted to use local materials) has already been successfully performed by Canadian Nuclear Laboratories. The grout formulation has been designed and evaluated through a testing program to validate its performance against the required and assumed properties, to confirm it performs as well as or better than estimated in the solute transport model, prior to the installation of any grout into the Whiteshell Reactor 1.

The primary purpose of grouting of the facility is to stabilize the structure and resist subsidence over time. But additionally, grouting has a twofold benefit: 1) it slows down the process which will corrode the system components, extending their lifetime as the initial barrier to containment, and 2) it slows the movement of contamination from outside of the system components, as well as contamination from the degraded system components. The safety case of the proposed in situ disposal does not currently require that the reactor vault be grouted. The existing structure provides sufficient barrier to releases, and additional grout would not considerably increase the effectiveness of that barrier. The safety case for the Whiteshell Reactor Disposal Facility is built on the conservative assumption that the only major aspect of the grout to its function as a barrier is the hydraulic conductivity of grout used in the groundwater flow model. Effectiveness of the grout and concrete materials used for the in situ disposal system have been evaluated through the sensitivity analyses carried out as part of the Project assessment modelling.

Radiological Inventory

Canadian Nuclear Laboratories received several requests for details on the current radiological content of the Whiteshell Reactor 1 facility and how the levels of radioactivity will reduce over time. It should be noted that the reactor fuel – the most radioactive part of the facility – was removed in 1985. In response to questions, Canadian Nuclear Laboratories has conducted further characterization of the facility and included the results in the updated Environmental Impact Statement.

Valued Components

Canadian Nuclear Laboratories surveyed attendees at public open house events to solicit input into the valued components selected for the Project. Canadian Nuclear Laboratories provided information handouts at public open houses, and created posters displaying the proposed valued components. The public was given the opportunity to identify new valued components through a questionnaire that was offered to visitors. Public feedback on the valued component selection included comments and questions about the Winnipeg River (water quality) valued component and the future land use at the Whiteshell Laboratories site(which is captured by the Traditional Land and Resource Use and Other Land and Resource Use valued components).

Canadian Nuclear Laboratories considered all suggested valued components and either added them to the assessment, determined they were effectively covered by existing valued components or provided rationale for why the valued component was not included in the assessment. Both the Winnipeg River and Land Use are represented in the Environmental Impact Statement as specific valued components .

Protecting the Winnipeg River

						The Winnipeg River was a key concern for the members of the public. Canadian Nuclear Laboratories confirmed that the Winnipeg River is a valued component and that the continued protection of the Winnipeg River is a key focus of the Environmental Impact Statement. Water quality, flow, recreational use, and fish and fish habitat were considered in the assessment. For the post-closure phase, an Ecological Risk Assessment was completed to evaluate the potential for adverse effects on aquatic health associated with exposure to chemical and radiological contaminants from the Project in the long-term. There are no exceedances of the radiation benchmark for the aquatic biota in the Winnipeg River and all predicted doses are well below this level. Therefore, it is unlikely there would be significant adverse effects on aquatic populations or communities as a result of radionuclide releases in the long-term during the post-closure phase. *Canadian Nuclear Laboratories will implement an Environmental Assessment Follow-up Program for the Project that will be integrated with the existing Environmental Assessment Follow-up Program for the Whiteshell Laboratories site. The purpose of the Environmental Assessment Follow-up Program for the Project is to verify the accuracy of environmental effects and determine the effectiveness of mitigation measures that have been implemented.* ***Effects of the Environment on the Project*** *Members of the public expressed concerns about the potential effects of an earthquake, climate change or other natural disasters on the Whiteshell Reactor 1. Canadian Nuclear Laboratories explained that an assessment was completed that evaluated the potential effects of natural hazards (i.e., extreme weather events, forest fires and seismic events) and climate change on the Project. The Project design includes environmental design features, management practices and other mitigation to reduce the risks from natural hazards and climate change. In addition, a seismic hazard analysis was completed for the Whiteshell Laboratories site, which concluded that a 1-in-10,000 year earthquake would not likely cause damage to the Whiteshell Reactor Disposal Facility. To provide further confidence, Canadian Nuclear Laboratories modelled a scenario where the concrete foundation of the Whiteshell Reactor Disposal Facility failed. This scenario did not result in adverse effects to human and ecological receptors.* ***Contingency Planning*** *Members of the public requested information on how the Project design accounts for the risk that in situ does not operate as planned. Canadian Nuclear Laboratories explained that the Whiteshell Reactor Disposal Facility will include multiple barriers, including the waste form, a specialized grout formulation, the existing the Whiteshell Reactor 1 facility walls, a concrete cap and engineered cover, and the surrounding geosphere. In the very unlikely case that degradation of these barriers occurs earlier than predicted, the surface and ground water monitoring system will detect contamination migration.* *Canadian Nuclear Laboratories will implement an Environmental Assessment Follow-up Program for the Project that will be integrated with the existing Environmental Assessment Follow-up Program for the Whiteshell Laboratories site. The Environmental Assessment Follow-up Program for the Project will include sufficient information on the type, quantity and quality of information required to reliably verify effects predicted by the environmental assessment and confirm the effectiveness of mitigations. If the Environmental Assessment Follow-up Program identifies that adverse environmental effects are greater than predicted, then Canadian Nuclear Laboratories will evaluate the need for revised mitigation actions and management practices to manage effects, with engagement with the public for openness and transparency. Where the need for revised mitigations is identified, they will be developed and implemented. Any proposals on modifications to the monitoring program will be communicated to the Canadian Nuclear Safety Commission.* ***Environmental Monitoring*** *Members of the public requested information on how the in situ design incorporates ongoing environmental monitoring. Canadian Nuclear Laboratories explained that the Environmental Assessment Follow-up Program developed for the Project will be integrated with the existing Environmental Assessment Follow-up Program for the Whiteshell Laboratories site. The Program serves to evaluate the risk to relevant human and non-human biota receptors resulting from exposure to contaminants and stressors related to the Whiteshell Laboratories site and its activities, and recommends further monitoring (the Effluent Monitoring Verification Program, Groundwater Monitoring Program, and the Environmental Monitoring Program) or assessment as needed based on the results, to clarify risks or reduce uncertainties identified in the recommended assessment. The Environmental Assessment Follow-up Program for the Project will include sufficient information on the type, quantity and quality of information required to reliably verify effects predicted by the environmental assessment and confirm the effectiveness of mitigations. Wherever possible, existing programs will be adapted to meet the objectives of the Environmental Assessment Follow-Up Program for the Project.* *Canadian Nuclear Laboratories explained that if the environmental assessment produces a positive decision on the Project, Canadian Nuclear Laboratories will work with Canadian Nuclear Safety Commission to enhance and finalize the Environmental Assessment Follow-up Program for the Project and will also engage local municipal governments and other regulator agencies.* *Interest was also expressed in the depth of monitoring wells. Depths and location of monitoring wells was explained and talked about in public presentations. Canadian Nuclear Laboratories has committed to adding additional ground monitoring well(s) between the Whiteshell Reactor 1 and the Winnipeg River as requested by the Red River Métis.* ***Future Land Use and Economic Opportunity*** *Members of the public expressed concern with the Project because it would limit the types of businesses and industries that could use the Whiteshell Laboratories site for future operations and therefore reduce the number of economic development opportunities available to them. This is a major concern*

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						for local communities who have considered the operation of the Whiteshell Laboratories site as an important economic contributor in the region, as expressed through the desire to recruit a new industry to the site. *Canadian Nuclear Laboratories is currently working with the communities and rural municipalities in the local area by supporting the activities of the Community Regeneration Partnership. The goal of the Whiteshell Laboratories Community Regeneration Partnership is to develop a socio-economic plan for the region. Canadian Nuclear Laboratories supported drafting of the regional socio-economic plan through the provision of in-kind resources and services. The public expressed hope that activities through the Community Regeneration Partnership would replace the employment lost at the Whiteshell Laboratories site with stable, high quality employment in the region. Although uncertainty remains about the timing and nature of a new industry being attracted to the site, there has already been interest expressed to develop the site for alternative uses. Canadian Nuclear Laboratories will continue to support/facilitate these discussions and potential opportunities moving forward through ongoing engagement, relationship-building, partnerships and collaboration with local communities and Indigenous nations.* *Future uses and zoning for the Whiteshell Laboratories site have not been determined. Although a small proportion of the Whiteshell Laboratories site will have restrictions on use because of the Project, it is still anticipated that the majority of the site will be safe and appropriate for unrestricted use, and that future designations will seek to maximize the amount of land available for other uses. Canadian Nuclear Laboratories will share information regarding future uses and access to the Whiteshell Laboratories site with the Community Regeneration Partnership as it becomes available. Canadian Nuclear Laboratories will also support robust communication of environmental monitoring results to confirm the safety of the Whiteshell Laboratories site and help address concerns and mitigate concerns about the site's suitability for future uses. These commitments have been included in Section 6.9 Socio-economic Environment."* **References:** *CNSC 2016. Generic Guidelines for the Preparation of an Environmental Impact Statement. May 2016.* *Golder 2022. Environmental Impact Statement for the In Situ Decommissioning of WR-1 at the Whiteshell Laboratories - Executive Summary. WLDP-26000-ENA-002. Revision 4. December 2022.*
11.	CNSC	C. Cianci	EIS - 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 *Generic EIS Guidelines*, 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 Environmental Impact Statement (EIS) Executive Summary (Golder 2022) was revised to provide more detail on the project's proposed follow-up and monitoring program so the reader can learn and understand it as required by the CNSC's Generic EIS Guidelines (CNSC 2016). **Change to EIS Executive Summary:** A section on Monitoring and Follow-up Programs was added to the EIS Executive Summary (Golder 2022) that includes the following information: *"Canadian Nuclear Laboratories will implement an Environmental Assessment Follow-up Program for the Project that will be integrated with the existing Environmental Assessment Follow-up Program for the Whiteshell Laboratories site (being implemented under Licence No. NRTEDL-W5-8.00/2024). The purpose of the Environmental Assessment Follow-up Program for the Project is to verify the accuracy of environmental effects and determine the effectiveness of mitigation measures that have been implemented. The Environmental Assessment Follow-up Program for the Project will include sufficient information on the type, quantity and quality of information required to reliably verify effects predicted by the environmental assessment and confirm the effectiveness of mitigations. Wherever possible, existing programs (Effluent Monitoring Verification Program, the Groundwater Monitoring Program, and the Environmental Monitoring Program) will be adapted to meet the objectives of monitoring the predictions made in the environmental assessment for the Project.* *The primary pathway for release of contamination from the Whiteshell Reactor Disposal Facility is by groundwater that has infiltrated into the sub-surface structure, picked up contamination and then carried it out of the sub-surface structure to the surrounding environment. As such groundwater monitoring during the post-closure phase is the main component of the Environmental Assessment Follow-up Program for the Project and adaptive management. A post-closure monitoring program will be developed as part of the Environmental Assessment Follow-up Program for the Project that will provide the sampling and analysis objectives and procedures for sampling and testing the groundwater quality in the vicinity of the Whiteshell Reactor Disposal Facility during the institutional control period. Data generated by the groundwater monitoring program will be evaluated on an ongoing basis within an adaptive management framework. If the Environmental Assessment Follow-up Program for the Project identifies that environmental effects are greater than predicted, then Canadian Nuclear Laboratories will evaluate whether they result in changes to the conclusions in this Environmental Impact Statement that describes the Project and assesses the likely effects of the Project on the environment. If changes are confirmed, then Canadian Nuclear Laboratories will evaluate the need for revised mitigation actions and management practices to manage effects. Where the need for revised mitigation is identified, it will be developed and implemented. Conversely, cessation of a monitoring activity might be appropriate once it has been shown that an effect has stabilized,*

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						or has been reduced to a level where it is no longer considered significant with respect to regulatory requirements or community concerns. Any proposals on modifications to the monitoring program will be communicated to the Canadian Nuclear Safety Commission. *In addition to incorporating the monitoring actions of this Environmental Impact Statement into the Environmental Assessment Follow-up Program for the Project, Canadian Nuclear Laboratories is committed to reviewing and adapting the existing Environmental Assessment Follow-up Program for the Whiteshell Laboratories site to incorporate Traditional Knowledge that has been collected through the environmental assessment for the Project, as well as ongoing engagement and relationship building, in order to provide each community with the information that is relevant and important to them.* *Canadian Nuclear Laboratories is committed to achieving continual improvement in environmental performance through its management systems. Canadian Nuclear Laboratories manages environmental-related matters through an existing Environmental Protection Program that includes compliance and improvement systems to evaluate areas for improvement or trending. The Environmental Protection Program will continue to be implemented during the Project's closure and post-closure phases, and will be updated, as needed, as part of an annual management review process.* *Recognizing that the First Nations and the Red River Métis are stewards of the land who have a great interest in participating in monitoring at Whiteshell Laboratories site, Canadian Nuclear Laboratories has committed to engaging with each Nation on their specific interest and concerns regarding monitoring for the Project and the existing Whiteshell Laboratories Site Environmental Assessment Follow-up Program. Some of the key elements of the initiative may include expansion and evolution of the monitoring program at Whiteshell Laboratories, through incorporation of feedback, recommendations, Traditional Knowledge, capacity development, including training in environmental monitoring, and opportunities for monitors from each First Nation and the Red River Métis to collect samples on site and in the surrounding area. The goal of the initiative is to help address concerns regarding protection of the environment, health of people, confidence in the health of country foods and to reduce fear and stigma associated with the Project. It is also an opportunity to involve youth and Elders, collaborate on ecological restoration, and address Nation-specific interests and concerns related to monitoring at the site. Each Nation may have different preferences for how to participate in the initiative and Canadian Nuclear Laboratories commits to development of a program that is flexible to the needs of each Nation.* *Canadian Nuclear Laboratories currently provides updates on environmental monitoring activities to all First Nations and the Red River Métis and invites them to observe and participate in the monitoring activities. Further, Canadian Nuclear Laboratories shares all the results of their annual environmental monitoring reports with all the communities and is in the process of developing a user-friendly document to share with Indigenous Nations. Canadian Nuclear Laboratories will continually evaluate both the process and the outcome of the ongoing engagement and communication activities, to address and manage issues as they arise."* **References:** *CNSC 2016. Generic Guidelines for the Preparation of an Environmental Impact Statement. May 2016.* *Golder 2022. Environmental Impact Statement for the In Situ Decommissioning of WR-1 at the Whiteshell Laboratories - Executive Summary. WLDP-26000-ENA-002. Revision 4. December 2022.*
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					1.0 Introduction	
12.	ECCC		EIS - Section 1.2 Project Overview	1-10, last paragraph	**Comment:** This section of the EIS states: "… total dismantling of the below-grade reactor systems exposes workers to many radiological and standard industrial hazards that are avoided through the in situ decommissioning (ISD) approach. Some examples include: the reactor core contains high radiation dose rates that pose a significant hazard to workers during dismantling activities; the reactor facility and systems contain large quantities of asbestos that would have to be abated." From the first bullet above, the statement implies that the project will dispose radioactive waste that have high radiation dose. CNL did not list these radioactive materials or their half-life. These may become a	**Resolved As:** Yes, the project will dispose of radioactive waste with high radiation dose rates. The radiological and non-radiological contaminants of potential concern to be disposed of are listed in Section 6.7.1.7.2 of the Environmental Impact Statement (EIS; Golder 2022). The radiological and non-radiological inventory to be disposed of is provided in Table 4-2 of the Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2021a), with half-lives provided in Table 4-1 of the GWFSTMR (Golder 2021a). The proposed in situ disposal (ISD) method is adequate as it will contain and isolate the waste. Whiteshell Reactor 1 (WR-1) and its systems will be permanently encased below grade in grout, a reinforced concrete cap and a multi-layered engineered cover (earthen cover) will be constructed on top of the grouted area, and a 100 year minimum institutional control period will be implemented restricting access (CNL 2021). Environmental pathways and exposure modelling was performed and found that doses to the public are predicted to be a fraction of the public dose limit of 1 mSv/y and to not exceed CNL's dose constraint of 0.25 mSv/y; the results of the modelling are documented in the Decommissioning Safety Assessment Report (DSAR; Golder 2021b), with a summary of predicted doses to the public provided in Table 8.2.4-1 of the DSAR (Golder 2021b). Doses to non-human biota are predicted to be well below the radiation benchmarks of 9.6 mGy/d for aquatic biota and 2.4 mGy/d for terrestrial and riparian biota (UNSCEAR 2011; Golder 2021b), with a summary of predicted doses to non-human biota provided in Table 8.4.4-1 of the DSAR (Golder 2021b).

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					concern because they are proposed to be buried in shallow depths. **Expectation to Address Comment:** Explain how this proposed in situ method is adequate by disposing radioactive waste with high radiation levels in shallow ground (just below grade) which is used for the proposed low and intermediate level radioactive waste storage.	The environmental pathways and exposure modelling also considers a scenario in which an exploration well is drilled into the disposal facility and into the ISD waste after the 100 year minimum institutional control period ends (Golder 2021b). It is assumed that contaminated waste would be brought to the surface during drilling and becomes mixed with clean material during excavation. Conservatively, this waste would be assumed to be left on surface as well as transported for testing. The conservative assumption that the well is not abandoned in accordance with best practices and standards is also made. The doses to a drill crew member and trespassers are predicted to be less than 1 mSv/y (Golder 2021b), with a summary of predicted doses provided in Table 8.6.1-4 of the DSAR (Golder 2021b). More detail on the environmental pathways and exposure modelling, and the adequacy of the ISD method is provided in the DSAR (Golder 2021b) and the Environmental Risk Assessment (ERA; EcoMetrix 2021). **Change to EIS:** Section 1.2 of the EIS (Golder 2022) was revised to remove the following text as it is outside of scope of a Project Overview section as per the CNSC's Generic EIS Guidelines (CNSC 2016) and the justification that ISD is a viable decommissioning strategy for WR-1, in accordance with CNSC REGDOC-2.11.2 (CNSC 2021), is provided in Section 6.3 of the WR-1 Detailed Decommissioning Plan (CNL 2021): *"WR-1 is well suited for this decommissioning approach because the small reactor core contains the vast majority of remaining activity and it can be isolated below-grade in a permanent, safe way that provides protection of the environment and people. On the contrary, total dismantling of the below-grade reactor systems exposes workers to many radiological and standard industrial hazards that are avoided through the ISD approach. Some examples include:* • *the reactor core contains high radiation dose rates that pose a significant hazard to workers during dismantling activities;* • *the reactor facility and systems contain large quantities of asbestos that would have to be abated;* • *there is limited access to the subsurface systems making hoisting and rigging operations for material retrieval to the surface very complex, resulting in significant industrial hazards; and* • *work in confined spaces, at heights and in extremely congested areas all pose significant risks during total dismantlement of WR-1."* **References:** *CNL 2021. Whiteshell Laboratories Detailed Decommissioning Plan: Volume 6 – Whiteshell Reactor #1: Building 100. WLDP-26400-DDP-001. Revision 5. October 2021.* *CNSC 2016. Generic Guidelines for the Preparation of an Environmental Impact Statement. May 2016.* *CNSC 2021. REGDOC-2.11.2 - Waste Management: Decommissioning. January 2021.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2021a. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2021b. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *UNSCEAR 2011. Sources and Effects of Ionizing Radiation. Volume II: Effects. April 2011.*
13.	CNSC	C. Cianci	EIS - Section 1.3 Project Location	1-11 1-12	**Comment:** As required by CNSC's *Generic EIS Guidelines* (p.8-9), the project location section should include a description of local and Aboriginal communities, and the traditional Aboriginal territories, treaty lands, and Indian reserves lands and Métis harvesting regions and/or settlements that are in the vicinity of the project. The locations of several First Nations communities are not described and no traditional Aboriginal territories are	**Incorporated:** Section 1.3 of the Environmental Impact Statement (EIS; Golder 2022) was revised to include the locations of all local First Nations and the Red River Métis, and identify traditional Indigenous territories. Section 1.3 provides a high level overview of the project location; the discipline sections provide more detailed descriptions. Section 6.8.1.5.2.2 provides detailed information on the First Nations, the Red River Métis, and Indigenous territories. **Change to EIS:** Section 1.3 of the EIS (Golder 2022) was revised as follows to include the locations of all local First Nations and the Red River Métis, and identify traditional Indigenous territories:

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					identified. **Expectation to Address Comment:** Please revise this section to include this information.	*"Historic treaties called the Numbered Treaties, which were agreements made between the Government of Canada and Indigenous Nations, cover much of the land in the region and set out continuing treaty rights and benefits. The majority of the WL [Whiteshell Laboratories] site is located on Treaty 3 land. A small portion of the WL site that extends west of the Winnipeg River falls on Treaty 1 land. Communities that are signatories to these Treaties and Treaty 5 have historical and current land use ties with the area. Anishinaabe and Ojibway communities with historical traditional territories in the area, and that have expressed some level of interest in the Project include the Sagkeeng and Brokenhead First Nations in Treaty 1; Black River and Hollow Water First Nations in Treaty 5; and Wabaseemoong Independent Nations in Treaty 3 (TRCM 2013; Ontario Ministry of Indigenous Affairs 2017). There are no reserve lands located within the WL site.* *Indigenous Nations in vicinity to the WL site are described below and additional detail can be found in Section 6.8.1.5.2.2 Traditional Land and Resource Use by Indigenous Peoples.* • ***Sagkeeng First Nation**, an Anishinaabe community, is the closest Indigenous community to the WL site. Sagkeeng reserve land is located 52 km directly downriver from the WL site and includes land parcels on either side of the Winnipeg River.* • ***Brokenhead Ojibway Nation** is located near the southern basin of Lake Winnipeg, occupies three reserves: 44 km northwest, 55 km northwest and 73 km southwest of the WL site. Brokenhead is primarily surrounded by the Rural Municipality of St. Clements.* • ***Black River First Nation** is an Ojibway community located along the eastern shoreline of Lake Winnipeg at the confluence of the Black and O'Hanly Rivers. The Black River reserve land is 75 km north of the WL site.* • ***Hollow Water First Nation**, an Anishinaabe community, is located along the eastern shore of Lake Winnipeg approximately 113 km north of the WL site.* • ***Wabaseemoong Independent Nations** is composed of four communities: Whitedog First Nation, serving as the main reserve parcel; One Man Lake; Swan Lake; and Agency 30 (shared with 12 other First Nations). Occupy four reserves: 80 km east, 85 km east, 95 km east and 140 km southeast of the WL site.* *The Project is also located in the homeland of the Red River Métis, as represented by the Manitoba Métis Federation. Statistics Canada identified Métis residents in many communities in proximity to the Project. Métis communities that historically emerged in the region include:* • ***Bas de la Rivière –** Situated on both shores of the Winnipeg River and established in 1732, the community served as a wintering post and trading depot. Fishing and agriculture were particularly important in the area. Originally a North West Company outpost, following amalgamation with the Hudson's Bay Company in 1821, the post lost its importance as a provisioning and transportation hub. It became known as Fort Alexander and then eventually Pine Falls.* • ***Berens River –** An initial trading post was built at the mouth of the river in 1814 and was a thriving Métis community until fishing was banned on Lake Winnipeg in 1970 as a result of mercury contamination.* • ***Fort Alexander –** Built by the Hudson's Bay Company on the Winnipeg River to counter the North West Company's Fort Bas de la Rivière, this post also had ties to the Métis in the area (Barkwell 2016).* *The Indigenous peoples within the area have resided at or near their respective reserve parcels since time immemorial (Sagkeeng Anicinabe n.d.). In the nineteenth century, Indigenous peoples living near Fort Alexander, present day Sagkeeng, were nomadic and would make frequent trips north to the Hudson's Bay post to trade and obtain food supplies (Sagkeeng First Nation 2000). The Winnipeg River has historically provided a network of travel routes for local communities (Petch 2005). Present day traditional land and resource use activities, including trapping and wild rice harvesting, continue to supplement the diet and income of local Indigenous peoples in the region. Wild rice harvesting was originally for domestic purposes, but eventually became a commercial economy (Manitoba Hydro and Golder Associates Ltd. 2012). The following provides a summary of traditional land and resource use activities for each Indigenous Nations, with additional detail found in Section 6.8.1.5.2.2 Traditional Land and Resource Use by Indigenous Peoples.* *Sagkeeng's reserve is located where the Winnipeg River empties into Lake Winnipeg and their traditional territory encompasses land within Treaty 1 along with land north and west of the Winnipeg River, falling within four Treaty areas (Sagkeeng First Nation 2015): Treaty 1 (1871), Treaty 2 (1871), Treaty 3 (1873) and Treaty 5 (1875). The land and waterways have historically been an important part of the economic well-being and transportation system for the Sagkeeng. In early spring and late fall, fishing was preferred near Catfish Creek and at Point au Mitasse on Lake Winnipeg (Sagkeeng First Nation 2000). Travel in the fall was typically to the Lac du Bonnet area, where the Pinawa Channel meets the Winnipeg River, to harvest wild rice (Sagkeeng First Nation 2000). Family units had preferred hunting areas which included areas close to Fort Alexander and spanned north to Black River First Nation and over 200 km southeast to Dalles and Big Island First Nations in Ontario (Sagkeeng First Nation 2000). Previous studies have documented that Sagkeeng participates in traditional activities of harvesting wild rice, subsistence fishing (sturgeon), gathering plants and medicines and berry picking (AECL 2001). Sagkeeng currently uses the Winnipeg River as its source for water supply to the community (J.R. Cousin Consultants Ltd. n.d.).*

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						Brokenhead Ojibway Nation's resource harvesters currently use traditional areas north of the Manigotagan River and as far south as the Rural Municipality of Brokenhead (Brokenhead Ojibway Nation 2015). This traditional use area spans Treaties 1, 3 and 5 (TRCM 2013). Brokenhead Ojibway Nation resource harvesting activities occur within wildlife management areas, parks and reserve boundaries. Resource harvesting sites within this area include locations along the Winnipeg and Brokenhead Rivers (Brokenhead Ojibway Nation 2015). Current resource harvesting activities include, but are not limited to, moose hunting and trapping for muskrat and beaver (Brokenhead Ojibway Nation 2015). *The Black River First Nation's traditional lands are primarily located south of the Manigotagan River, west of the Manitoba-Ontario border, and north of the Winnipeg River in Treaties 3 and 5 (Handkamer 2016; TRCM 2013). Resource use activities include hunting, fish, trapping, wild rice harvesting and plant collection both far afield and near the community (Black River First Nation 2015). Members of Black River First Nation have historically used the Black and Winnipeg rivers most frequently for travel (Handkamer 2016). The Black River served as an access route for resource harvesting in the east, specifically wild rice harvesting and hunting near Nopiming Provincial Park (Handkamer 2016).* *Hollow Water First Nation's traditional lands encompass an area south of the Bloodvein River, west of the Manitoba-Ontario border, and north of the Manigotagan River in Treaties 3 and 5 (TRCM 2013). Historically, Hollow Water First Nation's primary food source and economy was based on wild rice harvesting on the Wanipigow and Rice rivers along with Clangula Lake and bays on Lake Winnipeg (Thompson and Bushie 2015). The woodlands were used for hunting and trapping in the winter, fishing along the shores of Lake Winnipeg was popular in the spring, and wild rice was harvested on the shallow rivers and lakes in the fall (Reder 2013). Hollow Water First Nation community members currently maintain the historical tradition of gathering on Black Island to harvest blueberries. Economic activities for the community currently include fishing, hunting, trapping and wild rice harvesting. Fishing is considered the most important of these activities as a majority of community residents are directly employed in the Lake Winnipeg fishery (Manitoba Eco-Network 2010).* *Wabaseemoong Independent Nations' traditional land use area is located in Treaty 3 and adjacent to the Manitoba/Ontario border, north of the Town of Kenora (WIN n.d.). The Wabaseemoong Independent Nations have historically used and currently utilize the English and Winnipeg River systems for traditional land and resource use activities (Energy East Project 2016). Water routes from these two systems have provided resource use access to hundreds of kilometres in all directions (WIN n.d.). Previous discussions with Wabaseemoong Independent Nations, have confirmed interest in the area where traditional land and resource use activities regularly occur (AECL 2001).* *The Red River Métis is widely dispersed throughout the province and highly mobile in regard to geographic extent of traditional resource use (Barkwell 2016). In September 2012, based on presently available historical research, the Manitoba Government implemented a harvesting agreement with the Manitoba Métis Federation that recognizes that the Red River Métis possess collectively-held Métis Harvesting Rights, within the meaning of Section 35 of the Constitution Act, 1982, throughout a territory of approximately 750,000 km^2 in size (R v. Powley 2003; Provincial Court of Manitoba 2008; Government of Manitoba et al. 2012). Recognized Red River Métis Natural Resource Harvesting Areas 36 and Game Hunting Area 26, presented in Figure 6.8.2-1, are situated in the vicinity of the WL site (Manitoba Sustainable Development n.d.). Red River Métis resource harvesters may harvest throughout these areas on "all unoccupied Crown lands in Manitoba and occupied provincial Crown lands, including provincial parks, wherever First Nation Members are allowed to harvest; and on any privately owned lands in Manitoba on which that Red River Métis Harvester has been given permission by the owner or occupant, or Indian Reserve lands with permission of Band Council" (MMF 2013).* *The Red River Métis traditional land and resource use in the region generally consists of hunting, trapping and fishing, as well as harvesting of plants. Plant harvesting has been undertaken for food, crafts and medicines and has included birch, cedar, dandelion, milkweed, berries, wood products, roots, nuts and mushrooms. These activities were typically undertaken in the summer months and are known to occur in areas southwest of the Project. During the public and Indigenous engagement process, the Manitoba Métis Federation noted that its citizens' place of residence did not always correlate with their resource use areas, as the population is mobile and land use tends to be associated with where an individual learned to harvest. As such, Manitoba Métis Federation citizens often travel to other locations across the province when undertaking harvesting activities, which reflects the location in which they learned (e.g., where their grandfather taught them).* *With respect to hunting, the Red River Métis are known to have hunted and currently hunt deer across much of southern Manitoba, which has been documented south of the WL site and east to the Ontario border. Other game known to be harvested include grouse, partridge, ptarmigan, waterfowl and rabbit. The Red River Métis trapping activities, most of which are undertaken for commercial purposes, have focused on beaver, coyote, fisher, fox, lynx, marten, mink, muskrat, otter, rabbit, raccoon, squirrel, weasel, wolf and wolverine. Moose, white-tailed deer and elk are also important game species for the Red River Métis resource harvesters (Manitoba Hydro 2016)."* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project – Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *Barkwell 2016. The Métis Homeland: Its Settlements and Communities. 2016.* *Black River First Nation 2015. When Our Land is Gone, Where Will We Be? 2015.*

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						Brokenhead Ojibway Nation 2015. Brokenhead Ojibway Nation: Community Newsletter - Spring 2015. 2015. *Energy East Project 2016. Environmental and Socio-Economic Assessment: Volume 25, Binder 1: Regional Review of Traditional Land and Resource Use Information and Mitigation. May 2016.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Government of Manitoba et al. 2012. Province Partners with Manitoba Métis Federation to Uphold Métis Harvesting Rights, Natural Resource Conservation. September 2012.* *Handkamer 2016. Rooted in Water: Re-Connecting the Community of Black River First Nation. 2016.* *J.R. Cousin Consultants Ltd. n.d. Sagkeeng First Nation.* *Manitoba Eco-Network 2010. Hollow Water Reserve. 2010.* *Manitoba Hydro 2016. Manitoba-Minnesota Transmission Project: Summary of the Environmental Impact Statement. January 2016.* *Manitoba Hydro and Golder Associates Ltd. 2012. Lake Winnipeg East System Improvement (LWESI) Transmission Project: Socio-economic and Land Use Technical Report. December 2012.* *Manitoba Sustainable Development n.d. Recognized Areas for Métis Natural Resource Harvesting.* *MMF (Manitoba Métis Federation) 2013. Métis Laws of the Harvest: Guide to Métis Hunting, Fishing, Trapping and Gathering. Revision 3. 2013.* *Ontario Ministry of Indigenous Affairs 2017. First Nations and Treaties. 2017.* *Petch 2005. Cited in Northern Lights Heritage Services Inc. 2012. Lake Winnipeg East System Improvement (LWESI) Transmission Project: Heritage Resources Technical Report.* *Provincial Court of Manitoba 2008. R. v. Goodon, 2008 MBPC 59. December 2008.* *Reder 2013. Protect Hollow Water First Nation Territory. 2013.* *R v. Powley 2003. Supreme Court Judgments. September 2003.* *Sagkeeng Anicinabe n.d. Sagkeeng Anicinabe.* *Sagkeeng First Nation 2000. Sagkeeng First Nation: Treaty Land Entitlement: Statement of Historical Fact. May 2000.* *Sagkeeng First Nation 2015. Sagkeeng O-Pimatiziiwin 2: Traditional Knowledge Study: Manitoba-Minnesota Transmission Line Project. June 2015.* *Thompson and Bushie 2015. Sinking under the Negative Impacts of Manitoba Hydro. April 2015.* *TRCM (Treaty Relations Commission of Manitoba) 2013. We Are All Treaty People. 2013.* *WIN (Wabaseemoong Independent Nations) n.d. Wabaseemoong Independent Nations Traditional Land Use Area.*
14.	CNSC	C. Cianci	EIS - Section 1.3 Project Location	1-12	**Comment:** The paragraph which describes other land uses in the regional area does not consider subsistence fishing carried out by Indigenous communities in the vicinity of the Whiteshell Laboratories (WL) site. **Expectation to Address Comment:** Please revise accordingly.	**Incorporated:** Section 1.3 of the Environmental Impact Statement (EIS; Golder 2022) was revised to discuss fishing carried out by Indigenous Nations in the vicinity of the Whiteshell Laboratories (WL) site. **Change to EIS:** Section 1.3 of the EIS (Golder 2022) was revised as follows to include discussion on fishing carried out by Indigenous Nations in the vicinity of the WL site: *"The Indigenous peoples within the area have resided at or near their respective reserve parcels since time immemorial (Sagkeeng Anicinabe n.d.). In the nineteenth century, Indigenous peoples living near Fort Alexander, present day Sagkeeng, were nomadic and would make frequent trips north to the Hudson's Bay post to trade and obtain food supplies (Sagkeeng First Nation 2000). The Winnipeg River has historically provided a network of travel routes for local communities (Petch 2005). Present day traditional land and resource use activities, including trapping and wild rice harvesting, continue to supplement the diet and income of local Indigenous peoples in the region. Wild rice harvesting was originally for domestic purposes, but eventually became a commercial economy (Manitoba Hydro and Golder Associates Ltd. 2012). The following provides a summary of traditional land and resource use activities for each Indigenous Nations, with additional detail found in Section 6.8.1.5.2.2 Traditional Land and Resource Use by Indigenous Peoples.*

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						Sagkeeng's reserve is located where the Winnipeg River empties into Lake Winnipeg and their traditional territory encompasses land within Treaty 1 along with land north and west of the Winnipeg River, falling within four Treaty areas (Sagkeeng First Nation 2015): Treaty 1 (1871), Treaty 2 (1871), Treaty 3 (1873) and Treaty 5 (1875). The land and waterways have historically been an important part of the economic well-being and transportation system for the Sagkeeng. In early spring and late fall, fishing was preferred near Catfish Creek and at Point au Mitasse on Lake Winnipeg (Sagkeeng First Nation 2000). Travel in the fall was typically to the Lac du Bonnet area, where the Pinawa Channel meets the Winnipeg River, to harvest wild rice (Sagkeeng First Nation 2000). Family units had preferred hunting areas which included areas close to Fort Alexander and spanned north to Black River First Nation and over 200 km southeast to Dalles and Big Island First Nations in Ontario (Sagkeeng First Nation 2000). Previous studies have documented that Sagkeeng participates in traditional activities of harvesting wild rice, subsistence fishing (sturgeon), gathering plants and medicines and berry picking (AECL 2001). Sagkeeng currently uses the Winnipeg River as its source for water supply to the community (J.R. Cousin Consultants Ltd. n.d.). *Brokenhead Ojibway Nation's resource harvesters currently use traditional areas north of the Manigotagan River and as far south as the Rural Municipality of Brokenhead (Brokenhead Ojibway Nation 2015). This traditional use area spans Treaties 1, 3 and 5 (TRCM 2013). Brokenhead Ojibway Nation resource harvesting activities occur within wildlife management areas, parks and reserve boundaries. Resource harvesting sites within this area include locations along the Winnipeg and Brokenhead Rivers (Brokenhead Ojibway Nation 2015). Current resource harvesting activities include, but are not limited to, moose hunting and trapping for muskrat and beaver (Brokenhead Ojibway Nation 2015).* *The Black River First Nation's traditional lands are primarily located south of the Manigotagan River, west of the Manitoba-Ontario border, and north of the Winnipeg River in Treaties 3 and 5 (Handkamer 2016; TRCM 2013). Resource use activities include hunting, fish, trapping, wild rice harvesting and plant collection both far afield and near the community (Black River First Nation 2015). Members of Black River First Nation have historically used the Black and Winnipeg rivers most frequently for travel (Handkamer 2016). The Black River served as an access route for resource harvesting in the east, specifically wild rice harvesting and hunting near Nopiming Provincial Park (Handkamer 2016).* *Hollow Water First Nation's traditional lands encompass an area south of the Bloodvein River, west of the Manitoba-Ontario border, and north of the Manigotagan River in Treaties 3 and 5 (TRCM 2013). Historically, Hollow Water First Nation's primary food source and economy was based on wild rice harvesting on the Wanipigow and Rice rivers along with Clangula Lake and bays on Lake Winnipeg (Thompson and Bushie 2015). The woodlands were used for hunting and trapping in the winter, fishing along the shores of Lake Winnipeg was popular in the spring, and wild rice was harvested on the shallow rivers and lakes in the fall (Reder 2013). Hollow Water First Nation community members currently maintain the historical tradition of gathering on Black Island to harvest blueberries. Economic activities for the community currently include fishing, hunting, trapping and wild rice harvesting. Fishing is considered the most important of these activities as a majority of community residents are directly employed in the Lake Winnipeg fishery (Manitoba Eco-Network 2010).* *Wabaseemoong Independent Nations' traditional land use area is located in Treaty 3 and adjacent to the Manitoba/Ontario border, north of the Town of Kenora (WIN n.d.). The Wabaseemoong Independent Nations have historically used and currently utilize the English and Winnipeg River systems for traditional land and resource use activities (Energy East Project 2016). Water routes from these two systems have provided resource use access to hundreds of kilometres in all directions (WIN n.d.). Previous discussions with Wabaseemoong Independent Nations, have confirmed interest in the area where traditional land and resource use activities regularly occur (AECL 2001).* *The Red River Métis is widely dispersed throughout the province and highly mobile in regard to geographic extent of traditional resource use (Barkwell 2016). In September 2012, based on presently available historical research, the Manitoba Government implemented a harvesting agreement with the Manitoba Métis Federation that recognizes that the Red River Métis possess collectively-held Métis Harvesting Rights, within the meaning of Section 35 of the Constitution Act, 1982, throughout a territory of approximately 750,000 km^2 in size (R v. Powley 2003; Provincial Court of Manitoba 2008; Government of Manitoba et al. 2012). Recognized Red River Métis Natural Resource Harvesting Areas 36 and Game Hunting Area 26, presented in Figure 6.8.2-1, are situated in the vicinity of the WL site (Manitoba Sustainable Development n.d.). Red River Métis resource harvesters may harvest throughout these areas on "all unoccupied Crown lands in Manitoba and occupied provincial Crown lands, including provincial parks, wherever First Nation Members are allowed to harvest; and on any privately owned lands in Manitoba on which that Red River Métis Harvester has been given permission by the owner or occupant, or Indian Reserve lands with permission of Band Council" (MMF 2013).* *The Red River Métis traditional land and resource use in the region generally consists of hunting, trapping and fishing, as well as harvesting of plants. Plant harvesting has been undertaken for food, crafts and medicines and has included birch, cedar, dandelion, milkweed, berries, wood products, roots, nuts and mushrooms. These activities were typically undertaken in the summer months and are known to occur in areas southwest of the Project. During the public and Indigenous engagement process, the Manitoba Métis Federation noted that its citizens' place of residence did not always correlate with their resource use areas, as the population is mobile and land use tends to be associated with where an individual learned to harvest. As such, Manitoba Métis Federation citizens often travel to other locations across the province when undertaking harvesting activities, which reflects the location in which they learned (e.g., where their grandfather taught them).*

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						With respect to hunting, the Red River Métis are known to have hunted and currently hunt deer across much of southern Manitoba, which has been documented south of the WL site and east to the Ontario border. Other game known to be harvested include grouse, partridge, ptarmigan, waterfowl and rabbit. The Red River Métis trapping activities, most of which are undertaken for commercial purposes, have focused on beaver, coyote, fisher, fox, lynx, marten, mink, muskrat, otter, rabbit, raccoon, squirrel, weasel, wolf and wolverine. Moose, white-tailed deer and elk are also important game species for the Red River Métis resource harvesters (Manitoba Hydro 2016)." **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project – Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *Barkwell 2016. The Métis Homeland: Its Settlements and Communities. 2016.* *Black River First Nation 2015. When Our Land is Gone, Where Will We Be? 2015.* *Brokenhead Ojibway Nation 2015. Brokenhead Ojibway Nation: Community Newsletter - Spring 2015. 2015.* *Energy East Project 2016. Environmental and Socio-Economic Assessment: Volume 25, Binder 1: Regional Review of Traditional Land and Resource Use Information and Mitigation. May 2016.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Government of Manitoba et al. 2012. Province Partners with Manitoba Métis Federation to Uphold Métis Harvesting Rights, Natural Resource Conservation. September 2012.* *Handkamer 2016. Rooted in Water: Re-Connecting the Community of Black River First Nation. 2016.* *J.R. Cousin Consultants Ltd. n.d. Sagkeeng First Nation.* *Manitoba Eco-Network 2010. Hollow Water Reserve. 2010.* *Manitoba Hydro 2016. Manitoba-Minnesota Transmission Project: Summary of the Environmental Impact Statement. January 2016.* *Manitoba Hydro and Golder Associates Ltd. 2012. Lake Winnipeg East System Improvement (LWESI) Transmission Project: Socio-economic and Land Use Technical Report. December 2012.* *Manitoba Sustainable Development n.d. Recognized Areas for Métis Natural Resource Harvesting.* *MMF (Manitoba Métis Federation) 2013. Métis Laws of the Harvest: Guide to Métis Hunting, Fishing, Trapping and Gathering. Revision 3. 2013.* *Petch 2005. Cited in Northern Lights Heritage Services Inc. 2012. Lake Winnipeg East System Improvement (LWESI) Transmission Project: Heritage Resources Technical Report.* *Provincial Court of Manitoba 2008. R. v. Goodon, 2008 MBPC 59. December 2008.* *Reder 2013. Protect Hollow Water First Nation Territory. 2013.* *R v. Powley 2003. Supreme Court Judgments. September 2003.* *Sagkeeng Anicinabe n.d. Sagkeeng Anicinabe.* *Sagkeeng First Nation 2000. Sagkeeng First Nation: Treaty Land Entitlement: Statement of Historical Fact. May 2000.* *Sagkeeng First Nation 2015. Sagkeeng O-Pimatiziiwin 2: Traditional Knowledge Study: Manitoba-Minnesota Transmission Line Project. June 2015.* *Thompson and Bushie 2015. Sinking under the Negative Impacts of Manitoba Hydro. April 2015.* *TRCM (Treaty Relations Commission of Manitoba) 2013. We Are All Treaty People. 2013.* *WIN (Wabaseemoong Independent Nations) n.d. Wabaseemoong Independent Nations Traditional Land Use Area.*
15.	MSD		EIS - Section 1.6.1 Federal Review Process	1-17, 2nd paragraph	**Comment**: With respect to the 2nd bullet which states the following: "Waste generator registration will be maintained through the Manitoba Conservation and Water Stewardship, and in compliance with the Dangerous Goods Handling and	**Incorporated:** The second bullet of Section 1.6.1 of the Environmental Impact Statement (EIS; Golder 2022) was revised to include "Hazardous" in front of "Waste generator registration" and replace "Conservation and Water Stewardship" with "Sustainable Development".

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					Transportation Act" **Expectation to Address Comment:** Please include "Hazardous" in front of "Waste generator registration". Also, please replace "Conservation and Water Stewardship" with "Sustainable Development".	**Change to EIS:** The second bullet of Section 1.6.1 of the EIS (Golder 2022) was revised as follows to reflect the above response: • *"Hazardous waste generator registration will be maintained through Manitoba Sustainable Development (now Manitoba Environment, Climate and Parks), and in compliance with Manitoba's Dangerous Goods Handling and Transportation Act (C.C.S.M. c.D12)."* **References:** *C.C.S.M. c.D12. The Dangerous Goods Handling and Transportation Act. 1987.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
16.	MSD		EIS - Section 1.6.1 Federal Review Process	1-17, 3rd paragraph	**Comment**: This section of the EIS indicates the following: "The Project is located on Federal lands and is regulated by the CNSC, therefore, it is anticipated that provincial permits, licences or other authorizations are not required." Although the project is located on Federal lands, hazardous non-radiological wastes generated during the decommissioning need to be removed and shipped offsite for appropriate disposal. **Expectation to Address Comment:** Revise this statement accordingly and indicate the relevant provincial and municipal authorizations that are required for the management of hazardous non-radiological wastes.	**Incorporated:** Section 1.6.1 of the Environmental Impact Statement (EIS; Golder 2022) was revised to indicate the relevant provincial and municipal authorizations that are required for the management of hazardous non-radiological wastes. **Change to EIS:** Section 1.6.1 of the EIS (Golder 2022) was revised as follows to indicate the relevant provincial and municipal authorizations that are required for the management of hazardous non-radiological wastes: *"The Project is located on federal lands and is regulated by the CNSC. Provincial permits, licences and other authorizations required for the management of hazardous non-radiological wastes will be adhered to. For example, the WL [Whiteshell Laboratories] site is registered with the Manitoba Government as a Waste Generator and is required to abide by The Dangerous Goods Handling and Transportation Act, Continuing Consolidation of the Statutes of Manitoba 1987, c.D12 and the regulations under the Act. This includes the management of hazardous non-radiological waste under the Hazardous Waste Regulation (195/2015)."* **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Hazardous Waste Regulation. 195/2015. November 2015.* *The Dangerous Goods Handling and Transportation Act. C.C.S.M. c.D12. 1987.*
17.	CNSC	C. Cianci	EIS - Section 1.6.1 Federal Review Process	1-17	**Comment:** The following sentence in the EIS is not applicable to a CNSC EA process under CEAA 2012: "Under Section 8 of CEAA, 2012, a Project Description is required to initiate the screening process through which the Canadian Environmental Assessment Agency (the Agency) will determine if a federal environmental assessment is required for all designated projects." Section 8 of CEAA 2012 does not apply to designated projects that are regulated by the CNSC. **Expectation to Address Comment:** Please remove this statement.	**Incorporated:** Section 1.6.1 of the Environmental Impact Statement (EIS; Golder 2022) was revised to remove the quoted text. **Change to EIS:** Section 1.6.1 of the EIS (Golder 2022) was revised as follows to remove the quoted text: *"The federal environmental assessment requirements are detailed within CEAA [Canadian Environmental Assessment Act] 2012. Designated projects are defined under the Regulations Designating Physical Activities for CEAA 2012 and identify the CNSC as the Responsible Authority for projects that are regulated under the NSCA [Nuclear Safety and Control Act]. As such, the CNSC is responsible for the conduct of the environmental assessment and ensuring that the requirements of CEAA 2012 are met. Following submission of the 2016 Project Description document titled Environmental Assessment (and/or Environmental Effects Review), In situ Decommissioning of WR-1 Reactor at the Whiteshell Laboratories Site (CNL 2016), the CNSC issued a Record of Decision in the Matter of Canadian Nuclear Laboratories (CNSC 2017) and determined that the Project requires a federal environmental assessment pursuant to CEAA 2012."* **References:** *CNL 2016. Environmental Assessment (and/or Environmental Effects Review). WLDP-03700-ENA-001. Revision 0. April 2016.* *CNSC 2017. Decision on the Scope of Environmental Assessments for Three Proposed Projects at Existing Canadian Nuclear Laboratories' Facilities. March 2017.*

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						Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.
18.	CNSC	C. Cianci	EIS - Section 1.6.1 Federal Review Process	1-17	**Comment:** Please update this section to indicate the list of federal authorities that are providing their expertise during the EA process for this project, which are as follows: Environment and Climate Change Canada, Health Canada and Natural Resources Canada. In addition, please update this section to indicate that the province of Manitoba is participating as a member of the federal and provincial review team during the EA process for this project. **Expectation to Address Comment:** Please revise accordingly.	**Incorporated:** Section 1.6.1 of the Environmental Impact Statement (EIS; Golder 2022) was revised to indicate the list of federal authorities that are providing their expertise during the environmental assessment process for this project and to indicate that the province of Manitoba, the Manitoba Métis Federation, Sagkeeng First Nation, Black River First Nation, and Hollow Water First Nation are participating as members of the federal and provincial review team during the environmental assessment process for this project. **Change to EIS:** Section 1.6.1 of the EIS (Golder 2022) was revised as follows to reflect the above response: *"Under Section 15 of CEAA [Canadian Environmental Assessment Act] 2012, the CNSC is the Responsible Authority for the Project. As documented in the Record of Decision (CNSC 2017), CNSC staff have notified all relevant federal authorities, as well as all relevant provincial authorities in Manitoba with respect to the Project. All notified federal authorities indicated that they possess specialist knowledge with respect to the Project and expertise that could be drawn upon during the environmental assessment process. Federal authorities participating in the environmental assessment process include Environment and Climate Change Canada, Health Canada and Natural Resources Canada. The Manitoba Métis Federation, Sagkeeng First Nation, Black River First Nation, and Hollow Water First Nation joined the CNSC Federal and Provincial Review Team. In addition, the province of Manitoba is participating as a member of the review team during the environmental assessment process for the Project."* **References:** *CNSC 2017. Decision on the Scope of Environmental Assessments for Three Proposed Projects at Existing Canadian Nuclear Laboratories' Facilities. March 2017.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
19.	CNSC	G. Stoyanov	EIS - Section 1.6.2 Relevant Standards, Codes and Guidelines	1-17	**Comment:** It is not clear why CNL has not included in their list of standards CSA N292.3, *Management of low and intermediate level waste*. This standard is in the current WL decommissioning licence and is relevant for the site. **Expectation to Address Comment:** Please clarify why CSA N292.3 is not included in this list.	**Incorporated:** Section 1.6.2 of the Environmental Impact Statement (EIS; Golder 2022) was revised to include Canadian Standards Association (CSA) N292.3, Management of Low- and Intermediate-Level Radioactive Waste. **Change to EIS:** Section 1.6.2 of the EIS (Golder 2022) was revised as follows to include CSA N292.3 in the list of relevant standards, codes, and guidelines: • *"CSA N292.3-14 Management of Low- and Intermediate-Level Radioactive Waste (CSA Group 2014b)."* **References:** *CSA Group 2014b. N292.3-14 Management of Low- and Intermediate-Level Radioactive Waste. May 2014.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
20.	CNSC	C. Cianci	EIS - Section 1.6.2 Relevant Standards, Codes and Guidelines	1-18	**Comment:** The title of REGDOC-3.2.2, as reflected on this page, is incorrect. The title is REGDOC-3.2.2, *Aboriginal Engagement*. In addition, the list of relevant standards and codes is missing reference to RD/GD-99.3, *Public Information and* Disclosure. **Expectation to Address Comment:** Please revise accordingly.	**Incorporated:** Section 1.6.2 of the Environmental Impact Statement (EIS; Golder 2022) was revised to correct the title of REGDOC-3.2.2 and include REGDOC-3.2.1 (superseded RD-GD-99.3).

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						Change to EIS: Section 1.6.2 of the EIS (Golder 2022) was revised as follows to reflect the above response: • *"CNSC REGDOC-3.2.1, Public Information and Disclosure (CNSC 2018a).* • *CNSC REGDOC-3.2.2, Indigenous Engagement (CNSC 2019)."* **References:** *CNSC 2018a. REGDOC-3.2.1 - Public Information and Disclosure. May 2018.* *CNSC 2019. REGDOC-3.2.2 - Indigenous Engagement. Version 1.1. August 2019.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
					2.0 Purpose of the Project and Alternatives to the Project	
21.	CNSC	C. Cianci	EIS - Section 2.3 Purpose of the Project	2-2	**Comment:** The three main objectives for ISD as listed in this section are not consistent with other descriptions for this new proposed approach. In Section 1.1, Project Context on p.1-7, the ISD approach is proposed to reduce the need for interim storage of radioactive waste, but this objective is not identified in this section. **Expectation to Address Comment:** As per the information requirements of CNSC's *Generic EIS Guidelines* with respect to the purpose of the project (p.9), please provide a clear and consistent description of the purpose of the project including stated objectives.	**Incorporated:** Section 2.3 of the Environmental Impact Statement (EIS; Golder 2022) was revised to include the objective of limiting the need for interim storage if possible. With this change, the EIS now provides a clear and consistent description of the purpose of the project including stated objectives as per the information requirements of the CNSC's Generic EIS Guidelines (CNSC 2016). **Change to EIS:** Section 2.3 of the EIS (Golder 2022) was revised as follows to include the objective of limiting the need for interim storage if possible: *"CNL evaluated several decommissioning strategies, focusing on the following four main objectives:* *1) Ensure protection to the environment (i.e., human and ecological) by:* *a) limiting the need for interim storage if possible;* *b) reducing deferment periods where appropriate;* *c) limiting releases of radiological and hazardous substances from the facility;* *d) meeting applicable regulations;* *e) continuing to meet the obligations committed to in the Comprehensive Study Report (CSR; AECL 2001); and* *f) demonstrating the long-term safety of the selected decommissioning strategy, including implementation of a long-term monitoring and surveillance program.* *2) Apply international best practices to safely decommission WR-1 [Whiteshell Reactor 1].* *3) Apply CNL and international safety design principles to minimize radiation exposure to the public and workers (e.g., meeting the As Low As Reasonably Achievable [ALARA] principle).* *4) Avoid or minimize industrial hazards during decommissioning activities."* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project – Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *CNSC 2016. Generic Guidelines for the Preparation of an Environmental Impact Statement. May 2016.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

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22.	CNSC	All	EIS - Section 2.3 Purpose of the Project Section 2.4.2 Design Principles from External Sources	2-2 2-5	**Comment:** In Section 2.3 of the EIS, it is stated that CNL has evaluated other decommissioning options that allow the WR-1 Building to be decommissioned with greater safety and that ISD is the proposed approach. CNL also indicates that one of its main objectives includes the application of "international best practices to safely decommission the WR-1 Building while ensuring protection to the environment (i.e., human and ecological)". In Section 2.4.2 of the EIS, it is stated that "in addition to CNL's design principles, the design and implementation of the Project will also use Canadian and international best practices and safety fundamentals, including those from the International Atomic Energy Agency (IAEA) and the CNSC." **Expectation to Address Comment:** Please clarify/elaborate as to whether/how the proposed decommissioning approach aligns with IAEA's 2014 *Safety Standard, Decommissioning of Facilities - General Safety Requirements* (GSR) Part 6.	**Resolved As:** Yes, the proposed decommissioning approach aligns with the International Atomic Energy Agency's (IAEA's) 2014 Safety Standard, Decommissioning of Facilities - General Safety Requirements (GSR) Part 6 (IAEA 2014a); Section 2.4.2 of the Environmental Impact Statement (EIS; Golder 2022) was revised to elaborate on this alignment. **Change to EIS:** Section 2.4.2 of the EIS (Golder 2022) was revised as follows to elaborate on how the proposed decommissioning approach aligns with the IAEA's 2014 Safety Standard, Decommissioning of Facilities - GSR Part 6 (IAEA 2014a): *"Regulating nuclear safety in Canada is the responsibility of the CNSC. The IAEA is a valuable resource to provide guidance for decisions concerning safety related to CNL's plans to decommission WR-1. Current IAEA guidance states that in situ decommissioning should not be the preferred decommissioning strategy for nuclear power reactors, except possibly under exceptional circumstances (IAEA 2014a). As explained in Section 6.3 of the Whiteshell Laboratories Detailed Decommissioning Plan (DDP; CNL 2021), Canada's regulatory framework for decommissioning, according to CNSC REGDOC-2.11.2 (CNSC 2021), includes ISD as a viable decommissioning strategy option under specific circumstances or legacy sites. The Project meets all the requirements for a legacy site, as defined in REGDOC-2.11.2:* • *WR-1 was a research and a demonstration facility constructed at a time in history when decommissioning was not part of the design;* • *All reactor fuel has been removed from the WR-1 site;* • *Use of ISD will protect the workers, the public and the environment; and* • *WR-1 site will remain under Institutional Controls for a period defined in the safety case.* *All four technically feasible alternative means of carrying out the decommissioning of WR-1 assessed in Section 2.5.4 align with IAEA's General Safety Requirements Part 6, Decommissioning of Facilities (IAEA 2014a), which lists 15 requirements (which are outlined below) that should be met when selecting a specific decommissioning approach for a facility.* ***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.*** *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.* *All decommissioning work at CNL is carried out under the oversight of the CNL Radiation Protection Program, as per the CNSC-issued site decommissioning licence, which provides the framework and constraints for planned exposures during decommissioning work at WL.* *Furthermore, the Project is subject to federal legislation including the Nuclear Safety and Control Act and Canadian Environmental Assessment Act, 2012 (CEAA 2012). The Project is further subject to oversight and approval from the CNSC, which licenses all activities performed by CNL related to decommissioning and waste management. The Decommissioning Licence NRTEDL-W5-8.00/2024 dictates requirements for CNL to comply with and outline what activities CNL is permitted to perform. Regular inspections by the CNSC ensure compliance with the Decommissioning 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.* ***2) <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.*** *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.* *All decommissioning activities carried out by CNL are subject to CNSC oversight under the Decommissioning Licence NRTEDL-W5-8.00/2024. The Decommissioning Licence outlines the activities that CNL is permitted to perform and conditions that must be met while performing it. The Decommissioning 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 for nuclear power plants, which has specific provisions for application*

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						of graded approaches to performing work, commensurate with the risk level involved. This graded approach has been implemented in many of the policies, programs and procedures identified in the WL site licence, which have been deemed 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. *The graded approach is also apparent in CNSC oversight of CNL operations. The Decommissioning Licence also outlines which activities CNL may perform without notifying the CNSC, where the CNSC must be notified, or where the CNSC must approve prior to execution. These distinctions are based on the commensurate risk of the activities.* ***3)*** ***<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.*** *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.* *As part of the ongoing environmental assessment, under CEAA 2012, CNL has prepared this Environmental Impact Statement (EIS), which summarizes the assessed effects of the Project on the environment. This is supported through a detailed Decommissioning Safety Assessment Report for the WR-1 In Situ Decommissioning of Whiteshell Reactor 1 Project (DSAR; Golder 2021a), compliant with CNSC's REGDOC 2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management (CNSC 2018b). Detailed calculations and modelling that support the assessment in the DSAR are provided in an Environmental Risk Assessment (ERA) report (EcoMetrix 2021), and a Groundwater Flow and Solute Transport Modelling report (Golder 2021b). The DSAR also provides an assessment of accident and malfunction scenarios during decommissioning, and their effect on the environment. All of these documents provide supporting information for the Detailed Decommissioning Plan (DDP) that is prepared in compliance with CSA N294 and submitted for CNSC acceptance as a component of the licence application.* *This EIS, the DSAR and the supporting documents focus on the preferred Alternative #3 – ISD. Alternative #1 – Deferred Dismantling and Removal and Alternative #2 – Immediate Dismantling and Removal were shown to be safe in the CSR (AECL 2001). Alternative #4 – Partial Dismantling and Removal with ISD of the Remainder is a combination of Alternatives #2 and #3, both of which have been shown to be safe; therefore, Alternative #4 is deemed safe.* ***4)*** ***<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.*** *The responsibilities of the government shall include:* ▪ *Establishing a national policy for the management of radioactive waste, including radioactive waste generated during decommissioning;* ▪ *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;* ▪ *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;* ▪ *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.* *The Government of Canada provides the legislative framework supporting the CNSC, including defining its mandate and authority as Canada's independent nuclear regulator. The CNSC is responsible for the oversight of all civilian nuclear activities in Canada.*

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						Whiteshell Laboratories is the property of AECL, which is a Schedule III, Part 1 Crown Corporation under the Financial Administration Act, 1985 and an agent of Her Majesty in Right of Canada. As owner, 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 July 31, 2015 (Rickford 2015) and satisfy CNSC Regulatory Document-3.3.1 Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities (CNSC 2021a). AECL has chosen a Government-Owned, Contractor-Operated approach to completing the decommissioning of WL. The tendering process reviewed the proposed approaches to the decommissioning of WL against: ▪ *compliance with AECL mandate, policies and procedures as agent of the Federal Government of Canada;* ▪ *adherence to CNSC requirements for the vendor to be the site licence holder and be approved by the CNSC to perform decommissioning work;* ▪ *expertise of each vendor in safely performing nuclear decommissioning work; and* ▪ *financial commitments of AECL to execute work safely.* *5)* ***<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.*** *The CNSC is the authority having jurisdiction for all nuclear decommissioning work in Canada. The CNSC has a rigorous licencing approach that ensures nuclear safety in all licensed nuclear decommissioning work. The Decommissioning Licence (Licence No. NRTEDL-W5-8.00/2024) currently issued to CNL, and all future licences and licence revisions granted to CNL for decommissioning the WL 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.* *6)* ***<u>Responsibilities of the licensee for decommissioning</u> – 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.*** *The responsibilities of the licensee shall include:* ▪ *Selecting a decommissioning strategy as the basis for preparing and maintaining the decommissioning plans throughout the lifetime of the facility.* ▪ *Preparing and submitting an initial decommissioning plan and its updates for review by the regulatory body.* ▪ *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.* ▪ *Fostering a safety culture in order to encourage a questioning and learning attitude towards safety, and to discourage complacency.* ▪ *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.* ▪ *Notifying the regulatory body prior to the permanent shutdown of the facility.* ▪ *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.* ▪ *Managing the decommissioning project and conducting decommissioning or ensuring oversight of the actions conducted by contractors.* ▪ *Managing the remaining operational waste from the facility and all waste from decommissioning.*

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						▪ *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.* ▪ *Performing safety assessments and environmental impact assessments in support of decommissioning actions.* ▪ *Preparing and implementing appropriate safety procedures, including emergency plans.* ▪ *Ensuring that properly trained, qualified and competent staff are available for the decommissioning project.* ▪ *Performing radiological surveys in support of decommissioning.* ▪ *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.* *CNL performs many of these responsibilities on a daily basis as part of its core business operations. CNL carries out all work at WL in accordance with the Decommissioning Licence (Licence No. NRTEDL-W5-8.00/2024) 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, are subject to CNSC oversight and acceptance prior to any work being performed, 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.* *The preparation of a DDP by CNL 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 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.* ***7)*** ***<u>Integrated management system for decommissioning</u> – The Licensee shall ensure that its integrated management system covers all aspects of decommissioning.*** *The prime responsibility for safety shall remain with the licensee.* *CNL is the licensee for the overall WL Closure Project, including the decommissioning of WR-1. Under the terms of the Decommissioning Licence, CNL has demonstrated its commitment to safety through both policy and through daily work activities including safe work processes such as work permits, Event Free Tools, and fostering a strong safety culture that permeates the organization.* ***8)*** ***<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.*** *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*

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						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. *CNL has selected ISD as the decommissioning strategy for WR-1. 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 practices. The justification for the selection of this strategy is presented in this section. The EIS, supported by the DSAR (Golder 2021a), the ERA (EcoMetrix 2021) and other technical documents, demonstrates that the effects of this decommissioning strategy do not place an undue burden on future generations of people and the environment. All other alternative means for decommissioning WR-1 would have to be justified if they were selected as the preferred decommissioning strategy.* ***9) Financing of decommissioning – 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.*** *The requirements for financial guarantees are laid out in CSA N294, Decommissioning of Facilities Containing Nuclear Substances (CSA Group 2019). Adherence to this standard by CNL is required from national legislation to CNSC regulatory requirements and licence conditions.* ***10) 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 an Overview DDP for the wider WL site closure project. The Overview DDP provides the overall plan for decommissioning of the WL site, including WR-1, and has been periodically revised to include adjustments to the plan. This Overview DDP is part of a larger body work that supports the CNL application for a decommissioning licence for the WL site. It is supported by additional technical information, including but not limited to the Comprehensive Study Report, EIS, DSAR, and CNL policies, programs and procedures. Furthermore, CNL has also prepared a DDP specifically for WR-1 that will be maintained throughout the Project lifetime and is also subject to CNSC review and approval prior to being implemented.* ***11) 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.*** *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.* *A DDP has been prepared to address the requirements of a final decommissioning plan including each of the items listed above. Development of the DDP is done in accordance with the WL Closure Project Quality Assurance Manual (CNL 2018b) and CSA N294, the WL site licence and the WL Licence Conditions Handbook (CNSC 2020a), and guidance from recent project experience and regulatory input.* ***12) Conduct of decommissioning actions – The licensee shall implement the final decommissioning plan, including management of radioactive waste, in compliance with national regulations.*** *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.* *All operations at CNL, decommissioning or otherwise, are subject to approval by the CNSC. Approval is granted via a site licence that summarizes the policies, programs and key procedures that govern the work processes at WL. 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 Program and Quality Assurance. Any changes to these policies, programs or key procedures are submitted, if required, to the CNSC for review and/or acceptance prior to being implemented to perform work.*

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						CNL has been performing decommissioning work at WL under a CNSC-issued Decommissioning Licence since 2002. Since 2002, the CNSC has verified that CNL is performing its work in a safe and compliant manner. All work necessary to decommission WR-1 will comply with these accepted practices to ensure protection of workers, the public and the environment, safe and optimized waste management and minimization. ***13) <u>Emergency response arrangements for decommissioning</u> – 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 per the WL Decommissioning Licence and the Licence Conditions Handbook (Condition 10.1). CNL meets this requirement through the implementation of the WL's Site Emergency Response Plan, as per the CNSC-issued site Decommissioning Licence.* ***14) <u>Radioactive waste management in decommissioning</u> – Radioactive waste shall be managed for all waste streams in decommissioning.*** *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.* *The safe and effective management of radioactive wastes is mandated through the CNSC Decommissioning Licence under which all activities at WL are performed. Section 11 of the Decommissioning Licence mandates that CNL maintain a waste management program for WL.* *CNL maintains a waste management program for WL that controls the management of all radioactive wastes generated at WL, as per the CNSC-issued Decommissioning Licence.* ***15) <u>Completion of decommissioning actions and termination of the authorization for decommissioning</u> – 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 decommissioning of WR-1, CNL will prepare an End-State Report, which will document the work performed and the end-state achieved. Further, CNL will implement an Environmental Assessment Follow Up Program (EAFP) to provide evidence that the system is performing as designed after the end-state has been achieved. The End-State Report is mandated by the WL Quality Assurance Plan (CNL 2018b) and CSA N294. The EAFP is a mandated component of the environmental assessment process under CEAA 2012. Ongoing environmental monitoring is also a critical aspect of the WL Decommissioning Licence. CNL has previously prepared end-state reports for other work completed on the WL site, to the satisfaction of the CNSC, and will ensure the WR-1 End-State Report meets the same expectations. CNL has also been performing routine EAFP monitoring of all decommissioning work, to the satisfaction of the CNSC, to demonstrate their compliance with the criteria of the CSR.* *CNL will not adjust or cease monitoring of the WL site without the approval of the CNSC, and any decision to terminate, amend or transfer the Decommissioning Licence for the WL site will be made by the CNSC."* **References:** *CEAA 2012. Canadian Environmental Assessment Act, 2012. S.C. 2012, c. 19, s. 52. July 2012.* *CNL 2018b. Whiteshell Decommissioning. WLD-508300-QAP-001. Revision 2. November 2018.* *CNSC 2018b. REGDOC-2.11.1 Vol. 3 Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. May 2018. ISBN 978-0-660-25806-5* *CNSC 2020a. Licence Conditions Handbook NRTEDL-LCH-08.00/2024 for Whiteshell Laboratories. WLD-508760-HBK-002. Revision 0. January 2020.* *CSA Group 2019. N294-19 Decommissioning of Facilities Containing Nuclear Substances. November 2019.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Golder 2021a. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.*

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						Golder 2021b. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021. *IAEA 2014a. Decommissioning of Facilities. GSR Part 6. July 2014.* *Rickford 2015. Honourable G. Rickford, P.C., M.P., Minister of Natural Resources Canada, Letter to M. Binder, President and Chief Executive Officer, Canadian Nuclear Safety Commission. July 2015.*
23.	CNSC	G. Stoyanov	EIS - Section 2.4.2 Design Principles from External Sources	2-5	**Comment:** This section of the EIS refers to IAEA SSG-29, *Near Surface Disposal Facilities for Radioactive Waste*. In particular, Section 1.11 of SSG-29 states: "This Safety 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." **Expectation to Address Comment:** Clarify the applicability of SSG-29 to the WR-1 ISD project.	**Resolved As:** As the Whiteshell Reactor Disposal Facility (WRDF) will contain intermediate level waste (ILW), International Atomic Energy Agency (IAEA) SSG-29 (IAEA 2014b) is not applicable to the Whiteshell Reactor 1 (WR-1) Project; however, where relevant, guidance given in IAEA SSG-29 (IAEA 2014b) has been taken into account. The WRDF is designed to meet the needs of ILW disposal and will be constructed as such. As a portion of the disposal facility is at a depth less than 10 m below ground level, it is prudent to take into account the best practice guidance given in IAEA SSG-29 (IAEA 2014b). **Change to EIS:** Section 2.4.2 of the Environmental Impact Statement (EIS; Golder 2022) was revised as follows to clarify the applicability of SSG-29 to the WR-1 Project: *"The IAEA has also published SSG-29: Near Surface Disposal Facilities for Radioactive Waste (IAEA 2014b). This document gives detailed design guidance on the following:* ▪ *containment;* ▪ *isolation;* ▪ *multiple safety functions;* ▪ *passive safety; and* ▪ *surveillance and control of passive safety features.* *It is noted that as the Whiteshell Reactor Disposal Facility (WRDF) will contain intermediate level waste, SSG-29 is not applicable to the Project; however, where relevant, guidance given in SSG-29 has been taken into account."* **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *IAEA 2014b. Near Surface Disposal Facilities for Radioactive Waste. SSG-29. March 2014.*
24.	CNSC ECCC	All	EIS - Section 2.5, Alternative Means for Carrying out the Project	2-7 to 2-31	**Comment:** The information provided in the EIS does not provide sufficient detail to substantiate the conclusion that Alternative #3 is the preferred option based on the alternative means assessment. The methodology presented in this section of the EIS to assess the alternative means does not describe in sufficient detail how the criteria were used to assess the technical and economic feasibility of the alternative means, particularly, how these criteria were systematically evaluated to identify the preferred alternative. **Expectation to Address Comment:** Provide a systematic evaluation of alternatives which identifies and describes, in sufficient detail, how the different criteria were used to identify technically and economically feasible alternative means. Explain how the preferred alternative was identified based on the relative	**Incorporated:** Sections 2.5 to 2.7 of the Environmental Impact Statement (EIS; Golder 2022) were revised to: • **Provide more detail on how the criteria were used to assess the technical and economic feasibility of the alternative means (Sections 2.5.1, 2.5.2, 2.5.4, and 2.6).** Each alternative was evaluated first for its technical feasibility (whether the approach has been used elsewhere and can be easily adapted to this application).The technical feasibility criteria were not given a specific weight, but were given a "go, no-go" decision. The technologies for each proposed alternative are proven and have been successfully deployed at other sites. Monitoring requirements for Alternatives #3 (In Situ Disposal [ISD]) and #4 (Partial Dismantling and Removal with ISD of the Remainder) would be more extensive than for Alternatives #1 (Deferred Dismantling and Removal) and #2 (Immediate Dismantling and Removal), but can be developed to meet national requirements. All alternatives require at least some wastes be transported for storage or disposal. Alternative #5 (ISD Using Alternative Backfill Materials) is not easily adaptable for use in Whiteshell Reactor 1 (WR-1) because of the issue of the material settling with time and being a poor barrier to water movement. Alternative #6 (Rolling Stewardship) did not meet the feasibility criteria for being passively safe, as it required an undefined long-term human intervention period to be safe. Alternatives #1 to #4 were all considered technically feasible and carried forward for further assessment. Alternatives #5 and #6 were not considered technically feasible and were dropped from the assessment.

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					consideration of the safety, environmental, economic and technical criteria. In particular, provide an explanation of how the categories and criteria in Table 2.5.1-2 were defined, evaluated and combined to determine the overall ratings. All feasible alternatives should be considered and discussed at a comparable level of detail to avoid any indication of a bias towards a particular alternative(s). Consider carrying out a sensitivity or risk analysis to eliminate potential bias and subjectivity which is inherent in the evaluation process. Sufficient rationale and detail must be provided to enable the reader to understand how the preferred alternative was chosen.	For those alternatives deemed technically feasible, a comparison of economic feasibility (cost), safety, and environmental effects was completed. Alternative #1 was approved as the strategy for decommissioning WR-1 as part of the original plan for decommissioning the Whiteshell Laboratories site. The estimated costs have not changed substantially and were considered economically feasible. As such, an alternative that does not cost more than Alternative #1, and achieves the goal of decommissioning WR-1 is considered economically feasible. The costs of each alternative are summarized in Table 2.6.2-1 of the EIS (Golder 2022). All four alternatives were deemed economically feasible and carried forward for further assessment. • **Better explain how the preferred alternative was identified based on the relative consideration of the safety, environmental, economic, and technical criteria (Sections 2.5.1, 2.5.2, 2.6 and 2.7).** See above for an explanation of the technical and economic criteria. Safety and environmental effects were weighted as follows: • 30% worker safety; • 30% public and Indigenous safety; • 30% biophysical (groundwater, aquatic, terrestrial and atmospheric) environment; and • 10% socio-economic environment. Worker safety, public and Indigenous safety, and biophysical environment were given equal weight (30%) because it is recognized that they are inter-related (one can affect the other), and the assessment does not value the safety of one group of people over another. Socio-economic factors were given a lower weight as physical health and safety are a higher priority than socio-economic health even though both play an important role in the decision-making process. The alternatives were qualitatively ranked. The total score was calculated by adding up the weighted criteria score in each criteria (worker safety, public and Indigenous safety, biophysical environment, and socio-economic environment). The weighted criteria scores were determined by adding up the scores in each time period (closure phase + institutional control period + post-institutional control period), and multiplying the sum by the criteria weighting (a percentage) for that criteria score. $$Total\ score = (CS_{WS})W_{WS} + (CS_{PS})W_{PS} + (CS_{BE})W_{BE} + (CS_{SE})W_{SE}$$ $CS_{XX} = R_{XX,C} + R_{XX,IC} + R_{XX,PIC}$ CS_{XX} = *Criteria score* W_{XX} = *Criteria weighting* $R_{XX,YY}$ = *Ranking score* *WS = Worker Safety* *PS = Public and Indigenous Safety* *BE = Biophysical Environment* *SE = Socio-Economic Environment* *C = Closure Phase* *IC = Institutional control period* *PIC = Post-institutional control period* If an alternative had a high chance of successfully addressing a particular criterion, it was rated most favourable. If an alternative had a moderate likelihood of addressing a criterion, it was rated as favourable, and if an alternative was assessed as having a low likelihood of success with a particular criterion, it was rated as least favourable. More than one alternative could be given the same ranking. As for the evaluation of safety and environmental effects, this cannot be summarized down to a level appropriate for inclusion in this response while still providing an adequate explanation of how the preferred alternative was identified so please see Sections 2.6 and 2.7 of the EIS (Golder 2022). • **Better explain how the categories and criteria in Table 2.5.2-1 of the 2022 EIS (Golder 2022; formerly Table 2.5.1-2) were defined, evaluated, and combined to determine the overall ratings (Section 2.5.2 and 2.7).** Selection of the assessment criteria was based on the requirements of CNSC REGDOC-2.9.1 (CNSC 2020). The discussion and evaluation of alternatives and assessment criteria were also presented at numerous public and Indigenous engagement events and feedback was solicited. The general feedback indicated the criteria for assessment of safety and environmental effects were not detailed enough. Specific changes as a result of this feedback included

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						the separation of the Safety category into distinct categories for Worker Safety and Public Safety, reducing the perceived importance of transportation risk in the criterion, and defining different criteria for each time phase of the project (closure, institutional control, post-institutional control). Each alternative was evaluated first for its technical feasibility (whether the approach has been used elsewhere and can be easily adapted to this application).The technical feasibility criteria were not given a specific weight, but were given a "go, no-go" decision. For those alternatives deemed technically feasible, a comparison of economic feasibility (cost), safety, and environmental effects was completed. Safety and environmental effects were weighted as follows: • 30% worker safety; • 30% public and Indigenous safety; • 30% biophysical (groundwater, aquatic, terrestrial and atmospheric) environment; and • 10% socio-economic environment. Worker safety, public and Indigenous safety, and biophysical environment were given equal weight (30%) because it is recognized that they are inter-related (one can affect the other), and the assessment does not value the safety of one group of people over another. Socio-economic factors were given a lower weight as physical health and safety are a higher priority than socio-economic health even though both play an important role in the decision-making process. The alternatives were qualitatively ranked. The total score was calculated by adding up the weighted criteria score in each criteria (worker safety, public and Indigenous safety, biophysical environment, and socio-economic environment). The weighted criteria scores were determined by adding up the scores in each time period (closure phase + institutional control period + post-institutional control period), and multiplying the sum by the criteria weighting (a percentage) for that criteria score. $Total\ score = (CS_{WS})W_{WS} + (CS_{PS})W_{PS} + (CS_{BE})W_{BE} + (CS_{SE})W_{SE}$ $CS_{XX} = R_{XX,C} + R_{XX,IC} + R_{XX,PIC}$ CS_{XX} = *Criteria score* W_{XX} = *Criteria weighting* $R_{XX,YY}$ = *Ranking score* *WS = Worker Safety* *PS = Public and Indigenous Safety* *BE = Biophysical Environment* *SE = Socio-Economic Environment* *C = Closure Phase* *IC = Institutional control period* *PIC = Post-institutional control period* If an alternative had a high chance of successfully addressing a particular criterion, it was rated most favourable. If an alternative had a moderate likelihood of addressing a criterion, it was rated as favourable, and if an alternative was assessed as having a low likelihood of success with a particular criterion, it was rated as least favourable. More than one alternative could be given the same ranking. All feasible alternatives (Alternatives #1 to #4) were considered and discussed at a comparable level of detail in the 2017 EIS (Golder et al. 2017) and are still considered and discussed at a comparable level of detail in the 2022 EIS (Golder 2022). The level of detail provided has increased for the 2022 EIS (Golder 2022). The level of detail provided in the EIS is too much to include in this response and summarizing it down does not showcase the level of detail provided, which is a key aspect of this comment, so please see Section 2.5.4 of the EIS (Golder 2022). Carrying out a sensitivity or risk analysis was considered, but ultimately not done as the methodology for the assessment ensures that only technically feasible alternatives (can be performed safely and meet regulatory requirements) can be considered. According to regulatory guidance (The Agency 2015), when evaluating the feasible alternatives, "the analysis and the rationale for the choice should be explained from the perspective of the proponent". There is no requirement or guidance to consider bias or subjectivity in the assessment. CNL would not propose a project if it did not believe it could be safely executed.

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The nature of the information request requires extensive changes to Sections 2.5 to 2.7 of the EIS (Golder 2022). It is not practical to specifically identify every change that was made in response to this information request. However, the additional detail requested, as summarized above, is reflected in Sections 2.5 to 2.7 of the EIS as follows:
• More detail on how the criteria were used to assess the technical and economic feasibility of the alternative means (Sections 2.5.1, 2.5.2, 2.5.4, and 2.6).
• Better explain how the preferred alternative was identified based on the relative consideration of the safety, environmental, economic, and technical criteria (Sections 2.5.1, 2.5.2, 2.6 and 2.7).
• Better explain how the categories and criteria in Table 2.5.2-1 of the 2022 EIS (Golder 2022; formerly Table 2.5.1-2) were defined, evaluated, and combined to determine the overall ratings (Section 2.5.2 and 2.7).
References:
The Agency (Canadian Environmental Assessment Agency) 2015. Addressing “Purpose of” and “Alternative Means” under the Canadian Environmental Assessment Act, 2012. March 2015.
CNSC 2020. REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.2. September 2020. ISBN 978-0-660-06255-6.
Golder et al. 2017. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 1. September 2017.
Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.</td></tr>
<tr><td>25.</td><td>CNSC</td><td>C. Cianci</td><td>EIS - Section 2.5.1 Evaluation Approach</td><td>2-7</td><td>Comment: This section of the EIS indicates: “The decommissioning strategy for WR-1 draws upon the experiences and lessons learned from the decommissioning of similar reactors”. No evidence or information is provided in this section to support this statement. Expectation to Address Comment: Please identify the reactors and provide in sufficient detail which experiences and lessons learned from the decommissioning of similar reactors were taken into consideration, and how this informed the options considered in the alternative means assessment.</td><td>Incorporated:
Section 2.5.1 of the Environmental Impact Statement (EIS; Golder 2022) was revised to identify the reactors and clarify how the experiences and lessons learned contributed to the alternatives assessment. The experience was incorporated by informing the assessment of technical and economic feasibility. The application of In Situ Disposal (ISD) in other locations has shown that the approaches considered in the alternatives assessment are technically and economically feasible, with data to support that feasibility being easily accessible. Ongoing monitoring and data collection at these sites also informs the assessment of environmental effects from the alternatives.
Change to EIS:
Section 2.5.1 of the EIS (Golder 2022) was revised as follows to identify the reactors and clarify how the experiences and lessons learned contributed to the alternatives assessment:
“The decommissioning strategy for WR-1 [Whiteshell Reactor 1] draws upon the experiences and lessons learned from the decommissioning of similar reactors. CNL has conducted extensive research on reactor decommissioning strategies and past projects as part of the planning work for WR-1. CNL has relied on industry experts and has augmented its own team with staff that have been involved in previous reactor decommissioning work. CNL contracted Savannah River National Laboratory [SRNL] to perform a literature review of reactor encasement projects in order to assess techniques and performance results. This is documented in the report titled Cementitious Materials Applications for Reactor Decommissioning (SRNL 2017) and includes 12 reactors that have been encased in the USA, Russia, Georgia and Puerto Rico. CNL completed an additional report of 16 nuclear, hazardous, mining and industrial sites that have selected ISD as the strategy for permanent disposal (CNL 2019).
Staff from Savannah River National Laboratory visited both WR-1 and the Nuclear Power Demonstration reactor site in Ontario for the purpose of assessing these reactors and advising the CNL team. Technical considerations included size, condition, remaining radioactive inventory, site hydrogeology, site geology, construction type, integrity and durability of barriers, waste disposal options, site location relative to waste management facilities, site end state and other facility characteristics.
CNL also relied on extensive reactor dismantling experience from the companies that make up the Canadian National Energy Alliance. These companies (initially SNC Lavalin, Energy Solutions, Fluor and CH2M Hill; now SNC Lavalin, Fluor and Jacobs) have vast experience worldwide in nuclear decommissioning. CNL also relied on experience, lessons learned and strategies employed by the United States Department of Energy Office of</td></tr>
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						Environmental Management (US DOE EM) and other international sources. While not a complete list, lessons learned and strategic consideration for ISD that informed the alternatives analysis are readily documented in the following publications: ▪ *IAEA [International Atomic Energy Agency] TecDoc 1124 – Onsite Disposal as a Decommissioning Strategy (IAEA 1999).* ▪ *Innovations Report from Savannah River National Laboratory (SRNL 2013).* ▪ *Use of Cementitious Materials for SRS Reactor In-Situ Decommissioning (Langton et al. 2010).* ▪ *IAEA Nuclear Energy Series No. NW-G-2.1 Policies and Strategies for the Decommissioning of Nuclear and Radiological Facilities (IAEA 2011a).* ▪ *IAEA Technical Report Series No. 446 Decommissioning of Research Reactors: Evolution, State of the Art, Open Issues (IAEA 2006b).* ▪ *US DOE EM Strategy and Experience for In Situ Decommissioning, Office of Engineering and Technology, EM-20, September 2009 (US DOE 2009).* ▪ *In Situ Decommissioning Concepts and Approaches for Excess Nuclear Facilities Decommissioning End State – 13367, Waste Management 2013 Conference (Serrato et al. 2013).* ▪ *In Situ Decommissioning Lessons Learned 14042, Waste Management 2014 Conference (Negin et al. 2014).* ▪ *Entombment: A Viable Decommissioning Strategy for Research Reactors? International Nuclear Safety Journal, Volume 3, Issue 4, 2014 (Laraia 2014).* *The information gathered from these sources contributed to the alternatives assessment, particularly with regard to technical feasibility, economic feasibility and environmental effects during closure and post-closure.* **References:** *CNL 2019. Review of In Situ Disposal (ISD). 64-508300-REPT-001. Revision 0. October 2019.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *IAEA 1999. On-Site Disposal as a Decommissioning Strategy. IAEA-TECDOC-1124. November 1999.* *IAEA 2006b. Decommissioning of Research Reactors: Evolution, State of the Art, Open Issues. Technical Report Series No. 446. May 2006.* *IAEA 2011a. Policies and Strategies for the Decommissioning of Nuclear and Radiological Facilities. NW-G-2.1. December 2011.* *Langton et al. 2010. Use of Cementitious Materials for SRS Reactor Facility In-Situ Decommissioning – 11620. SRNL-STI-2010-00712. December 2010.* *Laraia 2014. Entombment: A Viable Decommissioning Strategy for Research Reactors? November 2014.* *Negin et al. 2014. In Situ Decommissioning Lessons Learned – 14042. March 2014.* *Serrato et al. 2013. In Situ Decommissioning (ISD) Concepts and Approaches for Excess Nuclear Facilities Decommissioning End State – 13367. February 2013.* *SRNL 2013. Innovations from Savannah River National Laboratory. January 2013.* *SRNL 2017. Cementitious Materials Applications for Reactor Decommissioning - Literature Review Report. 64-508330-REPT-001. Revision 0. December 2017* *US DOE 2009. Strategy and Experience for In Situ Decommissioning. EM-20. September 2009.*
26.	CNSC	C. Cianci	EIS - Table 2.5.1-1	2-8	**Comment:** Consistent with the Agency's Operational Policy Statement entitled, "Addressing "Purpose of" and "Alternative Means" under CEAA 2012" and CNSC's *Generic EIS Guidelines*, the alternative means assessment must explain and justify the methodologies that were used to identify technically and economically feasible alternative means. This section of the EIS is silent on whether other alternative means were considered, but determined not to be technically and economically feasible.	**Incorporated:** Two other alternative means were considered: • Alternative #5 – In Situ Disposal (ISD) Using Alternative Backfill Materials • Alternative #6 – Rolling Stewardship Alternative #5 was identified through public feedback as a way to retrieve or remediate the disposed reactor at an unspecified future date. A specific example was the use of sand instead of grout as a backfill material so that it could be more easily removed in the event that retrieval or remediation efforts were undertaken. Alternative #5 involves the ISD of Whiteshell Reactor 1 (WR-1) where below grade WR-1 systems, components, and structures will be filled with sand and the above grade structures and equipment will be demolished and removed.

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					Expectation to Address Comment: Any alternative means that were considered, but determined not to be technically and economically feasible, should be identified and described, and the rationale as to why they were determined not to be feasible should be documented in this section. Please identify whether any other options were considered, particularly those that may have been suggested by stakeholders and the public, and provide a rationale as to why they were determined not to be feasible.	Alternative #5 was determined to be not technically feasible as the post-institutional control technical feasibility criteria requires alternatives to not rely on a perpetual, or undefined long-term, human presence to safely implement the approach and intentionally retrievable wastes with no human controls is not considered a passively safe condition. Alternative #6 is the concept of "Rolling Stewardship", where wastes are packaged and stored in an accessible facility and monitored in perpetuity. It was proposed both through the public and Indigenous (specifically by Turtle Lodge, located on Sagkeeng First Nation) review of the Project's Draft Environmental Impact Statement (Golder et al. 2017). The concept is presented as an alternative to disposal or "abandonment" of wastes, rather than an alternative means to reach final disposal. The concept centres on the transfer of knowledge of, and responsibility for, the wastes from generation to generation through periodic ceremonies. In these ceremonies, wastes may be re-characterized, re-packaged, and passed symbolically to the next generation, over and over, until a "solution" to the radiation hazard is found. The concept is not explicit in what an acceptable solution would be. Alternative #6 was determined to be not technically feasible as the post-institutional control technical feasibility criteria requires alternatives to not rely on a perpetual, or undefined long-term, human presence to safely implement the approach and this alternative would require human intervention to maintain safety. Another suggestion from the public was to create a geologic repository on the Whiteshell Laboratories (WL) site. This option was not considered separately by CNL as it would be included in Alternative #4, which considers partial ISD with alternate disposal of the reactor core components in another facility. **Change to EIS:** Sections 2.5 to 2.7 of the Environmental Impact Statement (EIS; Golder 2022) were revised to: • Identify and describe Alternatives #5 – ISD Using Alternative Backfill Materials and Alternative #6 – Rolling Stewardship. • Document the rationale of why they were determined to be not feasible. Specifically, Section 2.5.4.5: Alternative #5 – In Situ Disposal Using Alternative Backfill Materials and Section 2.5.4.6: Alternative #6 – Rolling Stewardship were added to the EIS (Golder 2022) to describe these alternatives and document the rationale of why they were determined to be not feasible as reflected in the above response. Table 2.5.3-1 (formerly Table 2.5.1-1) of EIS (Golder 2022) was revised to include Alternative #5 – ISD Using Alternative Backfill Materials and Alternative #6 – Rolling Stewardship. Section 2.5.3 of the EIS (Golder 2022) was revised as follows to discuss feedback on alternatives from the public and Indigenous peoples: *"Feedback on alternatives from the public and Indigenous peoples (see Sections 4.0 Indigenous Engagement and 5.0 Public Engagement) focused on full dismantling as originally assessed and approved in the CSR [Comprehensive Study Report] (Alternative #1), thereby preserving the status quo.* *Other comments were related to being able to retrieve or remediate the disposed reactor at an unspecified future date should monitoring show that environmental effects are not acceptable. A specific suggestion was the use of sand instead of grout as a backfill material, with the expectation that the sand could be more easily removed in the event that retrieval or remediation efforts were undertaken; thus Alternative #5 was added to the assessment.* *The concept of "Rolling Stewardship," where wastes are packaged and stored in an accessible location and monitored on site in perpetuity, was proposed both through the public and Indigenous (specifically by Turtle Lodge, located on Sagkeeng First Nation) review of the Project's Draft Environmental Impact Statement (Golder et al. 2017); thus Alternative #6 was added to the assessment.* *Another suggestion was to create a geologic repository on the WL site. This option was not considered separately by CNL as it would be included in Alternative #4, which considers partial ISD with alternate disposal of the reactor core components in another facility."* **References:** *Golder et al. 2017. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 1. September 2017.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
27.	CNSC	C. Cianci	EIS - Section 2.5.1 Evaluation Approach	2-8	**Comment:** This section of the EIS indicates: "Public and Aboriginal engagement is also an important aspect of the decision-making process. A summary of	**Incorporated:** Public feedback was considered in and/or informed the alternative means assessment as follows:

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
					the alternative means being considered was made available to the public at open houses and meetings with First Nations communities, and input received is documented in Section 4.0 Aboriginal Engagement and Section 5.0 Public Engagement". CNL indicates that public input was received on the alternative means however neither in this section nor Section 5.0 Public Engagement, is there information on how public feedback was taken into consideration in the alternative means assessment. In particular, CNSC staff are aware that members of the public have inquired why other options were not considered in the alternative means assessment, such as, disposal of waste below bedrock. **Expectation to Address Comment:** Please provide in sufficient detail how public feedback was considered in and/or informed the alternative means assessment. If the input received was not considered in the alternative means assessment, please explain why, as well as indicate in the EIS the responses that were provided to the public in response to the issues and concerns that were raised.	• The assessment criteria for evaluating safety and environmental effects were expanded and additional details were added through the development of the Environmental Impact Statement (EIS; Golder 2022) as a result of feedback from the public and Indigenous peoples at engagement events, where discussion and evaluation of alternatives and assessment criteria were presented. Specific changes include: o The separation of the Safety category into distinct categories for Worker Safety and Public Safety. o Reducing the perceived importance of transportation risk in the criterion. o Defining different criteria for each time phase of the project (closure, institutional control, post-institutional control). Furthermore, the analysis was revised to clarify that this assessment is not intended to try to determine a 'best' alternative, which is highly subjective. It instead considers only alternatives that can all safely achieve the project goals and identifies the alternative that makes the most sense given the current circumstances. • Some alternative means to decommission Whiteshell Reactor 1 (WR-1) were identified from public engagement activities. Feedback on alternatives from the public focused on full dismantling as originally assessed and approved in the Comprehensive Study Report (CSR; AECL 2001), thereby preserving the status quo. o Other comments were related to being able to retrieve or remediate the disposed reactor at an unspecified future date should monitoring show that environmental effects are not acceptable. A specific suggestion was the use of sand instead of grout as a backfill material, with the expectation that the sand could be more easily removed in the event that retrieval or remediation efforts were undertaken; thus Alternative #5 was added to the assessment. o The concept of "Rolling Stewardship", where wastes are packaged and stored in an accessible location and monitored on site in perpetuity, was proposed both through the public and Indigenous (specifically by Turtle Lodge, located on Sagkeeng First Nation) review of the project's draft EIS (Golder et al. 2017); thus Alternative #6 was added to the assessment. o Another suggestion was to create a geologic repository on the Whiteshell Laboratories (WL) site. This option was not considered separately by CNL as it would be included in Alternative #4, which considers partial in situ disposal (ISD) with alternate disposal of the reactor core components in another facility. **Change to EIS:** Section 2.5.2 of the EIS (Golder 2022) was revised to expand on and provide additional detail on the assessment criteria, including defining different criteria for each time phase of the project (closure, institutional control, post-institutional control). It was also revised to include the following text to better explain how public and Indigenous feedback was considered in and/or informed the alternative means assessment: *"The discussion and evaluation of alternatives and assessment criteria were also presented at numerous public and Indigenous engagement events and feedback was solicited. The general feedback indicated the criteria for assessment of safety and environmental effects were not detailed enough. Specific changes as a result of this feedback included the separation of the Safety category into distinct categories for Worker Safety and Public Safety, reducing the perceived importance of transportation risk in the criterion, and defining different criteria for each time phase of the project (closure, institutional control, post-institutional control). Furthermore, the analysis was revised to clarify that this assessment is not intended to try to determine a 'best' alternative, which is highly subjective. It instead considers only alternatives that can all safely achieve the project goals, and identifies the alternative that makes the most sense given the current circumstances and as per the regulatory guidance [The Agency 2015]."* Sections 2.5.4 to 2.7 of the EIS (Golder 2022) were revised to clarify that this assessment is not intended to try to determine a 'best' alternative, but instead considers alternatives that can safely achieve the project goals and identifies the alternative that makes the most sense given the current circumstances. An excerpt of revised text from Section 2.7 is provided as an example: *"In consideration of all factors including Indigenous engagement, the assessment of the alternative decommissioning strategies for WR-1 shows that each alternative evaluated can be executed safely. The recommended alternative for the decommissioning of WR-1, based on the alternative means analysis, is Alternative #3 (ISD)."* Sections 2.5.4.5 and 2.5.4.6 of the EIS (Golder 2022) were added to discuss the alternative means of ISD Using Alternative Backfill Materials and Rolling Stewardship, respectively, which were identified from public and Indigenous engagement activities. Section 2.5.1 of the EIS (Golder 2022) was revised as follows to better explain how public and Indigenous feedback was considered in and/or informed the alternative means assessment: *"Public and Indigenous engagement was an important aspect of the decision-making process. A summary of the alternative means being considered was made available to the public at open houses and meetings with Indigenous peoples. The input received is documented in Section 4.0 Indigenous*

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						Engagement and Section 5.0 Public Engagement. As a result of these engagement activities, the assessment criteria for evaluating safety and environmental effects were expanded and additional details were added through the development of the EIS." Section 2.5.3 of the EIS (Golder 2022) was revised as follows to better explain how public and Indigenous feedback was considered in and/or informed the alternative means assessment: *"Feedback on alternatives from the public and Indigenous peoples (see Sections 4.0 Indigenous Engagement and 5.0 Public Engagement) focused on full dismantling as originally assessed and approved in the CSR (Alternative #1), thereby preserving the status quo.* *Other comments were related to being able to retrieve or remediate the disposed reactor at an unspecified future date should monitoring show that environmental effects are not acceptable. A specific suggestion was the use of sand instead of grout as a backfill material, with the expectation that the sand could be more easily removed in the event that retrieval or remediation efforts were undertaken; thus Alternative #5 was added to the assessment.* *The concept of "Rolling Stewardship," where wastes are packaged and stored in an accessible location and monitored on site in perpetuity, was proposed both through the public and Indigenous (specifically by Turtle Lodge, located on Sagkeeng First Nation) review of the Project's Draft Environmental Impact Statement (Golder et al. 2017); thus Alternative #6 was added to the assessment.* *Another suggestion was to create a geologic repository on the WL site. This option was not considered separately by CNL as it would be included in Alternative #4, which considers partial ISD with alternate disposal of the reactor core components in another facility."* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project – Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *Golder et al. 2017. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 1. September 2017.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *The Agency 2015. Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012. March 2015.*
28.	CNSC	C. Cianci	EIS - Section 2.5.1 Evaluation Approach	2-8	**Comment:** This section of the EIS indicates: "Public and Aboriginal engagement is also an important aspect of the decision-making process. A summary of the alternative means being considered was made available to the public at open houses and meetings with First Nations communities, and input received is documented in Section 4.0 Aboriginal Engagement and Section 5.0 Public Engagement". CNL indicates that Aboriginal communities' input was received on the alternative means however neither in this section nor Section 4.0 Aboriginal Engagement, is there information on how Aboriginal communities' feedback was taken into consideration in the alternative means assessment. **Expectation to Address Comment:** Please provide in sufficient detail how Aboriginal communities' feedback was considered in and/or informed the alternative means assessment. If the input received was not considered in the alternative means assessment, please explain why, as well as indicate in the EIS the responses that were provided to the Aboriginal communities' in response to the issues and concerns that were raised.	**Incorporated:** Indigenous feedback was considered in and/or informed the alternative means assessment as follows: • The assessment criteria for evaluating safety and environmental effects were expanded and additional details were added through the development of the Environmental Impact Statement (EIS; Golder 2022) as a result of feedback from the public and Indigenous peoples at engagement events, where discussion and evaluation of alternatives and assessment criteria were presented. Specific changes include: ○ The separation of the Safety category into distinct categories for Worker Safety and Public Safety. ○ Reducing the perceived importance of transportation risk in the criterion. ○ Defining different criteria for each time phase of the project (closure, institutional control, post-institutional control). Furthermore, the analysis was revised to clarify that this assessment is not intended to try to determine a 'best' alternative, which is highly subjective. It instead considers only alternatives that can all safely achieve the project goals and identifies the alternative that makes the most sense given the current circumstances. • Sagkeeng First Nation performed an independent alternative means assessment (Sagkeeng and Firelight 2020) including different assessment categories, weighting, and scoring. CNL re-evaluated its own work based on Sagkeeng's alternative means assessment, but believes the assessment categories, weighting, and scoring it applied are fair and balanced, acknowledging that the weighting of each criterion is a somewhat subjective exercise and that different perspectives and understandings will value different criteria more or less in decision making. • One of the alternative means (Rolling Stewardship) to decommission Whiteshell Reactor 1 (WR-1) was identified from Indigenous engagement activities. Feedback on alternatives from Indigenous peoples focused on full dismantling as originally assessed and approved in the Comprehensive Study Report (CSR; AECL 2001), thereby preserving the status quo. ○ The concept of "Rolling Stewardship", where wastes are packaged and stored in an accessible location and monitored on site in perpetuity, was proposed through both the public and Indigenous review (specifically by Turtle Lodge, located on Sagkeeng First Nation) of the project's draft EIS (Golder et al. 2017); thus Alternative #6 was added to the assessment.

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						Appendix 4.0-1 of the EIS (Golder 2022) includes Summary of Interests and Concerns Tables that provide responses to key interests and concerns raised by Indigenous Nations. **Change to EIS:** Section 2.5.2 of the EIS (Golder 2022) was revised to expand on and provide additional detail on the assessment criteria, including defining different criteria for each time phase of the project (closure, institutional control, post-institutional control). It was also revised to include the following text to better explain how public and Indigenous feedback was considered in and/or informed the alternative means assessment: *"The discussion and evaluation of alternatives and assessment criteria were also presented at numerous public and Indigenous engagement events and feedback was solicited. The general feedback indicated the criteria for assessment of safety and environmental effects were not detailed enough. Specific changes as a result of this feedback included the separation of the Safety category into distinct categories for Worker Safety and Public Safety, reducing the perceived importance of transportation risk in the criterion, and defining different criteria for each time phase of the project (closure, institutional control, post-institutional control). Furthermore, the analysis was revised to clarify that this assessment is not intended to try to determine a 'best' alternative, which is highly subjective. It instead considers only alternatives that can all safely achieve the project goals, and identifies the alternative that makes the most sense given the current circumstances and as per the regulatory guidance [The Agency 2015]."* *"Worker safety, public and Indigenous safety, and biophysical environment were given equal weight (30%) because it is recognized that they are inter-related (i.e., one can affect the other), and the assessment does not value the safety of one group of people over another. Socio-economic factors were given a lower weight as physical health and safety are a higher priority than socio-economic health, although, both are important in the decision-making process. While CNL did receive and consider alternative weighting from Sagkeeng, it did not result in changes to CNL's weighting, as CNL believes its weighting to be reasonable and balanced. Additional discussion can be found below.* *In their Alternative Means Assessment [Sagkeeng and Firelight 2020], Sagkeeng, described in further detail at Section 2.8, provided criteria and tests that are meaningful to their community and represented their community values and interests, as represented by the Chief and Council. CNL re-evaluated its own work based on the information in Sagkeeng's alternative means assessment and deliberated whether changes should be made to their alternative means assessment.* *CNL also acknowledges that the weighting of each criterion is a somewhat subjective exercise. Not surprisingly, study results reflected Sagkeeng's priority values and associated criteria and weighting for assessing alternatives. Different perspectives and understandings will value different criteria more or less in their decision making. CNL believes the categories, weighting, and scoring it applied to each criterion is fair and balanced. It assumes that impacts to the public and Indigenous peoples, and the environment in which they live and practice their rights, make up 60% of the evaluation. Impacts on the health and safety of workers who live in the local community are 30%, and impacts to the socio-economic interests of the area are given 10%. CNL feels this adequately places the most emphasis on the safety and health of all people, and the environment."* Sections 2.5.4 to 2.7 of the EIS (Golder 2022) were revised to clarify that this assessment is not intended to try to determine a 'best' alternative, but instead considers alternatives that can safely achieve the project goals and identifies the alternative that makes the most sense given the current circumstances. An excerpt of revised text from Section 2.7 is provided as an example: *"In consideration of all factors including Indigenous engagement, the assessment of the alternative decommissioning strategies for WR-1 shows that each alternative evaluated can be executed safely. The recommended alternative for the decommissioning of WR-1, based on the alternative means analysis, is Alternative #3 (ISD [In Situ Disposal])."* Section 2.8 of the EIS (Golder 2022) was added to provide a summary of Sagkeeng First Nation's independent Alternative Means Assessment Report (Sagkeeng and Firelight 2020) and explain how CNL considered and used the report. Section 2.5.4.6 of the EIS (Golder 2022) was added to discuss the alternative means of Rolling Stewardship, which was identified from public and Indigenous engagement activities. Section 2.5.1 of the EIS (Golder 2022) was revised as follows to better explain how public and Indigenous feedback was considered in and/or informed the alternative means assessment: *"Public and Indigenous engagement was an important aspect of the decision-making process. A summary of the alternative means being considered was made available to the public at open houses and meetings with Indigenous peoples. The input received is documented in Section 4.0 Indigenous Engagement and Section 5.0 Public Engagement. As a result of these engagement activities, the assessment criteria for evaluating safety and environmental effects were expanded and additional details were added through the development of the EIS."* Section 2.5.3 of the EIS (Golder 2022) was revised as follows to better explain how public and Indigenous feedback was considered in and/or informed the alternative means assessment:

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						"Feedback on alternatives from the public and Indigenous peoples (see Sections 4.0 Indigenous Engagement and 5.0 Public Engagement) focused on full dismantling as originally assessed and approved in the CSR (Alternative #1), thereby preserving the status quo. *Other comments were related to being able to retrieve or remediate the disposed reactor at an unspecified future date should monitoring show that environmental effects are not acceptable. A specific suggestion was the use of sand instead of grout as a backfill material, with the expectation that the sand could be more easily removed in the event that retrieval or remediation efforts were undertaken; thus Alternative #5 was added to the assessment.* *The concept of "Rolling Stewardship," where wastes are packaged and stored in an accessible location and monitored on site in perpetuity, was proposed both through the public and Indigenous (specifically by Turtle Lodge, located on Sagkeeng First Nation) review of the Project's Draft Environmental Impact Statement (Golder et al. 2017); thus Alternative #6 was added to the assessment."* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project – Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *Golder et al. 2017. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 1. September 2017.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Sagkeeng and Firelight 2020. Alternative Means Assessment for the Environmental Assessment of Canadian Nuclear Laboratories' Proposed WR-1 Reactor Decommissioning Project. WLDP-26000-041-000. October 2020.* *The Agency 2015. Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012. March 2015.*
29.	CNSC	RPD	EIS - Table 2.5.1-2	2-8	**Comment:** In the alternative means assessment, the criteria identified for worker safety are focused on minimizing the mitigation required to ensure that radiological dose limits are not exceeded during decommissioning. In contrast, for other VCs under "Environmental Effects", the criteria consider how the likely effects compare. The criteria for various VCs in the alternatives assessment appear to be inconsistent. **Expectation to Address Comment:** Please justify the selection of criteria for the alternatives means assessment, and include in this justification, the reason why the criteria for the VC of worker health is defined differently than for other VCs.	**Resolved As**: The selected criteria are derived from CNSC REGDOC 2.9.1 (CNSC 2020), which provides requirements for performing the assessment and refers to additional guidance documents (The Agency 2015). This guidance indicates that only technically and economically feasible alternatives be included, and that the impacts of those feasible alternatives on Valued Components (VCs) be assessed. The VCs for the alternative means assessment are broadly grouped into human and environmental health. Human Health is subdivided into worker and public health, as the two have considerably different potential risks and exposure pathways. The environment is divided into major ecological environments, which is a sufficient level of detail for an alternatives assessment. Further detailed assessment is reserved for the selected alternative. The Worker Health VC is treated differently because worker health and protection is viewed differently to public health and protection. Workers are expected to accept additional, and different types of risks compared to the public. For certain types of risk, such as radiological risks, there is an expectation that workers will be exposed to elevated risks in order to complete the work. That does not mean workers are unnecessarily exposed, and CNL implements mitigations to reduce those risks to only what is necessary, following the As Low As Reasonably Achievable (ALARA) principle, keeping exposures well below regulatory limits. But because of these expectations, risks to workers have to be evaluated differently than risks to the public and the environment. When evaluating the effects on the public health, the criteria for the alternative means is the anticipated amount of effect on a given member of the public. When evaluating the effects on the workers, the starting assumption is that the workers will receive exposure commensurate with the ALARA principles and the criteria for evaluating the alternative means is the amount of effort required to keep exposure to those ALARA levels for each of the means. This is the perspective that has been reflected in how the criteria were defined, discussed, and assessed as per CNSC REGDOC 2.9.1 (CNSC 2020) and guidance on Addressing the Purpose of and Alternative Means (The Agency 2015). **Change to EIS**: Section 2.0 of the Environmental Impact Statement (EIS; Golder 2022) has been significantly revised. Table 2.5.1-2 was revised and updated as Table 2.5.2-1. The bullet point regarding mitigation effort was removed from Table 2.5.2-1. Description of worker safety considerations are provided in Section 2.5.2.3 of the EIS as follows: ▪ *"**Worker safety** – The defense-in-depth principle and ALARA principle were considered when alternatives were evaluated for worker safety. For the criteria considered, it is often not possible to completely eliminate the hazard, but all alternatives include appropriate mitigation to reduce the hazard and protect workers.* – ***Radiological hazards during decommissioning** – All alternatives would involve some level of radiation exposure to workers during decommissioning; however, appropriate mitigation (e.g., temporary shielding and ventilation, PPE&C) could be put in place for all*

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						alternatives so that worker dose limits would not be not exceeded. The amount of mitigation required would vary among the alternatives due to different types of exposure and radiation levels among the alternatives. Alternatives that minimize the need for mitigation the most were considered most favourable, while alternatives that require more mitigation were considered proportionately less favourable. – ***Non-radiological hazards during decommissioning*** *– The WR-1 Building also contains non-radiological hazards such as lead, polychlorinated biphenyls (PCBs) and asbestos-containing materials such as pipe insulation. Appropriate mitigation (e.g., PPE&C and ventilation) could be put in place for all alternatives to ensure the protection of worker health. The degree to which mitigation would be needed determined the level of favourability of each alternative. Alternatives requiring the least amount of mitigation were considered most favourable and alternatives requiring the greatest amount of mitigation were considered proportionately less favourable.* – ***Industrial safety during decommissioning*** *– Decommissioning of the WR-1 Building would introduce standard worker industrial safety hazards (e.g., working at heights, confined spaces, congested workspaces and hoisting/rigging). These hazards would be more prevalent in some alternatives. Alternatives with the lowest exposure to these worker safety issues, compared to the other alternatives, were considered most favourable. Alternatives with the highest potential exposure to these worker safety issues, compared to the other alternatives, were considered proportionately less favourable.* – ***Waste handling*** *– The transport of waste off site would require additional handling by workers. Appropriate mitigation (e.g., temporary shielding and ventilation, PPE&C) could be put in place for all alternatives to ensure that worker dose limits would not be not exceeded during waste handling and packaging for transport. However, as an appropriate facility does not yet exist for waste disposal, interim storage of wastes would be necessary and double handling of the waste would be required for final disposal at an unspecified future date. Alternatives that would not require the double-handling of wastes were considered most favourable. Alternatives that would require double-handling of wastes and interim storage were considered proportionately less favourable."* **References**: *CNSC 2020. REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.2. September 2020. ISBN 978-0-660-06255-6.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *The Agency 2015. Operational Policy Statement: Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012. March 2015.*
30.	CNSC ECCC	All	EIS - Table 2.5.1-2 Criteria for Evaluating Alternative Means of Carrying Out the Project	2-9	**Comment:** Based on the criteria identified, it is unclear whether CNL has assessed the alternatives based on effects during both the closure and post-closure phases in all cases. The evaluation criteria for 'Environmental Effects' includes the question: "Can it be decommissioned in a manner that provides long-term protection of ecological and human health?" Although this question/criteria does attempt to examine the issue of long-term effects, more specific time periods in the evolution of each of the alternative means would be more appropriate since there are very specific time periods with respect to institutional control. These periods are the closure period, post-closure with institutional control and post-closure without institutional control. Potential ecological effects during active decommissioning activities will be markedly different from the post-closure near term. As well, the potential environmental effects between post-closure near term will likely be very different from the post-closure long term especially when geologic	**Incorporated:** This comment has been addressed by incorporating the additional requested information into Section 2.5, 2.6, and 2.7 of the revised Environmental Impact Statement (EIS; Golder 2022). The alternatives assessment was expanded to describe the assessment criteria, the effects of each alternative, and the comparison of alternatives to the criteria in a time dependant manner. The assessment was divided into three time phases: 1) Closure Phase, 2) Institutional Control Phase, and 3) Post-Institutional Control Phase. The closure phase includes the current state until the end of physical decommissioning work (until 2027 for in-situ disposal). The Institutional Control phase begins once closure is achieved and continues for a minimum of 100 years. The end of the Institutional Control Phase is uncertain, and may continue indefinitely. The Post-Institutional Control Phase is assumed to begin when institutional controls are removed, or the knowledge and control of the facility is lost due to a significant event such as government collapse or catastrophic natural disaster. There is uncertainty around when this may happen, but for the purposes of the assessment it is assumed to occur 100 years after closure of the facility (i.e., at the end of the institutional control period). The post-institutional control period will continue indefinitely; however, the timeframe defined for assessment of potential effects as part of the normal evolution of the Project is 10,000 years as described in Section 5.3 (Timeframes) of the Decommissioning Safety Assessment Report (Golder 2021). The criteria are summarized in Table 2.5.2-1 of the EIS and the discussion of each alternative is now specific to each of the time phases. In the Closure Phase, risks are associated with physical decommissioning work (decontamination, demolition, grouting, etc.). In this case, the risk to workers, the public, and the environment due to emissions increases proportionally with the level of intrusive decommissioning work (cutting into pipes and tanks). In this phase, Alternatives 1 and 2 have significantly higher risks as they involve the removal, segmentation, packaging, transport, and storage of the reactor core components, and the rest of the reactor and non-reactor systems. In the Institutional Control Phase, In Situ Disposal (ISD) is preferred as it requires only limited monitoring of disposed wastes through groundwater monitoring. All other alternatives require ongoing storage and monitoring of wastes, with the liability of performing additional disposal actions to be

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					timescales are considered. **Expectation to Address Comment:** Expand the temporal evaluation of the environmental effects of the alternative means to the closure period, the post-closure with institutional control period and the post-closure beyond/without institutional control period. In particular, it seems Alternative #3 has a higher risk for the environment in the long-term than completely or partially removing the core from the site. Please clarify and compare each alternative's effects to human health and the environment in the short-term and long-term.	taken in the future. There is even the possibility that additional waste storage facilities will need to be constructed in order to accommodate the wastes, which lends itself to additional risks to the workers, public, and environment from that development. Alternative #3 does not necessarily pose a higher risk to the environment in the long term (Post-Institutional Control) compared to other options. It *may* appear as higher risk in the long term, but that relies on the assumptions that: 1. A more suitable, permanent waste storage facility will be approved, built, commissioned, and operated at an unspecified point in the future. 2. The permanent waste storage facility will provide a significantly greater level of protection. Both of these assumptions are subject to uncertainty. However, the EIS makes the reasonable assumption that a new facility, which would also be subject to long term environmental risks, would be mitigated using similar safety analysis and design processes as the ones that were used for the Whiteshell Reactor Disposal Facility. In this case, since all alternatives provide a disposal path that meets regulations, with at least similar levels of protection, there is no clear preference or increased risk from any alternative in this phase. If such a facility never comes to exist, or if future conditions do not allow for the same level or protection from that facility, then the risks from ISD would be significantly less than the other alternatives. By assuming at least similar benefit, the decision is biased against ISD. **Change to EIS:** Section 2.0 of the EIS (Golder 2022) has been significantly revised and updated. Table 2.5.1-2 was renumbered as Table 2.5.2-1 and was updated to reflect the time phases. Section 2.5.2 was updated to reflect the criteria and time phases in which they are applied. Section 2.5.4 was updated to discuss each alternative in the different time phases. Section 2.6 was updated to discuss the direct comparison of alternatives in each time phase. **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.*
31.	ECCC		EIS - Table 2.5.1-2 Criteria for Evaluating Alternative Means of Carrying Out the Project	2-9	**Comment:** In the 'Technical Feasibility' evaluation of the alternatives, a reasonable assessment of the similarities and differences between the proposed alternative and the past experience example(s) should be presented for the evaluation. The description of the technical feasibility for the ISD alternative includes references to the experience in the United States. At the Hallam Nuclear Power Facility, "only low-level waste was included" for the entombment structure [1] such that the decommissioned end state was similar to that of a near surface disposal facility for low-level waste which is consistent with the IAEA guidance. This ensured that all three entombed reactor sites in the US could meet unrestricted use standards in about a hundred years. It should also be noted that the US-List of Decommissioned Reactors shows that the majority of decommissioned reactors have been through decommissioning which is effectively complete dismantling and decontamination. The footnote for entombment states: "radioactive contaminants are encased in a structurally long-lived material, such as concrete. The entombment structure is appropriately maintained, and continued surveillance is carried out until the radioactivity	**Incorporated:** Regulating nuclear safety in Canada is the responsibility of the Canadian Nuclear Safety Commission (CNSC). The International Atomic Energy Agency (IAEA) is a valuable resource to provide guidance for decisions concerning safety related to CNL's plans to decommission Whiteshell Reactor 1 (WR-1). Current IAEA guidance states that In Situ Disposal (ISD) should not be the preferred decommissioning strategy for nuclear power reactors, except possibly under exceptional circumstances (IAEA 2014). The IAEA (IAEA 2014) goes on to list the 15 requirements that should be met when selecting a specific decommissioning pathway for a facility. As documented in Section 2.4.2 of the Environmental Impact Statement (EIS; Golder 2022), all four technically feasible alternatives considered were compared against IAEA guidance provided in IAEA GSR Part 6 Section 2 (IAEA 2014) and determined to be aligned with the fifteen requirements for safety, protection of people and protection of the environment. This EIS and the supporting documents focus on the preferred Alternative #3 – ISD. The ISD alternative was evaluated in detail through the assessments carried out in the rest of the EIS and found to be the preferred alternative that was protective of the human health and the environment. Based on CNL's understanding of the hazards associated with WR-1, CNL believes the Whiteshell Reactor Disposal Facility (WRDF) can be built to meet CNSC regulations. CNL also believes that the safety case has been made that this dedicated facility can be used to permanently dispose of the waste, rather than temporarily store it until such time as a suitable permanent disposal facility is available. IAEA GSR Part 6 Section 1.10 (IAEA 2014), does allow for the use of "entombment" under exceptional circumstances. As explained in Section 6.3 of the Whiteshell Laboratories Detailed Decommissioning Plan (DDP; CNL 2021), Canada's regulatory framework for decommissioning, according to CNSC REGDOC-2.11.2 (CNSC 2021), includes ISD as a viable decommissioning strategy option under specific circumstances or legacy sites. The WR-1 project meets all the requirements for a legacy site, as defined in REGDOC-2.11.2: - WR-1 was a research and a demonstration facility constructed at a time in history when decommissioning was not part of the design; - All reactor fuel has been removed from the WR-1 site; - Use of ISD will protect the workers, the public and the environment; and

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					decays to a level permitting unrestricted release of the property." [2] The post-closure status of the ISD will be that of a near surface disposal facility under IAEA guidelines. Therefore, the evaluation of 'Technical Feasibility' should include the extent which the end-state will be similar to a near surface disposal facility as defined by the IAEA. **Expectation to Address Comment:** All alternatives should be clearly analyzed for alignment with the IAEA guidelines for decommissioning nuclear reactors or its equivalent, that is, that decommissioned nuclear reactor sites should be releasable for unrestricted public use. **References:** [1] Birk, S.M., R.G. Hanson and D.K Vernon Jr. 2000. Entombment: It is Time to Reconsider This Technology. Proceedings of the Idaho International Engineering and Environmental Laboratory. INEEL/CON-2000-00597 PREPRINT. [2] NEI. 2016. Decommissioning Status of Shut-Down US Nuclear Power Reactors. https://www.nei.org/Knowledge-Center/Nuclear-Statistics/US-Nuclear-Power-Plants/Decommissioning-Status-for-Shut-Down-US-Nuclear-Po	- WR-1 site will remain under Institutional Controls for a period defined in the safety case. Additionally, the original decommissioning strategy for WR-1 relied on the projections that there would be a disposal facility available in Canada for reactor components at the time of decommissioning. There are no disposal pathways available for reactor components in Canada currently, and continuing the storage with surveillance (SWS) of WR-1 safely becomes more difficult as the facility continues to age well beyond its original intended life. In summary, CNL's position is that WR-1 is a suitable facility to propose ISD, based on our detailed site and facility characterization studies, our commitment to have a 100-year institutional control period, and our understanding of the technology available to decommission small, legacy, research reactors. The risks associated with this method of disposal are low. The approach will require the facility to apply for a licence as a disposal facility and will need to meet the associated regulatory requirements for this type of facility. ISD is a well-known technique and has been utilized successfully at a number of nuclear sites worldwide since the 1960s. It is also used successfully to remediate sites contaminated with toxic and hazardous wastes. The ISD of the WR-1 facility will meet the requirements of all current legislation. Notwithstanding any of the above, IAEA GSR Part 6 (IAEA 2014) explicitly excludes the closure of waste disposal facilities from its scope in Sections 1.1 and 1.17: *"1.17. These requirements do not apply to radioactive waste disposal facilities or disposal facilities for NORM [Naturally Occurring Radioactive Material] or for waste from mining and mineral processing. Requirements for the closure of such facilities are established in Ref. [3] [IAEA 2011]. However, requirements for the decommissioning of supporting buildings and services of such facilities are established in the present publication."* All aspects of ISD that do not include final grouting and disposal are in compliance with IAEA GSR Part 6 (IAEA 2014). The WR-1 ISD Project further aligns with applicable IAEA SSR-5 Disposal of Radioactive Waste requirements (IAEA 2011). The Project is not simply the entombment of WR-1 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. **Change to EIS:** Section 2.4.2 of the Environmental Impact Statement (EIS; Golder 2022) was updated with a description of how all four technical feasible alternatives considered are aligned with the requirements of IAEA GSR Part 6 (IAEA 2014): *"All four technically feasible alternative means of carrying out the decommissioning of WR-1 assessed in Section 2.5.4 align with IAEA's General Safety Requirements Part 6, Decommissioning of Facilities (IAEA 2014), which lists 15 requirements … that should be met when selecting a specific decommissioning approach for a facility.*" Section 2.5.4.3.1 was also revised as follows to justify how ISD meets the technical feasibility criteria: *"The US Nuclear Regulatory Commission has recognized ISD as an acceptable decommissioning and disposal strategy since the 1970s (US DOE 2013). The CNSC and the Canadian Standards Association (CSA) also both recognize ISD as an acceptable approach for legacy nuclear facilities such as WR-1, which are remnants of the dawn of the nuclear industry in Canada, and for which decommissioning was not planned as part of the design (CNSC 2021; CSA 2019)"* **References:** *CNL 2021. Whiteshell Laboratories Detailed Decommissioning Plan: Volume 6 – Whiteshell Reactor #1: Building 100. WLDP-26400-DDP-001. Revision 5. October 2021.* *CNSC 2021. REGDOC-2.11.2 - Waste Management: Decommissioning. January 2021.* *CSA 2019. N294, Decommissioning of facilities containing nuclear substances. January 2019.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *IAEA 2011. Disposal of Radioactive Waste, IAEA Specific Safety Requirements Series No. SSR-5.* *IAEA 2014. Decommissioning of Facilities, IAEA General Safety Requirements Part 6.* *US DOE 2013. DOE EM Project Experience & Lessons Learned for In Situ Decommissioning. Prepared By U.S. Department of Energy, Office of Environmental Management, Office of D&D and FE, EM-13. Washington DC: Office of Environmental Management.*

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32.	MSD		EIS - Section 2.5 Alternative Means of Carrying out the Project	2-10	**Comment:** With respect to the paragraph on "Waste Handling", there is mention of interim storage of waste but the location is not provided. **Expectation to Address Comment:** Clarify where the interim storage would be located. Would it be located on the WL site? If so, provide a specific location and indicate if any site monitoring will be conducted during the time it is in use.	**Resolved As:** The final location of Interim storage has not been determined for any alternative, but will be either at Whiteshell Laboratories (WL) at the existing Waste Management Area or at Chalk River Laboratories (CRL) and stored in the existing Waste Management Areas at the CRL site. All of these areas are licenced by Canadian Nuclear Safety Commission (CNSC), and monitored as part of CNL's Radiation Protection (CNL 2021a; CNL 2018) and Environmental Protection (CNL 2021b) Programs. All wastes are confirmed to meet the applicable Waste Acceptance Criteria (and applicable licensing/safety documents) prior to emplacement in the Waste Management Areas. No other interim storage locations for these wastes are currently identified. **Change to EIS**: No changes have been made to the Environmental Impact Statement. **References:** *CNL 2018. Radiation Protection. 900-508740-GDI-001. Revision 2. June 2018.* *CNL 2021a. Radiation Protection. 900-508740-PDD-001. Revision 2. July 2021.* *CNL 2021b. Environmental Protection. 900-509200-PDD-001. Revision 3. June 2021.*
33.	ECCC		EIS - Section 2.5.4.3 Technical	2-23	**Comment:** This section of the EIS states that: "Alternative #3 will require the transport and disposal of small quantities of radioactive wastes offsite, although it is anticipated that the majority of wastes will be contained with the WR-1 ISD structure." **Expectation to Address Comment:** Provide the volume and type of waste, as well as the number of trips to deliver off-site. Estimate the release of radiological and non-radiological contaminants (e.g., lead, cadmium) for this operation.	**Resolved As:** The estimated volumes and types of waste associated with in situ disposal are provided in Section 8.3 of the Detailed Decommissioning Plan (CNL 2021), specifically Table 29 provides estimated non-compacted and non-segmented waste volumes and masses by waste classification and work package to be removed from Building 100 (B100). The estimated total volumes for each waste classification are as follows: • Clean Non-Radioactive Waste: 12,113 m^3 • Low Level Waste: 2,658 m^3 • Intermediate Level Waste: 0 m^3 • Hazardous Waste: 983 m^3 • Mixed Waste: 331 m^3 This gives an estimated total of 16,085 m^3 of waste to be removed from B100 and disposed of off-site, which is estimated to require approximately 800 trucks or trips. This information has not been included in the assessment as the assessment is clear that Alternative #3 removes less radiological material than Alternative #1 by the very nature of the alternative. No radiological or non-radiological hazardous contaminants are expected to be released as a result of transportation of this waste. All waste would be transported in approved packages to mitigate releases, even in the event of a traffic accident. Tables 11 to 14 of Appendix 6.2-2 of the Environmental Impact Statement (EIS; Golder 2022) summarize the maximum and average scenario daily emission rates and percentages that each emission source contributes to the grouting and demolition project stage, including emissions from the removal of hazardous waste, recycling of materials, and disposal of asbestos. The removal of hazardous waste, recycling of materials, and disposal of asbestos emission sources represent a small portion of the total emissions for the project. **Change to EIS:** There has been no specific change to the EIS as a result of this comment, but the Technical Feasibility of Alternative #3 – In Situ Disposal is now discussed in Section 2.5.4.3.1 of the EIS (Golder 2022). **References:** *CNL 2021. Whiteshell Laboratories Detailed Decommissioning Plan: Volume 6 – Whiteshell Reactor #1: Building 100. WLDP-26400-DDP-001. Revision 5. October 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

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34.	MSD		EIS - Section 2.6 Summary	2-27	**Comment**: The first paragraph in the Summary refers to a table numbered Table 2.6-1, but this is missing from this section of the EIS. Is the text in this section referring to Table 2.7-1? **Expectation to Address Comment:** Update this section of the EIS accordingly.	**Incorporated**: The content from Section 2.6 – Summary in the 2017 Environmental Impact Statement (EIS; Golder et al. 2017) has been updated and is now found in Section 2.6 – Comparison of Alternatives in the latest revision of the EIS (Golder 2022). The cross reference has been corrected to refer to Table 2.7-1 and 2.7-2. **Change to EIS:** Section 2.6 – Summary from the 2017 EIS (Golder et al. 2017) has been retitled in the latest revision and is now Section 2.6 – Comparison of Alternatives. The table reference in the first paragraph of Section 2.6 has been updated to Table 2.7-1 and 2.7-2 and reads as follows: *"As described in Section 2.5.2, the alternatives were qualitatively ranked according to the criteria listed in Table 2.5.2-1. Results are summarized in Table 2.7-1 and 2.7-2 illustrating the relative preference of each feasible alternative, as shown below."* **References**: *Golder et al. 2017. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 1. September 2017.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
35.	MSD		EIS - Section 2.7 Conclusion	2-31	**Comment**: The concluding remarks state that [emphasis added]: "In Situ Decommissioning is the safest technique, dramatically reducing the risk to workers compared to dismantling, and provides **long-term safety to the public and the environment**." The summary of the evaluation of alternatives in Table 2.7-1 does not substantiate the long-term safety to the public and environment by the Alternative #3. **Expectation to Address Comment:** Revise the statement in Section 2.7 to reflect the summary of evaluation of alternatives in Table 2.7.1.	**Resolved As:** The summary paragraph in Section 2.7 of the Environmental Impact Statement (EIS; Golder 2022) has been revised to reflect the position that several options can meet the standards for long term safety to workers, the public, and the environment, rather than attempting to justify one alternative as "safest" since they can all be executed safely. The two primary drivers for selecting the In Situ Disposal (ISD) option are the reduction in upfront hazard to workers and the public due to the less invasive decommissioning work, and the uncertainty surrounding future disposal options or technologies that have yet to be determined. Detailed discussion of the justification of these concluding statements are provided in the preceding Sections 2.5 and 2.6, which discuss each alternative against the criteria. The specific discussion of long term safety of ISD is provided in Section 2.5.4.3.3.2 of the EIS (Golder 2022). Section 2.7 is not intended to perform detailed quantitative analysis of every alternative in this part of the assessment or to substantiate the long-term safety of any particular alternative. The alternative means assessment provides the justification, based on qualitative and comparative analysis from the proponent's perspective, for selecting ISD as the preferred alternative, and proceeding with the detailed assessment of that alternative. The detailed assessment, as provided in the subsequent sections of the EIS, specifically Section 6.0, provides the detailed assessment and substantiates that the ISD alternative can provide the required long-term safety and protection of workers, the public, and the environment. **Change to EIS:** Section 2.7 was revised with Tables 2.7-1 and 2.7-2, which provide visual summary of the comparison of alternatives to each criteria in each time phase, and also revised with the following text: *"In consideration of all factors including Indigenous engagement, the assessment of the alternative decommissioning strategies for WR-1 [Whiteshell Reactor 1] shows that each alternative evaluated can be executed safely. The recommended alternative for the decommissioning of WR-1, based on the alternative means analysis, is Alternative #3 (ISD)."* and *"The selection of ISD was based on the safety, environmental, technical and economic factors. ISD is a safe option, reducing the risk to workers compared to dismantling and providing long-term safety to the public and the environment. The ISD approach also has the least reliance on undefined future disposal options or technologies."* **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
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36.	CNSC ECCC	N. Kwamena	EIS - Section 3.1.1 Project Overview	3-1	**Comment:** The Project activities assessed in the EIS are limited to the ISD of the WR-1 Building. The EIS indicates that the removal of the east wing (also referred to as east extension or east annex) and service wings of the WR-1 complex were assessed as part of the *Comprehensive Study Report* (CSR) (AECL 2001) and are covered under CNL's existing decommissioning licence for the WL site. However, air emission estimates, air dispersion modeling and cumulative effects for criteria air contaminants (CACs) only consider the ISD of WR-1 Building. **Expectation to Address Comment:** Clarify what project activities are included in the air emission estimates, dispersion modeling results and cumulative effects analysis for air quality and greenhouse gases (GHG). Clarify whether there will be any other decommissioning and demolition activities done in the Site Study Area (SSA) during the ISD of the WR-1 complex? If so, determine the cumulative effects of these activities on air quality and GHG emissions.	**Resolved As:** The project activities included in the air emission estimates, dispersion modelling results, and cumulative effects analysis for air quality and greenhouse gases (GHG) are: preparation for in situ disposal (ISD; Stage 1), grouting of below-grade structures and systems (Stage 2), and removal of above-grade Whiteshell Reactor 1 (WR-1) structures and systems (Stage 3). Other activities to be performed in the Site Study Area during the project include: installation of concrete cap and engineered cover (Stage 4), final site restoration (Stage 5), and preparation for institutional control (Stage 6). The cumulative effects of Stages 4 to 6 on air quality and GHG emissions are not determined as Stages 1 to 3 are considered to involve the highest level of emissions compared to Stages 4 to 6 as they occur during overlapping years. Additionally, Stages 4 to 6 will include significantly less road and non-road activities and will not include the batch mixing plant or similar equipment, demolition or propane combustion, resulting in lower emissions. As for other activities to be performed in the Local Study Area, such as decommissioning of the remaining infrastructure and support facilities at the Whiteshell Laboratories (WL) site as per the existing decommissioning licence, the Comprehensive Study Report (AECL 2001) included consideration of the WR-1 Building in the original evaluation of residual effects to air quality (see Section 6.3.1 of AECL 2001) and concluded that release of air emissions is negligible; consequently, no significant effects were predicted (AECL 2001). Although the decommissioning strategy has changed for WR-1 from a complete removal of the facility to ISD, activities related to the decommissioning of the reactor are expected to be less disruptive than those assessed in the Comprehensive Study Report (AECL 2001) of the currently approved decommissioning approach (i.e., complete removal of the facility). Mitigation such as the use of dust suppression methods will be implemented during building demolition or soil remediation activities to control airborne emissions and nuisance dust to further limit emissions. Consequently, the project is not anticipated to result in a change in the conclusions of the 2001 Comprehensive Study Report related to air quality. As such, the project is not expected to contribute cumulatively to the effects of decommissioning of the remaining infrastructure and support facilities at WL to cause a significant effect. **Change to EIS:** Section 6.2.1.4.2 of the Environmental Impact Statement (EIS; Golder 2022) was revised as follows to clarify why preparation for ISD, grouting of below-grade structures and systems, and removal of above-grade WR-1 structures and systems are the project activities included in the air emission estimates, dispersion modelling results, and cumulative effects analysis for air quality and GHG: *"Project Stages 1 to 3 are considered to involve the highest level of emissions compared to the remaining stages as they occur during overlapping years. Project Stages 4 to 6 will include substantially less road and non-road activities and will not include the batch mixing plant or similar equipment, demolition or propane combustion, resulting in lower emissions. Emissions sources for Stage 4 were compiled to verify Stages 1 to 3 as the bounding case for the atmospheric assessment (Golder 2020a). While Stage 4 also includes travel on unpaved roads that have a greater emission factor than paved roads, the vehicular travel along the roads is assumed to be substantially less when compared to Stages 1 to 3. The remaining sources of emissions from Stage 4 are substantially less than in Stages 1 to 3, as a result, no further assessment is required. Therefore, only activities associated with Stages 1 to 3 are considered in the air quality assessment as they represent the most conservative air emission scenario. Details on the sources of emissions are provided in Appendix 6.2-2."* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project – Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *Golder 2020a. WR-1 Environmental Impact Statement - Rationale for Identification of the Bounding Scenario for the Assessment of Air Quality and Greenhouse Gas Emissions. WLDP-26000-021-000. March 2020.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
37.	ECCC		EIS - Table 3.5-1	3-28	**Comment:** It is not clear what is meant by the following statement in the EIS: "Pipes and conduits penetrating out walls to be cut to provide an air gap". Does this mean that it is possible that air will escape from the encapsulated portion of the entombment that is below grade? Will the escaping air be monitored to ensure that no radioactive material is emitted into the atmosphere from the entombment with the air? **Expectation to Address Comment:**	**Resolved As:** What was meant by "Pipes and conduits penetrating out walls to be cut to provide an air gap." was that some of the piping of the active drainage system extends out of the area to be grouted and disposed of in situ, and in these locations, the piping will be cut and the hole sealed to limit its potential as a groundwater pathway. During grouting, air will be displaced by the grout, but it will be vented to the above grade portion of Building 100 (B100) by planned ventilation pathways where it will be filtered as necessary and monitored to ensure release of radioactive material are below the Derived Release Limits for the Whiteshell Laboratories site (CNL 2021). "Air Gapping" is a decommissioning term that describes a physical severance in a mechanical or electrical system. It is often used during deactivation of energized systems where a physical "air gap" can be seen, providing clear evidence that a system is disconnected.

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					Provide clarification on what the air gaps mean and their purpose.	**Change to EIS:** Table 3.4.5-1 of the Environmental Impact Statement (EIS; Golder 2022) was revised to remove the statement "Pipes and conduits penetrating out walls to be cut to provide an air gap." and include the following table note for increased clarity: *"NOTE: All pipes and conduits penetrating outer walls to be cut away from the wall and the penetration to be sealed prior to grouting."* Section 3.4.6.2 of the EIS (Golder 2022) was revised as follows to clarify what air gapping means and its purpose: *"The overall fill design will target the elimination of transport pathways through large diameter pipes or ducts by cutting or "air gapping" the pipes, ducts, and other conduit. The term "Air Gapping" indicates providing a physical space cut in piping so that when grout fill is placed, that space is filled with grout and will provide a "grout break" in the pipe, limiting its potential to be a groundwater pathway."* **References:** *CNL 2021. Derived Release Limits for CNL's Whiteshell Laboratories. WL-509211-RRD-001. Revision 6. January 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
38.	ECCC		EIS - Section 3.5.1.1.3 Create Grout Flow Paths	3-32	**Comment**: This section of the EIS indicates that: "In order to permit grout to fully encapsulate the below grade systems, it may be necessary to penetrate interior walls, piping systems, or tanks. For interior walls, pathways may be created between rooms to allow flow of grout into, and air and grout curing heat out of, all areas of the below grade structure. For piping systems and tanks, penetrations may be made at strategic locations to allow grout to further penetrate into tanks and piping systems for a two-fold purpose: Reduce buoyancy loads from empty tanks and large pipes surrounded by liquid grout. Provide additional barriers to release of contamination, above and beyond that already accounted for by the planned macro- encapsulation." The statement "encapsulate in grout" was included in places (tables) and then the above statement refers to grout flow path. However, it is not specified whether the grout will be injected with pressure or allowed to flow by gravity. If the grout is to flow by gravity, it is likely that void spaces will not be filled with grout, especially in tight spots or places where gravity would not be sufficient to force grout in such spaces. Also, CNL states that "penetrations may be made at strategic locations to allow grout to further penetrate into tanks and piping systems". Given that there are several pipes below grade of various sizes, the statement does not specify that all the pipes will be cut open to allow the grout to fill them up. This may then mean that a number of the pipes below grade, especially horizontal pipes and a good number of the narrow pipes, will not be filled with grout. **Expectation to Address Comment:** Explain the rationale for relying on gravity instead of pressure to apply the grout, what the plans are to get grout into	**Resolved As:** A combination of gravity-fed grouting and low pressure grouting will be used, with gravity-fed grouting being the primary method. Gravity-fed grout placement is sufficient for most areas of Building 100 (B100) as: • The grout is specially designed to be a highly flowable, self-consolidating product that remains cohesive during pumping and placement. (See the Grout Report [Golder 2022a] for more detail on the grout design.) • Placement will be planned and documented in an engineered grout placement plan. Grout lines will be used to deliver grout to the various areas of B100 and multiple deposition ports will be used in each room or area to ensure as complete of fill as practical. While bulk filling of rooms or areas will be the general approach, targeted filling of larger pipes, tanks, and vessels will be done as necessary. (See the Preliminary Grout Fill Plan [Golder 2021a] for more detail on grout placement.) A combination of gravity-fed grouting and low pressure grouting has been used by other reactor grouting projects and other nuclear bulk fill projects (US DOE 2013). Correct, not all pipes will be cut open to allow the grout to fill them up. Instead, CNL is focusing on: • Pipes that penetrate the outer walls of the facility (Golder 2021a). • Pipes that penetrate the reactor vault (as this is where a significant portion of the radioactivity is located; Golder 2021a). • Pipes that are greater than 200 mm (8 in.) in diameter (to ensure there are no significant voids in the grouted facility; Golder 2021a). CNL is relying on a combination of gravity-fed grouting and low pressure grouting; gravity-fed grout placement is sufficient for most areas of B100 for the reasons provided above. Grout is not planned to get into all of the pipes and small spaces as this is not necessary; the safety case for Whiteshell Reactor 1 (WR-1) is built on the conservative assumption that the grout provides no additional barrier to release. Since there is no expectation for grout to completely penetrate and fill every void space, the existence of voids is not detrimental to the overall safety of the system. The primary purpose of the grout is to prevent subsidence or structural collapse of the facility with time. In fact, in the solute transport modelling (Golder 2021b), it is conservatively assumed that all contaminants are immediately dispersed throughout the grout at the start of the simulation or as they have been released by corrosion from the metals of the reactor vessel. As such, not filling all of the pipes and small spaces with grout has no implications. **Change to EIS:** The Environmental Impact Statement (EIS; Golder 2022b) was revised and the "Create Grout Flow Paths" section is now Section 3.4.6.1.3. It was revised as follows to clarify that the grout is not planned to get into all of the pipes and small spaces, and the long-term safety of the facility is not dependent on 100% grout fill: *"To permit grout to fill the below-grade systems to the extent practicable, it may be necessary to penetrate interior walls, piping systems or tanks. Pathways may also be created between rooms to allow the flow of grout and air out of all areas of the below-grade structure. For piping systems and tanks, penetrations may also be made at strategic locations to:*

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					all the pipes, all the small spaces, and the implications of not filling the pipes and spaces with grout.	*1) reduce buoyancy loads from empty tanks and large pipes surrounded by liquid grout; and* *2) further improve the grout flow into specific piping systems."* Section 3.4.6.2 of the EIS (Golder 2022b) was revised as follows to reflect the above response: *"The grout has been designed to achieve the required physical properties listed in Table 3.4.6-1 to flow easily into the void spaces of the WR-1 below-grade structure. The design takes into account the effects of using local fill materials (e.g., sand) and the materials the grout will interact with in the WR-1 below-grade structure (e.g., aluminium and lead). The grout design includes guidance on appropriate quality control measures to be applied during mixing and placement of the grout."* *"Grouting of the below-grade structure will be carried out in stages. The safety case for the WRDF is built on the conservative assumption that the only major aspect of the grout to its function as a barrier is the hydraulic conductivity of grout used in the groundwater flow model. Since there is no expectation for grout to completely penetrate and fill every void space, the existence of voids and cold joints is not detrimental to the overall safety of the system. Instead, the structure will be filled to eliminate as many void spaces as is reasonably achievable. The overall fill design will target the elimination of transport pathways through large diameter pipes or ducts by cutting or "air gapping" the pipes, ducts, and other conduit. The term "Air Gapping" indicates providing a physical space cut in piping so that when grout fill is placed, that space is filled with grout and will provide a "grout break" in the pipe, limiting its potential to be a groundwater pathway. The placement of the grout will be completed using an engineered fill schedule (i.e., grouting plan). Multiple lifts of grout will be poured to systematically fill as practical the reactor building voids."* *"The maximum lift size (depth of fresh grout) will be determined for each room based on the structural properties of the room, the heat generated by the curing grout, and the presence of equipment that could be crushed, filled or dislodged if grout is poured too quickly. Each lift of grout will be given sufficient time to cure before additional grout is poured. Smaller lifts may be used in specific areas, for example to fill targeted voids, or specific systems. Quality control measures on grouting operations will be implemented to ensure all requirements for the grout are met and the final product will perform as expected. Grout filling via an engineered grout placement plan that relies on delivery of grout pumped through lines is the approach used by other reactor grouting projects. It is not expected that high pressure application of the grout will be required (US DOE 2013)."* **References:** *Golder 2021a. WRDF Preliminary Grout Fill Plan. WLDP-26000-PLA-004. Revision 0. April 2021.* *Golder 2021b. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022a. CNL Whiteshell Reactor 1 - Phase 1000 Grout Formulation Testing Report. WLDP-26000-REPT-012. Revision 1. May 2022.* *Golder 2022b. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *US DOE 2013. DOE EM Project Experience & Lessons Learned for In Situ Decommissioning. Prepared By U.S. Department of Energy, Office of Environmental Management, Office of D&D and FE, EM-13. Washington DC: Office of Environmental Management.*
39.	CNSC	G. Stoyanov	EIS - Section 3.5.1.2 Grouting of Below Grade Structures and Systems	3-32	**Comment:** This section of the EIS indicates that: "The grout will be designed to achieve the required physical properties to provide adequate resistance to damage, and release of contamination. There is limited information on the grout design in the EIS which would allow for establishing and verifying efficient grout performance. **Expectation to Address Comment:** Provide sufficient detail with respect to the development of the grout mix design, grout production (batch plant) and grout placement technology with their respective QA/QC requirements (including testing).	**Incorporated**: Section 3.4.6.2 (formerly Section 3.5.1.2) of the Environmental Impact Statement (EIS; Golder 2022a) was revised to include details regarding the grout mix design, grout production, and the grout placement technology. CNL contracted a division of Golder Associates with significant experience with in-situ grouting of industrial and mining facilities to fabricate and test various grout formulations based on the Savannah River National Laboratory (SRNL) grout formulation and test plan (SRNL 2018). Through this testing, ingredient materials were investigated and tested, and the grout formulation was refined and confirmed to produce the required fresh and cured grout properties. This was documented in the Phase 1000 Grout Testing Report (Golder 2022b) produced by Golder Associates for CNL. CNL has further contracted Golder Associates to prepare a preliminary grout fill plan (Golder 2021). This plan includes an overview of all steps required to procure, manufacture, deliver, place and test the grout fill material for the Whiteshell Reactor 1 (WR-1) In Situ Disposal (ISD) Project. Details on the grout ingredients, recipe development, final formulation mix design, fresh and cured property testing are provided in the Grout Formulation Testing Report (Golder 2022b). Preliminary details on the fabrication, placement, as well as Quality Assurance (QA) and Quality Control (QC) programs for the grout installation have been provided in the Preliminary Grout Fill Plan (Golder 2021). The grout performance and specification information from both of these sources has been summarized in Section 3.4.6.2 of the EIS. The details on the production methods and QA and QC programs have not been included in the EIS at this time because they are preliminary examples of a program. The actual final production, placement, and

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						QA and QC plan will be prepared by the selected construction contractor, following CNSC licensing decision, and will meet the requirements of CNL's program and procedures for management of engineering and construction work. The preliminary grout fill plan (Golder 2021) was prepared to demonstrate that the grout production, placement and testing methodology is an established, mature part of the industry and can be achieved by qualified contractors.

The target physical properties of grout are documented in Table 3.4.6-1 in Section 3.4.6.2 of the EIS:

Table 3.4.6-1: Target Physical Properties of Grout

Property	***Target***	***Basis***
Bleed Water after 24 hr (vol.%)	*0*	*Eliminate need for liquid removal*
Maximum Temperature Rise during Curing	*<25°C difference between grout interior and exterior*	*Manage effects of heat of hydration*
pH	*<13.5*	*Compatible with materials and contaminants in most of the rooms to be grouted*
Compressive Strength	*>3.4 MPa at 28 days*	*Non-structural grout, needs only to support its own mass*
Effective Porosity (vol.%)	*<0.6*	*Used in solute transport model*
Dry Bulk Density (kg/m^3)	*2,100*	*Used in solute transport model*
Hydraulic Conductivity (m/yr)	*<0.03*	*Used in solute transport model*

vol.% = volume percent; MPa = megapascal.

The grout formula used for Stage 2 testing is documented in Table 3.4.6-2 in Section 3.4.6.2 of the EIS and is provided below:

Table 3.4.6-2: Grout Formulation for Stage 2 Testing

Material	***Quantity per m^3***
Portland Cement	*89 kg*
Fly Ash	*297 kg*
Sand	*1,570 kg*
Gravel	*0 kg*
Water	*232 kg*
Polycarboxylate Polymer	*1.77 L*
Diutan Gum Based Viscosity Modifying Admixture	*260 g*

Change to EIS:

Section 3.5.1.2 has been renumbered as 3.4.6.2 and updated to include the description of grout placement methodology as follows:

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						"Grouting of the below-grade structure will be carried out in stages. The safety case for the WRDF is built on the conservative assumption that the only major aspect of the grout to its function as a barrier is the hydraulic conductivity of grout used in the groundwater flow model. Since there is no expectation for grout to completely penetrate and fill every void space, the existence of voids and cold joints is not detrimental to the overall safety of the system. Instead, the structure will be filled to eliminate as many void spaces as is reasonably achievable. The overall fill design will target the elimination of transport pathways through large diameter pipes or ducts by cutting or "air gapping" the pipes, ducts, and other conduit. The term "Air Gapping" indicates providing a physical space cut in piping so that when grout fill is placed, that space is filled with grout and will provide a "grout break" in the pipe, limiting its potential to be a groundwater pathway. The placement of the grout will be completed using an engineered fill schedule (i.e., grouting plan). Multiple lifts of grout will be poured to systematically fill as practical the reactor building voids. *The safety case of the proposed ISD does not currently require that the reactor vault be grouted. The existing structure provides sufficient barrier to releases, and additional grout would not considerably increase the effectiveness of that barrier. If during grouting it is safe and efficient to allow grout to fill the reactor vault, it may be done. Likely the risks involved to properly install grout in the reactor vault, or within the calandria, will outweigh the benefits of additional grout. This option will be reassessed as more detailed grouting plans are developed and the available technologies and strategies from various vendors can be reviewed.* *The maximum lift size (depth of fresh grout) will be determined for each room based on the structural properties of the room, the heat generated by the curing grout, and the presence of equipment that could be crushed, filled or dislodged if grout is poured too quickly. Each lift of grout will be given sufficient time to cure before additional grout is poured. Smaller lifts may be used in specific areas, for example to fill targeted voids, or specific systems. Quality control measures on grouting operations will be implemented to ensure all requirements for the grout are met and the final product will perform as expected. Grout filling via an engineered grout placement plan that relies on delivery of grout pumped through lines is the approach used by other reactor grouting projects. It is not expected that high pressure application of the grout will be required (US DOE 2013)."* **References:** *Golder 2021. WRDF Preliminary Grout Fill Plan. WLDP-26000-PLA-004. Revision 0. April 2021.* *Golder 2022a. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Golder 2022b. CNL Whiteshell Reactor 1 - Phase 1000 Grout Formulation Testing Report. WLDP-26000-REPT-012. Revision 1. May 2022.* *SRNL 2018. Grout Formulation Test Plan for WR-1 Reactor Facility Decommissioning Project. SRNL-L3200-2017-00155. January 2018.* *US DOE 2013. DOE EM Project Experience & Lessons Learned for In Situ Decommissioning. Prepared By U.S. Department of Energy, Office of Environmental Management, Office of D&D and FE, EM-13. Washington DC: Office of Environmental Management.*
40.	ECCC		EIS - Section 3.5.1.2 Grouting of Below Grade Structures and Systems	3-32	**Comment**: This section of the EIS indicates that: "The grout will be designed to achieve the required physical properties to provide adequate resistance to damage, and release of contamination. The design will take into account the effects of using local fill materials (e.g., sand and gravel) and the materials the grout will interact within the WR-1 below grade structure (e.g., aluminium). Multiple grout formulations may be necessary to achieve complete filling of the below grade structure, but all formulations will adhere to the same minimum requirements to ensure the final end state performs as expected. Grouting of the below grade structure will be carried out in stages. The structure will be filled to eliminate as many void spaces as is reasonably achievable. The placement of the grout will be completed using an engineered fill schedule (i.e., grouting plan). Multiple lifts of grout will be executed to systematically encapsulate the reactor systems and the entire below grade structure. The	**Resolved As:** The grout's primary function is to fill void space to prevent subsidence of the facility over time. Its primary function is not to provide a barrier to groundwater movement or contaminant release. The safety case for the Whiteshell Reactor Disposal Facility (WRDF) is built on the conservative assumption that the only significant aspect of the grout to its function as a barrier is the hydraulic conductivity of grout used in the groundwater flow model. Nonetheless, the grout will have some beneficial impacts on the facility, including raising groundwater pH conditions (which slows down corrosion of steel reactor components) and limited groundwater transport resistance, but these are conservatively ignored in the safety assessment and not described in further detail. Although there is no minimum life expectancy specified for the grout, based on the literature review conducted (Golder 2020b), a step function was developed for grout degradation, that assumes the grout to degrade in 500 year increments and reach its fully degraded stage by 2000 years (Section 4.1.4 of the Groundwater Flow and Solute Transport Modelling Report [GWFSTMR]; Golder 2021a). The grout was modelled as an equivalent porous medium, so there are no expectations for the grout in terms of bonding of lifts or minimization of cold joints. This is deemed to be sufficiently conservative because sensitivity scenarios completed in the GWFSTMR confirmed that while variations in hydraulic conductivity of the grout affect the rate of water movement through the WRDF, and thus influence the performance of the containment system, they do not control the overall safety of the containment system. A literature review was conducted (Golder 2020b) as part of the grout formulation study. The hydraulic conductivity of the grout used in the Whiteshell Reactor 1 (WR-1) assessment (5×10^{-8} m/s) was a factor of five times greater than the highest value cited in the literature reviewed, and a factor of 50 times higher than the grout performance specification of 9.5×10^{-10} m/s. Testing carried out on the preferred bulk fill grout formula (Golder 2022a) indicated an average hydraulic conductivity value of 1.27E-11 m/s, confirming that it is lower than values derived through the literature study and used as the target performance specification, and is several orders of magnitude lower than the value used in the solute transport model.

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					maximum lift size (depth of fresh grout) will be determined for each room based on the structural properties of the room, and the presence of equipment that could be crushed, filled or dislodged if grout is poured too quickly. Each lift of grout will be given sufficient time to cure before additional grout is poured. Smaller lifts may be used in specific areas, for example to fill targeted voids. Quality control measures on grouting operations will be implemented to ensure all requirements for the grout are met and the final product will perform as expected." With respect to these statements, how does CNL ensure that the grout layers/lifts are sufficiently bonded or bound together in order to avoid interface that could create potential pathways for water? **Expectation to Address Comment:** Explain how the grout lifts are bonded together and how long the grout is expected to last and be effective – what is the life of the grout? Clarify whether grout is cement or epoxy based. If the grout is epoxy based, how would the heat that might be generated below grade be managed?	CNL contracted a division of Golder Associates with significant experience with in-situ grouting of industrial and mining facilities to fabricate and test various grout formulations based on the Savannah River National Laboratory (SRNL) grout formulation and test plan (SRNL 2018). Through this testing, ingredient materials were investigated and tested, and the grout formulation was refined and confirmed to produce the required fresh and cured grout properties. This was documented in the Phase 1000 Grout Testing Report (Golder 2022a) produced by Golder Associates for CNL. CNL has further contracted Golder Associates to prepare a preliminary grout fill plan (Golder 2021b). This plan includes an overview of all steps required to procure, manufacture, deliver, place, and test the grout fill material for the WR-1 In Situ Disposal (ISD) Project. The detailed grout plan is not complete at this phase of the project. The detailed grout design, procurement of a qualified contractor, fabrication, and placement and testing will be done according to CNL's Engineering Change Control process during the execution phase of the Project, following a CNSC licensing decision. Details on the grout ingredients, recipe development, final formulation mix design, and fresh and cured property testing are provided in the Grout Formulation Testing Report (Golder 2022a). Details on the preliminary approach to fabrication and placement of grout have been provided in the Preliminary Grout Fill Plan (Golder 2021b), with Appendix D of the Preliminary Grout Fill Plan providing details on management of the heat of hydration. The final grout mix is a blend of Portland Cement, Fly Ash, and fine aggregate (sand). The use of fly ash generally results in less heat from hydration, but the generation of heat as a result of hydration of cementitious materials is a well understood phenomenon, and is a standard consideration in any concrete or grout pouring operation (Golder 2021b). Typical methods of controlling heat of hydration include controlling lift heights, controlling ventilation, and controlling the temperature of raw materials used in the mix (Golder 2021b). In any case, the acceptable temperature rise is a defined criteria for application of the grout (Environmental Impact Statement [EIS; Golder 2022b] Table 3.4.6-1), and will be adhered to by the final grout placement strategy. There is no expected impact on the system performance as a result of either cold joints or heat of hydration, and the modeling assumes that some voids will remain after grouting. The effect of grout degradation at the end of its lifetime was evaluated in Section 5.2, Scenario 8 of the GWFSTMR (Golder 2021a). The mass loadings and subsequent exposure to the environmental and human receptors were found to be insensitive to the rate of grout (and cover and foundation) degradation. **Change to EIS:** Section 3.5.1.2 was renumbered as Section 3.4.6.2 and has been updated with specific grout properties and mix design, and updated to include the description of grout placement methodology as follows: *"Detailed performance requirements and a supporting test plan were prepared by Savannah River National Laboratory (SRNL 2018). CNL engaged a vendor to develop a grout formulation that meets or exceeds the requirements specified by SRNL, using locally available materials. A similar grout design process (where an existing formula was adapted to use local materials) has already been successfully performed by CNL (Golder 2020a). The formulations have been tested to validate their performance against the required and assumed properties, to confirm they perform as well as or better than estimated in the solute transport model, prior to the installation of any grout into WR-1 (Golder 2022a)."* and *"Grouting of the below-grade structure will be carried out in stages. The safety case for the WRDF is built on the conservative assumption that the only major aspect of the grout to its function as a barrier is the hydraulic conductivity of grout used in the groundwater flow model. Since there is no expectation for grout to completely penetrate and fill every void space, the existence of voids and cold joints is not detrimental to the overall safety of the system. Instead, the structure will be filled to eliminate as many void spaces as is reasonably achievable. The overall fill design will target the elimination of transport pathways through large diameter pipes or ducts by cutting or "air gapping" the pipes, ducts, and other conduit. The term "Air Gapping" indicates providing a physical space cut in piping so that when grout fill is placed, that space is filled with grout and will provide a "grout break" in the pipe, limiting its potential to be a groundwater pathway. The placement of the grout will be completed using an engineered fill schedule (i.e., grouting plan). Multiple lifts of grout will be poured to systematically fill as practical the reactor building voids.* *The safety case of the proposed ISD does not currently require that the reactor vault be grouted. The existing structure provides sufficient barrier to releases, and additional grout would not considerably increase the effectiveness of that barrier. If during grouting it is safe and efficient to allow grout to fill the reactor vault, it may be done. Likely the risks involved to properly install grout in the reactor vault, or within the calandria, will outweigh the benefits of additional grout. This option will be reassessed as more detailed grouting plans are developed and the available technologies and strategies from various vendors can be reviewed.* *The maximum lift size (depth of fresh grout) will be determined for each room based on the structural properties of the room, the heat generated by the curing grout, and the presence of equipment that could be crushed, filled or dislodged if grout is poured too quickly. Each lift of grout will be given sufficient time to cure before additional grout is poured. Smaller lifts may be used in specific areas, for example to fill targeted voids, or specific systems. Quality control measures on grouting operations will be implemented to ensure all requirements for the grout are met and the final product will perform*

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						as expected. Grout filling via an engineered grout placement plan that relies on delivery of grout pumped through lines is the approach used by other reactor grouting projects. It is not expected that high pressure application of the grout will be required (US DOE 2013).” **References:** *ACI 2005. American Concrete Institute 207.1R-05. Guide to Mass Concrete. 2.* *Golder 2020a. Laboratory Testing Program on Fresh and Cured Properties of Bulk and Low pH Grout. CNL NPD Decommissioning. March 2020.* *Golder 2020b. CNL WR-1 Information Request No. 48. GAL-132-1656897. March 2020.* *Golder 2021a. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2021b. WRDF Preliminary Grout Fill Plan. WLDP-26000-PLA-004. Revision 0. April 2021.* *Golder 2022a. CNL Whiteshell Reactor 1 - Phase 1000 Grout Formulation Testing Report. WLDP-26000-REPT-012. Revision 1. May 2022.* *Golder 2022b. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *SRNL 2018. Grout Formulation Test Plan for WR-1 Reactor Facility Decommissioning Project. SRNL-L3200-2017-00155. January 2018.* *US DOE 2013. DOE EM Project Experience & Lessons Learned for In Situ Decommissioning. Prepared By U.S. Department of Energy, Office of Environmental Management, Office of D&D and FE, EM-13. Washington DC: Office of Environmental Management.*
41.	ECCC		EIS - Section 3.5.1.3 Removal of Above-grade WR-1 Building Structures	3-33	**Comment**: This section of the EIS indicates that: “Soil surrounding the foundation will be segregated and radiological clearance surveys will be performed, and subsequent remediation will be completed as required.” It is not clear how this will affect air emissions during the decommissioning phase of the project and during the post-closure phase. **Expectation to Address Comment:** Provide criteria for soil segregation, how the segregation will most likely be performed (e.g., in an open or enclosed space, estimated volumes, concentrations of contaminants, etc.)	**Incorporated:** Description of soil remediation was provided in greater detail in the revised Environmental Impact Statement (EIS; Golder 2022) Section 3.4.6.3 Removal of Above-Grade WR-1 Building Structures. Final radiological and environmental clearance surveys will be performed on the soil surrounding the foundation, and subsequent remediation will be completed as required. Soil surrounding the building will be remediated if it exceeds the soil clean-up criteria (CNL 2019). Soil surrounding the building footprint is not expected to exceed the clean-up criteria; however, if soil contamination is encountered, it would be removed using standard excavation equipment and practices. Dust suppression methods (e.g., water misting, use of applicable immobilization agents on the soil surface) will be applied during excavation as required to suppress dust levels. The contaminated soils will be managed through CNL’s Waste Management Program and placed in an approved waste management facility. As outlined in EIS Section 6.2 Atmospheric Environment (specifically Section 6.2.1.6.2.2), during the Closure Phase, remaining radiological, industrial, and environmental hazards will be remediated as practical and required for building demolition. The goal is to remove or remediate radiologically contaminated areas and systems so that the building and non-grouted reactor areas can be released for demolition as clean (non-contaminated). A Radiological Clearance Survey of the building will be performed to demonstrate remaining areas and systems are clean, confirm areas that are contaminated, and/or identify areas that are not feasible to demonstrate as clean. Contaminated areas, including soils, that are not feasible to remove, remediate, or demonstrate as clean prior to demolition, will be identified and marked for segregation during demolition. An assessment will be done on whether such building areas or systems pose a risk for cross-contamination of clean building areas and the subsequent need to be managed as radioactive waste. The magnitude of potential dispersion of contamination during demolition and the need to implement contamination controls will be assessed in accordance with the WL Open-Air Demolition Technical Basis Document (CNL 2020). Soil remediation may be carried out in an enclosed space or in open air, depending on the assessment of hazard and contamination levels. Environmental air monitoring will be carried out for radiological and non-radiological air emissions during soil remediation work if performed in open air. Specific management practices and mitigation actions to control emissions resulting from decommissioning of Whiteshell Reactor 1 (WR-1) , including soil remediation, are provided in Table 6.2.1-10 of the EIS, and include: • Implementation of CNL’s Environmental Protection (CNL 2021) and Management and Monitoring of Emissions (CNL 2018), and the WL Open Air Demolition Technical Basis document (CNL 2020), which includes operational control monitoring, air verification monitoring and environmental monitoring. • Implementation of dust management techniques to control dust generated by the Project, consistent with the Environmental Assessment Follow-up Program for the WL site.

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						• Use of dust suppression methods during building demolition or soil remediation activities to control airborne emissions and nuisance dust during building demolition or soil remediation. Methods may include: ○ Wetting techniques during demolition to limit mobility of dust; ○ Wind restrictions during demolition to stop work or apply wetting techniques; and ○ Hydro seeding during backfilling and landscaping to reduce soil erosion. **Change to EIS:** Updated EIS Section 3.4.6.3 Removal of Above-Grade WR-1 Building Structures with added description of soil remediation as described above. Section 6.2.1.6.2.2 revised to include the open air demolition/remediation criteria. **References:** *CNL 2018. Management and Monitoring of Emissions. 900-509200-STD-009. Revision 0. March 2018.* *CNL 2019. Whiteshell Laboratories Screening Soil Cleanup Criteria, WL-509420-REPT-001. Revision 0. January 2019.* *CNL 2020. Whiteshell Laboratories Open-Air Demolition Technical Basis Document. WLDP-508740-TD-001. Revision 0. July 2020.* *CNL 2021. Environmental Protection. 900-509200-PDD-001. Revision 3. June 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
42.	CNSC ECCC	N. Kwamena	EIS - Section 3.5.1.4 Installation of Engineered Cover	3-33	**Comment:** This section of the EIS with respect to the installation of engineered cover does not describe its limiting effect on gas (e.g., tritium, radon) effusion during post-decommissioning phase. **Expectation to Address Comment:** Include in the estimate of air emissions releases from soil related to tritium, as well as releases of gases due to radioactive decay. Provide an estimate of the gases likely to be released through the engineered cover during the post-ISD phase (e.g., through the radioactive decay). This is necessary to fully assess long-term impacts on air quality.	**Resolved As:** The engineered cover is not designed to limit gas effusion during the post-closure phase as the radioactivity likely to be released through the engineered cover or the surrounding soil is negligible. The tritium inventory of the Whiteshell Reactor 1 (WR-1) Building is associated with the helium and heavy water system. This system was drained as part of Phase 1 decommissioning (1989-1995; AECL 1996) and is currently being purged to atmosphere through air flow to remove any additional tritium in the system. In the Environmental Risk Assessment (ERA; EcoMetrix 2021) during the closure phase, tritium is assumed to be released at ground level (see Section 4.2.5.1 of the ERA) at a rate similar to the maximum and average tritium release rates from the WR-1 Building from 2011 to 2019 (see Section 3.1.1.3 of the ERA). The on-site Whiteshell Laboratories (WL) worker is assumed to spend 40 hours/week and 50 weeks/year on the WL site (see Section 4.2.2 of the ERA) and receives a maximum dose of 6.72E-06 mSv/a from tritium (see Tables 4-8 and 4-16 of the ERA). In the post-closure phase, the tritium release rate through the engineered cover or the surrounding soil is anticipated to be much lower, resulting in negligible doses to any receptors that may be present. The current Canadian guideline for radon in indoor air for dwellings is 200 Bq/m^3 (Health Canada 2017). The peak inventory of radon within the Whiteshell Reactor Disposal Facility considering ingrowth is estimated to be less than 200 Bq (CNL 2021). Conversely, the peak mass loading rate for radon to the Winnipeg River is estimated to be 4.82E-12 g/yr (see Table 3-16 of the ERA [EcoMetrix 2021]). This equates to approximately 2.74E+04 Bq/yr. According to a 2017 report by Statista Research Department, the average size of a Canadian home is 1,792 ft^2 (~166 m^2) (Paradise Developments 2021). Assuming a room ceiling height of 2.1 m in accordance with the minimum ceiling height requirement of National Building Code of Canada (NRCC 2015), this gives a volume of approximately 348 m^3. If the peak mass loading rate for radon to the Winnipeg River were applied to this volume for a year without any decay (~79 Bq/m^3), the 200 Bq/m^3 guideline (Health Canada 2017) would not be exceeded. Since the half-life of radon is 3.8235 days (see Table 4-1 of the Groundwater Flow and Solute Transport Modelling Report [GWFSTMR; Golder 2021]), there will be substantial decay. Releases of radon through the engineered cover or the surrounding soil are estimated to be negligible. **Change to EIS:** The “Installation of Engineered Cover” section of the revised Environmental Impact Statement (EIS; Golder 2022) is now Section 3.4.6.4 Installation of Concrete Cap and Engineered Cover. **References:** *AECL 1996. The WR-1 Reactor Phase 1 Decommissioning Interim Endstate Report - Facility Description. RC-1290. Revision 1. March 1996.* *CNL 2021. Whiteshell Reactor Disposal Facility - Source and Release versus Time. WLDP-26000-038-000. Revision 0. December 2021.*

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						EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021. *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Health Canada 2017. Guide for Radon Measurements in Residential Dwellings (Homes). May 2017.* *NRCC (National Research Council of Canada) 2015. National Building Code of Canada 2015. NRCC 56190. Volume 2. January 2015.* *Paradise Developments 2021. Average House Size in Canada. June 2021.*
43.	MSD		EIS - Section 3.5.1.4 Installation of Engineered Cover	3-33	**Comment**: This section of the EIS proposes the installation of an engineered cover over the former footprint of the WR-1 Building site. Will federal and provincial agencies involved in this EA have an opportunity to review design specifications for the engineered cover prior to the approval of the ISD project? **Expectation to Address Comment:** Please clarify.	**Resolved As:** The engineering design requirements for the reinforced concrete cap and engineered soil cover are derived from the modelled parameters used to perform the groundwater flow modeling and the key parameters are described in Section 4.1.6 of the Groundwater Flow and Solute Transport Modelling Report (Golder 2021). The concrete cap and soil cover system has been designed to meet or exceed all of the modelled parameters to confirm that the final structure performs as well, or better than predicted in the modelling. The design package for the engineered cover (AECOM 2020) is referenced in Sections 3.4.6.4 and 3.4.9.1.6 of the Environmental Impact Statement (EIS; Golder 2022) and is available for review as part of the submission package for the Project. CNSC is the regulatory authority for designs performed for nuclear application and will make the decision on who will be involved in the review. CNSC feedback will be reviewed and incorporated where appropriate. **Change to EIS:** Section 3.5.1.4 is now Section 3.4.6.4 Installation of Concrete Cap and Engineered Cover. A reference to the current cap and cover design package was added to Section 3.4.6.4: *"After grouting has been completed and the other portions of the WR-1 Complex are demolished, a reinforced concrete cap and engineered cover (CNL 2020c) will be constructed on top of the grouted area."* A reference to the current cap and cover design package was provided in Section 3.4.9.1.6 *"The detailed design (AECOM 2020 of engineered cover was confirmed to limit groundwater recharge through vertical infiltration to 0.8 mm/year."* **References:** *AECOM 2020.* Concrete Cap and Engineered Cover for the WR-1 Disposal Facility. AECOM. WLDP-26000-235-000. Revision 0. *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
44.	MSD		EIS - Section 3.5.3 Waste Generation and Management	3-35	**Comment**: This section of the EIS indicates there is nothing available at this time for off-site waste disposal. Waste may include nuclear, radioactive, polychlorinated biphenyl compounds (PCBs), asbestos and lead materials. **Expectation to Address Comment:** Manitoba Sustainable Development recommends that once an offsite disposal location has been determined, CNL are to contact the facility owner to obtain approval to accept the waste in advance and to notify both the federal and provincial governments of the disposal locations.	**Resolved As:** CNL could not find any statement in Section 3.5.3 of the 2017 Environmental Impact Statement (EIS; Golder et al. 2017), or Section 3.0 as a whole, that indicated that there is nothing available at this time for off-site waste disposal, where waste may include nuclear, radioactive, polychlorinated biphenyl (PCB) compounds, asbestos, and lead materials. In other sections, the 2017 EIS (Golder et al. 2017) may have indicated that there is nothing available at this time for off-site radioactive waste disposal, but there are off-site disposal facility available for PCBs, asbestos, and lead. Consistent with the recommendations from Manitoba Sustainable Development (now Manitoba Environment, Climate and Parks), CNL's Off-Site Transportation of Dangerous Goods requirements (CNL 2018b) specify that prior to transporting any materials, the owners of the disposal or storage facilities will be contacted to verify acceptance of the materials, and a notification will be sent to the appropriate authorities as required. **Change to EIS:** The "Waste Generation and Management" section of the revised EIS (Golder 2022) is now Section 3.4.8. It was revised as follows to clarify CNL follows the practice of verifying acceptance of waste before transport and notifying the appropriate authorities:

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						"In accordance with established CNL Off-Site Transportation of Dangerous Goods requirements (CNL 2018b), prior to transporting any materials, the owners of the disposal or storage facilities will be contacted to verify acceptance of the materials, and a notification will be sent to the appropriate authorities as required." **References:** *CNL 2018b. Off-Site Transportation of Dangerous Goods. 900-508520-STD-001. Revision 0. March 2018.* *Golder et al. 2017. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 1. September 2017.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
45.	MSD		EIS - Section 3.5.3.2 Hazardous Non-Radiological Wastes	3-35	**Comment**: Details provided in this section are very vague. What are small quantities? Are CNL's waste management practices (CNL 2017b, c) & Environmental Protection Program (CNL 2017d) part of this EIS? **Expectation to Address Comment:** The following sentence needs further clarification: "The wastes will be shipped offsite to an appropriate hazardous waste facility, or encapsulated in the same manner as radiological wastes where it is demonstrated safe to do so." What are the deciding factors? (not all hazardous non-radiological wastes may be suitable for in-situ disposal). CNL is already registered with the Manitoba Sustainable Development as a generator of hazardous wastes. Waste generator registration needs to be reviewed prior to the beginning of the decommissioning project to ensure that all of the wastes that will be generated / and transported offsite are registered. Appropriate waste disposal facilities for hazardous non-radiological wastes and non-hazardous wastes need to be identified prior to decommissioning. Transportation of hazardous waste will be in accordance with provincial/federal regulations. Movement documents will be prepared and transmitted as required by the provincial regulations.	**Resolved As:** The small quantities of non-radiological hazardous waste anticipated to be removed from the Whiteshell Reactor 1 (WR-1) Building are: • Asbestos - ~200 m^3 (~30 Mg) • Lead - ~1,500 kg • Polychlorinated biphenyls (PCBs) - ~2 m^3 • Mercury - ~3 m^3 These are preliminary estimates largely based on the professional judgement of CNL's Waste Management Program; further characterization and identification work is planned occur as part of the Project. CNL's waste management practices and Environmental Protection Program are company-wide practices and programs, which have been deemed as satisfactory by the CNSC. The deciding factors for whether the hazardous non-radiological wastes will be shipped off-site to an appropriate hazardous waste facility or remain in the building for in situ disposal (ISD) are worker safety and risk to the environment. For example, quantities of lead within the area to be grouted are on the order of 40,800 kg (CNL 2017), but this was modelled in the Groundwater Flow and Solute Transport Modelling (Golder 2021) and shown to be safe in Sections 5.0 and 7.0 of the Environmental Risk Assessment (ERA; EcoMetrix 2021) so lead will be removed from the area to grouted as practical based on worker safety. On the other hand, all PCBs above the solid exemption quantity or suspected of exceeding the solid exemption quantity, will be removed prior to grouting. CNL's waste generator registration will be reviewed prior to the beginning of the decommissioning project to ensure that all of the wastes that will be generated and transported off-site are registered. Appropriate waste disposal facilities for hazardous non-radiological wastes and non-hazardous wastes will be identified prior to decommissioning and transportation of hazardous waste will be in accordance with provincial/federal regulations. Movement documents will be prepared and transmitted as required by the provincial regulations. **Change to EIS:** The "Hazardous Non-radiological Wastes" section of the revised EIS (Golder 2022) is now Section 3.4.8.2. It was revised as follows to clarify worker safety and risk to the environment are the deciding factors for whether the hazardous non-radiological wastes will be shipped off-site to an appropriate hazardous waste facility or remain in the building for ISD: *"Some small quantities of non-radiological hazardous wastes may be collected from the WR-1 Building during the Project. Hazardous wastes will be managed in accordance with CNL's waste management practices (CNL 2020b) and Environmental Protection Program (CNL 2021c), and will meet all federal, provincial and municipal requirements. The collected wastes will be shipped off site to an appropriate hazardous waste facility. The factors that determine if any material is collected for disposal or remains in the building for ISD, are worker safety and risk to the environment."* Section 3.4.8.4 of the EIS (Golder 2022) was revised as follows to clarify that shipment documentation will be prepared in accordance with all applicable regulations: *"The Waste Management Program (CNL 2020b) defines the process for managing wastes from point of generation to ultimate disposition and provides direct support and oversight to ensure waste generating activities are performed in a manner that protects the workers, the public and the environment. The Transportation of Dangerous Goods Program (CNL 2018b) interfaces with the Waste Management Program and is responsible for the coordination and transport of all types of wastes (including radiological, hazardous and non-regulated construction and demolition material) from the*

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						Project. Specific requirements in the management of transporting radioactive wastes from the Project to Chalk River Laboratories for long-term storage and/or disposal include liaising with the Chalk River Laboratories Waste Receiver and transportation subcontractors and preparing dangerous goods shipments (including classifying the shipment and/or packages and preparing shipment documentation) in accordance with all applicable regulations. The main function of the Transportation of Dangerous Goods Program is to protect personnel, property and the environment from the effects of radiation and hazardous materials during transport by establishing and maintaining requirements and procedures necessary to facilitate the safe transport of dangerous goods and non-regulated waste materials from the Project." **References:** *CNL 2017. Memo, J. Miller to B. Barrios. Non-Radiological Inventory of WR-1. WLDP-26000-021-000. March 2017.* *CNL 2018b. Off-Site Transportation of Dangerous Goods. 900-508520-STD-001. Revision 0. March 2018.* *CNL 2020b. Management of Waste. 900-508600-MCP-004. Revision 2. February 2020.* *CNL 2021c. Environmental Protection. 900-509200-PRD-001. Revision 3. March 2021.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
46.	MSD		EIS - Section 3.5.4 End-State and Post-Closure Activities	3-36	**Comment**: What is the anticipated closure and post-closure for the existing landfill on the property? Any closure and post-closure work should be submitted for review and approval by the appropriate governing authority. **Expectation to Address Comment:** Please clarify.	**Resolved As:** The closure of the existing sanitary landfill is outside the scope of the Whiteshell Reactor 1 Environmental Assessment. However, CNL is preparing an Environmental Risk Assessment for the landfill that will be submitted for review and approval by the governing authorities.
47.	CNSC	G. Stoyanov	EIS - Section 3.5.4.1 Multilayered In Situ Decommissioning System	3-36	**Comment:** CNL acknowledges that barriers will degrade over time; however, CNL has not established a specific time period(s) and performance requirements for the barriers commensurate with the characteristics of the waste that are to be confined. REGDOC-2.9.1 requires design, maintenance and monitoring of barriers. There is no information in the EIS about the barriers that can establish and support, with sufficient detail, their performance over time. **Expectation to Address Comment:** For the existing barriers (reactor system components, internal walls/bioshield, building foundation): At this time, does CNL have a current condition assessment where the condition of the above barriers against the original design requirements and against its function is established (e.g., presence of defects, permeability, cracks, corrosion, water ingress, required repairs, maintenance, etc.)? If yes, please provide a reference. If no, please explain why not. At this time, does CNL have an assessment for the confinement function in the disposal project of the existing barriers? This includes consideration of: Original	**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. Information on specific time periods and performance requirements for the barriers commensurate with the characteristics of the waste that are to be confined is provided in the Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2021a), the Design Requirements (DR) Document (CNL 2020), and the Decommissioning Safety Assessment Report (DSAR; Golder 2021b). Specifically: • Table 4-3 and Table 4-4 of the GWFSTMR (Golder 2021a) provide information on specific time periods and performance requirements for the reactor system components (calandria vessel, fuel channels, etc.), the grout, the concrete cap, the engineered cover, and the building foundation (see the table below for a summary of the time to fully degraded). • Section 4.0 of the GWFSTMR (Golder 2021a) provides the reasoning behind the time periods and performance requirements, and Section 5.0 provides the sensitivity analysis performed as part of the safety assessment modelling, some of which focused on barrier time periods and performance requirements. • Section 3 of the DR Document (CNL 2020) provides the performance requirements of the barriers. • Section 6.0 of the DSAR (Golder 2021b) summarizes barrier specific sensitivity analyses performed and the result of the analyses.

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					design; Current condition; Assessment of degradation mechanisms that the barrier may experience during the life of the facility and the ability of the barrier to perform its function. This is presumably up to the point where clearance level for the waste will be reached (as in CSA N292.3), unless CNL provides justification for an alternate duration; and, Demonstration of the ability of the barrier to perform efficiently its function. For the new barriers (grout and engineered cover), please provide additional information with respect to: Design requirements; Assessment of degradation mechanisms that the barrier may experience during the life of the facility and the ability of the barrier to perform its function. This is presumably up to the point where clearance level for the waste will be reached (as in CSA N292.3), unless CNL provides justification for an alternate duration; and, Demonstration of the ability of the barrier to perform efficiently its function.	(see nested table and text below)

Component	Time to Fully Degraded (years)
Reactor System Components (Calandria Vessel, Fuel Channels, etc.)	6,350 to 178,000 (depending on material type)
Grout, Concrete Cap, and Engineered Cover	2,000 (properties equivalent to the surrounding geosphere)
Building Foundation	10,000 (properties equivalent to the surrounding geosphere)

The barrier lifetimes are not designed to align with the hazardous lifetime of the wastes; however, the degradation of those barriers over time and the impact of that degradation on the release of contaminants is fully examined over the entire hazardous lifetime of the wastes. The assessment looks at the effectiveness of the facility as is and determined that the barriers in place at closure, regardless of their lifetime, are sufficient to provide effective containment and isolation of the waste for the lifetime of the facility.

For the reactor system components (calandria vessel, fuel channels, etc.), CNL does not have a current condition assessment because to access this barrier to perform a current condition assessment would require damaging or partially dismantling this and other barriers, and would result in a significant dose to workers performing the assessment without providing a justifiable benefit. As can be seen in Figure 3.2.1-2 of the Environmental Impact Statement (EIS; Golder 2022a), the reactor core is completely surround by shielding; to gain access to the reactor core would require removal of some portion of this shielding, which also provides a barrier function. Assessing the fuel channels would require pulling them from the reactor core and transferring them to a hot cell facility for inspection. The reactor core and fuel channels provide a barrier to the release of contaminants as the majority of the radioactivity is embedded within the matrix of steels and zirconium alloys, which will corrode very slowly in the chemical environment of the grouted reactor, as discussed in Section 4.1.3 of the GWFSTMR (Golder, 2021a). A current condition assessment would provide little benefit as the corrosion rate of these metals is the mechanism that determines the rate of release of contaminants. This mechanism is largely unaffected by the current condition of metals.

For the internal walls/bioshield, CNL does not have a current condition assessment because these barriers are not accounted for in the safety assessment modelling; Section 4.0 of the GWFSTMR (Golder 2021a) provides information on barrier modelling.

For the building foundation, CNL has a current condition assessment in the form of a Building Condition Assessment (BCA; Golder 2022b). The purpose of the BCA was to evaluate the integrity of the subsurface concrete foundation and bottom slab of the building to verify assumed properties and identify areas of potential weakness or required repairs. The BCA included both visual inspection and core testing of the subsurface concrete foundation and bottom slab. The tests performed include: compressive strength, pH value, chloride depth, porosity/density, hydraulic conductivity, and petrographic analysis. As detailed in Table 7 of the BCA (Golder 2022b), the hydraulic conductivities of the selected cores ranged from 1.16×10^{-11} m/s to 9.75×10^{-11} m/s. In Section 6.0 of the BCA (Golder 2022b), the report concludes saying that "Based on the results of surface deterioration mapping and delamination surveys, as well as testing of the recovered cores for compressive strength, chloride ion content, pH value, density, absorption, and voids in hardened concrete, hydraulic conductivity, and petrographic examination, we believe that the existing concrete is compatible with the proposed decommissioning works, subject to confirmation that the results obtained are compatible with the assumptions made during the previous modelling of the long term performance of the decommissioned facility." As can be seen in Table 4-4 of the GWFSTMR (Golder 2021a), the initial hydraulic conductivity of the subsurface concrete foundation and bottom slab was assumed to be 5×10^{-10} m/s in the safety assessment modelling, a value conservative of the results of the BCA.

For the building foundation, CNL has an assessment for the confinement function through the BCA (Golder 2022b); specifically Section 4.2.3 compares current compressive strength to the original design, Section 4.0 provides the current condition, and Section 6.0 provides an assessment of the building foundation's ability to perform its function. An assessment of degradation mechanisms that the building foundation may experience during its lifetime are provided in Section 4.1.5 of the GWFSTMR (Golder 2021a). Justification for the assessment timeframe of 10,000 years is provided in Section 5.3 of the DSAR (Golder 2021b) and Figure 8.2.4-1 of the DSAR shows the Whiteshell Reactor Disposal Facility (WRDF) is protective of the public.

For the local hydrogeology, CNL has an assessment for the confinement function through the Hydrogeological Study Report (Dillon 2018) and the Geosynthesis Report (CNL 2022); specifically:

- Sections 3.0 to 5.0 of the Hydrogeological Study Report (Dillon 2018) and Sections 2 to 4 of the Geosynthesis Report (CNL 2022) provide the current conditions.
- Section 5 of the Geosynthesis Report (CNL 2022) assesses the future evolution of the site.

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						For the reactor system components (calandria vessel, fuel channels, etc.) and the internal walls/bioshield, CNL does not have a current conditions assessment to compare to the original design for the reason discussed above, but an assessment of degradation mechanisms that the reactor system components may experience during their lifetimes are provided in Section 4.1.3 of the GWFSTMR (Golder 2021a). For the grout, concrete cap, and engineered cover, the design requirements are provided in the DR Document (CNL 2020). As part of the Design of the Concrete Cap and Engineered Cover (AECOM 2020a), a DR Document specific to the concrete cap and engineered cover was developed (AECOM 2020b). The grout design and the results of the testing conducted to verify the grout can perform its function in accordance with its design requirements are provided in Sections 5.0 to 7.0 of the Grout Formulation Testing Report (Golder 2022c). An assessment of the degradation mechanisms for these barriers is provided in Sections 4.1.4 and Section 4.1.6 of the GWFSTMR (Golder 2021a). Justification for the assessment timeframe of 10,000 years is provided in Section 5.3 of the DSAR (Golder 2021b) and Figure 8.2.4-1 of the DSAR shows the WRDF is protective of the public. Overall, there is some small uncertainty in the lifetime and condition of the barriers of the facility; however, CNL has addressed these uncertainties within the EIS and supporting technical documents through the assessment of various scenarios, including scenarios where barrier effectiveness was drastically reduced. The results of these assessments indicate there is no significant increase in risk or exposure as a results of the uncertainty in barrier performance and lifetime. (Section 6.0 of the DSAR [Golder 2021b] summarizes barrier specific sensitivity analyses performed and the result of the analyses.) As such, CNL determined that the values selected to represent the effectiveness and lifetime of the barriers within the assessment were adequate to demonstrate the long-term performance of the facility and no further investigation of barrier condition or lifetime potential was required. **Change to EIS:** The “Multilayered In Situ Decommissioning System” section of the revised EIS (Golder 2022) is now Section 3.4.9.1 In Situ Disposal System. It was revised to include additional information on: • Corrosion rate assumptions (Section 3.4.9.1.1) • Modelling of the grout (Section 3.4.9.1.2) • Assumed building foundation hydraulic conductivity and BCA (Golder 2022b) hydraulic conductivities (Section 3.4.9.1.4) • Concrete degradation rate assumptions and sensitivity (Section 3.4.9.1.1) • Layers of the proposed WRDF (Sections 3.4.9.1.2 and 3.4.9.1.6) • A Geosynthesis Report (CNL 2022) prepared for the Project (Section 3.4.9.1.5) **References:** *AECOM 2020a. Concrete Cap and Engineered Cover for the WR-1 Disposal Facility. WLDP-26000-235-000. Revision 0. March 2020.* *AECOM 2020b. Design of the Concrete Cap and Engineered Cover of the Whiteshell Reactor (WR-1) Disposal Facility. WLDP-26000-DR-002. Revision 0. March 2020.* *CNL 2020. Design Requirements for WR-1 Disposal Facility. WLDP-26000-DR-001. Revision 0. March 2020.* *CNL 2022. Geosynthesis for WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. January 2022.* *Dillon 2018. WR-1 Hydrogeological Study Report. WLDP-26000-REPT-004. Revision 1. November 2018.* *Golder 2021a. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2021b. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022a. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Golder 2022b. Building Condition Assessment In-Situ Decommissioning of Whiteshell Reactor 1 (WR-1). WLDP-26000-REPT-011. Revision 1. May 2022.* *Golder 2022c. CNL Whiteshell Reactor 1 - Phase 1000 Grout Formulation Testing Report. WLDP-26000-REPT-012. Revision 1. May 2022.*

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48.	CNSC	G. Stoyanov	EIS - Section 3.5.4.1 Multilayered In Situ Decommissioning System	3-36	**Comment:** CNSC staff could not identify research (both existing and new specific to the project) that will be used to support the argument for barrier performance (this includes, but not limited to, the following topics: durability/ deterioration/ degradation, defects, permeability, corrosion). CNL has not provided the basis for barrier performance in terms of technical justification for their performance. As part of this it is expected that it will include the following building blocks: literature review for, and analysis of, available information that is used in justifying the performance of the barriers; identification of any gaps where there may not be sufficient technical basis to support the performance of a barrier; and, plan for bridging those gaps, as needed. **Expectation to Address Comment:** Provide information on the technical information/research from academia and existing projects with similar challenges (maybe nuclear or non-nuclear) that are being used to justify barrier performance.	**Incorporated:** Section 3.5.4.1 Multilayered In Situ Decommissioning System of the Environmental Impact Statement (EIS; Golder 2022a) was renumbered and renamed as Section 3.4.9.1 In Situ Disposal System, and was updated to provide either a further discussion of each system component or references to research (literature reviews or project-specific studies) that was performed for each of the system components described in subsections 3.4.9.1.1 through 3.4.9.1.7. It should be noted that the purpose of this section is to describe the overall composition of the In Situ Disposal System, and while the description of each component was updated to include some discussion of durability, deterioration/degradation rates, defects, permeability, corrosion and other properties or features as relevant for the performance of individual component, the in-depth description of each is provided in referenced supporting documents. References to those documents and key information were added to Section 3.4.9.1 of the EIS where appropriate. These updates are summarized below: <u>Section 3.4.9.1.1 Reactor Core and Bioshield Components:</u> Updated to include corrosion rates and a reference to the Groundwater Flow and Solute Transport Modeling Report (GWFSTMR; Golder 2021a): *"Corrosion rates for the reactor materials were based on estimates from literature for an aerobic environment and ranged from 1.78E-3 m/yr for aluminum to 1.0E-8 m/yr for Ozhennite and Zr-Nb alloy. Details on the selection of corrosion rates and calculation of times required for complete dissolution of each reactor component are provided in Golder's groundwater flow and solute transport modelling document (Section 4.1.3 of Golder 2021)."* The corrosion rates used in the GWFSTMR were validated through the Waste Form Synthesis Report (Arcadis 2021) and it was concluded that the corrosion rates used in Whiteshell Reactor 1 (WR-1) assessment are generally consistent with the long term measurements. It was assumed that corrosion would occur on both sides of the reactor components. The concrete bioshield degradation rates were based on the Walton et al. [1990]; and Clifton et al. (1995) and confirmed through a review (Golder 2020) of the following documents. These degradation rates also apply to the cementitious grout fill and concrete foundation walls. 1. AECL (Atomic Energy of Canada Limited). 1992. High-Performance Cement-Based Grouts for use in a Nuclear Waste Disposal Facility. AECL-10511. December 1992. 2. Alonso, M.C., Fernandez Luco, L., Garcia, J.L., Hidalgo, A., Huertas, F. 2007. Low-pH Cementitious Materials Design and Characterisation . Instituto de Ciencias de la Construccion Eduardo Torroja (IETcc-CSIC), Madrid Spain; Empresa Nacional de Residuos Radiactivos S.A. (ENRESA), Madrid, Spain. 3. Arnold, J.R., Garrabrants, A.C., Samson, E., Flach, G.P., and Langton, C.A. 2009. Moisture Transport Review. November 2009. CBP-TR-2009-002 Rev. 0. 4. Carter, W.J., Ezirim, H., and Emerson, M. 1996. Properties of concrete in the cover zone: water penetration, sorptivity and ionic ingress. Magazine of Concrete Research, 48, No. 176, Sept., 149-156. 1996. 5. Garcia Calvo, J.L., Alonso, M.C., Ferdandez Luco, L., Hidalgo, A., Sanchez, M. 2008. Implications of the use of low-pH Cementitious Materials in High Activity Radioactive Waste Repositories. International Conference - Underground Disposal Unit Design & Emplacement Processes for a Deep Geological Repository. 16-18 June 2008. Prague. 6. Guizzardi, M., Derome, D., Mannes, D., Vonbank, R., Carmeliet, J. 2016. Electrical Conductivity Sensors for Water Penetration Monitoring in Building Masonry Materials. Materials and Structures (2016) 49:2535-2547. 2016. 7. Golder. 2018. Summary of Laboratory Permeability Testing of Cementitious Backfill Grouts. Provided by email from Golder Burnaby, May 18, 2018. 8. Ortega, J.M., Esteban, M.D., Rodriguez, R.R., Pastor, J.L., Ibanco, F.J., Sanchez, I., Climent, M.A. 2017. Long-Term Behaviour of Fly Ash and Slag Cement Grouts for Micropiles Exposed to a Sulphate Aggressive Medium. Materials 2017, 10, 598. May 2017. 9. Park, J-W., and Kim, C-L. 2013. Long Term Behaviour of Cementitious Materials in the Korean Repository Environment. Attachment to: The Behaviours of cementitious materials in long term storage and disposal of radioactive waste: results of a coordinated research project. International Atomic Energy Agency. 2013. 10. Schmertmann, G.R., Huyng, R., and Stening, J. 2017. Groundwater and Soil Vapour Containment Design at an Industrial Site. 1st International Conference on Geomechanics and Geoenvironmental Engineering, 20-22. November 2017. Sydney, Australia. 11. Natural Analogues in Support of the Canadian Concept for Nuclear Fuel Waste Disposal (Cramer 1994) 12. A Natural Analogue Study of Cement Buffered, Hyperalkaline Groundwaters and Their Interaction with a Repository Host Rock II (Linklater 1998) 13. On the Chief Methods of Construction Used in Ancient Rome (Middleton 1888)

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						14. A Mineralogical and Stable Isotope Study of Natural Analogues of Ordinary Portland Cement (OPC) and CaO-SiO2-H2O (CSH) Compounds (Milodowski et al. 1989) 15. Post-closure Safety Assessment of a Used Fuel Repository in Sedimentary Rock (NWMO 2013) 16. The ROMACONS Project: A Contribution to the Historical and Engineering Analysis of Hydraulic Concrete in Roman Maritime Structures (Oleson et al. 2004) 17. Chemical, Mineralogical and Petrographic Characterization of Roman Ancient Hydraulic Concretes Cores from Santa Liberata, Italy and Caesarea Palestinae, Israel (Vola et al. 2011)" <u>Section 3.4.9.1.2 Grout:</u> Updated to explain that the safety case for the Whiteshell Reactor Disposal Facility (WRDF) is built on the conservative assumption that the only major aspect of the grout to its function as a barrier is the hydraulic conductivity used in the groundwater flow model. Sensitivity scenarios completed confirm that variations in hydraulic conductivity of the grout affect the rate of water movement through the WRDF and thus influence the performance of the containment system; however, they do not control the overall safety of the containment system. A literature review was conducted (Golder 2020) as part of the grout formulation study, which indicated that the hydraulic conductivity of the grout used in the WR-1 assessment (5×10^{-8} m/s) was a factor of five times greater than the highest value cited in the literature reviewed, and a factor of 50 times higher than the grout performance specification of 9.5×10^{-10} m/s. Testing carried out on the preferred bulk fill grout formula (Golder 2022b) indicated an average hydraulic conductivity value of 1.27E-11 m/s, confirming that it is lower than values derived through the literature study and used as the target performance specification, and is significantly lower than the value used in the solute transport model. <u>Section 3.4.9.1.3 Internal Walls</u> Discussion of internal walls was clarified to state that while internal walls will remain and are often either sealed or painted, which will help slow the migration of groundwater through the grouted Whiteshell Reactor 1 (WR-1) Building, this is not relied upon in the assessment modeling. Thus, no supporting studies were carried out on the performance of internal walls or coatings. <u>Section 3.4.9.1.4 Building Walls and Foundation:</u> A literature review of cementitious material degradation rates was conducted (Golder 2020). The hydraulic conductivity of the concrete foundation used in the WR-1 assessment (5×10^{-10} m/s) was more than an order of magnitude greater than the highest value cited in the literature reviewed. To validate the results of the literature study and the hydraulic conductivity values used in the assessments, a Building Condition Assessment (Golder 2022c) was completed to evaluate the integrity of the existing subsurface concrete foundation and bottom slab of WR-1 prior to grouting the existing structure of the WR-1 Building. Hydraulic conductivity testing was completed on core samples of the concrete as a part of this assessment, which indicated a range in hydraulic conductivity of approximately 1.2×10^{-11} m/s to 9.8×10^{-11} m/s. The hydraulic conductivity used in the WR-1 assessment is therefore conservative compared to values determined from the Building Condition Assessment. <u>Section 3.4.9.1.5 Local Geosphere</u> Added a reference to a Geosynthesis report (CNL 2022, summarized in EIS Section 6.3.1 Geology) that has been prepared to support the groundwater flow and solute transport assessment. It discusses the characteristics of the local and regional geosphere as it pertains to performance of the geosphere as a barrier. Buried or embedded services outside of the WRDF that may provide a preferential hydraulic pathway will be removed or sealed. The Geosynthesis report (CNL 2022) references the WR-1 Project-specific Hydrogeological Study Report (Dillon 2018) as well as numerous previous studies carried out at the CNL Underground Research Lab (URL) and WL site between the 1960s and early 2000s. The Geosynthesis report also identified gaps or uncertainties that exist in the geological information and a verification program to evaluate the significance of these gaps and uncertainties. <u>Section 3.4.9.1.6 Concrete Cap and Engineered Cover</u> The function of the concrete cap and engineered cover were clarified. The concrete cap is intended to deter intrusion, while the engineered cover protects the concrete cover and WRDF from frost and resists surface water infiltration. The concrete cap will be made of reinforced concrete. The engineered cover will be sloped to direct surface water away from the WRDF, include a drainage layer for any infiltrating surface water, and include a compacted stone layer to deter burrowing animals and roots. Limiting the amount of water entering the WRDF limits the release of contamination as groundwater is the main transport pathway for contamination. The engineered covered was designed to provide resistance to groundwater movement through vertical infiltration (AECOM 2020). <u>Section 3.4.9.1.7 Post-Closure Monitoring</u> was not modified as there were no relevant studies to conduct. Post-Closure Monitoring activities are detailed in Section 11.0 of the EIS (Golder 2022a).

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						Two key references that summarize the studies or literature review performed are the Decommissioning Safety Assessment Report (DSAR, Golder 2021b) and the GWFSTMR (Golder 2021a). The DSAR Sections 6.0 Defense-In-Depth for the In-Situ Disposal System provides a review of the multiple barrier system components that are summarized in EIS Section 3.4.9.1. Section 6.0 of the DSAR evaluates the uncertainties associated with the performance of each component and provides references to the sensitivity analyses performed in the GWFSTMR to evaluate these uncertainties. The GWFSTMR provides further detail on each of the system components described in the EIS Section 3.4.9.1 and DSAR Section 6.0 by providing references to studies, reports and testing carried out to validate various performance parameters and detailing the sensitivity analyses carried out. Through these sensitivity analyses, CNL confirmed that the key system property to controlling releases to the environment is the corrosion rate of the reactor metals. Degradation of grout or cementitious material performance contributes to the overall groundwater flow through the WRDF but ultimately does not control the performance of the WRDF (Section 6 of the GWFSTMR). To validate that appropriate corrosion rates were used, CNL completed a Wasteform Synthesis Report (Arcadis 2021), referenced in EIS Section 3.4.9.1.1, which validated the corrosion rates used in the groundwater modeling. CNL applied several layers of conservatism by assuming neutral pH conditions in the WRDF, thus ignoring the passivation protection from corrosion resulting from high pH of surrounding grout, and aerobic conditions, ignoring that air will be largely displaced by grout and groundwater. The literature review was conducted (Golder 2020) as part of the grout formulation study, and which supports the DSAR and the GWFSTMR provides the following information on the durability of cementitious materials, corrosion rates of metals and the performance of grout: ***"Cement Durability*** *Studies of natural cements suggest that the material is very durable. For example, ~2 million years old natural cements were found in northern Jordan (NWMO 2013), and natural cements that were produced ~58 million years ago were reported in Northern Ireland (Milodowski et al. 1989). 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; Cramer 1994).* *According to the NWMO* [Nuclear Waste Management Organization] *(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 1888). Recent studies of Roman cements, even those exposed to saline water (e.g., marine environment) demonstrate little degradation over approximately 2000 years (Cramer 1994; Oleson et al. 2004; Vola et al. 2011).* *The natural cements have been exposed to a range of conditions and cannot be narrowed down to a specific set of conditions especially when you are considering a time frame 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 WRDF and the natural analogues. 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.* *Reference to the anthropological cements is made to 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 WRDF are subjected to less harsh conditions than the Roman/Tyrinian cements which are more robust even though due to the chemical differences they can provide confidence that cements can survive for long periods*. ***Corrosion Rates*** *Corrosion rates selected from the Ontario Power Generation (OPG) Deep Geologic Repository (DGR) project are justified for several reasons:* *1. The Corrosion rates selected were for Aerobic Humid conditions which will be similar to the conditions expected in the WRDF.* *2. The WRDF environment is expected to be alkaline leading to potential orders of magnitude reduction in the corrosion rates for steel and other alloys. A summary of the newer references will be provided.* *3. Sensitivity studies were conducted with the selected corrosion rates showing that even with these elevated rates the WRDF was protective of people and the environment.* ***Grout Performance*** *The grout performance specifications will be set to reflect the model parameters. An additional sensitivity simulation where the grout and/or foundation are instantly (within ~100 years) degraded to the high value is being completed.*

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						A literature review was conducted to support the parametrization of the grout and concrete foundation materials, and the results are summarized in the following table. The hydraulic conductivity of the grout used in the WR-1 assessment (5 x 10^{-8} m/s) was a factor of five times greater than the highest value cited in the literature reviewed. The hydraulic conductivity of the concrete foundation used in the WR-1 assessment (5 x 10^{-10} m/s) was more than an order of magnitude greater than the highest value cited in the literature reviewed. *Information on barrier degradation was limited in the sources reviewed, and the assumed step function used in the WR-1 assessment (based on information provided in Walton et al. (1990)) is considered justified.* *(a) A higher hydraulic conductivity value of 3x10^{-9} m/s was cited for porous cement mortar. This type of porous cement was not considered representative of foundation materials for WR-1.* *The hydraulic conductivity of the grout used in the WR-1 assessment (5 x 10^{-8} m/s) was a factor of five times greater than the highest value cited in the literature reviewed. The hydraulic conductivity of the concrete foundation used in the WR-1 assessment (5 x 10-10 m/s) was more than an order of magnitude greater than the highest value cited in the literature reviewed.* *Information on barrier degradation was limited in the sources reviewed, and the assumed step function used in the WR-1 assessment (based on information provided in Walton et al [1990]) is considered justified."* **Change to EIS:** The text in Section 3.4.9.1 was revised as described above. **References:** *AECL 1992. High-Performance Cement-Based Grouts for use in a Nuclear Waste Disposal Facility. AECL-10511. December 1992.* *AECOM 2020. Concrete Cap and Engineered Cover for the WR-1 Disposal Facility, WLDP-26000-235-000 #51799185. Revision 0. March 2020.* *Alonso MC, Fernandez Luco L, Garcia JL, Hidalgo A, Huertas F 2007. Low-pH Cementitious Materials Design and Characterisation. Instituto de Ciencias de la Construccion Eduardo Torroja (IETcc-CSIC), Madrid Spain; Empresa Nacional de Residuos Radiactivos S.A. (ENRESA), Madrid, Spain.* *Arcadis 2021. NPD and WR-1 In Situ Decommissioning Projects Waste Form Synthesis Report. 64-508760-REPT-017. Revision 1. July 2021.* *Arnold JR, Garrabrants AC, Samson E, Flach GP and Langton CA 2009. Moisture Transport Review. November 2009. CBP-TR-2009-002 Revision 0.* *Carter WJ, Ezirim H and Emerson, M. 1996. Properties of concrete in the cover zone: water penetration, sorptivity and ionic ingress. Magazine of Concrete Research, 48, No. 176, Sept., 149-156. 1996.* *CNL 2022. Geosynthesis for WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. January 2022.* *Cramer J 1994. Natural Analogues in Support of the Canadian Concept for Nuclear Fuel Waste Disposal. AECL-10291, COG-92-258.* *Dillon 2018. WR-1 Hydrogeological Study Report, WLDP-26000-REPT-004. Revision 1. November 2018.* *Garcia Calvo JL, Alonso MC, Ferdandez Luco L, Hidalgo A and Sanchez M 2008. Implications of the use of low-pH Cementitious Materials in High Activity Radioactive Waste Repositories. International Conference - Underground Disposal Unit Design & Emplacement Processes for a Deep Geological Repository. 16-18 June 2008. Prague.* *Golder 2018. Summary of Laboratory Permeability Testing of Cementitious Backfill Grouts. Provided by email from Golder Burnaby, May 18, 2018.* *Golder 2020. CNL WR-1 Information Request No. 48. GAL-132-1656897. March 2020.* *Golder 2021a. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2021b. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022a. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Golder 2022b. CNL Whiteshell Reactor 1 - Phase 1000 Grout Formulation Testing Report. WLDP-26000-REPT-012. Revision 1. May 2022.* *Golder 2022c. Building Condition Assessment In-Situ Decommissioning of Whiteshell Reactor 1 (WR-1). WLDP-26000-REPT-011. Revision 1. May 2022.* *Guizzardi M, Derome D, Mannes D, Vonbank R and Carmeliet J 2016. Electrical Conductivity Sensors for Water Penetration Monitoring in Building Masonry Materials. Materials and Structures (2016) 49:2535-2547. 2016.*

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						Linklater CM (ed) 1998. A Natural Analogue Study of Cement Buffered, Hyperalkaline Groundwaters and Their Interaction with a Repository Host Rock II. Nirex Science Report, S-98-003, NDA-RWMD, Harwell, UK. *Middleton JH 1888. On the Chief Methods of Construction Used in Ancient Rome. Archaeologie Ll, 41-60.* *Milodowski AE, Nancarrow PHA and Spiro B 1989. A Mineralogical and Stable Isotope Study of Natural Analogues of Ordinary Portland Cement (OPC) and CaO-SiO2-H2O (CSH) Compounds. United Kingdom Nirex Safety Studies Report, NSS/R240, NDA, Moor Row, UK.* *NWMO 2013. Post-closure Safety Assessment of a Used Fuel Repository in Sedimentary Rock. NWMO-TR-2013-07.* *Oleson, JP, Brandon C, Cramer SM, Cucitore R, Gotti E and Hohlfelder RL 2004. The ROMACONS Project: A Contribution to the Historical and Engineering Analysis of Hydraulic Concrete in Roman Maritime Structures. Intern. J. autical Archaeol., 33.2, 199-229, doi: 10.1111/j.1095-9270.2004.00020.x.* *Ortega JM, Esteban MD, Rodriguez RR, Pastor JL, Ibanco FJ, Sanchez I and Climent MA 2017. Long-Term Behaviour of Fly Ash and Slag Cement Grouts for Micropiles Exposed to a Sulphate Aggressive Medium. Materials 2017, 10, 598. May 2017.* *Park J-W and Kim C-L 2013. Long Term Behaviour of Cementitious Materials in the Korean Repository Environment. Attachment to: The Behaviours of cementitious materials in long term storage and disposal of radioactive waste: results of a coordinated research project. International Atomic Energy Agency. 2013.* *Schmertmann GR, Huyng R and Stening, J. 2017. Groundwater and Soil Vapour Containment Design at an Industrial Site. 1st International Conference on Geomechanics and Geoenvironmental Engineering, 20-22. November 2017. Sydney, Australia.* *Vola G, Gotti E, Brandon C, Oleson JP and Hohlfelder RH 2011. Chemical, Mineralogical and Petrographic Characterization of Roman Ancient Hydraulic Concretes Cores from Santa Liberata, Italy, and Caesarea Palestinae, Israel. Periodico di Mineralogia 80, 317-338.* *Walton JC, Plansky LE, Smith RW 1990. Models for Estimation of Service Life of Concrete Barriers in Low-Level Radioactive Waste Disposal. Idaho National Engineering Laboratory, EG&G Idaho Inc. September 1990.*
49.	ECCC		EIS - Section 3.5.4.1.2 Grout	3-36	**Comment:** Insufficient information is provided in the EIS to be able to estimate air emissions from grout production and backfilling operations. **Expectation to Address Comment:** Provide physical properties of the grout proposed to be used (including particle size distribution) and mixing conditions.	**Incorporated:** CNL has developed and tested a complete grout formulation (Golder 2022a) based on detailed performance requirements and a supporting test plan that were prepared by Savannah River National Laboratory (SRNL 2018). CNL's formulation uses local materials and has been tested to ensure it meets or exceeds the expected criteria documented in the test plan. The properties of the final formulation are documented in Table 3.4.6-1 in Section 3.4.6.2 of the Environmental Impact Statement (EIS; Golder 2022b) and are provided below: (table follows)

Table 3.4.6-1: Target Physical Properties of Grout

Property	Target	Basis
Bleed Water after 24 hr (vol.%)	0	Eliminate need for liquid removal
Maximum Temperature Rise during Curing	<25°C difference between grout interior and exterior	Manage effects of heat of hydration
pH	<13.5	Compatible with materials and contaminants in most of the rooms to be grouted
Compressive Strength	>3.4 MPa at 28 days	Non-structural grout, needs only to support its own mass
Effective Porosity (vol.%)	<0.6	Used in solute transport model
Dry Bulk Density (kg/m^3)	2,100	Used in solute transport model
Hydraulic Conductivity (m/yr)	<0.03	Used in solute transport model

vol.% = volume percent; MPa = megapascal.

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						The grout formula used for Stage 2 testing is documented in Table 3.4.6-2 in Section 3.4.6.2 of the EIS (Golder 2022b) and is provided below:

Table 3.4.6-2: Grout Formulation for Stage 2 Testing

Material	Quantity per m^3
Portland Cement	89 kg
Fly Ash	297 kg
Sand	1,570 kg
Gravel	0 kg
Water	232 kg
Polycarboxylate Polymer	1.77 L
Diutan Gum Based Viscosity Modifying Admixture	260 g

Details on the grout components that can influence airborne emissions, such as Portland cement, fly ash, and sand, are provided in the Attachment A-1 and A-2 of the Grout Formulation Testing Report (Golder 2022a). Portland cement is Type GU hydraulic cement, an industry-standard product meeting the requirements of ASTM C150/CSA A3001. Fly Ash is a Type F fly ash, also an industry standard product meeting the requirements of ASTM 618/CSA A3001. Project-specific material is the fine aggregate (sand) for which the particle size distribution graph is provided below, with further testing detailed in Attachment A-1/A-2 of the Grout Formulation Testing Report.

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						(continued below)

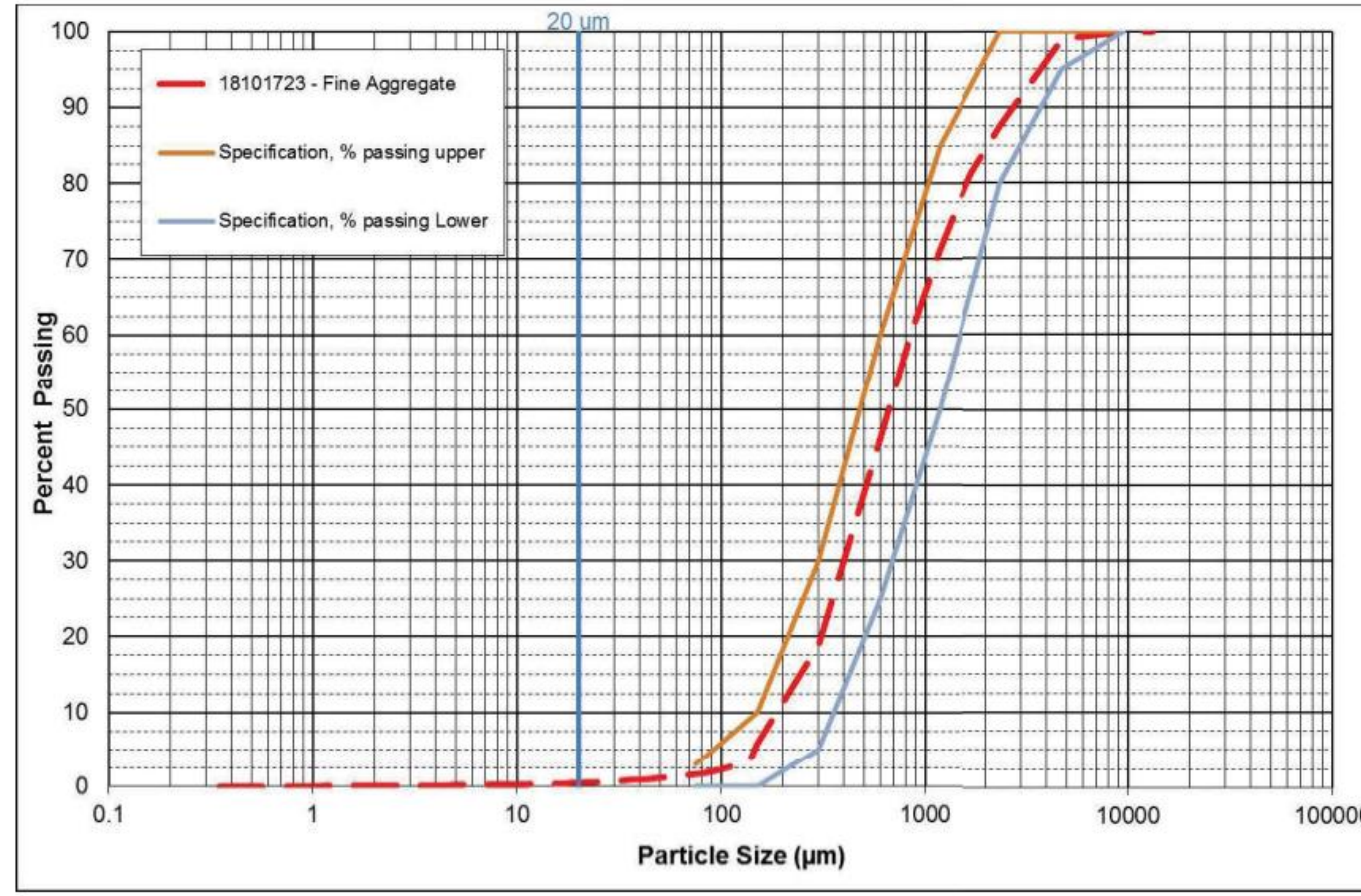

Figure A-2: PSD Results - 18101723 Fine Aggregate

CNL used EPA AP42 Section 11.12 for emission factors for batching of concrete (as described in EIS Section 6.2.1.7.1). CNL considers the use of these factors reasonable since the project will be using conventional practises during the concrete/grout batching process. The average and maximum emission rates from grout production are provided in Table 12 and 13 respectively in Appendix 6.2-2 of the EIS and are shown below:

Table 12: Average Scenario Summary of Emissions Rates During the Closure Phase

Project Stage	Duration	Project Component		Emission Source Type	Daily Emission Rates (g/s)					
					SPM	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO
1 Preparation for In Situ Disposal	2022 - 2024	1.1	Create pathways between rooms	Non-road Equipment Exhaust	3.28×10^{-3}	3.28×10^{-3}	3.18×10^{-3}	5.47×10^{-2}	1.09×10^{-4}	1.84×10^{-2}
		1.2	Batch mixing plant (temporary)	Process	4.04×10^{-2}	1.39×10^{-2}	2.89×10^{-3}	—	—	—
				Non-road Equipment Exhaust	1.56×10^{-3}	1.56×10^{-3}	1.52×10^{-3}	3.06×10^{-2}	3.61×10^{-5}	1.54×10^{-2}
				Raw Material Handling	2.17×10^{-3}	1.03×10^{-3}	1.55×10^{-4}	—	—	—
				Road Exhaust	1.95×10^{-4}	1.95×10^{-4}	1.16×10^{-4}	5.37×10^{-3}	3.56×10^{-5}	2.82×10^{-3}
				Paved Roads	1.84×10^{0}	3.54×10^{-1}	8.56×10^{-2}	—	—	—
				Propane Combustion	4.13×10^{-4}	4.13×10^{-4}	4.13×10^{-4}	2.69×10^{-2}	3.10×10^{-3}	1.55×10^{-2}

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						(continued below)

Table 13: Maximum Scenario Summary of Percentage Contributions of Emissions Rates During the Closure Phase

Project Stage	Duration	Project Component	Emission Source Type	Compound Percent of Overall Compound Emissions					
				SPM	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO
1 Preparation for In Situ Disposal	2022 - 2024	1.1 Create pathways between rooms	Non-road Equipment Exhaust	<1%	<1%	2%	5%	<1%	5%
		1.2 Batch mixing plant (temporary)	Process	2%	3%	2%	—	—	—
			Non-road Equipment Exhaust	<1%	<1%	<1%	3%	<1%	4%
			Raw Material Handling	<1%	<1%	<1%	—	—	—
			Road Exhaust	<1%	<1%	<1%	<1%	<1%	1%
			Paved Roads	87%	68%	61%	—	—	—
			Propane Combustion	<1%	<1%	<1%	2%	15%	3%

Change to EIS:

Section 3.5.4.1.2 has been renumbered as Section 3.4.6.2 and was revised to include the preferred grout mix design formula in Table 3.4.6-2 of the EIS (Golder 2022b).

A new document, the Grout Formulation Testing Report (Golder 2022a) has also been provided by Golder. The particle size distribution for the fine aggregate is provided in Figure A-2 of the Grout Formulation Testing Report.

The emission rates from grout production were updated in Table 12 and Table 13 of Appendix 6.2-2 in the EIS (Golder 2022b).

References:

Golder 2022a. CNL Whiteshell Reactor 1 - Phase 1000 Grout Formulation Testing Report. WLDP-26000-REPT-012. Revision 1. May 2022.

Golder 2022b. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.

SRNL 2018. Grout Formulation Test Plan for WR-1 Reactor Facility Decommissioning Project. SRNL-L3200-2017-00155. January 2018.

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
50.	CNSC	G. Su / J. Brown	EIS - Section 3.5.4.1.5 Local Geosphere	3-37	**Comment:** The baseline geological environment is inadequately characterized in the EIS (and supporting documents); it falls short of what is needed to assess the submission in light of the reliance of the project on the enclosing geological environment (for long-term safety). The compilation of existing geological information is limited; there is no geological history of the region, no description of the tectonic setting, no three-dimensional framework models of geology and structural geology, seismic hazard assessment (linked to regional geology and tectonics), limited geomorphology and quaternary geology. CNL's proposal for ISD of the WR-1 involves permanently entombing the facility. Whether the geosphere can be considered as an important barrier depends on its physical, chemical, hydrogeological, and mechanical properties and the site evolution within the defined timeframe. Section 6.3.1.4.2.2 states that geological formations consist of bedrock and surficial soils. The upper bedrock contains numerous fractures and is relatively permeable. The surficial overburden soils consist of (from bottom to top) basal sand, clay till, clay, and a thin deposit of interbedded silt and clay. The upper bedrock and basal sand consist of a	**Incorporated:** The term Entombment, within the context of its use in international guidance, is overly simplistic and is not appropriate to describe the WR-1 In Situ Decommissioning Project. WR-1 is being converted into a passively safe disposal facility, meeting all regulatory requirements for such a facility. To document the baseline geosphere characterization, CNL has prepared a Geosynthesis Report (CNL 2022) that includes the requested information. The geological information is also presented in Section 6.3.1 of the Environmental Impact Statement (EIS; Golder 2022) and has been updated to include additional information on structural geology and bedrock fractures. The Geosynthesis report provides information to support the WR-1 EIS, in three areas: 1. A Geosynthesis of the information used to support the EIS and licence amendment application for decommissioning of Whiteshell Reactor 1 (WR-1); 2. Ensuring that CNSC EIS regulatory baseline geological and hydrogeological requirements of Appendix B.4 of Regulatory Document 2.9.1 (CNSC 2020) and Section 7.3.1 of Regulatory Document 2.11.1 Volume III (CNSC 2018) are met; and 3. Identification of geoscientific data uncertainties and an assessment of their relevance/significance to the decommissioning project. The Geosynthesis (CNL 2022) focuses on reviewing and summarizing of available geological, hydrogeological and geomechanical information, including published scientific literature, Whiteshell Laboratories (WL) site characterization reports, information on the regional and local geology developed during the Canadian Nuclear Fuel Waste Management Program, government documentation of area soil and available mapping data from the Manitoba Geological Survey and Earthquakes Canada. Hydrogeological information is contained in the WR-1 Hydrogeological Study Report (Dillon 2018) but is briefly summarized in this document. The Geosynthesis Report (CNL 2022) summarizes the geosphere data used to set up the environmental models as indicated in Section 2.3 of the Groundwater Flow and Solute Transport Modeling Report (GWFSTMR; Golder 2021), which uses the geotechnical data to evaluate environmental releases through the geosphere and determine that the geological setting provides a barrier to containment release.

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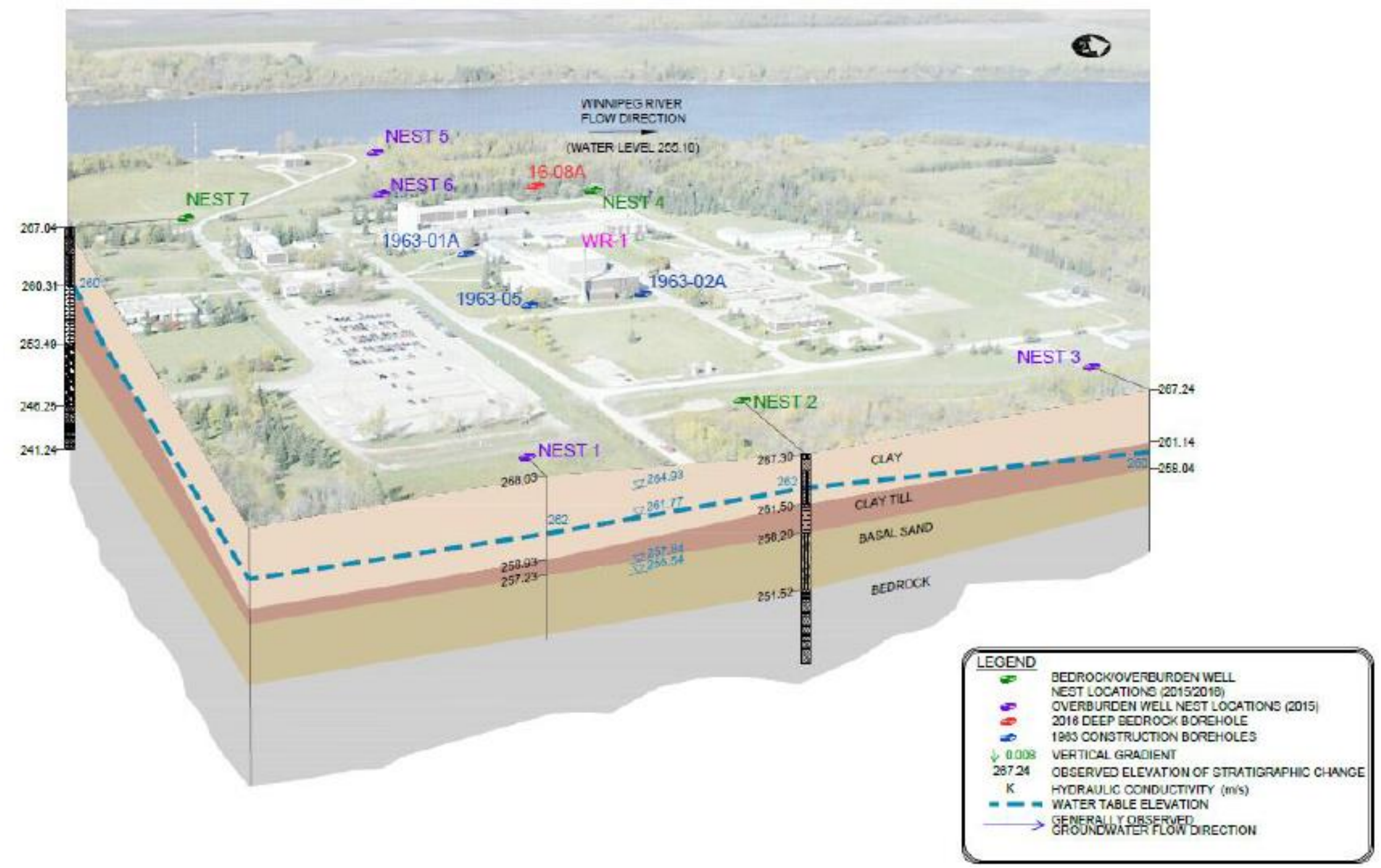
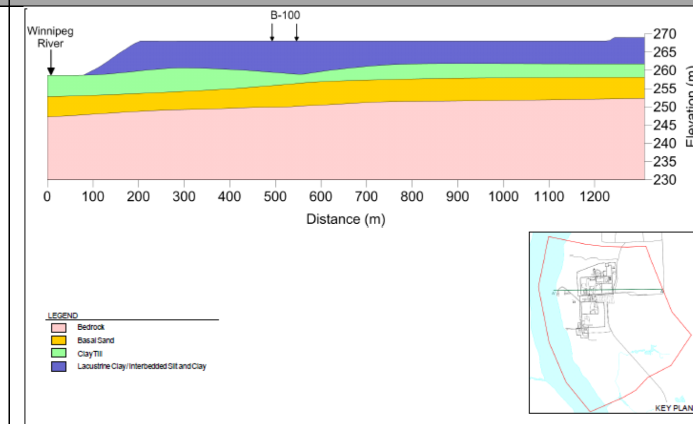
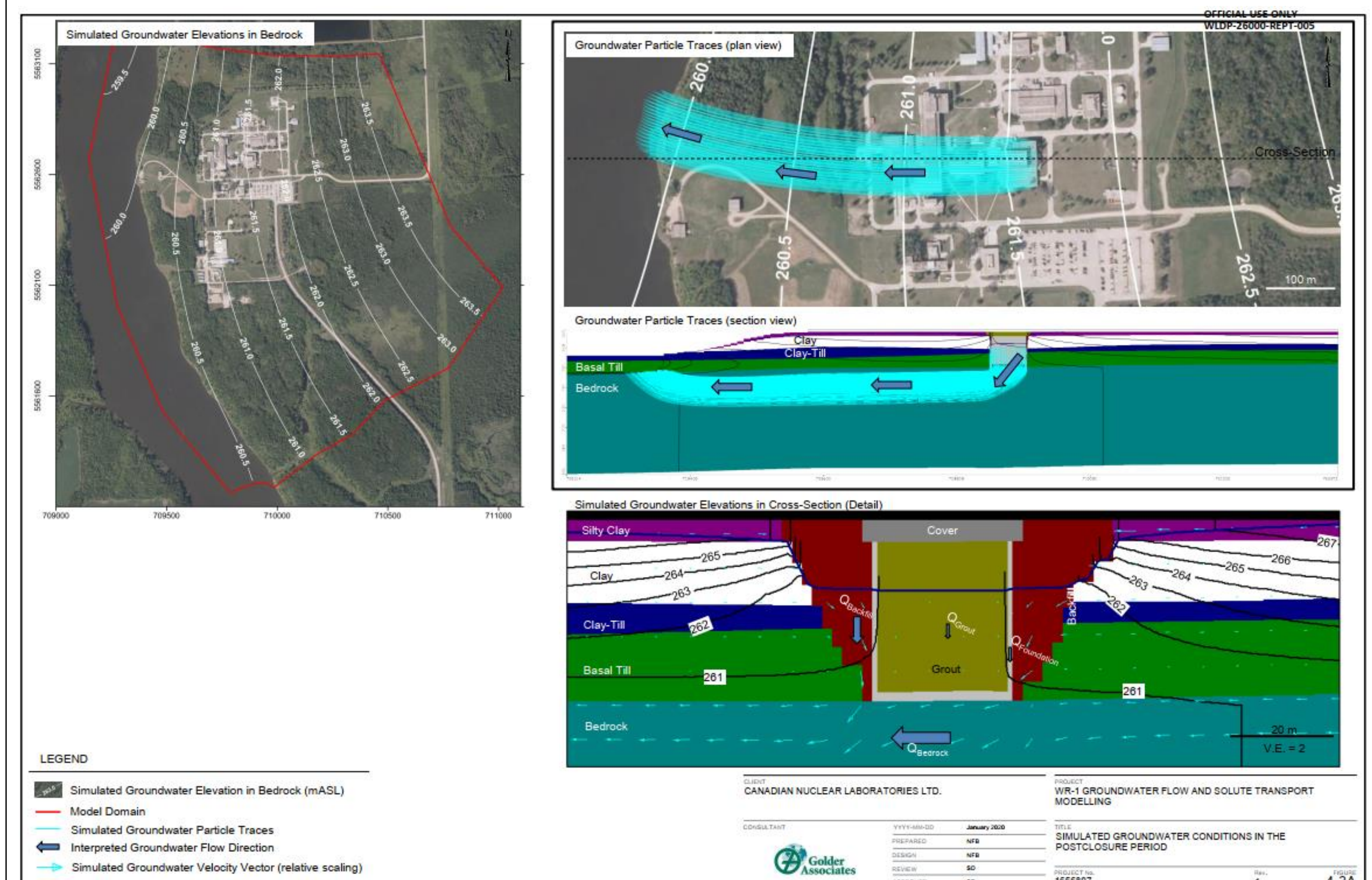
					shallow groundwater aquifer. If the engineered barriers fail and lose their containment functions, the contaminants in the ISD facility would migrate faster along the bedrock and basal sand aquifer to reach the receiving environment. Also, within the defined timeframe, the evolution of the site and the Winnipeg River might remove at least some surficial soils if not all of them, which will impact the safety of the disposal facility (see related comment on Section 6.3.1 below). The importance of the geosphere as a natural barrier for long-term safety is also discussed in the Decommissioning Safety Assessment Report (e.g., p.45, Section 2.3.1.5 "The surrounding geosphere provides natural barriers for long-term safety during post-closure as the WR-1 ISD structure will be located below-grade."). This highlights the need for the inclusion of geological data, which needs both to be integrated with the safety assessment, and forms an additional component in the safety case. **Expectation to Address Comment:** Provide a synthesis of the complete geosphere characteristics that are relevant for this project, so that CNSC staff can evaluate this important component of the safety case. This information is required to support the statement that local soils provide a barrier to contaminant release to the environment. One specific request includes providing a cross-section showing the relationship between the geology and the WR-1 facility to demonstrate and justify the importance of the geosphere barrier.	To specifically address the request, the Geosynthesis provides a summary of the data on the local overburden and the hydrogeological properties of the WL site. It provides the compositional information for the basal unit, including hydraulic conductivity measurements, to justify statements made in the EIS that the geosphere soils are largely clay based, and restrict groundwater flow in the vicinity of Whiteshell Reactor 1 (WR-1) to less than 5 m per year. As per the reviewer comment, the Geosynthesis compiles the information that confirms that the upper bedrock and basal sand interface layer has the greatest hydraulic conductivity and thus is the preferential water pathway as assessed in the groundwater flow model (Section 4.2.2.2 of GWFSTMR [Golder 2021]). This was confirmed and evaluated in Sensitivity Scenario 11 (Section 5.2 of the GWFSTMR [Golder 2021]) where the hydraulic conductivity of the upper bedrock layer was doubled, and higher peak mass loadings corresponding to a faster water flow rate were observed at the receptor location. Given that this geologic layer directly affects the rate of nuclide migration from the Whiteshell Reactor Disposal Facility (WRDF) to the environment, it is thus deemed a geospheric barrier to release. The Geosynthesis (CNL 2022) further addresses the request by providing multiple cross sectional diagrams of the soil layers at the WL site as provided below. 

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						 The data in the Geosynthesis also supports the cross-sectional diagram used in Figure 4-3A (provided below) in the GWFSTMR (Golder 2021) that shows the WR-1 building in relation to the overburden and bedrock layers, as well as the effect the geological layers have on the transport pathways.  **Change to EIS:** Section 3.5.4.1.5 of the EIS (Golder 2022) was renumbered as Section 3.4.9.1.5 Local Geosphere, and updated with a reference to the Geosynthesis Report (CNL 2021).

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						Relevant information from the Geosynthesis has also been added in Section 6.3.1 of the EIS to describe both the regional and local geology, with specific updates to the bedrock fracture geology in section 6.3.1.5.2.2 Local Geological Conditions. **Change to Geosynthesis:** The Geosynthesis (CNL 2022) is a new document. Section 3.3 Describes the hydrogeological conditions. Section 4.2 Describes the geotechnical properties of the overburden layers. **References:** *CNL 2022. Geosynthesis for WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. January 2022.* *CNSC 2018. REGDOC-2.11.1 Vol. 3 Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. May 2018. ISBN 978-0-660-25806-5* *CNSC 2020. REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.2. September 2020. ISBN 978-0-660-06255-6.* *Dillon 2018. WR-1 Hydrogeological Study Report. WLDP-26000-REPT-004. Revision 0. November 2018.* *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
51.	ECCC		EIS - Section 3.5.4. 2 Post-Closure Activities	3-38	**Comment:** This section of the EIS states that: "The monitoring program will focus on groundwater quality and the functioning of the containment." However, it is not clear whether emissions of radiological and non-radiological contaminants through the processes of migration to the surface (including uptake by plants) and wind erosion during post-closure have been considered. Lead and strontium-90 are examples of contaminants that could reach the surface through plant uptake. If judged to be significant, Table 1 in Appendix 6.1-1 should be updated accordingly. **Expectation to Address Comment:** Clarify whether emissions of radiological and non-radiological contaminants through the processes of migration to the surface (including uptake by plants) and wind erosion during post-closure have been considered. If contaminants are assessed to be significant, update Table 1 in Appendix 6.1-1 accordingly.	**Resolved As:** CNL did assess the potential for the emissions of radiological and non-radiological contaminants through the processes of migration to the surface (including uptake by plants) and wind erosion during post-closure, but determined it was not plausible because groundwater flow surrounding the Whiteshell Reactor 1 (WR-1) Building is downward towards the bedrock (Section 5.1 of Dillon 2018) and the basal sand unit (right above the bedrock) and the shallow bedrock are more permeable than the overlaying strata (Section 5.1 of Dillon 2018). **References:** *Dillion 2018. WR-1 Hydrogeological Study Report. WLDP-26000-REPT-004. Revision 1. November 2018.*
					4.0 Aboriginal Engagement	
52.	CNSC	C. Cianci S. Arnott	EIS - All – General	N/A	**Comment:** The final EIS and supporting documentation (*Aboriginal Engagement Report*) should include a schedule of proposed engagement activities and meetings with First Nation and Métis groups as per the requirements of REGDOC-3.2.2.	**Incorporated:** The Environmental Impact Statement (EIS; Golder 2022) and Indigenous (formerly Aboriginal) Engagement Report (IER; CNL 2022) were revised to provide updated future planned engagement activities, including more detail and timelines to the extent known. CNL supplies an updated list to the CNSC each month.

<table>
<tr><th>No.</th><th>Department/ Agency</th><th>SME</th><th>Section Table or Figure</th><th>Pg. #</th><th>Information Request or Summary of Comment</th><th>Response by CNL</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>Change to EIS:
Section 4.2.5 of the EIS (Golder 2022) was revised to provide updated future planned engagement activities, including more detail and timelines to the extent known.
Change to IER:
Section 3.5 of the IER (CNL 2022) was revised to provide updated future planned engagement activities, including more detail and timelines to the extent known.
References:
CNL 2022. Whiteshell Laboratories WR-1 Reactor Decommissioning Indigenous Engagement Report. WLDP-26000-REPT-002. Revision 8. December 2022.
Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.</td></tr>
<tr><td>53.</td><td>CNSC</td><td>C. Cianci
S. Arnott</td><td>EIS - All – General</td><td>N/A</td><td>Comment: The final EIS and supporting documentation (Aboriginal Engagement Report) should include an update on the development of engagement work plans with identified First Nation and Métis groups, as per the requirements of REGDOC-3.2.2.</td><td>Incorporated:
The Environmental Impact Statement (EIS; Golder 2022) and Indigenous (formerly Aboriginal) Engagement Report (IER; CNL 2022) were revised to provide an update on Indigenous engagement plan progress, as per the requirements of REGDOC-3.2.2 (CNSC 2019).
Change to EIS:
Section 4.2 of the EIS (Golder 2022) was revised to provide an update on Indigenous engagement plan progress and Table 4.2-1 provides a high level summary of the progress made.
Change to IER:
Section 3 of the IER (CNL 2022) was revised to provide an update on Indigenous engagement plan progress and Table 2 provides a high level summary of the progress made.
References:
CNL 2022. Whiteshell Laboratories WR-1 Reactor Decommissioning Indigenous Engagement Report. WLDP-26000-REPT-002. Revision 8. December 2022.
CNSC 2019. Public and Indigenous Engagement: Indigenous Engagement. REGDOC-3.2.2. Version 1.1. August 2019.
Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.</td></tr>
<tr><td>54.</td><td>CNSC</td><td>C. Cianci
S. Arnott</td><td>EIS - All – General</td><td>N/A</td><td>Comment: The final EIS and supporting documentation (Aboriginal Engagement Report) should provide an updated list of engagement activities, communications and meetings with identified First Nation and Métis groups (the current list is up to July 2017), as per the requirements of REGDOC-3.2.2. Expectation to Address Comment: In the final EIS, provide an updated list and description of First Nation and Métis engagement activities, including any discussions CNL has had with identified First Nation and Métis groups regarding potential impacts to potential or established Aboriginal and/or treaty rights.</td><td>Incorporated:
The Environmental Impact Statement (EIS; Golder 2022) and Indigenous (formerly Aboriginal) Engagement Report (IER; CNL 2022) were revised to provide an updated description of engagement activities, communications, and meetings with identified Indigenous Nations, including any discussions regarding potential impacts to potential or established Aboriginal and treaty rights, as per the requirements of REGDOC-3.2.2 (CNSC 2019). The table below provides an example of new engagement activities with Sagkeeng First Nation where Aboriginal and Treaty Rights/Traditional Land Use was discussed. For all engagement activities with Sagkeeng First Nation and the other Indigenous Nations, please see Appendix 4.0-1 of the EIS (Golder 2022).
<table><tr><th>Date</th><th>Activity</th><th>Attendance</th><th>Description</th></tr><tr><td>January 11, 2021</td><td>E-mail/Letter</td><td>Sagkeeng First Nation
CNL</td><td>CNL sent Sagkeeng a final round of responses to Sagkeeng’s comments on the draft Environmental Impact Statement.</td></tr></table></td></tr>
</table>

<table>
<tr><th>No.</th><th>Department/ Agency</th><th>SME</th><th>Section Table or Figure</th><th>Pg. #</th><th>Information Request or Summary of Comment</th><th>Response by CNL</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>
<table>
<tr><td>August 24, 2021</td><td>Teleconference: EIS Technical Working Group Subcommittee Meeting</td><td>3 representatives from Sagkeeng
4 representatives from CNL</td><td>CNL and Sagkeeng met to discuss the Sagkeeng's comments on their summary of interest and concerns table, Sagkeeng's list of valued components, the Psychosocial Impact Assessment write up.</td></tr>
<tr><td>October 14, 2021</td><td>E-mail</td><td>3 representatives from Sagkeeng
3 representatives from CNL</td><td>CNL provided Sagkeeng with a revised version of EIS Section 6.7 for their review for verification that CNL had adequately incorporated Sagkeeng's interests and concerns related to environmental and human health into this subsection.</td></tr>
</table>
Change to EIS:
Section 4.2.4 of the EIS (Golder 2022) was revised to provide an updated summary narrative of engagement activities, communications, and meetings with identified Indigenous Nations, including any discussions regarding potential impacts to potential or established Aboriginal and treaty rights, as per the requirements of REGDOC-3.2.2 (CNSC 2019). Appendix 4.0-1 of the EIS (Golder 2022) was revised to provide summary of engagements and summary of interests and concerns tables.
The information has been updated to reflect engagement activities carried out up to September 30, 2022.
Change to IER:
Section 3.4 of the IER (CNL 2022) was revised to provide an updated summary narrative of engagement activities, communications, and meetings with identified Indigenous Nations, including any discussions regarding potential impacts to potential or established Aboriginal and treaty rights, as per the requirements of REGDOC-3.2.2 (CNSC 2019). Appendices A and B of the IER (CNL 2022) were revised to provide an updated record of communication with regional Indigenous Nations and full tables of Indigenous comments on the EIS and CNL's responses, respectively.
The information has been updated to reflect engagement activities carried out up to September 30, 2022.
References:
CNL 2022. Whiteshell Laboratories WR-1 Reactor Decommissioning Indigenous Engagement Report. WLDP-26000-REPT-002. Revision 8. December 2022.
CNSC 2019. Public and Indigenous Engagement: Indigenous Engagement. REGDOC-3.2.2. Version 1.1. August 2019.
Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.
</td></tr>
<tr><td>55.</td><td>CNSC</td><td>C. Cianci
S. Arnott</td><td>EIS - All – General</td><td>N/A</td><td>Comment: The final EIS and supporting documentation (Appendix 4.0-1 Contact Tracker) should provide an updated list of important correspondence from First Nation and Métis groups (the current list is up to July 2017). Please indicate, for example, whether any groups have indicated that they are not interested in further engagement on the project, have raised specific concerns or requests in correspondence, etc.</td><td>Incorporated:
The Environmental Impact Statement (EIS; Golder 2022) and Indigenous Engagement Report (IER; CNL 2022) were revised to provide an updated description of engagement activities, communications, and meetings with identified Indigenous Nations, including specific concerns or requests and whether any Nations have indicated that they are not interested in further engagement.
In fall of 2020, CNL received verbal confirmation from Brokenhead Ojibway Nation that they no longer had interest in further engagement on the Project with CNL at this time. CNL respects this position and remains interested in future engagement with Brokenhead if the Nation chooses to re-engage. CNL continues to send project updates to Brokenhead Ojibway Nation to keep the Nation informed.</td></tr>
</table>

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						Change to EIS: Section 4.2.4 of the EIS (Golder 2022) was revised to provide an updated summary narrative of engagement activities, communications, and meetings with identified Indigenous Nations, including specific concerns or requests and whether any Nations have indicated that they are not interested in further engagement. Appendix 4.0-1 of the EIS (Golder 2022) was revised to provide summary of engagements and summary of interests and concerns tables. The summary of interests and concerns tables illustrate the specific interests and concerns of each Indigenous Nation, the steps CNL has taken to address these concerns to date, the relevant sections of the EIS that address these interests (if applicable), the changes to the EIS that have resulted from each interest or concern, and the status on each interest or concern. The information has been updated to reflect engagement activities carried out up to September 30, 2022. **Change to IER:** Section 3.4 of the IER (CNL 2022) was revised to provide an updated summary narrative of engagement activities, communications, and meetings with identified Indigenous Nations, including specific concerns or requests and whether any Nations have indicated that they are not interested in further engagement. Appendices A and B of the IER (CNL 2022) were revised to provide an updated record of communication with regional Indigenous Nations (Contact Tracker) and full tables of Indigenous comments on the EIS and CNL's responses, respectively. The information has been updated to reflect engagement activities carried out up to September 30, 2022. **References:** *CNL 2022. Whiteshell Laboratories WR-1 Reactor Decommissioning Indigenous Engagement Report. WLDP-26000-REPT-002. Revision 8. December 2022.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
56.	CNSC	C. Cianci S. Arnott	EIS - All – General	N/A	**Comment:** It is not clear from this section of the EIS and the *Aboriginal Engagement Report*, whether or not CNL provided Aboriginal groups the opportunity to participate in the development, implementation and review of mitigation measures, as per the guidance of REGDOC-3.2.2 and CNSC's *Generic EIS Guidelines*. **Expectation to Address Comment:** Please indicate in the EIS whether CNL sought the views of Aboriginal groups on the development, implementation and review of mitigation measures, as per the guidance of REGDOC-3.2.2 and CNSC's *Generic EIS Guidelines*.	**Incorporated:** Yes, CNL has provided Indigenous Nations with the opportunity to participate in the development of mitigation measures and will provide Indigenous Nations with the opportunity to participate in the implementation and review of mitigation measures as per the guidance of REGDOC-3.2.2 (CNSC 2019) and CNSC's Generic Environmental Impact Statement (EIS) Guidelines (CNSC 2016). CNL sought review and input from all interested Indigenous Nations on the EIS assessment (Golder 2022), the results provided, and the mitigations proposed to identify where CNL could improve the proposed mitigations. As the EIS (Golder 2022) does not predict residual adverse effects to be significant, physical mitigation activities proposed by CNL are limited and largely focus on follow-up monitoring to confirm the predicted performance. As project activities are dependent on a licensing decision, mitigation measures have not yet been implemented and cannot be reviewed for effectiveness. Engagement with Indigenous Nations has started to focus on the development of the follow-up monitoring plans and CNL has committed to establishing a monitoring program led by Indigenous peoples (which will include community-driven country foods monitoring) and hence committed to Indigenous involvement with mitigation measures. **Change to EIS:** Appendix 4.0-1 of the EIS (Golder 2022) was revised to: • Provide a list of all key engagements with the Indigenous Nations who are engaged on the project and indicate which engagements focused on mitigation measures. • Provide Summary of Interests and Concerns Tables. These tables include the feedback from the Indigenous Nations on where CNL could improve the proposed mitigations. • Detail the commitment of establishing a monitoring program led by Indigenous peoples in the Summary of Interests and Concerns Tables. Section 4.4 of the EIS (Golder 2022) was revised to include the following text to indicate that CNL sought the views of Indigenous Nations on mitigation measures as per the guidance of REGDOC-3.2.2 (CNSC 2019) and CNSC's Generic EIS Guidelines (CNSC 2016): *"For more information on specific interests and concerns of each First Nation and the Manitoba Métis Federation as well as how these interest and concerns influenced the EIS, see Appendix 4.0-1 – the tables of interest and concerns including how CNL incorporated and considered feedback on mitigation measures for the Project."*

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						References: *CNSC 2016. Generic Guidelines for the Preparation of an Environmental Impact Statement. May 2016.* *CNSC 2019. Public and Indigenous Engagement: Indigenous Engagement. REGDOC-3.2.2. Version 1.1. August 2019.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
57.	CNSC	C. Cianci S. Arnott	EIS - Section 4.1 Introduction	4-1	**Comment:** The introduction of this section should indicate that this is an interim status update on CNL's Aboriginal engagement plan that was submitted to the CNSC as part of its *Aboriginal Engagement Report*, as per the requirements of REGDOC-3.2.2. **Expectation to Address Comment:** Please revise accordingly.	**Resolved As:** Section 4.0 of the Environmental Impact Statement (EIS; Golder 2022) is a stand-alone section summarizing Indigenous engagement; it is not intended to be an interim status update on the Indigenous Engagement Report (IER; CNL 2022). The IER provides additional information and context on CNL's engagement activities for the Whiteshell Reactor 1 (WR-1) Decommissioning Project and remains a living document that will continue to be updated. **Change to EIS:** Section 4.1 of the EIS (Golder 2022) was revised as follows to clarify that it is a stand-alone section summarizing Indigenous engagement and that the IER (CNL 2022) remains a living document that will continue to be updated to satisfy the interim status update requirement of REGDOC-3.2.2 (CNSC 2019): *"Canadian Nuclear Laboratories (CNL) has prepared this stand-alone section to document Indigenous engagement with respect to the In Situ Disposal (ISD) of the WR-1 Reactor at the Whiteshell Laboratories (WL) site (Project). This section was updated and enhanced since the March 2020 draft version of the WR-1 Decommissioning Project draft Environmental Impact Statement (EIS). This section is intended to clarify the engagement between the First Nations, the Manitoba Métis Federation, and CNL with respect to the Project, in particular, interests and relevant mitigations while meeting the requirements outlined by the Canadian Nuclear Safety Commission (CNSC) REGDOC-3.2.2 (CNSC 2019)."* *and* *"This section of the EIS is supported by CNL's Indigenous Engagement Report (IER; CNL 2022) for the WR-1 Decommissioning Project, which was recently updated in 2022. The IER was prepared in accordance with CNSC's REGDOC-3.2.2 Indigenous Engagement (CNSC 2019). The IER outlines CNL's approach to Indigenous engagement to support the environmental assessment process for the proposed Project. The IER is a more detailed version of Section 4.0 that provides additional information and context on CNL's engagement activities for the Project, which are summarized and incorporated in this EIS. The IER remains a living document that will continue to be updated.* *After the filing of the EIS, CNL is committed to continue to engage with First Nations and the Manitoba Métis Federation both about the Project, and also more broadly about the WL site decommissioning and environmental remediation. CNL is working towards developing long-term relationships, or other agreements, with First Nations and the Manitoba Métis Federation on whose traditional territory CNL operates and with those that have territory and modern-day interests near CNL operations. Consistent with the Government of Canada's approach to reconciliation, CNL is working closely with Atomic Energy of Canada Limited (AECL), a federal Crown corporation and owner of the site, to engage and build long-term relationships with Indigenous peoples, on matters beyond the scope of this environmental assessment and licence amendment for the Project.* *Discussions regarding long-term relationships and on specific aspects of projects such as the Project will be ongoing up until and after the CNSC Commission Hearing on the Project. Because of the ongoing nature of these discussions and relationships, CNL intends to provide a revised IER as part of the Commission Member Document package for the CNSC Commission Hearing on the Project."* **References:** *CNL 2022. Whiteshell Laboratories WR-1 Reactor Decommissioning Indigenous Engagement Report. WLDP-26000-REPT-002. Revision 8. December 2022.* *CNSC 2019. Public and Indigenous Engagement: Indigenous Engagement. REGDOC-3.2.2. Version 1.1. August 2019.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
58.	CNSC	C. Cianci S. Arnott	EIS - Section 4.3.2 Summary of First Nation and Métis	N/A	**Comment:** The final EIS and supporting documentation (*Aboriginal Engagement Report*) should include further details on the concerns and questions raised by First Nation and Métis groups, and how CNL is addressing them (e.g., mitigation	**Incorporated:** Section 4.0 of the Environmental Impact Statement (EIS; Golder 2022) and the Indigenous (formerly Aboriginal) Engagement Report (IER; CNL 2022) were revised to include key interests and concerns raised by First Nations and the Red River Métis, and how these were responded to or addressed as per of the requirements of REGDOC-3.2.2 (CNSC 2019) and the CNSC's Generic EIS Guidelines (CNSC 2016).

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			Engagement Activities		measures) as per the requirements of REGDOC-3.2.2 and CNSC's *Generic EIS Guidelines*. Particularly, those related to impacts on any potential or established Aboriginal and/or treaty rights. Although key interests and concerns for each Aboriginal group are identified in this section of the EIS, how CNL has responded to or addressed these concerns is not provided. **Expectation to Address Comment:** As per the requirements of REGDOC-3.2.2 and CNSC's *Generic EIS Guidelines*, update this section to include all comments, specific issues and concerns raised by Aboriginal groups and how these were responded to or addressed.	**Change to EIS:** Section 4.2.4 of the EIS (Golder 2022) was revised to include further details on the interests and concerns raised by First Nations and the Red River Métis, and how CNL is addressing them as per of the requirements of REGDOC-3.2.2 (CNSC 2019) and the CNSC's Generic EIS Guidelines (CNSC 2016). Appendix 4.0-1 of the EIS (Golder 2022) was revised to provide summary of interests and concerns tables, including how the key interests and concerns are being responded to and addressed. **Change to IER:** Section 3.4 of the IER (CNL 2022) was revised to include further details on the interests and concerns raised by First Nations and the Red River Métis, and how CNL is addressing them as per of the requirements of REGDOC-3.2.2 (CNSC 2019) and CNSC's Generic EIS Guidelines (CNSC 2016). Appendix B of the IER (CNL 2022) was revised to provide full tables of Indigenous comments on the EIS and CNL's responses. **References:** *CNL 2022. Whiteshell Laboratories WR-1 Reactor Decommissioning Indigenous Engagement Report. WLDP-26000-REPT-002. Revision 8. December 2022.* *CNSC 2016. Generic Guidelines for the Preparation of an Environmental Impact Statement. May 2016.* *CNSC 2019. Public and Indigenous Engagement: Indigenous Engagement. REGDOC-3.2.2. Version 1.1. August 2019.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
					5.0 Public Engagement	
59.	CNSC	L. Donnelly	EIS - General	5-1 to 5-16	**Comment:** The EIS should indicate the public concerns raised and the extent to which this information was incorporated in the design of the project (which is an information requirement of Section 6 as per CNSC's *Generic EIS Guidelines*, p.14). There is limited information related to this in the EIS. **Expectation to Address Comment:** Provide additional details on how public concerns were considered as part of the EA process.	**Incorporated**: Issues, interests and concerns raised through the public engagement process were considered as part of the environmental assessment process. For example, the future use of the Whiteshell Laboratories site was identified as important for local and rural municipalities. As such, the importance of continued economic development was considered under the context of community well-being and was included as a Valued Component (VC) for the assessment. The VCs are described at the outset of each subsection of Section 6.0 Environmental Effects (Sections 6.2 Atmospheric Environment, through 6.9 Socio-economic Environment) of the Environmental Impact Assessment (EIS; Golder 2022). Section 2.0 of the EIS also includes information on how public feedback was considered in the alternatives assessment. In Section 5.3.1 of the EIS, Table 5.3.1-1 Summary of Feedback and Responses has been updated, and summarizes the feedback received by CNL from stakeholders/general public and the steps CNL took to incorporate it into the ongoing engagement on the EIS, or into the Project design. Key concerns and interests that CNL investigated during project design are summarized below. In the Stakeholder Engagement Report (SER; CNL 2022), Appendix D has been updated to include a list of public open houses and Appendix E has been updated to include details of issues, concerns and responses. Specific to the design of the project, Table 5.3.1-1 of the EIS was updated with the following key public interest and concerns about various technical aspects of the project (only concerns relevant to project design from Table 5.3.1-1 are presented here):

Table 5.3.1-1 Summary of Feedback and Responses (only the relevant lines from Table 5.3.1-1 in the EIS are presented here)

Topic	Key Interests and Concerns	Response
Alternative Means	How was ISD chosen as the preferred option?	Alternatives that were safe and both technically and economically feasible were presented at all the public engagements. It was explained that these options were qualitatively assessed for their environmental effect, socio-economic effect, and human health effects. Members of the public asked CNL to provide further detail on how the ISD method was chosen for the Project. In accordance with guidance from The Agency, the original EIS included qualitative assessments of the options considered. In response to requests, CNL revised the assessment of alternatives for clarity, and to incorporate feedback from the public and from First Nations and the Manitoba Métis Federation. This is provided in Section 2.0 of the EIS.

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								The updated assessment clarifies the differences between the alternatives and explains the risks and benefits relative to each alternative. Based on this assessment, ISD is CNL's preferred option and is low risk to the public and the environment when compared to the limits established by Canada's nuclear regulator, the CNSC. Complete removal of the WR-1 following a deferment period was the decommissioning method described in the Comprehensive Study Report. Since then, CNL has re-evaluated that plan considering international best practice to reduce deferment periods. The Canadian regulations have adopted specific conditions for when ISD would be acceptable. WR-1 meets those conditions as: • it is a legacy facility from the dawn of the nuclear age in Canada; • it was not designed with decommissioning of the facility in mind; • all reactor fuel has been removed; • the use of ISD will be protective of workers, the public and the environment; and • the Project site will remain under institutional control for the period defined in the safety case. The ISD option is a safe decommissioning option for the WR-1 with respect to the environment, workers and the public and has been used successfully for over six decades in other parts of the world. CNL's plans for WR-1 are going through a rigorous licensing approval process by Canada's independent nuclear regulator, the CNSC. If approved, ISD will be undertaken under strict CNSC regulations.
						Lessons Learned	Ensuring that the Project was properly quantifying and incorporating available lessons learned from other similar work already conducted and work done at the WL site.	Members of the public wanted assurance from CNL that the Project was properly quantifying and incorporating available lessons learned from other similar work already conducted and work done at the WL site. CNL has gathered data and lessons learned where available on other ISD projects (Section 2.5.1 Evaluation Approach). CNL has participated in several learning workshops with technical experts that have performed ISD and has used services and advisement from organizations that have performed the ISD method. Development of the grout formulation incorporated lessons learned from the in situ grouting of the Savannah River National Laboratory's reactors, as described in Section 3.4.6.2 Grouting of Below-Grade Structures. Lessons learned documents from previous decommissioning work, including operating experiences were reviewed as part of assessing the potential for accidents and malfunctions (Section 7.0 Accidents and Malfunctions). CNL recognizes the incredible depth of research on nuclear waste disposal that was carried out at the WL site and has been incorporating that research into the Groundwater Flow and Solute Transport Modelling (Golder 2021) and the Geosynthesis reports (CNL 2022) supporting the EIS. Gathering and incorporating lessons learned will be an important part of the detailed work planning activities prior to starting the work.
						Design and engineering details	What would eventual design look like?	During engagement sessions, many questions were raised on the design of the Project. When CNL submitted the EIS, it had completed a preliminary, conceptual design. Since then, the design process has continued to progress, and more refined designs have been prepared for the re-submission of the final EIS. The final detailed design will equal or surpass the performance of the conceptual design that was assessed in the EIS. The current design of the disposal system is described in Section 3.4.9.1 In Situ Disposal System. Design of the monitoring program will include input from the regulators, the Indigenous Nations, and local municipalities (Section 11.0 Summary of Monitoring and Follow-up Programs). CNL also received questions about the IAEA's safety standard for decommissioning, which states that ISD is not a suitable option for all nuclear facilities and should be considered only under certain conditions. CNL agrees with this assessment, and CNL determined that WR-1 has features that make it suitable for long-term disposal such as: its location below grade, it does not contain substantial quantities of long-lived isotopes, and that it can be monitored post-closure during the institutional control period. CNL is following IAEA safety standards for the decommissioning of the facility and more importantly is also following the IAEA safety standards for waste disposal, since the WRDF – in its end state – would be classified as a disposal site.

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL		
								The Agency and the CNSC require CNL to demonstrate that the proposed Project does not pose an unacceptable level of risk to human health or the environment. The Project is subject to approval by the CNSC, who has established regulations for the management of radioactive materials. They draw input to their regulations from the IAEA but are an independent regulator with the responsibility to verify the information CNL has presented as part of the EIS. The regulatory framework for this Project is provided in Section 1.7 Regulatory Framework, and AECL's and CNL's commitment to international best practices, including the IAEA is provided in Section 1.1 Project Context.
						Effectiveness of the Grout	How effective is the grout?	Since CNL has identified ISD as the preferred option for decommissioning the WR-1, and the use of grout to fill the building below-grade has prompted many questions. CNL has developed specially-formulated grout based on the requirements of the WRDF and experience from Savannah River National Laboratory's ISD projects. The grout formulation has been designed and evaluated through a testing program to validate its performance against the required and assumed properties, to confirm it performs, as well as or better than estimated in the solute transport model, prior to the installation of any grout into the WR 1 Building. Properties of the grout are discussed in Section 3.4.6.2 Grouting of Below-Grade Structures and Systems. The primary purpose of grouting the WRDF is to stabilize the structure and resist subsidence over time. The physical presence of grout will also reduce the total amount of groundwater in the WRDF and thus reduce the amount of water available for various chemical and corrosion reactions. In addition, it provide a favourable chemical environment due to its high pH, which will slow down the rates of corrosion of the steel-based components, including the reactor vessel. The safety case for the proposed ISD does not require that the reactor vault be grouted. The existing structure provides sufficient barrier to releases, and additional grout would not considerably increase the effectiveness of that barrier. The safety case for the WRDF is built on the conservative assumption that the primary aspect of the grout to its function as a barrier is the hydraulic conductivity of grout used in the groundwater flow model. Effectiveness of the grout and concrete materials used for the ISD system have been evaluated through the sensitivity analysis evaluated and presented in Section 5.0 of the Groundwater Flow and Solute Transport Modelling Report (Golder 2021).
						Radiological Inventory	Understanding current inventory Confirmation on how the radiological inventory will reduce over time	CNL received several requests for details on the current radiological content of the WR-1 facility and how the levels of radioactivity will reduce over time. It should be noted that the reactor fuel – the most radioactive part of the facility – was removed in 1985. The available information on the radiological status is primarily based on reactor core modelling from the early 1990s (CNL 2020a). In response to questions, CNL has conducted further radiological characterization of the WR-1. A comprehensive characterization campaign was performed during 2017 and 2018 to address data gaps and to provide quantitative estimates of residual radionuclide content remaining within WR-1 systems (CNL 2020a). The updated radiological inventory information is provided in Section 3.3.3.1 Radiological Hazards.
						Effects of the Environment on the Project (Extreme Weather Events, Forest Fires, Seismic Events)	Has the Project examined the potential effects of an earthquake or climate change or other natural disasters on WR-1?	Members of the public expressed concerns of the potential effects of an earthquake or climate change or other natural disasters on WRDF. CNL explained that an assessment was completed that evaluated the potential effects of natural hazards (i.e., extreme weather events, forest fires and seismic events) and climate change on the Project (Section 10.0 Effects of the Environment on the Project). The Project design includes environmental design features, management practices and other mitigation to reduce the risks from natural hazards and climate change. In addition, a seismic hazard analysis was completed for the WL site, which concluded that an earthquake would not cause damage to the WRDF. To provide further confidence, CNL modelled a scenario where the concrete foundation of the WRDF failed (WRDF Barrier Failure Disruptive Event; Section 6.7 Human and Ecological Health), which predicted that adverse effects to human and ecological receptors are not anticipated from WRDF barrier failure.
						Environmental Monitoring	Information was sought on how the in situ design incorporates ongoing environmental monitoring.	Members of the public requested information on how the ISD incorporates ongoing environmental monitoring. CNL explained that the EAFP developed for the Project will be integrated with the existing EAFP for the WL site. Section 11.0 Summary of Monitoring and Follow-up Programs was updated to include this commitment. The EAFP for the Project will include sufficient information on the type, quantity and quality

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						(continued) Interest was expressed in the depth of monitoring wells. — of information required to reliably verify effects predicted by the environmental assessment and confirm the effectiveness of mitigations. Wherever possible, existing programs will be adapted to meet the objectives of the EAFP for the Project. Table 11.1-1 summarizes the conceptual monitoring programs to be included in the overall EAFP for the Project. Section 11.2 Adaptive Management was updated with CNL's commitment to engage with the local municipal governments, regulators, the CNSC, and the First Nations and the Manitoba Métis Federation on the monitoring program and incorporate their feedback on the monitoring program, where appropriate. Interest was also expressed in the depth of monitoring wells. Depths and location of monitoring wells was explained and talked about in public presentations. CNL has committed to adding additional ground monitoring well(s) between the WRDF and the Winnipeg River as requested by the Manitoba Métis Federation. IAEA guidance for In Situ Disposal — Participants wanted to ensure that international guidance on in situ design was being properly considered. — CNL received questions about the IAEA's safety standard for decommissioning, which states that in-situ disposal is not a suitable option for all nuclear facilities and should be considered only under certain conditions. CNL agrees with this assessment, and CNL determined that WRDF has features that make it suitable for long-term disposal such as: its location below grade, it does not contain substantial quantities of long-lived isotopes, and that it can be monitored post-closure during the institutional control period. CNL is following IAEA safety standards for the decommissioning of WR-1 and more importantly is also following the IAEA safety standards for waste disposal, since the facility – in its end state – would be classified as a disposal site. The Agency and the CNSC require CNL to demonstrate that the proposed Project does not pose an unacceptable level of risk to human health or the environment. The Project is subject to approval by the CNSC, who has established regulations for the management of radioactive materials. The CNSC draws input to their regulations from the IAEA but are an independent regulator with responsibility to verify the information CNL has presented as part of the EIS. The regulatory framework for the Project is provided in Section 1.7 Regulatory Framework, and AECL's and CNL's commitment to international best practices, including IAEA is provided in Section 1.1 Project Context. **Change to EIS:** Information and concerns raised by the public during engagement activities that influenced the scope of the environmental assessment are summarized in Table 5.3.1-1 of the EIS shown above. **Change to SER:** The SER (CNL 2022) has been updated to include a list of public open houses and details of issues, concerns and responses, which are provided in Appendix D and E respectively. **References:** *CNL 2022. Environmental Assessment Stakeholder Engagement Report - WR-1 In Situ Decommissioning. WLDP-26000-REPT-010. Revision 4. December 2022.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
60.	CNSC	L. Donnelly	EIS - Section 5.2.2.2 Media Coverage	5-7 5-14	**Comment:** CNL provided copies of media coverage, but there is no analysis of the coverage. **Expectation to Address Comment:** Provide further information about the general nature and tone of the	**Incorporated:** Section 5.2.2.2 has been renumbered as Section 5.2.19. Additional context and analysis evaluating the general nature and tone of articles was included in the Environmental Impact Statement (EIS; Golder 2022) in Section 5.2.19 as requested. A summary of the media coverage has also been updated in Appendix U of the Stakeholder Engagement Report (SER; CNL 2022).

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			Section 5.3.3.2 Media Coverage		articles, and whether media coverage has increased over the life of this project.	A total of 46 articles and 16 opinion pieces were written from June 2016 to December 3, 2020, about the WR-1 In Situ Disposal (ISD) project or referencing the project. There were five media publications during the preliminary round of open house sessions (from June 2016 to September 2016). Three were interviews with CNL to introduce the proposed Project to the general public. One was an interview with the Mayor of Pinawa. There was one opinion piece written by a freelance writer and published in the Winnipeg Free Press that depicted the end-state of the Project negatively. CNL provided a response letter to the opinion piece correcting several factual errors. During Round 1 of open house information sessions (from October 2016 to February 2017), a total of nine articles appeared in local news outlets as well as one radio interview. For the most part, the articles were written with input from CNL to inform the public. Others were submitted to the Winnipeg Free Press by individual(s) voicing concerns about ISD of Whiteshell Reactor 1 (WR-1). There were six media articles during Round 2 of open house sessions (from May 2017 to August 2017) leading up to the public comment period, all of which provided public information. A total of 42 articles were written after CNL's media release on the public comment period in September 2017, with the majority encouraging public feedback. Some media attention has focused on economic development opportunities, and several editorials have been written critical of Canada's nuclear legacy. A few instances saw organized opposition generate some coverage; CNL was able to make itself available, respond and bring reporters on site. CNL's stakeholder benchmarking trip to an in situ site in Hallam, Nebraska, saw considerable coverage with five articles written on the trip. Media coverage gradually grew over 2016 and 2017 as CNL hosted the WR-1 open houses, peaking in 2018 with the trip to Hallam, Nebraska, and then levelling off again in 2019 through 2021. **Change to EIS:** Section 5.2.2.2 has been renumbered as Section 5.2.19. The Summary of Media Coverage in Section 5.2.19 was expanded to further describe the tone of the articles and whether media coverage increased over the life of this project. **Change to SER:** The summary of the media coverage has been updated in Appendix U of the SER (CNL 2022). **References:** *CNL 2022. Environmental Assessment Stakeholder Engagement Report - WR-1 In Situ Decommissioning. WLDP-26000-REPT-010. Revision 4. December 2022.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
61.	CNSC	L. Donnelly	EIS - Section 5.3 Project-specific Public Engagement	5-8 to 5-16	**Comment:** In this section, 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 is no clear indication of strategy used to respond to the public and ensure follow-up on outstanding questions. CNSC staff heard from some members of the public that CNL had either not responded to their information requests or not responded in a timely manner. **Expectation to Address Comment:** Provide details on the strategy for responding to information requests, and/or evidence of tracking and responding to all public requests for information (e.g., received by phone, email, or in-person).	**Resolved As:** When requests were received (email, letters, formal comment cards submitted at an Open House, etc.), they were electronically logged and assigned to appropriate subject matter experts (SME). Once the response was received from the SME, it was then issued for management review. The response was electronically recorded and returned to the originator via the same stream it was received. If the request received was for copies of the Environmental Impact Statement (EIS) supporting documentation, the files are deposited in a Secure File Transfer Protocol (SFTP) site and the login information forwarded to the originator. CNL also delivered hard copies of the EIS if requested. Total public inquiries from Round 3, are summarized in Table 4-1 of the Stakeholder Engagement Report (SER; CNL 2022).

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<tr><th>No.</th><th>Department/ Agency</th><th>SME</th><th>Section Table or Figure</th><th>Pg. #</th><th>Information Request or Summary of Comment</th><th>Response by CNL</th></tr>
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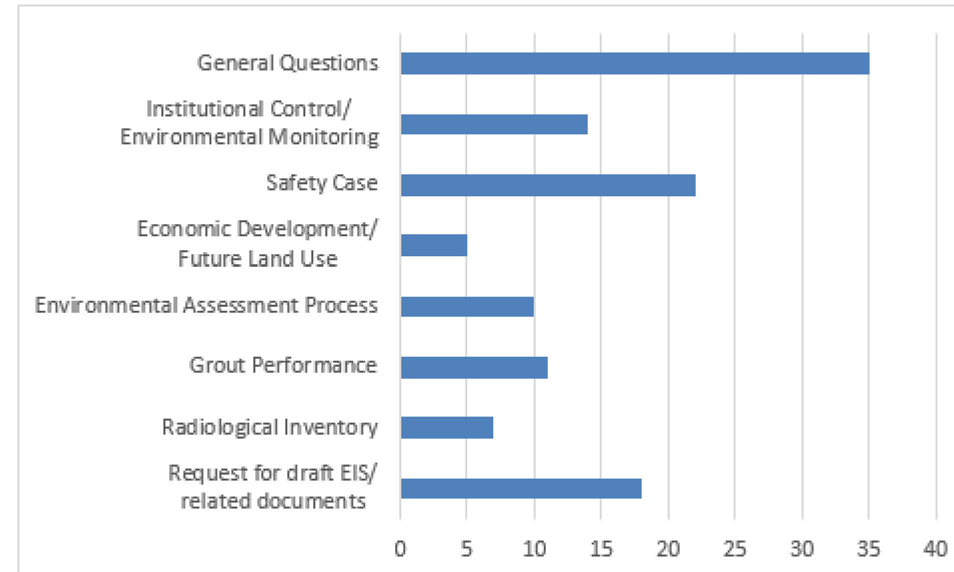
Table 4-1: Summary of the Areas of Interest from the Public



Change to EIS:

The content of Section 5.3 has been redistributed through Section 5.2 and Section 5.3 of the revised EIS (Golder 2022).

Section 5.2.20 was revised to include the requested information on the strategy for responding to information requests, and/or evidence of tracking and responding to all public requests for information. The revised text in Section 5.2.20 is as follows:

"When requests for information were received (e.g., via email, letters, formal comment cards submitted at an open house), they were electronically logged and assigned to appropriate subject matter experts. Once the response was received from the subject matter experts, it was then issued for final internal review. The response was electronically recorded and returned to the originator via the same stream it was received. If the request received was for copies of the EIS supporting documentation, the files were deposited in a Secure File Transfer Protocol site and the login information forwarded to the originator. CNL also delivered hard copies of the EIS if requested."

Change to SER:

Table 4-1 was provided to summarize public inquiries. Summary of written public feedback received was provided in Table 4-2.

References:

CNL 2022. Environmental Assessment Stakeholder Engagement Report WR-1 In-situ Decommissioning. WLDP-26000-REPT-010. Revision 4. December 2022.

Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.
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<tr><td>62.</td><td>CNSC</td><td>L. Donnelly</td><td>EIS - Section 5.3.4 Future Engagement Activities Planned</td><td>5-16</td><td>

Comment: Since the submission of the EIS, CNL has participated in various municipal meetings and meetings with elected officials. The CNSC would like further information on those meetings. **Expectation to Address Comment:** Provide further details on the municipal meetings CNL has attended, and a summary of the discussions had, as well as the outcomes.
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Incorporated:

Section 5.3.4 was renumbered as 5.4 'Planned Future Engagements'.

Engagement with Municipal officials was primarily through three main avenues: Public Liaison Committee, Whiteshell Community Regeneration Partnership and individual meetings and presentations to individual municipalities. Details on the municipal meetings CNL has attended, the summary of discussions, as well as the outcomes are provided in Sections 5.2.1, 5.2.2, and 5.2.3 of the Environmental Impact Statement (EIS; Golder 2022). In the Stakeholder Engagement Report (SER; CNL 2022), Sections 3.1, 3.2 and 3.3, as well as Table 3-2 were added to provide a list of the municipal meetings and presentations that CNL has participated in.

CNL reached out to all regional municipalities to gauge interest on engagement with elected officials and municipal staff. CNL met with both the Town and the Rural Municipality of Lac du Bonnet, and the Local Government District of Pinawa. CNL also engaged with the Town of Powerview-Pine Falls and
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						the Rural Municipality of Alexander, including a Whiteshell Laboratories site visit and tour of the reactor facility. Municipal representatives also joined CNL on the Hallam benchmarking trip (CNL 2022). Generally, feedback from the municipalities was similar to other stakeholder feedback. Concerns were raised around the protection of the Winnipeg River, clarification was sought on decommissioning and licensing timelines, and some asked about participation in the licensing process. Questions were asked about risk to the public, how the grouting will last against the timeline for radioactivity, and what monitoring and contingencies would be in place. Concern was expressed around future use of the site and economic development, particularly the impact of having an in situ reactor on-site. CNL's stakeholder engagement activities were generally thought of as positive. Some suggestions were given on engaging the local media more and the timing of public information sessions. CNL has incorporated this feedback into its engagement activities. It was also suggested that CNL develop an easy to understand brochure. As a result, CNL created an info-graphic style brochure. **Change to EIS:** Sections 5.2.1, 5.2.2, and 5.2.3 of the EIS were updated to provide details on the municipal meetings CNL has attended, the summary of discussions, as well as the outcomes. **Change to SER:** Table 3-2 was added in the SER (CNL 2022) to provide a list of the municipal meetings and presentations that CNL has participated in. **Table 3-2: Municipal Engagement Tours and Presentations** May 18, 2017 — Provincial Working Group June 30, 2017 — Manitoba Department of Sustainable Development Minister July 17, 2017 — Manitoba Department of Sustainable Development Deputy Minister August 10, 2017 — Powerview Pine Falls Town Council May 9, 2018 — Reginal Municipality of Alexander council October 9, 2018 — Update with the Local Government District of Pinawa November 26, 2018 — Meeting at MB Legislature regarding Small Modular Reactor development on Whiteshell site July 16, 2019 — WR-1 update/meeting with the Local Government District of Pinawa September 24, 2020 — Assistant Deputy Minister Conservation and Climate, Director of Environmental Compliance and Enforcement Branch, Industry Workforce Development, Economic Development and Training, Lac du Bonnet MLA Appendix B was provided in the SER for an example of a typical meeting agenda. Appendix C was provided in the SER for a few examples of a public presentation. **References:** *CNL 2022. Environmental Assessment Stakeholder Engagement Report - WR-1 In Situ Decommissioning. WLDP-26000-REPT-010. Revision 4. December 2022.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
					6.0 Environmental Effects	
					6.1 Environmental Assessment Approach	

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63.	ECCC		EIS - Section 6.1.2 Valued Components Section 6.6.2 Valued Components	6-5 6-234	**Comment:** The EIS does not discuss potential effects to aquatic and breeding terrestrial migratory birds in the project area. For example, there are trees surrounding the building to be decommissioned and there is a high likelihood that birds may nest in those trees, such as American Robin and Black-Capped Chickadee. The EIS only discusses potential effects to the VC Barn Swallow and Golden Winged Warbler, which are not likely to nest on the site. **Expectation to Address Comment:** It is recommended that the EIS identify appropriate VCs for terrestrial and aquatic migratory birds, and discuss how the project will not destroy eggs and active nests of migratory birds, whether trees will be destroyed during the nesting season, whether there will there be disturbance (noise, machinery, demolition) of active nests in those trees during the nesting season, and what measures will be put in place to avoid impacts to terrestrial and aquatic migratory birds (including their eggs and active nests).	**Resolved As:** It is generally an impractical task to assess the effect of radiological and non-radiological emissions on all the species of biota within a natural ecosystem, and specifically within the ecosystem around the Whiteshell Laboratories site. Therefore, representative organisms are chosen for the Environmental Risk Assessment (EcoMetrix 2021) and Environmental Impact Statement (EIS; Golder 2022). These organisms are selected because they are known to exist on the site, and within the Winnipeg River, and are representative of major taxonomic groups or exposure pathways, or have a special importance or value. As per REGDOC-2.9.1., valued component (VC) selection focused on providing a “full accounting of effects on species with elevated conservation status and their habitat” (CNSC 2020). The barn swallow is a species at risk likely to nest in an area to be directly affected by decommissioning of the WR-1 Building. Consequently, the barn swallow was selected as a VC to be representative of nesting migratory birds. **This is reflected in the text of EIS Section 6.6.3 (Valued Components):** *“Species at risk identified as VCs for the terrestrial environment assessment are presented in Table 6.6.3-1. Individual species for which the potential effects of the Project are similar were grouped into a single VC (e.g., bats; Table 6.6.3-1). Both avian VC species (barn swallow and golden-winged warbler) are also protected by additional federal legislation (Migratory Birds Convention Act, 1994 [MBCA]). Section 5 of the MBCA prohibits the disturbance, destruction or removal of a nest or related shelter, or egg of a migratory bird, or possession of a live migratory bird, or a carcass, nest or egg of a migratory bird. The Project has the potential to affect migratory birds and adherence to the MBCA 1994 is required as part of the Project works. Because the RSA is a federally owned site, the applicable legislation for wildlife species protection is SARA. However, CNL also recognizes the importance of protecting species designated under provincial legislation (i.e., the provincial Endangered Species and Ecosystems Act, C.C.S.M. c. E111; ESEA).* *Most of the VCs identified for the terrestrial assessment can also be used as indicators for broader groups of species. For example, golden-winged warbler represents migratory bird species that may breed in the edge habitat within adjacent forested areas and could be affected by decommissioning-related noise. Snapping turtle represents herptile species vulnerable to mortality on roadways. Consequently, understanding the potential effects of the Project on the selected VCs provides inferences about effects on other wildlife species or guilds with similar life history traits and habitat requirements (Appendix 6.6-1).”* As discussed, in EIS Section 6.6.6.2.2 (Secondary Pathways), CNL is legally required to comply with the Migratory Birds Act (Migratory Birds Convention Act 1994) and Species at Risk Act (Species at Risk Act. S.C. 2002) and will ensure through CNL’s Management of Land, Habitat and Wildlife standard (CNL 2018) that eggs and active nests are protected, pre-disturbance surveys are carried out and if nests are located, appropriate mitigation would then be put into place following consultation with Environment and Climate Change Canada (ECCC) and in accordance with habitat protection provisions and the required permitting process under SARA and potentially MBCA. Tree removal is minimized and restricted to specific times of year. Trees are inspected by Environmental Protection staff prior to tree removal. **Change to EIS:** Section 6.1.2 has been renumbered as 6.1.3. Section 6.6.2 has been renumbered as 6.6.3. **References:** *CNL 2018. Management of Land, Habitat and Wildlife. 900-509200-STD-006. Revision 0. April 2018.* *CNSC 2020. REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.2. September 2020. ISBN 978-0-660-06255-6.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Migratory Birds Convention Act, 1994. S.C. 1994, c. 22.* *Species at Risk Act. S.C. 2002, c. 29.*
64.	CNSC	G. Stoyanov	EIS - Section 6.1.3.2 Temporal Boundaries	6-15	**Comment:** This section of the EIS indicates that: “CNL plans to start decommissioning activities related to the WR-1 Building in 2019. The Project site will be turned over to Institutional Control in 2024, which is assumed to last for 300 years, with active controls (e.g., ground water monitoring and site inspection)	**Resolved As:** The 300 year time frame was not a design life for the barriers of the Whiteshell Reactor Disposal Facility (WRDF). During previous revisions of the Environmental Impact Statement (EIS; Golder et al. 2017), it was indicated in Section 6.1.3.2.2 of the EIS, that the 300 year period is an assumed duration of institutional control during which access restrictions will be in place. This duration was selected based on a reasonable assumption of the reliability of institutional controls, not the half-life of the radiological material. In the current revision of the EIS (Golder 2022), this time period was revised to 100

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					only required for the first 100 years. This timeframe is consistent with that required for other near surface disposal projects (ranging from 100 to 300 years), including similar projects under CNSC jurisdiction (e.g., Ontario Power Generation's Deep Geological Repository project)". CNSC staff note that DGR project is not yet approved and as such it may not be appropriate to make reference to it. It also may not be appropriate to borrow values from the DGR project as, for example, the DGR project is planned to have engineered barriers which will be accessible for inspection for a relatively long period of time allowing to acquire data on their performance. The design life should be based on the specific waste that is to be in the Whiteshell disposal facility and the design used to confine it. Current estimates of waste activity show periods significantly longer than the 300 years mentioned by CNL. **Expectation to Address Comment:** Provide information on the target design life (in terms of number of years) and the rationale behind it for the following barriers: reactor system components, internal walls/bioshield, grout, building foundation, and engineered cover.	years, as beyond 100 years, there is less confidence that institutional controls can be relied upon as a barrier. As such, 100 years was selected as the limit beyond which the In Situ Disposal (ISD) structure must be safe without reliance upon human intervention. Institutional controls such as groundwater monitoring and site inspections are proposed to continue for at least 100 years, but could extend to a longer period of time as required by the Regulator, as indicated in Section 11.2 of the EIS: *"Institutional controls are proposed to be in place for at least 100 years post closure, and the continuation of these controls would be based on regulatory input. Stopping a monitoring activity would occur once it can be shown that an effect has stabilized or has been reduced to a level where it is no longer considered significant by regulatory requirements or community concerns. Any proposals on modifications to the monitoring program will be communicated to the CNSC."* The 100 year Institutional Control period was selected to ensure that sufficient opportunity is provided to verify the ISD system is performing as expected. The results of the normal evolution, presented in EIS Figure 6.7.1-8 indicates that contaminants would be detectable (albeit at very low levels still) within the first 100 years at groundwater monitoring boreholes around the WRDF. The results of the 100 year monitoring period will support the discussions to reduce, or even stop monitoring in the future, once sufficient data is available to provide further confidence that the ISD system is performing as expected. The Decommissioning Safety Assessment Report (DSAR; Golder 2021a) Section 5.3 provides a discussion of various timeframes associated with this environmental assessment. The timeframes include among others, barrier lifetimes and proposed 100 year Institutional Control period, as listed in Section 5.3 of the DSAR: • *"Assessment timeframe – The time over which the effects of the project are assessed and the Normal Evolution Scenario is defined.* • *Design life – The time over which an engineered component will perform to its minimum specifications. All design lives are completed within the assessment timeframe.* • *Barrier lifetime – The time over which a component degrades from fully functional, to a fully degraded final state. This period encompasses any defined design life, and a period after the design life, where the component is no longer meeting the original minimum specification, but also is not fully degraded. All barrier lifetimes are completed within the assessment timeframe.* • *Glaciation timeframe – The estimated time until onset, and completion of the next glacial advance and retreat at the project site. This is independent of the assessment timeframe.* • *Modelling timeframe – The output of the groundwater flow, solute transport and dose models are provided for a period of 500,000 years after closure. This timeframe is selected to provide confidence that the models have captured the peak effects of the Project. This timeframe is independent of the assessment timeframe and provides no bearing on the development of the Normal Evolution Scenario.* • *Closure phase – The time during which physical construction of the WRDF is occurring. Expected to last approximately 3 years.* • *Post-closure phase – The time after construction of the WRDF is complete, which includes institutional control and post-institutional control:* ○ *Institutional control period – The time during which the CNSC or other authority having jurisdiction requires oversight of the WRDF through a licence or other regulatory means. For the purposes of the assessment, it is assumed to last a minimum of 100 years after closure of the facility, during which long-term performance monitoring and maintenance activities will continue, to demonstrate compliance with the safety case assumptions.* ○ *Post-institutional control occurs after the assumed loss of institutional control (~year 2125[see note below]) and continues indefinitely."* Detailed discussion of each timeframe listed above is provided in Section 5.3 of the DSAR. The design lives of various components (engineered cover, grout, and foundation) all fall within 10,000 years. The assumed barrier lifetime for the engineered cover and grout is 2,000 years, and for the foundation it is 10,000 years. The effectiveness of the reactor bioshield and non-core reactor components as barriers was conservatively disregarded for the purposes of the Safety Assessment (Section 4.1.1.1 of the DSAR). The only property of the reactor core and systems components significant to the assessment is the corrosion rate of reactor metals, which have been evaluated in Section 6.1 of the DSAR. The overall design of the WRDF is based on the slow degradation of reactor components and barrier materials based on the available data and conservative assumptions. 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 REGDOC-2.11.1 Vol 3. A significant portion of the radioactivity was generated by neutron activation and is found within the reactor core metal alloys, which will corrode very slowly in the expected alkaline environment. The corrosion rates used in Table 4.3 in Section 4.1.3 of the Groundwater Flow and Solute Transport Modelling (Golder 2021b) were estimated based on neutral pH conditions and are very conservative.

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						Timeframe defined for assessment of potential effects as part of the normal evolution of the Project is 10,000 years. This time period encompasses the phase in which peak effects (i.e., radiological doses) are anticipated. The barriers are all assumed to completely degrade to their end state within the 10,000 year period, including loss of institutional controls during this period. The cover and grout are assumed to degrade from fully intact to those of native soil conditions (hydraulic conductivity properties become equivalent to those of surrounding soils) over 2,000 years. The foundation walls degrade from fully intact to match the condition of native soil over 10,000 years. The corrosion rate of the radioactive system components reaches its steady state corrosion rate at the beginning of the simulation. Institutional control are assumed to fail after 100 years and site becomes accessible to human occupation. It is true that the radioactivity will remain beyond 100 years, and far out into the future is it uncertain how long any barrier will actually last. The estimates presented in the EIS are based on available scientific literature to date, and have been used as part of the Normal Evolutions scenario in Section 8.0 of the DSAR (Golder 2021a). Sensitivity Studies in Section 5.2 of the Groundwater Flow and Solute Transport Modelling Report (Golder 2021b), were performed to understand the impact of the barrier degradation uncertainty. Sensitivity study Scenario 9 in Section 5.2 of the Groundwater Flow and Solute Transport Modelling Report (Golder 2021b) was performed to examine the impact of a change in corrosion rates. Any reduction in corrosion rate produced a comparable reduction in peak dose rate. The lifetime of barrier materials (cap, foundation, grout) was examined through sensitivity analyses in Scenario 8, Scenario 14 and Scenario 15 of the Groundwater Solute Transport Modelling Report (Golder 2021b). The base case assumed that the concrete barriers complete their first degradation step (hydraulic conductivity is doubled) within 500 years. The sensitivity cases assumed that time is reduced to 250 years, and show no significant changes to peak releases. Both time frames were considered conservative based on the available literature and other analogues. Other sensitivity studies in Section 5.2 of the Groundwater Flow and Solute Transport Modelling Report (Golder 2021b) examined the effects of sudden failures (such as a crack in the foundation wall) and show there is very little effect on the overall releases. WRDF is designed to mitigate releases until after the peak dose rate has occurred (~1,000 years), and account for variability in what are already considered conservative assumptions of barrier degradation and component corrosion. Due to the uncertainty in future conditions, it is not practical to define a design life for individual barriers that corresponds to the radioactivity of the wastes. Rather than rely on a barrier lasting a certain time period, the assessment focusses on demonstrating that the facility concept overall is safe, regardless of when the barriers degrade. The modeling of the base case indicated that there will not be negative effects on the environment or human health as a result of releases from WRDF. As shown in Section 5.2 of the Groundwater Flow and Solute Transport Modelling Report (Golder 2021b), modeling of failures of various barriers of WRDF did not significantly increase the amount or rate of emissions from WRDF. Thus, because the failure of the barriers was already considered in the assessment of impacts on releases, a specific target design life was not necessary to define. None of the above precludes the option of extending the active monitoring period or institutional control period beyond 100 years if the institutions in question have the resources and desire to do so. However, 6.1.4.2.2 of the EIS conservatively assumed that institutional control is lost beyond 100 years from closure to ensure the potential bounding effects of the ISD system can be assessed. This is a reasonable assumption. For institutional controls to be lost implies government control of land titles and land use restrictions are lost on a local, provincial and federal level. Note: The dates for the Institutional Controls were updated in the EIS to be 2027 to 2127. The dates in the DSAR will be updated in the next revision to match. **Change to EIS:** In Section 3 and throughout the EIS, reference to Active and Passive Institutional Control Periods were removed. The 300 year time frame was also removed and the Institutional Control period was established as 100 years. Section 6.1.3.2 was renumbered as 6.1.4.2.2, and updated to state: *"The institutional control period spans a minimum of 100 years (i.e., 2027 to 2127), during which long-term monitoring and maintenance activities will continue to demonstrate WRDF performance is in compliance with the safety case assumptions and performance modelling.* *The 100-year timeframe is not related to the design life of the WRDF barriers. The 100-year active monitoring period was selected to ensure that sufficient opportunity is provided to verify the WRDF is performing as expected. The WR-1 Groundwater Flow and Solute Transport Modelling report (Golder 2021b) indicates that in the event of a failure of the ISD primary barrier, contaminants would be detectable (albeit at very low levels) within the first 100 years. The results of the 100-year active monitoring period will support the discussions to reduce, or even stop active monitoring in the future, once sufficient data are available to provide further confidence that the ISD system is performing as expected. Additionally, beyond 100 years, there is less confidence that institutional controls, like access restrictions, can be relied upon."*

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						References: *CNSC 2018. REGDOC-2.11.1 Vol. 3 Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. May 2018. ISBN 978-0-660-25806-5* *Golder 2021a. In Situ Decommissioning of Whiteshell Reactor 1 Project - Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2021b. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - WR-1 Groundwater Flow and Solute Transport Modelling Report, WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
65.	CNSC	G. Stoyanov	EIS - Section 6.1.3.2 Temporal Boundaries	6-15	**Comment:** This section of the EIS indicates that: "During active Institutional Control, long-term performance monitoring and maintenance activities will continue through to 2124 to demonstrate compliance with the safety case assumptions." There is no further information on what the performance monitoring and maintenance activities will consist of. It is important to understand the performance monitoring in light of ensuring efficient barrier performance. **Expectation to Address Comment:** Provide additional information on what the performance monitoring and maintenance activities will consist of.	**Resolved As:** Activities during the Institutional Control period for the Whiteshell Reactor Disposal Facility (WRDF) are described in Section 3.4.9.2 Post-Closure Activities of the Environmental Impact Statement (EIS; Golder 2022), which states that: *"During institutional control, long-term monitoring and maintenance activities will continue. CNL operates an Environmental Assessment Follow-up Program at the WL site that will be revised to include activities to manage monitoring for the Project. It will reflect the priorities and requirements that are necessary to sufficiently assess the ongoing performance of the WRDF. Since the groundwater flow surrounding the WRDF is downward toward the bedrock, contamination releases, if any, would be expected to also be driven deeper with the groundwater. As such, the monitoring program will focus on groundwater contamination, though other sampling methods may also be included such as short-term air monitoring or vegetation samples to confirm that the Environmental Assessment Follow-up Program is comprehensive and appropriate.* *Institutional control will continue until the CNSC agrees that it is no longer needed. …"* As mentioned in Section 3.4.9.2 above, CNL will continue to operate an Environmental Assessment Follow-Up Program that will be responsible for monitoring the performance of the WRDF and develop maintenance activities as required. An overview of this program is provided in Section 11.1 of the EIS, which includes a description of the Integrated Environmental Monitoring Program (CNL 2020) designed to track radiological and non-radiological contaminants throughout the environment and the Environmental Assessment Follow-Up Program for the Whiteshell Laboratories (WL) (CNL 2018). site that includes specific effluent and environmental monitoring activities for the WL site and Whiteshell Reactor 1 (WR-1) specifically. Monitoring activities specific to WR-1 Project are described in Table 11.1-1 in Section 11.1.1 of the EIS. They include air monitoring during closure, and groundwater and surface water monitoring during post-closure Institutional Control period to confirm that the assessment predictions are within the applicable criteria and limits and that the mitigations proposed for the project are functioning as intended. Groundwater monitoring will include semi-annual water level measurement and water quality measurements; however, the frequency of recurrence of water sampling will be reviewed based on performance data. The number and location of wells, and parameters measured, may change based on an annual review of the data. Surface water and ditch system water will be sampled on a semi-annual basis at one upstream and two downstream locations. Frequency of recurrence will be assessed based on performance data. These programs will be integrated into the existing WL site Environmental Assessment Follow-Up Program. As stated in Section 11.1.1 of the EIS, the current Environmental Assessment Follow-up Program (CNL 2018) for the site has been updated with "Work Package #10 Whiteshell Reactor Disposal Facility (WRDF) Enhanced Monitoring" that includes work tasks for review and integration of WR-1 Project groundwater, environmental, and effluent monitoring requirements into the WL Integrated Environmental Monitoring Program, development of WR-1 specific monitoring and surveillance plan, and the preparation of remedial action plans for the Project. A preliminary inspection and maintenance plan for the physical surface features of the WRDF has been prepared as part of the engineered cover design and will be provided to CNSC for review (AECOM 2020). Elements of this plan will be incorporated into the inspection and maintenance activities listed in line 8 of Work Package #10 in the Environmental Assessment Follow-Up Program once the WRDF facility is constructed and its features and elements are finalized. In general, maintenance activities will include a visual review of the engineered cover and fence for damage, erosion and vegetation overgrowth, and will include the necessary maintenance to address erosion or vegetation overgrowth. Table 1 is included in the Environmental Assessment Follow-Up Program for WL, which includes the WR-1 project (CNL 2018). Activities relevant to WR-1 from Table 1 are reproduced below:

Table 1
Summary of Effluent and Environmental Monitoring Activities at the Whiteshell Laboratories

Environmental Component	Sampling Location	Parameters	Sampling Frequency
Air	WL Perimeter and Off-Site	γ (TLDs)	Continuous
	WL Site	Dust Particulates (TSP, Gross α/β, γ-spec) Quantities of fuel combusted for building heating. Diesel burned in their standby generators. Quantity of Total (filterable) Particulate Matter, particulate below 10 microns (PM_{10}), particulate below 2.5 microns ($PM_{2.5}$)[3] Record of Dust Control Treatments and Site Inspections Halocarbon	Continuous during building demolition Internal worksheet tools are used to perform the calculations required to report to the NPRI. In addition, Environment Canada provides companies with various calculators (road dust, landfill gas) All releases of halocarbons are recorded and those over 10 kg are reported to Environment Canada
Air Effluents	WL Facilities (B100 (WR1), B200, B300) and WMA Facilities	Gross α/β, γ-spec, C-14[4], tritium[#]	Continuous
Noise	WL Site	Noise monitoring	During periods of high activity
Topography	WRDF Intrusion Resistant (Engineered) Cap, surface drainage areas	Visual inspection of Berm and Fencing and Grounds Maintenance Visual Inspection of WMA ditch system and other drainage pathways identified in Storm Water Management plan Visual Inspection of the Winnipeg River Bank in the vicinity of the WL site	Semi-Annually
Surface Water	Winnipeg River	Gross α/β, Sr-90, Tritium, Uranium, γ-spec	Daily to Weekly, monthly composite analyzed
Groundwater	WMA	Gross α/β, tritium, uranium non-radiological, field measurement of pH, conductivity and temperature water level measurements	Semi-Annually
	Landfill, Lagoon[###]	Gross α/β, tritium, uranium non-radiological, field measurement of pH, conductivity and temperature water level measurements	Annually (Spring)
	Main Campus (including locations in the vicinity of, and up and down gradient of, WR1)	Gross α/β, tritium, uranium non-radiological, field measurement of pH, conductivity and temperature	Semi-Annually (basal and bedrock), Annually (water table and clay-till)

Change to EIS:

Section 11.0 was revised to significantly expand the description of the monitoring, maintenance activities and follow-up programs for the WL site and WR-1 specifically, including Table 11.1-1 that summarizes how each of the Valued Components for the project will be monitored, monitoring program objectives, and which CNL program will be responsible.

References:

AECL 2008. Sampling and Analysis of Winnipeg River Bottom Sediments at Three Target Areas: Current Baseline Conditions. WLDP-03704-REPT-007. Revision 0. April 2008.

AECOM 2020. WRDF Engineered Cover Preliminary Long-Term Maintenance Plan. WLDP-26000-PLA-54421075. March 2020.

CNL 2018. Environmental Assessment Follow-Up Program for Whiteshell Laboratories. WL-509246-STD-001. Revision 0. December 2018.

CNL 2020. Whiteshell Laboratories Integrated Monitoring Program Framework. WL-509200-OV-001. December 2020.

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						Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.
					6.2 Atmospheric Environment	
66.	CNSC ECCC	N. Kwamena	EIS - Section 6.2 Atmospheric Environment	6-27 to 6-59	**Comment:** This section of the EIS does not meet the following information requirements of CNSC's *Generic EIS Guidelines* (Part 1: Section 3 Preparation and Presentation of the EIS; 3.2 Study Strategy and Methodology (p.4)): effects that are likely to arise from the project methods used to predict impacts of the project, in this case impacts on air quality arising from decontamination and demolition activities **Expectation to Address Comment:** Present and estimate in this section, the emission of radiological and non-radiological air contaminants resulting from the demolition of above-ground structures and decommissioning of WR-1, including the handling of potentially contaminated soils. Updates should be carried forward into the remainder of the assessment, including the residual effects analysis and determination of significance.	**Resolved As:** Potential air emissions from the Project are assessed in two sections of the Environmental Impact Statement (EIS; Golder 2022). Indicator compounds, including suspended particulate matter (SPM), particles nominally smaller than 10 micrometres (µm) in diameter (PM10), particles nominally smaller than 2.5 µm in diameter (PM2.5), carbon monoxide (CO), sulphur dioxide (SO_2) and nitrogen oxides (NO_x) expressed as nitrogen dioxide (NO_2), are assessed in Section 6.2 (Atmospheric Environment). Hazardous radiological and non-radiological air emissions are described in Sections 3.1.1 and 3.1.2 of the Environmental Risk Assessment (ERA; EcoMetrix 2021) and assessed in Sections 4.0 and 6.0 of the ERA. The results are provided in Section 6.7 (Human and Ecological Health) of the EIS and are summarized below. The indicator compounds and the hazardous radiological and non-radiological air emissions are assessed in different sections because the hazardous radiological and non-radiological emissions require additional screening and assessment as part of the ERA to meet the requirements for the Canadian Standards Association (CSA) N288.6 standard on environmental risk assessment for Class I nuclear facilities (CSA Group 2017). Both the EIS and the ERA considered air emissions associated with the demolition of above-ground structures and decommissioning of Whiteshell Reactor 1 (WR-1). Closure activities from the Project that could alter the concentration of indicator compounds were included in the Application Case assessed in Section 6.2.1.7 (Residual Effects Analysis) of the EIS (Golder 2022). Table 6.2.1-11 (Maximum Scenario Summary of Daily Emissions Rates during the Closure Phase) in the EIS lists the Project components included in the Application Case and their associated emission rates. This table includes estimates for the demolition of main reactor hall, the above-grade portion of the Primary Heat Transport System, the 50T reactor hall bridge crane and the Ventilation Stack. Dispersion modelling was completed to estimate the ground level concentrations for the Application Case for the air quality indicator compounds. As noted in Section 6.2.17.2 (Application Case Results) of the EIS (Golder 2022), the predicted ground level concentrations for the Application Case are below applicable air quality guidelines and/or standards. These concentrations were considered to be of low to moderate magnitude, limited to the Regional Study Area and of medium term-duration. Based on the low to moderate magnitude, the limited geographical extent of the effect and the medium-term duration, the overall residual adverse effect of the Application Case on air quality is determined to be not significant. Section 6.7 (Human and Ecological Health) of the EIS (Golder 2022) summarizes the results of the ERA (EcoMetrix 2021), which considered the potential effects on human and ecological health from changes in ambient levels of radioactivity and non-radiological substances. For the closure phase, radiological and non-radiological contaminants of potential concern (COPCs) are expected to be released via atmospheric releases from the WR-1 Building as reactor systems are dismantled, transported off-site or entombed within the Whiteshell Reactor Disposal Facility (WRDF). Radiological COPCs were identified through the source-term characterization process and are listed in Section 6.7.1.7.1.1 (Methods) of the EIS, subsections "Selection of Radiological COPCs". The estimated radionuclide release rates during demolition are provided in Section 3.1.1.1 (Release During Demolition Prior to Grouting) of the ERA (EcoMetrix 2021). Non-radiological COPCs were identified through the completion of a formal screening process. For the closure phase, all predicted air concentrations for the non-radiological COPCs evaluated were below their relevant ambient air quality criteria; therefore, no non-radiological COPCs were identified for the closure phase. Soil will be remediated if radioactivity is encountered that exceeds soil clean-up criteria established for the site end-state and land use (CNL 2019). As indicated in Section 3.4.6.3 of the EIS (Golder 2022), soil surrounding the foundation is not expected to exceed clean-up criteria; however, if soil contamination is encountered, it would be removed and segregated using standard excavation equipment and practices. As indicated in Table 6.2.1-10 of the EIS (Golder 2022), dust suppression methods (e.g., water misting, use of applicable immobilization agent onto the soil surface) would be applied during excavation as required to suppress dust levels to meet environmental dust limit. Therefore, the release of radiological and non-radiological contaminants related to soil remediation was not anticipated to result in a residual effect. An environmental transport and pathways model was used to evaluate the effects of contaminants on the local environment including human receptors. The calculated radiological doses for the Project are all below the 0.25 mSv/a limit, for all human receptors in the candidate critical groups. Since the dose estimates are a small fraction of the public dose limit, no discernable health effects are anticipated due to exposure to radioactive releases from Project activities. For the closure phase, all predicted air concentration for non-radiological COPCs were below their relevant ambient air quality criteria; therefore, no non-radiological COPCs were identified for the closure phase and no health effects are anticipated as a result of airborne effluents from the Project. Overall, residual effects are considered to be not significant for all human health valued components (VCs) during the closure phases.

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						Results of the radiological dose assessment for the closure phases indicate that doses to ecological health VCs are below their respective benchmark values. In addition, all predicted non-radiological concentrations were less than their selected guidelines or alternate benchmarks, with the exception of benthic invertebrates during the post-closure period. The hazard quotients for benthic invertebrates due to exposure to maximum concentrations of cadmium and the coolant HB-40 in groundwater at the seepage front were above the target level of 1; however, these concentrations are conservatively estimated, and would be spatially and temporally limited. Therefore, it is unlikely that there would be significant adverse effects on either aquatic or terrestrial populations or communities as a result of these chemical releases. **Change to EIS:** The information above was taken directly from the EIS, and applicable section numbers are referenced in the above text. The additional text described above regarding soil remediation and the Preliminary Soil Cleanup Criteria was added to Section 6.7.1.7.1.1 (Methods), subsection "Contaminants of Potential Concern": *"Soil around the WR-1 building will be remediated if radioactivity is encountered that exceeds soil clean-up criteria established for the site end-state and land use (CNL 2019). As indicated in Section 3.4.6.3, soil surrounding the foundation is not expected to exceed clean-up criteria; however, if soil contamination is encountered, it would be removed and segregated using standard excavation equipment and practices. As indicated in Table 6.2.1-10, dust suppression methods (e.g., water misting, use of applicable immobilization agent onto the soil surface) would be applied during excavation as required to suppress dust levels to meet environmental dust limit. Therefore, the release of radiological and non-radiological contaminants related to soil remediation was not anticipated to result in a residual effect."* **References:** *CNL 2019. Whiteshell Laboratories Screening Soil Cleanup Criteria, WL-509420-REPT-001. Revision 0. January 2019.* *CSA Group 2017. N288.6-12: Environmental Risk Assessment at Class 1 Nuclear Facilities and Uranium Mines and Mills.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
67.	CNSC ECCC	N. Kwamena	EIS - Section 6.2 Atmospheric Environment	6-27 to 6-59	**Comment:** Refer to comment above (#66) regarding environmental effects. The EIS should refer to studies, where possible, that estimate the radiological and non-radiological contaminants likely to be remaining in WR-1 Building following decontamination, and the specific mitigation measures to be taken to minimize the fugitive emissions of these contaminants during the application phase of the project. **Expectation to Address Comment:** Please revise accordingly.	**Incorporated:** As indicated in Section 6.1.1 of the Environmental Impact Statement (EIS; Golder 2022), decommissioning and dismantling of the majority of the above grade portion of the building is out of scope of this EIS, and is already authorized through the existing CNSC site licence and is covered in the 2001 Comprehensive Study Report (AECL 2001). There are no specific studies that have been performed to determine post-decontamination amounts of radiological and non-radiological contaminants in the WR-1 building. During the Closure Phase, remaining radiological, industrial, and environmental hazards will be remediated as practical and required for building demolition. The goal is to remove or remediate radiologically contaminated areas and systems so that the building and non-grouted reactor areas can be released for demolition as clean (non-contaminated). A Radiological Clearance Survey of the building will be performed to demonstrate remaining areas and systems are clean, confirm areas that are contaminated, and/or identify areas that are not feasible to demonstrate as clean. Contaminated areas that are not feasible to remove, remediate, or demonstrate as clean, will be identified and marked for segregation during demolition. An assessment will be done on whether such building areas or systems pose a risk for cross-contamination of clean building areas and the subsequent need to be managed as radioactive waste. The magnitude of potential dispersion of contamination during demolition and the need to implement contamination controls will be assessed in accordance with the Whiteshell Laboratories Open-Air Demolition Technical Basis Document (CNL 2020). In order to provide a conservative estimate of doses that could result from uncontrolled release of airborne contamination during closure activities, CNL performed its assessments based on radiological contamination inventory prior to any remediation or decontamination activities. CNL evaluated airborne releases in Section 3.1 of the Environmental Risk Assessment (ERA; EcoMetrix 2021) during closure for the following activities: - Demolition prior to Grouting (Section 3.1.1.1 of ERA): conservative assumption that 20.1% of the primary heat transport system radionuclide inventory is dispersed as airborne contamination during building demolition. This is not a realistic scenario as most of the radionuclides are embedded in system metals, but provides a bounding dose estimate. - Releases during Grouting (Section 3.1.1.2 of ERA): conservative assumption that below-grade radionuclide is available to be mixed with grout and released as dust particulate. This is also very conservative assumption as most contaminants are not readily mixed and dispersed in this manner.

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						- Release of Tritium (Section 3.1.1.3 of ERA): conservatively estimated to be released for an entire year of demolition work at the maximum release rate based on last 9 years of emissions of 1.28E+10 Bq/week for the entire 1-year duration of the grouting phase, although vibrating and heating activities are not likely to occur for the full duration. - Non-radiological contaminants (Section 3.1.2 of ERA) were based on conservative inventory of all hazardous non-radiological contaminants present in the WR-1 building as distributed throughout the grout block and available for release as a portion of the dust emissions. The results of this assessment are presented in Section 6.7.1.7.1.2 of the EIS (Golder 2022) for workers and the public. The calculated radiological doses are all below these limits, for all human receptors in the candidate critical groups. Since the dose estimates are a small fraction of the public dose limit, no discernable health effects are anticipated due to exposure to radioactive releases from Project activities. It is expected that there will be negligible release of radionuclides to the atmosphere during WR-1 building decommissioning activities after grouting since CNL intends to characterize, survey, and decontaminate or immobilize any residual contamination prior to demolition. To help control the air emissions, the criteria for moving from enclosed decontamination to open-air demolition will be determined using the Whiteshell Laboratories Open Air Demolition Technical Basis document (CNL 2020). This document outlines the methodology by which the remaining activity that is left in the building for the demolition is correlated to the method of demolition and doses to adjacent receptors are determined. Based on the dose constraints and Derived Air Concentrations, a screening level will be assigned to the demolition work, ranging from Level 1 where no additional modeling or special precautions are necessary to Level 3, where in-depth modeling will be required and demolition controls will be subject to approval by the Radiation Protection and Environmental Protection program managers. Generally, open-air demolition is not performed above Level 3 dose constraint. During the Closure Phase, the CNL document on Management and Monitoring of Emissions (CNL 2018a) defines the key requirements, responsibilities, and processes for the management of radioactive and non-radioactive emissions at AECL-owned or operated sites and facilities in Canada. (Cross-reference has been made to this document in the EIS). The following text has been added to the end of Section 6.2.1.6.1 Project Interactions and Mitigation – Methods of the Environmental Impact Statement: *"CNL's Management and Monitoring of Emissions (CNL 2018a) outlines the requirements for identification, control and treatment of emissions at CNL sites. Some applicable mitigation methods are described below:* • *Facilities shall be designed, operated, decommissioned and abandoned such that radioactive and non-radioactive emissions to the environment remain As Low As Reasonably Achievable, economic and social factors being taken into account (ALARA).* • *Radioactive and non-radioactive emissions to the environment from CNL facilities and sites shall be controlled so as to remain below regulatory release limits specified in any applicable legislation, licence, permit, or approval issued in respect of the operation of that specific facility or site by a regulatory agency having jurisdiction.* • *To the extent practical, emissions to the environment should be controlled by proactive prevention of the emission at the source, through means such as:* • *Selecting or using such types, quantities, and physical and chemical forms of radioactive and non-radioactive contaminants, or materials that may become contaminated in use, that minimize the potential for and significance of emissions;* • *Implementing preventative maintenance and inspection programs on systems containing radioactive or non-radioactive contaminants."* The Standard for Management and Monitoring of Emissions document (CNL 2018a) is an overview of the protocols and methodologies that are to be used on CNL sites and does not contain specific management or monitoring scenarios for individual sites. Rather, it is a guideline for developing site, source, and contaminant specific emission management and monitoring plans to be referenced. Typical mitigations in previous demolition activities have included: • Reducing work during higher winds. • Dust suppression techniques such as fixatives or water. • Targeted remediation of materials prior to demolition. • Air quality monitoring during demolition.

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						Specific management practices and mitigation actions to control fugitive emissions resulting from decommissioning of WR-1 are provided in Table 6.2.1-10 of the EIS (Golder 2022), and include: • Implementation of CNL's Environmental Protection (CNL 2021), Management and Monitoring of Emissions (CNL 2018a) and the WL Open Air Demolition Technical Basis document (CNL 2020) which includes operational control monitoring, air verification monitoring and environmental monitoring. • Implementation of dust management techniques to control dust generated by the Project, consistent with the Environmental Assessment Follow-up Program for the WL site (CNL 2018b). • Use of contamination immobilization agents, containment, ventilation and High Efficiency Particulate Air (HEPA) filters to control generation of airborne emissions during decontamination or removal of contaminated systems or structures. • Use of dust suppression methods during building demolition or soil remediation activities to control airborne emissions and nuisance dust during building demolition or soil remediation. Methods may include: ○ Wetting techniques during demolition to limit mobility of dust; ○ Wind restrictions during demolition to stop work or apply wetting techniques; and ○ Hydro seeding during backfilling and landscaping to reduce soil erosion. • Road watering and chemical dust suppressant when necessary. Dust suppressant is already used annually at the site for select unpaved roads. • Removal of accumulations of particulates (e.g., dirt) on road as soon as possible. • On-site vehicles and equipment engines will meet Tier 3 emission standards, where possible, and be maintained in good working order. • Limit idling of vehicles on-site and speed on roads. • Use of tarps or 3 sided enclosures for raw material storage. **Change to EIS:** Cross-reference has been made to CNL document on Management and Monitoring of Emissions throughout the document. Table 6.2.1-9 has been renumbered as Table 6.2.1-10, and expanded with content on Effects Pathways and Management Practices and Mitigation Actions. **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project. Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *CNL 2018a. Management and Monitoring of Emissions. 900-509200-STD-009. Revision 0. March 2018.* *CNL 2018b. Environmental Assessment Follow-Up Program for Whiteshell Laboratories. WL-509246-STD-001. Revision 0. December 2018.* *CNL 2020. Whiteshell Laboratories Open-Air Demolition Technical Basis Document. WLDP-508740-TD-001. Revision 0. July 2020.* *CNL 2021. Environmental Protection. 900-509200-PDD-001. Revision 3. June 2021.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
68.	CNSC ECCC	N. Kwamen a	EIS - Section 6.2.1.1 Scope of the Assessment Section 6.2.1.2 Valued Components	6-27 6-29	**Comment:** The proposed project includes construction of temporary structures, demolition, transportation and power generation. In addition to the indicator compounds identified in the assessment there is the potential for increased levels of other fuel-combustion products such as polycyclic aromatic hydrocarbons, volatile organic compounds (VOCs) and metals (e.g., lead and cadmium). Further, the EIS states that VOCs are not expected to be emitted from	**Resolved As:** CNL evaluated the request to consider presenting and discussing the radiological and non-radiological contaminants in Section 6.2 and determined that the current organization of assessment is appropriate. Justification has been provided below and added to the revised Environmental Impact Statement (EIS; Golder 2022). The indicator compounds and the hazardous radiological and non-radiological air emissions are assessed in different sections because the hazardous radiological and non-radiological emissions require additional screening and assessment as part of the Environmental Risk Assessment (ERA; EcoMetrix 2021) to meet the requirements for the Canadian Standards Association (CSA) N288.6 standard on environmental risk assessment for Class I nuclear facilities (CSA Group 2017).

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					decommissioning activities with the exception of VOCs from fuel combustion. However, there is residual organic coolant that is in piping in tanks that may be emitted from project activities. VOCs are a precursor to ground-level ozone generation. Radiological contaminants are discussed in Section 6.7 Human and Ecological Health of the EIS. Non-radiological contaminants of potential concern (COPCs) are also discussed in this section. Both types of contaminants relate to air quality, however, are not presented in this section. **Expectation to Address Comment:** Provide justification for not including other products of fuel combustion (i.e., polycyclic aromatic hydrocarbons, volatile organic compounds and metals) as indicator compounds for the assessment. Consider presenting and discussing radiological and non-radiological contaminants in this section.	Non-road, non-mobile fuel combustion products such as polycyclic aromatic hydrocarbons and metals were not considered as indicator compounds as their associated emission factors are significantly lower than the assessed indicator compounds (e.g., NO_x). It is not expected that potential emissions from fuel combustion would result in significant predicted concentrations. The volatile organic compounds (VOCs), while a criteria air contaminant, are not considered indicator compounds for this Project. The VOCs are not expected to be emitted from the decommissioning activities with the exception of some VOC emissions from fuel combustion. There are no provincial or federal standards for total VOCs to compare predicted concentrations, therefore, they were not retained for the air quality baseline assessment. Non-road mobile fuel combustion products may include hydrocarbons; however, the associated emission factors may represent total hydrocarbons or non-methane hydrocarbons. The bulk of the residual organic coolant that is in piping in tanks has been drained out, with the remainder to be encapsulated in place. The material in question is HB-40 hydrogenated terphenyl used as reactor coolant (also known as OS-84) and the Safety Data Sheet for the coolant used (OS-84; AECL 2014) notes that the material's evaporation rate is negligible and vapour pressure of lower than 0.001 hPa; therefore, the coolant's components are not volatile and are not expected to be released to the atmosphere in measurable amounts. Potential air emissions from the Project are assessed in two sections of the EIS (Golder 2022). Indicator compounds, including suspended particulate matter (SPM), particles nominally smaller than 10 micrometres (µm) in diameter (PM_{10}), particles nominally smaller than 2.5 µm in diameter ($PM_{2.5}$), carbon monoxide (CO), sulphur dioxide (SO_2) and nitrogen oxides (NO_x) expressed as nitrogen dioxide (NO_2), are assessed in Section 6.2 (Atmospheric Environment). Hazardous radiological and non-radiological air emissions are assessed in the Sections 4.0, 5.0, 6.0, and 7.0 in the ERA (EcoMetrix 2021) and summarized in Section 6.7 (Human and Ecological Health) of the EIS (Golder 2022). The reason for assessing the radiological and non-radiological air contaminants in Section 6.7 is that during closure, airborne releases are the only potential pathway to affecting human health. Section 6.7.1.7.1 and Section 6.7.2.7.1 considers the potential airborne contaminants, determines the potential pathways, mitigations and resulting doses to the affected human and ecological receptors during closure phase. Section 6.7.1.7.1.1 specifically lists the potential radionuclides that can be released during closure work in Table 6.7.1-8:

Table 6.7.1-8: Potential Radionuclide Release during the Closure Phase

Reactor Core	Biological Shield	Primary Heat Transport System
• Carbon-14 • Iron-55 • Cobalt-60 • Nickel-59 • Nickel-63 • Niobium-94 • Silver-108m • Tritium	• Chlorine-36 • Calcium-41 • Nickel-63 • Carbon-14 • Cobalt-60 • Europium-152	• Strontium-90 • Caesium-137 • Europium-154 • Europium-155 • Technetium-99 • Iodine-129 • Uranium-235 • Uranium-238 • Neptunium-237 • Neptunium-239 • Plutonium-238 • Plutonium-239 • Plutonium-240 • Plutonium-241 • Americium-241 • Americium-243 • Curium-244 • Silver-108m • Cobalt-60

Section 6.7.1.7.1.1 also lists the non-radiological contaminants that were assessed under the sub-heading "Selection of Non-Radiological COPCs", which states:

"*Non-radiological airborne COPCs have been identified as potentially being released during the closure phase from the WL site. These include:*

asbestos (friable [contains more than 1% asbestos by weight or area and can be crumbled by the human hand] and non-friable [material that contains more than 1% asbestos and cannot be crumbled under hand pressure] asbestos containing materials);

organic coolant (HB-40 used as reactor coolant, also known as OS-84, primarily hydrogenated terphenyl) in the PHT [primary heat transport] *system;*

lead based paint and lead shielding;

polychlorinated biphenyls (PCBs) in fluorescent light fixture ballasts;

small quantities of mercury in thermostats and switches; and

- *mould.*

With the exception of HB-40, the identified hazardous substances are routinely addressed in construction projects. HB-40 consists mainly of hydrogenated terphenyl (74% to 87%), with smaller fractions of partially hydrogenated terphenyls and terphenyl. Since HB-40 is an oil, or a tar if irradiated, its release to air with dust should be limited.

The non-radiological COPCs listed above were compared against applicable air quality criteria as part of the ERA (EcoMetrix 2021). The predicted air concentrations for all non-radiological COPCs evaluated are below their relevant ambient air quality criteria. Therefore, exposure concentrations and dose for non-radiological COPCs were not completed as part of the ERA (EcoMetrix 2021)."

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						Change to EIS: Section 6.2.1.1 was updated with the following text: *"The assessment of air quality within Section 6.2.1 Air Quality focused on predicting changes in the concentrations of above-mentioned indicator compounds emissions; radiological and non-radiological hazardous parameters are considered in Section 6.7 Human and Ecological Health. Parameters with no established federal or provincial standards or criteria were not considered."* Section 6.2.1.2 was renumbered as Section 6.2.1.3. Section 6.2.1.3 (Valued Components) was updated as follows: *"Hazardous radiological and non-radiological air emissions are assessed in the Environmental Risk Assessment technical supporting document (ERA [EcoMetrix 2021]) and summarized in Section 6.7 (Human and Ecological Health) of the EIS. The indicator compounds and the hazardous radiological and non-radiological air emissions are assessed in different sections because the hazardous radiological and non-radiological emissions require additional screening and assessment as part of the ERA TSD* [technical support document] *to meet the requirements for the Canadian Standards Association (CSA) N288.6 standard on environmental risk assessment for Class I nuclear facilities (CSA Group 2017).* *While ozone (O_3) is not directly emitted into the atmosphere from the Project, it is associated with the reaction of NO_X and volatile organic compounds (VOCs) to create NO_2 (MOECC 2016). Ozone baseline data will be used to calculate the NO_2 emissions from the Project. The VOCs, while a criteria air contaminant, are not considered indicator compounds for this Project. The VOCs are not expected to be emitted from the decommissioning activities with the exception of some VOC emissions from fuel combustion. There are no provincial or federal standards for total VOCs to compare predicted concentrations, therefore, were not retained for the air quality baseline assessment. Polycyclic aromatic hydrocarbons (PAHs) and metals are not considered as indicator compounds as their associated emission factors, where applicable, are considerably lower than the assessed indicator compounds (e.g., NOx). It is not expected that emissions from fuel combustion would result in substantial predicted concentrations. Non-road mobile fuel combustion products may include hydrocarbons; however, the associated emission factors may represent total hydrocarbons or non-methane hydrocarbons.* *Components of the residual organic coolant that is in piping in tanks are not considered indicator compounds for this Project. The residual organic coolant has been drained out, with the remainder to be encapsulated in place. The material in question is OS-84 and the Safety Data Sheet (AECL 2014) notes that the material's evaporation rate is negligible with a vapour pressure of lower than 0.001 hPa; therefore, the coolant's components are not volatile and are not expected to be released to the atmosphere in measurable amounts."* **References:** *AECL 2014. HB-40/OS-84 Material Safety Data Sheet. April 2014.* *CSA Group 2017. N288.6-12: Environmental Risk Assessment at Class 1 Nuclear Facilities and Uranium Mines and Mills.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *MOECC 2016. Air Quality in Ontario 2016 Report, PIBs 9920e. Updated 9 March 2016.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
69.	ECCC		EIS - Section 6.2.1.2 Valued Components Section 6.2.1.6 Residual Effects Analysis Section 6.2.1.8 Residual Effects Classification and Determination of Significance	6-29 to 6-30 6-44 to 6-50 6-53 to 6-55 6-61	**Comment:** With respect to the comment above (#68), VOCs as well as radiological and non-radiological contaminants should be included as VCs in this assessment. Updates should be carried forward into the remainder of the assessment, including the residual effects analysis and determination of significance. **Expectation to Address Comment:** Please revise accordingly.	**Resolved As:** The volatile organic compounds (VOCs), while a criteria air contaminant, are not considered indicator compounds for this Project. The VOCs are not expected to be emitted from the decommissioning activities with the exception of some VOC emissions from fuel combustion. As there are no provincial or federal standards for total VOCs to compare predicted concentrations, they were not retained for the air quality baseline assessment. Without a standard to measure against, an assessment of VOCs provides no valuable information. Non-road, non-mobile fuel combustion products such as polycyclic aromatic hydrocarbons and metals were not considered as indicator compounds as their associated emission factors are significantly lower than the assessed indicator compounds (e.g., NO_x). It is not expected that potential emissions from fuel combustion would result in significant emissions and predicted concentrations. Non-road mobile fuel combustion products may include hydrocarbons; however, the associated emission factors may represent total hydrocarbons or non-methane hydrocarbons. The organic coolant remaining in the building piping and tanks is not volatile based on the material Safety Data Sheet (AECL 2014) and are not expected to be released to the atmosphere in measureable amounts.

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			Section 6.2.2 Greenhouse Gases. Section 6.2.2.2 Valued Components			Radiological, and non-radiological hazardous material emissions are not assessed in total air quality, but are specifically addressed in Human and Ecological Health assessments in Section 6.7 of the Environmental Impact Statement (EIS; Golder 2022). **Change to the EIS:** Section 6.2.1.1 was updated with the following text: *"The assessment of air quality within Section 6.2.1 Air Quality focused on predicting changes in the concentrations of above-mentioned indicator compounds emissions; radiological and non-radiological hazardous parameters are considered in Section 6.7 Human and Ecological Health. Parameters with no established federal or provincial standards or criteria were not considered."* Section 6.2.1.2 has been renumbered as Section 6.2.1.3 and updated with the following text: "*While ozone (O_3) is not directly emitted into the atmosphere from the Project, it is associated with the reaction of NO_X and volatile organic compounds (VOCs) to create NO_2 (MOECC 2016). Ozone baseline data will be used to calculate the NO_2 emissions from the Project. The VOCs, while a criteria air contaminant, are not considered indicator compounds for this Project. The VOCs are not expected to be emitted from the decommissioning activities with the exception of some VOC emissions from fuel combustion. There are no provincial or federal standards for total VOCs to compare predicted concentrations, therefore, were not retained for the air quality baseline assessment. Polycyclic aromatic hydrocarbons (PAHs) and metals are not considered as indicator compounds as their associated emission factors, where applicable, are considerably lower than the assessed indicator compounds (e.g., NOx). It is not expected that emissions from fuel combustion would result in substantial predicted concentrations. Non-road mobile fuel combustion products may include hydrocarbons; however, the associated emission factors may represent total hydrocarbons or non-methane hydrocarbons.* *Components of the residual organic coolant that is in piping in tanks are not considered indicator compounds for this Project. The residual organic coolant has been drained out, with the remainder to be filled as practical in place. The material in question is OS-84 and the Safety Data Sheet (AECL 2014) notes that the material's evaporation rate is negligible with a vapour pressure of lower than 0.001 hPa; therefore, the coolant's components are not volatile and are not expected to be released to the atmosphere in measurable amounts."* **References:** *AECL 2014. HB-40/OS-84 Material Safety Data Sheet. April 2014.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *MOECC 2016. Air Quality in Ontario 2016 Report, PIBs 9920e. Updated 9 March 2016.*
70.	CNSC ECCC	N. Kwamena	EIS - Section 6.2.1.3.1 Spatial Boundaries Appendix 6.2-1 Baseline Air Quality and Meteorology	6-30 1	**Comment:** The Local Study Area (LSA) and Regional Study Area (RSA) for the atmospheric environment appear limited. The area selected for the RSA seems too limited to assess the cumulative air quality effects of the project. For example, Figure 6.2.1-1 on p.6-31 shows local surrounding population centers (for example, Pinawa and Lac du Bonnet) and National Pollutant Release Inventory (NPRI) point source facilities that are not included in the RSA. In addition, the nearby communities of the Village of Lac Du Bonnet and the Local Government District of Pinawa are not included as part of the LSA. Very little justification is provided for the spatial boundaries used in the assessment. **Expectation to Address Comment:** Provide additional justification or rationale for the spatial boundaries for the atmospheric environment.	**Resolved As**: For the atmospheric environment, the Local Study Area (LSA) and the Regional Study Area (RSA) were selected to assess the maximum potential effects for the Project. Potential effects in the atmospheric environment remain close to the emission sources, which were centered around Whiteshell Reactor 1 (WR-1) and will decrease with distance. The size of the LSA and RSA capture the maximum potential effect for both areas and do not underestimate the potential effects; therefore, the LSA and RSA were not expanded. **Change to EIS:** Section 6.2.1.3.1 was renumbered as 6.2.1.4.1 and revised to state: *"The LSA and the RSA were selected to assess the maximum potential effects for the Project. The size of the LSA and RSA capture the maximum potential effects considering that potential effects of the Project are predicted to remain close to the emission sources centered around WR-1 and to decrease with distance. To provide a conservative assessment, the maximum predicted air quality results at the LSA boundary are presented and are considered to be representative of the highest concentrations at ground-level of contaminants expected outside the LSA from Project activities. "* **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

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71.	CNSC ECCC	N. Kwamena	EIS - Section 6.2.1.3.2 Temporal Boundaries Appendix 6.2-2 Emissions Estimates	6-33 3	**Comment:** Air emissions, including Greenhouse Gases (GHG) emissions, associated with the different steps in the closure phase of the project are missing. **Expectation to Address Comment:** Include non-road vehicle nuisance dust as well as any stationary combustion sources (e.g., space heating) in emissions estimates (see Table 1: Activities and Non-Radiological Indicator Compounds Released/Expected During the Closure Phase, Appendix 6.2-2 Emissions Estimates (p.3)). Include air emissions from offsite transportation, either as upstream emissions for the delivery of grout and other materials or as direct emissions for the hauling of disposal material offsite, in total emissions for the project.	**Resolved As:** Green House Gas (GHG) emissions from propane combustion, including building heating, were estimated to be a maximum of 1,630 tonnes CO_2eq per year in Table 6.2.2-6. This was estimated by assuming buildings are heated eight (8) months per year (September to April) through propane combustion. This value would apply to the baseline assessment (i.e., Base Case) as well as the Project assessment (i.e., Application Case). This is conservative as building heating requirements will diminish over the Project's lifecycle and use of an alternate energy source for heating (e.g., hydroelectric) would further reduce GHG emissions. GHG emissions related to disposal of waste on site were assessed in Section 6.2.2 of the Environmental Impact Statement (EIS; Golder 2022) (mobile on-road equipment GHG emissions). As stated in Table 3 in Section 2.2 of Appendix 6.2-2, GHG emissions from transportation that occurs outside the Whiteshell Laboratories (WL) Site boundary, including shipping of waste from Winnipeg, Manitoba to Chalk River, Ontario, are considered indirect emissions and are, therefore, not included in the total GHG emissions for the Project (i.e., these emissions would be captured in the assessment of effects for the Whiteshell Reactor 1 (WR-1) Decommissioning Project). Air emissions, including non-road vehicle nuisance dust from raw material handling and demolition activities, as well as from propane combustion are provided in Table 6.2.1-11 as well as in Table 11 in Appendix 6.2-2. Dust was assessed in the EIS and included particulate emissions from paved roads as well as the batch mixing plant (process emissions and raw material handling). These emissions were modelled through a conservative volume source. As stated in Table 6.2.1-10, during closure work, potential sources of dust would be managed through the implementation of dust management techniques consistent with CNL's Environmental Protection Program (CNL 2021), CNL's Management and Monitoring of Emissions (CNL 2018a), and the Environmental Assessment Follow-up Program (CNL 2018b). **Change to EIS:** Table 6.2.2-5 has been renumbered as Table 6.2.2-6. Greenhouse gas emission values have been updated to reflect the current assessment. Appendix 6.2-2, Section 4.1.5.3 'Propane Combustion' has been renumbered as Section 4.2.2.1 and expanded with a description of how greenhouse gas emissions from propane combustion, including building heating were calculated. **References:** *CNL 2018a. Management and Monitoring of Emissions. 900-509200-STD-009. Revision 0. March 2018.* *CNL 2018b. Environmental Assessment Follow-Up Program for Whiteshell Laboratories, WL-509246-STD-001. December 2018.* *CNL 2021. Environmental Protection. 900-509200-PDD-001. Revision 3. June 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
72.	CNSC	N. Kwamena	EIS - Section 6.2.1.3.2 Temporal Boundaries	6-33	**Comment:** Appendix C of REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* (REGDOC-2.9.1) states that "the licensee should identify and characterize all atmospheric emissions expected to be generated for all phases of the lifecycle of the facility or activity". The assessment currently bounds stages 1-3 as those stages of the closure period which are likely to result in the most emissions. Additional supporting evidence should be provided to justify why emissions during the other stages of the closure period and the stages of the project were not further assessed. **Expectation to Address Comment:** Demonstrate with additional supporting evidence why the emissions from the other stages of the closure period and phases of the project are adequately bounded by the stages 1-3 of the closure period.	**Incorporated:** Project Stages 1-3 are considered to result in worst-case emission conditions as they occur in parallel during the same years. Further, Stages 4-6 will include significantly less road and non-road activities and will not include the batch mixing plant, demolition or propane combustion, resulting in lower emissions. The emissions sources for Stage 4 were compiled to verify Stages 1 to 3 as the bounding case for the atmospheric assessment (Golder 2020). Although Stage 4 includes travel on unpaved roads that have a greater emission factor than paved roads, the vehicular travel along the roads is assumed to be substantially less when compared to Stages 1 to 3. The remaining sources of emissions from Stage 4 are substantially less than in Stages 1 to 3, as a result, no further assessment is required. Therefore, only activities associated with Stages 1 to 3 are considered in the air quality assessment as they represent the most conservative air emission scenario. The following table was included in Section 6.2.1.4.2 of the Environmental Impact Statement (EIS; Golder 2022) to reflect the overlapping years of each stage: **Table 6.2.1-4: Project Stages and Associated Activities during the Closure Phase**

Project Stage	Activity Description	Duration	Number of Years
1	Preparation for In Situ Disposal	2022 to 2025	3

<table>
<tr><th>No.</th><th>Department/ Agency</th><th>SME</th><th>Section Table or Figure</th><th>Pg. #</th><th>Information Request or Summary of Comment</th><th>Response by CNL</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>
<table>
<tr><td>2</td><td>Grouting of below-grade structures and systems</td><td>2025</td><td>1</td></tr>
<tr><td>3</td><td>Removal of above-grade WR 1 structures</td><td>2024-2025</td><td>2</td></tr>
<tr><td>4</td><td>Installation of concrete cap and engineered cover</td><td>2026</td><td>1</td></tr>
<tr><td>5</td><td>Final site restoration</td><td>2026</td><td>1</td></tr>
<tr><td>6</td><td>Preparation for Institutional Control</td><td>2026</td><td>1</td></tr>
</table>
Change to EIS:
Section 6.2.1.3.2 was renumbered as 6.2.1.4.2, and was updated to include the following text:
"Project Stages 1 to 3 are considered to involve the highest level of emissions compared to the remaining stages as they occur during overlapping years. Project Stages 4 to 6 will include substantially less road and non-road activities and will not include the batch mixing plant or similar equipment, demolition or propane combustion, resulting in lower emissions. Emissions sources for Stage 4 were compiled to verify Stages 1 to 3 as the bounding case for the atmospheric assessment (Golder 2020a). While Stage 4 includes travel on unpaved roads that have a greater emission factor than paved roads, the vehicular travel along the roads is assumed to be substantially less when compared to Stages 1 to 3. The remaining sources of emissions from Stage 4 are also substantially less than in Stages 1 to 3, as a result, no further assessment is required. Therefore, only activities associated with Stages 1 to 3 are considered in the air quality assessment as they represent the most conservative air emission scenario. Details on the sources of emissions are provided in Appendix 6.2-2. "
References:
Golder 2020. WR-1 Environmental Impact Statement – Rationale for identification of the Bounding Scenario for the Assessment of Air Quality and Greenhouse Gas Emissions. GAL-129-1656897. WLDP-26000-021-000 53565199. March 2020.
Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.
</td></tr>
<tr><td>73.</td><td>CNSC ECCC</td><td>N. Kwamen a</td><td>EIS - Section 6.2.1.4 Description of the Environment Section 6.2.2.4 Description of the Environment</td><td>6-34 to 6-39
6-62 to 6-63</td><td>Comment: It is possible that the air monitoring station located at 65 Ellen Street in Winnipeg may not completely represent baseline air quality conditions in the LSA and RSA, given the relative remoteness of these areas. Expectation to Address Comment: Include the measurements of air quality parameters in the LSA and RSA for comparison with measurements recorded at the Winnipeg station.</td><td>Resolved As:
There are no air quality measurement data available in the Local Study Area (LSA) and Regional Study Area (RSA), therefore comparison with measurements recorded at the Winnipeg, Manitoba station were not possible. The Project is located in a fairly remote area, with very few industrial emission sources that influence the airshed surrounding the Project. The air flow into the Winnipeg area is from the south, thereby including local and transboundary industrial influences. Therefore, because the selected monitoring station is in a more industrial and urban area, the air quality data from the station can be considered to provide air quality estimates for a rural and remote area and is likely to be greater than the existing conditions in the RSA.
Change to EIS:
Section 6.2.1.4 has been renumbered as Section 6.2.1.5 of the Environmental Impact Statement (EIS; Golder 2022). The text describing the justification for using the Ellen Street station has been updated in Section 6.2.1.5.1 to state:
"Ideally, an air quality monitoring station would be within proximity of the Project with a similar geographical siting and similar influences; however, the NAPS [National Air Pollution Surveillance] program focuses on areas that are affected by local sources and not on remote un-affected areas like the WL site. The Winnipeg station is both the closest station to the Project and has the most indicator compounds. As the station is in a more industrial and urban area, the air quality data from the selected station can be considered to provide conservative air quality estimates and are likely to be greater than the existing conditions in the RSA. Therefore, for the Project, the 65 Ellen Street station is the most representative station of the RSA, although there are differences in the geographical setting."
References:
Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.
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74.	CNSC	N. Kwamena	EIS - Section 6.2.1.4 Description of the Environment	6-37	**Comment:** The EIS includes a thorough discussion regarding the selection of the Winnipeg (65 Ellen Street) ECCC monitoring station as the source of background air quality data. The EIS acknowledges that the monitoring stations closest to the project are quite different geographically and that site-specific data would be more representative. However, absent from this discussion is the uncertainty associated with not having site-specific information from the project location. **Expectation to Address Comment:** Provide a discussion of the uncertainty and limitations of not having site-specific background air quality data for the assessment.	**Resolved As:** As discussed in the Environmental Impact Statement (EIS; Golder 2022), there is a limited number of stations available in the area. While there is some uncertainty associated with the use of the Winnipeg, Manitoba (65 Ellen Street) station, this station represents the best station with appropriate data quality. The air flow into the Whiteshell Laboratories (WL) site varies in direction, but is predominantly blowing from the south and south-southeast and slightly less predominantly from the north-northwest and northwest. The Project is in a fairly remote area, with very few industrial emission sources that influence the airshed surrounding the Project. The air flow into the Winnipeg area is from the south (including local and transboundary industrial influences). Therefore, because the selected monitoring station is in a more industrial and urban area, the air quality data from the station can be considered to provide conservative air quality estimates for a rural and remote area and is likely to be greater than the existing conditions in the Regional Study Area (RSA). **Change to EIS:** Section 6.2.1.4 was renumbered to Section 6.2.1.5. The following text was added to Section 6.2.1.8 on Prediction Confidence and Uncertainty: ▪ *"There is limited number of stations available in the area. While there is some uncertainty associated with the use of the Winnipeg (65 Ellen Street) station, this station represents the best station with appropriate data quality. The air flow into the WL site varies in direction, but is predominantly blowing from the south and south-southeast and slightly less predominantly from the north-northwest and northwest. The Project is in a fairly remote area, with very few industrial emission sources that influence the airshed surrounding the Project. The air flow into the Winnipeg area is from the south, (including local and transboundary industrial influences). Therefore, because the selected monitoring station is in a more industrial and urban area, the air quality data from the station can be considered to provide conservative air quality estimates for a rural and remote area and is likely to be greater than the existing conditions in the RSA."* **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
75.	CNSC	N. Kwamena	EIS - Section 6.2.1.5 Project Interactions and Mitigation	6-40 to 6-42	**Comment:** The EIS identifies non-radiological contaminants including asbestos, insulating material and organic coolant that may remain in the WR-1 Building. These contaminants may be a source of fugitive emissions to the environment. How were these non-dust fugitive emissions considered in the assessment? **Expectation to Address Comment:** An explanation should be provided outlining how fugitive emissions were considered in the assessment. Mitigation measures to minimize fugitive emissions should be identified, if appropriate.	**Incorporated:** Materials such as insulating material and asbestos are handled through existing strict procedures as outlined in the Management Control Procedure, Controlling Asbestos Hazard (CNL 2017) and are therefore not included in the assessment. Table 6.2.1-13 in Section 6.2.1.7.2 of the Environmental Impact Statement (EIS; Golder 2022) has been revised to include this information. As a mitigation measure to minimize fugitive emissions, the bulk of the residual HB-40 hydrogenated terphenyl used as reactor coolant (also known as OS-84) that is in piping and tanks has been drained out, with the remainder to be encapsulated in place. CNL conservatively estimated that volume to be 87,700 kg (Table 3.3.3-2 of the EIS) and used this amount for the safety modeling. However, CNL plans to drain the liquid coolant where practical during closure activities (see Section 3.4.6.1.5 Targeted Remediation), further reducing the potential releases from the coolant. This coolant's Safety Data Sheet (AECL 2014) notes that its evaporation rate is negligible and its vapour pressure is lower than 0.001 hPa. Therefore, the coolant's components are not volatile and are not expected to be released to the atmosphere in measurable amounts. **Change to EIS:** Section 6.2.1.5 was renumbered as Section 6.2.1.6. Table 6.2.1-13 in Section 6.2.1.7.2 of the EIS was revised to include the following text as a Rationale for Excluding Non-dust fugitive emissions from the Air Quality Assessment: ▪ *"Materials such as insulating material and asbestos are handled through existing strict procedures outlined in the Management Control Procedure, Controlling Asbestos Hazard (CNL 2017) and are therefore not included in the assessment.* ▪ *The bulk of the residual organic coolant that is in piping and tanks has been drained out, with the remainder to be filled as practical in place. This coolant, OS-84, has a negligible evaporation rate and its vapour pressure is lower than 0.001 hectopascal pressure unit. Therefore, the coolant's components are not volatile and are not expected to be released to the atmosphere in measurable amounts."*

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						References: *AECL 2014. HB-40/OS-84 Material Safety Data Sheet. April 2014.* *CNL 2017. Management Control Procedure, Controlling Asbestos Hazard. 900-510400-MCP-003. Revision 0. November 2017.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
76.	ECCC		EIS - Table 6.2.1-9	6-41 to 6-42	**Comment:** In the "Effects Pathways" column, the disturbance of possibly-contaminated soil around reactor building B100 is not included in the closure phase effects. In the CSR (AECL 2001), volume 1 (p.ES-11) it is stated that: "HEPA filters used during decontamination will remove a high level of radioactively contaminated dust (99.97%). As a result virtually no radioactivity will be released during the decontamination process." Is this mitigation measure still valid for radiological and non-radiological contaminants for this project? **Expectation to Address Comment:** Include rationale for not including the effect of potentially-contaminated soil disturbance around B100 as either a primary or secondary pathway. Confirm validity of mitigation measures described in the 2001 CSR - such as the use of HEPA filters and portable enclosures - for the minimization of radiological and non-radiological emissions in the form of dust. If necessary, provide more detail on mitigation measures in Table 6.2.1-9.	**Incorporated:** The quoted text from the Comprehensive Study Report (CSR; AECL 2001) addresses High-efficiency Particulate Air (HEPA) filtration of exhaust resulting from radiological decontamination work. The mitigation measures listed in the CSR, such as use of containment, exhaust and HEPA filtration are still valid for the radiological and non-radiological contaminants during Stage 1 activities involving the decontamination or removal of contaminated systems. In addition, applicable immobilization agents would be used to suppress airborne emissions. These measures have been added to Table 6.2.1-10 of the Environmental Impact Statement (EIS; Golder 2022). Additional text was added to Section 6.2.1.6.2.2. to describe the process by which dust-generating work is allowed to proceed outside of an enclosed space: *"To control the radiological air emissions, the criteria for moving from enclosed decontamination to open-air demolition will be determined using the WL* [Whiteshell Laboratories] *Open Air Demolition Technical Basis document (CNL 2020). This document outlines the methodology by which the remaining activity that is left in the building for the demolition is correlated to the method of demolition and doses to adjacent receptors are determined. Based on the dose constraints and Derived Air Concentrations a screening level will be assigned to the demolition work, ranging from Level 1 where no additional modeling or special precautions are necessary to Level 3, where in-depth modeling will be required and demolition controls will be subject to approval by the Radiation Protection and Environmental Protection program managers. Generally, open-air demolition is not performed above Level 3 dose constraint."* Specific to air quality effects resulting from disturbance of possibly-contaminated soil around Building 100, the soil surrounding the exterior foundation is not expected to exceed clean-up criteria. If soil contamination is encountered outside of the building, it would be handled under the same contamination controls as removal of the other hazardous or radiological materials or building demolition. Soil remediation was added to the list of activities under Primary Pathways in Table 6.2.1-10. In the assessment of indicator compounds in Section 6.2, generation of dust from disturbance of soil was deemed to be adequately bounded by the production and placement of grout and the demolition activities (Table 6.2.1-11). In the assessment of radiological and hazardous emissions in Section 6.7, generation of dust from disturbance of potentially-contaminated soil is bounded by the demolition activities, which extremely conservatively assumes that up to 20% of the radiological inventory contained in the Primary Heat Transport (PHT) system is released as air emissions (Section 3.1.1.1 of the Environmental Risk Assessment [ERA; EcoMetrix 2021]). This is a very unlikely scenario used to bound all other potential dust releases, as the radiological inventory of the PHT is significantly more than any potential soil contamination around the outer foundation walls. **Change to EIS:** Table 6.2.1-9 was renumbered to 6.2.1-10; the Management Practices and Mitigation Actions column was revised to state: *"- Use of contamination immobilization agents, containment, ventilation and HEPA filters to control generation of airborne emissions during decontamination or removal of contaminated systems or structures"* *"- Use of dust suppression methods during building demolition or soil remediation activities to control airborne emissions and nuisance dust during building demolition or soil remediation. Methods may include:* ▪ *wetting techniques during demolition to limit mobility of dust;* ▪ *wind restrictions during demolition to stop work or apply wetting techniques; and* ▪ *hydro seeding during backfilling and landscaping to reduce soil erosion."* Section 6.2.1.6.2.2 updated to include: *"To control the radiological air emissions, the criteria for moving from enclosed decontamination to open-air demolition will be determined using the WL* [Whiteshell Laboratories] *Open Air Demolition Technical Basis document (CNL 2020). This document outlines the methodology by which the remaining activity that is left in the building for the demolition is correlated to the method of demolition and doses to adjacent receptors are determined. Based on the dose constraints and Derived Air Concentrations a screening level will be assigned to the demolition work, ranging from Level 1 where no additional modeling or special precautions are necessary to Level 3, where in-depth modeling will be required and demolition controls will be subject to approval by*

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						the Radiation Protection and Environmental Protection program managers. Generally, open-air demolition is not performed above Level 3 dose constraint." **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project. Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *CNL 2020. Whiteshell Laboratories Open-Air Demolition Technical Basis Document. WLDP-508740-TD-001. Revision 0. July 2020.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
77.	CNSC ECCC	N. Kwamena	EIS - Section 6.2.1.5.2.2 Secondary Pathways	6-43	**Comment:** Reference in this section of the EIS is made to the CSR (AECL 2001), Section 6.3.1 Air Quality (pages 6 to 9), stating that the conclusions regarding air quality effects are still valid. In the CSR, non-radioactive emissions are erroneously referred to as solely particulates and do not include combustion emissions. Also, radioactive emissions are also considered solely as particulates whereas tritium is a gas. In Section 6.3.1.2 Likely Environmental Effects of the CSR (pages 6 to 12), it is questionable whether "area affected by nuisance dust is expected to be small." "Nuisance dust" as total suspended particulates (TSP) includes PM_{10} and $PM_{2.5}$ (and associated emissions of radiological and non-radiological contaminants). Even if, as the study states, the impaction with trees will capture a portion of the nuisance dust, this will most likely be primarily the non-inhalable fraction, and the re-emission of settled dust is likely in any event. In Section 6.3.1.3 Identified Mitigation Measures of the CSR (pages 6 to 12) dust suppression methods are described for both radiological and non-radiological particulate matter. HEPA filters are to be used during radioactive decontamination to prevent air emissions, in addition to portable enclosures used to limit non-radioactive emissions during in situ decommissioning and above-grade demolition. But the first level of B100 may contain radioactive material in the form of activation products, particularly in the primary heat transport (PHT) system and embedded in walls as activation products, or accidentally spilled in surrounding soil, etc. Section 4.4.1 Decontaminating of the CSR (pages 4 to 36) states that most contamination originates inside the building and occasionally works its way through to the exterior walls. How does this relate to B100, the building housing WR-1? **Expectation to Address Comment:** All air emissions, in addition to particulates (e.g., combustion emissions), need to be listed here. Redefine the affected area, given the higher potential toxicity (compared with nuisance	**Incorporated:** Radiological and non-radiological hazardous emissions are not part of this section and are instead assessed in Section 6.7 Human and Ecological Health. In the assessment of radiological and hazardous emissions in Section 6.7, during demolition work it was extremely conservatively assumed that up to 20% of the radiological inventory contained in the Primary Heat Transport (PHT) system is released as air emissions (Section 3.1.1.1 of the Environmental Risk Assessment [ERA; EcoMetrix 2021]). This is a very conservative assumption, as the only portion of the PHT system that will be disassembled is the relatively small portion that is above ground. During grouting it was conservatively assumed that the entire inventory of radionuclides is made available for release with dust particulate. In reality, much of the inventory will be fixed on surfaces of Whiteshell Reactor 1 (WR-1) structures. Using this conservative assumption, the results of the human health assessment during closure phase presented in Section 6.7.1.7.1.2 conclude that there are no significant adverse health effected predicted for on-site workers or humans living near the Whiteshell Laboratories site. The above-listed releases and health assessment assume no mitigation are in place, which is also a very conservative assumption because during demolition, work is governed by CNL's standard for Management and Monitoring of Emissions (CNL 2018). Decontamination practices and contamination control techniques provide additional mitigation. Mitigation for fugitive dust emissions includes the use of contamination immobilization agents, containment, ventilation and High-Efficiency Particulate Air (HEPA) filters to control generation of airborne emissions during decontamination or removal of contaminated systems or structures. In addition, use of dust suppression methods during building demolition or soil remediation activities will be implemented to control airborne emissions and nuisance dust during building demolition or soil remediation. Releases from dust or gaseous emissions are expected to be negligible because these particulates are anticipated to be captured in the remnant organics (oil), within the system. In addition, the structure is made of steel not concrete, which also inhibits the collection of dust and particulates on the PHT system. Regardless of the decontamination and dismantling techniques used for the WR-1, best practices will be implemented and will follow the Environmental Protection Program (CNL 2021). Section 6.2 includes air quality assessment using indicator compounds emissions. All air emissions including particulates and combustions emissions are considered and assessed or rationale for excluding them is provided in Table 6.2.1-13 of the Environmental Impact Statement (EIS; Golder 2022) and Table 2 in Appendix 6.2-2. **Change to EIS:** The following was added to Table 6.2.1-13 of the EIS and Table 2 of Appendix 6.2-2 to address combustion emissions from propane space heating: *"Activity/Compound: Combustion from Propane Space Heating* *Rationale for Excluding from the Air Quality Assessment: At the time of the assessment, it is unknown when the electric building heating systems will be taken offline for the WR-1 Building and replacement heating using propane has not been confirmed. The possible emissions from the combustion of propane used to replace the electric space heating would account for less than 5% of the total emissions from the Project and were not included in the representative scenario."* **References:** *CNL 2018. Management and Monitoring of Emissions. 900-509200-STD-009. Revision 0. March 2018.* *CNL 2021. Environmental Protection. 900-509200-PDD-001. Revision 3. June 2021.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

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					dust) of radiological and non-radiological contaminants potentially present in the inhalable fraction of the dust. Provide more detail on the mitigation measures to limit non-radiological air emissions, which may actually also contain radioactive substances. Clarify whether portable enclosures will be used during procedures such as CO_2 blasting, with or without the use of HEPA filters to remove fine particulates.	
78.	CNSC ECCC	N. Kwamena	EIS - Section 6.2.1.6 Residual Effects Analysis Appendix 6.2-3 Dispersion Modeling	6-44 to 6-45	**Comment**: Other radiological and non-radiological air contaminants will be emitted in the ISD or WR-1 and the demolition of the WR-1 complex. Given the possible toxicity of these contaminants when dispersed in small amounts during demolition – and the possible re-deposition and emission of these contaminants as road dust – it is possible that more sophisticated models for air dispersion may apply in this case than SCREEN3 and CAL3QHC, such as AERMOD or CALPUFF. The EIS provided justification for the use of SCREEN3 as the dispersion model for the emission sources other than from paved roads. In particular it was stated the model was appropriate for use because: The terrain surrounding the Project is relative simple Long-range transport of compounds is not anticipated. In WLDP-26000-REPT-006-REPT-006 Environmental Risk Assessment (CNL 2017), Section 4.2.5.1 Atmospheric Dispersion (p.4.18), mentions the use of IMPACT, an environmental pathways and exposure modelling tool. **Expectation to Address Comment**: Further explanation should be provided regarding the assumptions made regarding the terrain in the LSA and RSA and the decision to use SCREEN3 instead of a more complex dispersion model, such as AERMOD or CALPUFF. Estimate the validity of dispersion modeling for radiological and non-radiological air emissions conducted in 2001 to the present case. Include the IMPACT modelling results in the EIS. Since the air emission modelling results provided by CNL only includes CACs, CNL should include the results of the IMPACT modelling if they are representative of the emissions of radiological and non-radiological contaminants in this project.	**Resolved As:** The SCREEN3 and CAL3QHC dispersion models were used in Section 6.2 (Atmospheric Environment) of the Environmental Impact Statement (EIS; Golder 2022) to model indicator compounds, including suspended particulate matter (SPM), particles nominally smaller than 10 micrometres (µm) in diameter (PM10), particles nominally smaller than 2.5 µm in diameter (PM2.5), carbon monoxide (CO), sulphur dioxide (SO_2) and nitrogen oxides (NO_x) expressed as nitrogen dioxide (NO_2). Hazardous radiological and non-radiological air emissions are assessed using the IMPACT environmental transport and pathways model as part of the Environmental Risk Assessment technical supporting document (ERA; EcoMetrix 2021) and summarized in Section 6.7 (Human and Ecological Health) of the EIS. Additional assumptions and decisions for each modelling approach are described below. SCREEN3 and CAL3QHC Dispersion Models Given that the main source of emissions is the Whiteshell Reactor 1 (WR-1) Project and the emissions from vehicles travelling on the roads, it is appropriate to use SCREEN3 in combination with CAL3QHC. SCREEN3, like AERMOD, uses the Gaussian algorithms and both models are known to overestimate emissions. Both models would have been set up similarly with a volume source. SCREEN3 is known to be more conservative than AERMOD given that it incorporates the worst-case meteorology and was thus chosen for use in this case. CAL3HQC is recommended to assess emissions from vehicular traffic and allows for the incorporation of the road layout and signalization. The dispersion modelling results, which correspond to the sum of the emissions of each model, represent a conservative estimate as it assumes that the location of the maximum from each model would overlap in space and time, which would not occur in reality. This allows for a conservative estimate that does not underestimate the potential effects from the Project. A summary of the results of the SCREEN3 and CAL3QHC dispersion modelling is provided in Section 6.2.1.7.2 (Application Case Results) of the EIS (Golder 2022), which concluded that predicted concentrations for the Application Case are below applicable air quality guidelines and/or standards. The conservativeness included in the SCREEN3 and CAL3QHC dispersion modelling reduces uncertainty as discussed in Section 6.2.1.8 (Prediction Confidence and Uncertainty) of the EIS (Golder 2022). Examples of the conservative assumptions listed in Section 6.2.1.8 (Prediction Confidence and Uncertainty) include: ▪ The Application Case (i.e., during the closure phase, Project Stages 1 to 3) were assumed to occur simultaneously. It is conservatively assumed that all non-road equipment is operating simultaneously during the daytime operating hours for Project Stages 1 to 3 and for the entire duration of these three stages. In reality, it is unlikely that all equipment would operate simultaneously and that the same type of equipment will operate simultaneously for different components of these stages. The modelling assessment includes all operations occurring simultaneously and continuous over the entire modelling period. ▪ The combined effect from road and non-road emission sources is estimated by adding the maximum predicted concentrations from the SCREEN3 and CAL3QHC models. This is conservative as it is assumed that each model's worst-case meteorological conditions occur at the same time and the same receptor. IMPACT Environmental Transport and Pathways Model As described in Section 6.7.1.7.1.1 (Methods) of the EIS (Golder 2022), an environmental transport and pathways model was used to evaluate the effects of contaminants on the local environment including human and ecological receptors. The software used for the exposure pathways analysis and for the calculation of radiological doses was IMPACT[TM] Version 5.5.1, which is consistent with the equations outlined in Canadian Standards Association (CSA) N288.1-14 (CSA Group 2014) and the methods outlined in CSA N288.6-12 (CSA Group 2017). A more detailed description of the model is provided in Section 1.5 (Quality Assurance/Quality Control) of the ERA (EcoMetrix 2021). A summary of the IMPACT model results is provided in Section 6.7.1.7.1.2 (Results [Human Health – Closure]), Section 6.7.1.7.2.2 (Results [Human Health – Post Closure]), Section 6.7.2.7.1.1 (Results [Ecological Health – Closure]) and Section 6.7.2.7.2.1 (Results [Ecological Health – Post Closure]) of the EIS (Golder 2022). The calculated radiological doses for the Project are below the CNSC public dose limit of 1 mSv/a, as well as the dose constraint for the

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						Project of 0.25 mSv/a. Further, the hazard quotients derived for non-radiological constituents of potential concern were below the protective benchmark for all receptors. Overall, residual effects are considered to be not significant for all human health and ecological health valued components (VCs) during the closure and post-closure phases. The conservativeness included in the IMPACT modelling to reduce uncertainty is discussed in Section 6.2.1.8 (Prediction Confidence and Uncertainty [Human Health]) and Section 6.7.2.8 (Prediction Confidence and Uncertainty [Ecological Health]) of the EIS (Golder 2022). Areas where conservative assumptions were incorporated include: source-terms and contaminant release rates, consumption of traditional food sources, and ability of grout, building foundation and concrete cap and engineered cover to contain and isolate the waste. Validity of 2001 Emissions Modelling The estimates of emissions and impacts on air quality provided in the Comprehensive Study Report (CSR; AECL 2001) continue to serve as a fundamental basis for the approval to proceed with decommissioning of the Whiteshell Laboratories site, and have been reaffirmed as appropriate and adequate though multiple licence renewals for the closure project, and ongoing monitoring of the closure project demonstrating CNL's compliance with estimates of the CSR. As indicated in Section 6.2.1.6.2.2, *"The Comprehensive Study Report included consideration of the WR-1 Building in the original evaluation of residual effects to air quality (see Section 6.3.1 of AECL 2001). Although the decommissioning strategy has changed for WR-1 from a complete removal of the facility to in situ disposal, activities related to the decommissioning of the reactor are expected to be less disruptive than those assessed in the Comprehensive Study Report (AECL 2001) for the currently approved decommissioning approach (i.e., complete removal of the facility)."* **Change to EIS:** No changes to the EIS are required. **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project Comprehensive Study Report, Volume 1, Main Report. WLDP-03702-041-000. Revision 2. March 2001.* *CSA Group. 2014. N288.1-14: Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities.* *CSA Group. 2017. N288.6-12. Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. eDecember 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
79.	CNSC ECCC	N. Kwamen a	EIS - Section 6.2.1.9 Monitoring and Follow-up	6-56 to 6-57	**Comment:** Verification of adequacy baseline data through field monitoring is necessary. Monitoring of potential radiological and non-radiological (e.g., lead) air contaminants to validate mitigation measures is required. The technical supporting documents (TSDs), *Environmental Risk Assessment* (ERA) (CNL, August 2017) and *WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates* (CNL, August 2016) list radionuclides possibly emitted during the decommissioning and demolition activities of the project (these can be embedded in concrete, notably Cs-137 that can chemically bind to bare concrete). The latter document also mentions the presence of non-radiological contaminants such as PCBs in ballasts and lead in paint. Contaminated concrete structures could include those above-grade slated for demolition. Although the *WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates* document predicts negligible air	**Resolved As:** Table 6.2.1-17 lists the air quality monitoring activities that will be completed during the closure phase as part of the existing environmental monitoring program. The purpose of monitoring includes verifying that the predictions are within the air quality criteria and that air emissions are in compliance with regulatory requirements. In addition, the document Management and Monitoring of Emissions (CNL 2018) defines the key requirements, responsibilities, and processes for the management of radioactive and non-radioactive emissions at CNL-operated sites and facilities in Canada. The baseline dataset used in the assessment is high quality, long term data from the Environment and Climate Change Canada (ECCC) National Air Pollution Surveillance Network (NAPS) in Winnipeg. The Winnipeg station is both the closest station to the Project and has the most indicator compounds. As the station is located in a more industrial and urban area, the air quality data from the selected station can be considered to provide conservative air quality estimates and are likely to be greater than the existing conditions in the RSA. Any other available data used to attempt to verify the baseline dataset would be from a station further away from the Project. The duration for follow up monitoring is through the closure phase (Table 6.2.1-17) which includes the Application Case (Golder 2022). The Application Case consists of Stages 1-3 (of 6) of the Closure Phase. **Change to EIS:** No changes to the EIS. **References:** *CNL 2018. Management and Monitoring of Emissions. 900-509200-STD-009. Revision 0. March 2018.*

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					release of radionuclides during the application phase of the project, in keeping with the precautionary principle, it is recommended that follow-up monitoring be conducted during the application phase of the project to confirm this statement. **Expectation to Address Comment:** Verify adequacy of baseline data through field monitoring. Include monitoring of potential radiological and non-radiological air contaminants. Although the *WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates* document predicts negligible air release of radionuclides during the application phase of the project, in keeping with the precautionary principle, consider conducting follow-up monitoring during the application phase of the project to confirm this statement. If follow-up monitoring will be carried out, revise Section 6.2.1.9 accordingly.	*Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
80.	CNSC ECCC	N. Kwamena	EIS - Section 6.2.2 Greenhouse Gases Appendix 6.2-2 Emissions Estimates, Section 5.2 Greenhouse Gas Assessment	6-60 to 6-69 36 to 37	**Comment:** This section of the EIS does not meet the following information requirement of CNSC's *Generic EIS Guidelines* (Part 1: Section 2 Guiding Principles; 2.1 Government of Canada Interim Measures (p.2)): details regarding the estimation of direct GHG emissions linked to the Project. **Expectation to Address Comment:** Include in the direct GHG emissions estimates of all stationary combustion sources, including space heating.	**Incorporated:** Green House Gas (GHG) emissions are provided in Table 6.2.2-6 of Section 6.2.2.6.2.2 of the Environmental Impact Statement (EIS; Golder 2022), and include emissions resulting from building heating. The GHG emissions from building heating were estimated to be 1,531 tonnes CO_2eq, as indicated in Appendix 6.2-2, Section 4.2.2.1. This was estimated by assuming buildings are heated 8 months per year (September to April) with propane. This value would apply to the baseline assessment (i.e., Base Case) as well as the Project assessment (i.e., Application Case). This is very conservative as the Project would have reduced building heating requirements over time. At the time of the assessment, it is unknown when the electric building heating systems will be taken offline for the Whiteshell Reactor 1 (WR-1) Building and replacement heating using propane has not been 100% confirmed. The possible GHG emissions from the combustion of propane used to replace the electric space heating would account for approximately 10% of the total GHG emissions from the Project. As a conservative assumption, the GHG emissions from building heating have been included in the EIS Section 6.2 and Appendix 6.2-2. No additional direct GHG emission sources were included. **Change to EIS:** Section 6.2.2.6.2.2 Secondary Pathways has been updated to include "<u>all</u> stationary fuel combustion emissions" as indicated below (changes <u>underlined</u>): "*The reporting inventory boundary is based on the GHG Reporting Program (GHGRP); and therefore, <u>all</u> stationary fuel combustion emissions and on-site mobile emissions have been included in the GHG assessment. The source categories included in the GHG assessment are:* • *on-site stationary fuel combustion sources <u>(including eight months of propane heating the WR-1 Building once it is disconnected from the grid)</u>;*" and in Table 6.2.2-6: **Table 6.2.2-6: Summary of Annual Greenhouse Gas Emissions.**

Source	Annual GHG Emissions (tonnes CO_2e/year)			Annual GHG Emissions (tonnes CO_2e/year)
	CO_2	CH_4	N_2O	CO_2e
Mobile Equipment (Road and Non-Road)	11,886	17	693	12,595
Propane Combustion <u>(including heating)</u>	1,629	0.65	0.77	1,630
Emergency Power Generators	3	0.004	0.13	3

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						Total | 13,517 | 17 | 694 | **14,228** **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
81.	CNSC	N. Kwamena	EIS - Section 6.2.2 Greenhouse Gases	6-60 to 6-69	**Comment:** CNSC's *Proposed Path Forward for Assessing Total GHG Production from Nuclear Facilities* recommends that the assessment of total GHG production be completed for EAs under CEAA 2012. The methodology for this assessment was through the use of a lifecycle assessment although no specific guidance was provided regarding waste disposal facilities. It is CNSC staff's expectation that a similar lifecycle assessment be completed or justification be provided for why such an assessment was not completed. The assessment of GHG emissions for the proposed decommissioning of WR-1 did not consider indirect emissions. The indirect emissions from the production of cement and grout may be large contributors to GHG emissions for the project. However, these sources of emissions were not considered in the assessment. This omission may underestimate GHG emissions and result in an assessment which is not adequately conservative. **Expectation to Address Comment:** It is recommended that indirect GHG emissions be considered in the assessment or additional justification should be provided for their omission along with a discussion or related uncertainty in the assessment.	**Resolved As:** An Upstream Greenhouse Gases (GHGs) assessment (Golder 2020) has been prepared and is available for reference as a standalone document; however, it is not part of the overall Environmental Impact Statement (EIS; Golder 2022). The indirect emissions from the production of cement and grout have been calculated. As there are currently no provincial or federal GHG thresholds based on a lifecycle analysis; any estimates of lifecycle GHG emissions cannot be compared to reported provincial and federal GHG emissions. In addition, the estimated life of the cement and grout was estimated to be over 100 years. The lifecycle emissions from the cement and grout production were estimated to be around 8,400 tonnes CO_2eq based on an assumed final block volume of 15,000 m³ of grout. The anticipated volume of grout in the Whiteshell Reactor Disposal Facility (WRDF) is around 7,500 m³. As these emissions are considered to be lifecycle (i.e., for the lifetime of the grout), the annual emissions must be assessed in order to assess their significance with respect to the Project. The cement and grout are assumed to have a life expectancy of 100 years; therefore, annual GHG emissions were estimated to be 84 tonnes CO_2eq, which represents less than 1% of the direct annual GHG emissions for the Project. **Change to EIS:** The following text was added to Table 3 of Appendix 6.2-2, and Table 6.2.2-5 in Section 6.2.2.6.2.2 as justification for not including Upstream GHG emissions in the assessment: *"A March 19, 2016 Notice in the Canada Gazette presented ECCC's* [Environment and Climate Change Canada] *proposed method for estimating the upstream GHG emissions associated with projects undergoing federal environmental assessments. Upstream GHG emissions are those resulting from all industrial activities from the point of resource extraction to the Project. The specific processes will vary by resource but generally include extraction, processing, handling and transportation. The final block volume of 15,000m³ of grout is not planned to enable new soil or clay extraction or cement production facilities. Rather, the Project will be a customer for existing soil or clay supply and cement facilities and is unlikely to affect the Provincial supply and demand for these materials. Therefore, these indirect and upstream emissions have been excluded from the assessment.* *However, an upstream GHG assessment has been conducted and the resulting GHG emissions estimates are considerably lower than the ECCC's Strategic Assessment of Climate Change (ECCC 2020) threshold for requiring an upstream GHG assessment, therefore, the upstream GHG assessment (Golder 2020b) has not been included in this report but is available as a standalone document."* **References:** *ECCC 2020. Strategic Assessment of Climate Change. July 2020* *Golder 2020. CNL WR-1 Upstream Greenhouse Gas Emissions Assessment - Golder. GAL-135-1656897. WLDP-26000-REPT-014. Revision 0. November 2020* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
					6.3 Geological and Hydrogeological Environment	
82.	CNSC	G. Su / J Brown	EIS - 6.3.1 Geology	6-71 to 6-106	**Comment:** The geomorphology of the area, and its future evolution, requires characterization and assessment – especially with respect to erosion. Geomorphology is an important component of the environment that may affect or be affected by the project. Geomorphologic evolution of the ground surface (e.g., erosion), in particular, the evolution of	**Incorporated:** Information on historical geomorphology of the Winnipeg River, including shoreline erosion, was included in the new Geomorphology subsection of Section 6.3.1.5.2.2 of the Environmental Impact Statement (EIS; Golder 2022) and in Section 2.2 and 5.2.5 of the Geosynthesis Report (CNL 2021). This information was used to extrapolate future evolution of the river, including potential for erosion, during the assessment timeframe. Additional erosion considerations for the Whiteshell Laboratories (WL) site is described in Section 2.4.3 and 4.8 of the Geosynthesis Report, which concludes that the WL campus has limited or negligible surface air and water erosion potential.

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					the Winnipeg River, is an unavoidable natural process. The Winnipeg River shoreline is ~500m from the WR-1 structures. The overburden soils between the shoreline and those structures are glacial deposits, which are vulnerable to shoreline erosion. What are the estimated river erosion rates? Is shoreline migration expected over the time frames considered in safety assessments? The evolution of the Winnipeg River, as a significant feature that can impact the project between now and the next glacial period, should be evaluated and assessed in the normal evolution scenario. **Expectation to Address Comment:** Describe the geomorphology of the site and its evolution, in particular, the potential impact of erosion of the site, and the evolution of the Winnipeg River. Assess the impact(s) on the safety of the disposal facility.	Uncertainty in performance of the Whiteshell Reactor Disposal Facility (WRDF) resulting from the changes in geomorphology of the site, including that resulting from Winnipeg River erosion has been assessed through the Sensitivity Analyses. Specifically, three sensitivity analyses have been completed to assess the potential impact on safety of the disposal facility resulting from potential future changes in geomorphology. The conclusions of the sensitivity analysis is that geomorphic evolution of the site does not significantly influence the safety of the WRDF. This sensitivity analysis is described in Section 6.5 of the Decommissioning Safety Assessment Report (DSAR; Golder 2021a) and are detailed in Section 5.0 of the Groundwater Flow and Solute Transport Model Report (Golder 2021b), and include modelling increased flow through the bedrock, low river levels, and effective shoreline migration. The Sensitivity Analyses of interest include: - **Scenario 1 Preferential Pathway** - Uncertainty in the geological pathways that exist between the Whiteshell Reactor 1 (WR-1) Building and the Winnipeg River was assessed through the inclusion of a preferential pathway in the solute transport model. Conceptually, this is intended to represent a geological or man-made feature that would provide an enhanced hydraulic connection through the groundwater flow system. The flow rate through the pathway was set to be a factor of 10 greater than the flow rate specified in the bedrock pathway (which was maintained in the Scenario 1 simulation). This scenario could also represent the condition where future geomorphological changes bring the groundwater discharge location (i.e., the Winnipeg River) closer to WR-1. - **Scenario 13 Low River Stage** - The stage of the Winnipeg River at the WL site is presently controlled by the Seven Sisters Dam, located approximately 7.5 km upstream (to the south) on the river. Future conditions of the river and dam are uncertain, and as such a simulation was completed to evaluate the potential changes to mass loadings resulting from a low river stage condition (i.e., higher gradient due to lowering of the downstream river head boundary, which controls outflow in the model). Based on the relationship between the flow at the Seven Sisters Dam and the stage of the Winnipeg River at the WL site in 2013 and 2014 (Figure 5-3, the low flow periods at the dam correspond to a stage of approximately 254.6 masl, a value of 1.5 m was subtracted from the low stage condition to approximate a “dry river” scenario. In the groundwater flow model this was achieved by adjusting the constant head boundary condition in the post-closure groundwater flow model to an elevation of 253.1 masl (2.0 m lower than current conditions). - **Scenario 16 Half Pathway Length** - The base case groundwater flow model applied a length of 500 m to represent the total travel distance through the bedrock pathway between the solute release location at WR-1 and the groundwater discharge location at the Winnipeg River. Scenario 16 was developed to evaluate solute mass loadings in the event that groundwater is intercepted halfway between the source release point and groundwater discharge point (e.g., via a groundwater well). This was represented in the solute transport model by reducing the bedrock pathway length from 500 m to 250 m. This scenario can effectively represent shoreline migration via erosion that puts the shoreline of Winnipeg River twice as close to WR-1. A summary of the sensitivity results are found in Section 5.2 of the Groundwater Flow and Solute Transport Model Report (Golder 2021b). It was confirmed through modelling that the potential geomorphic changes, including erosion issues, do not produce a negative impact on the WRDF. **Change to EIS:** Additional text was included in Section 6.3.1.5.2.2 Local Geological Conditions – Geomorphology as follows: ***“Geomorphology*** *The surficial deposits in the RSA* [Regional Study Area] *consist of glaciofluvial tills, outwash deposits and glacial lacustrine deposits that originated from Wisconsin glaciations of the Pleistocene epoch and associated stages of the Glacial Lake Agassiz (McPherson 1968; Cherry et. al 1970). The basal overburden unit was deposited near the glacier front during glaciation, whereas the overlying clay till was deposited during an episode of glacial advance from the northwest (McPherson 1968; Robertson and Cherry 1985). Final deglaciation in the RSA occurred between 12,000 and 13,000 years before present. Glacial Lake Agassiz, which formed during deglaciation, inundated the RSA until approximately 9,500 years before present. The lacustrine clay unit was deposited in an early deep water phase of Glacial Lake Agassiz. Surficial silt, sand and gravel materials were formed during a late shallow water phase of Glacial Lake Agassiz (Robertson and Cherry 1985). After the final drainage of Glacial Lake Agassiz, there has been some aeolian reworking of the uppermost sediments, though the overall stratigraphic sequence remains unchanged.* *To the west of the LSA* [Local Study Area] *the overburden sequence has been partially incised by the Winnipeg River. Based on the available mapping of surficial geology, fluvial deposits associated with the Winnipeg River are not known to be found in the RSA indicating a relatively consistent lateral position of the river following drainage of Glacial Lake Agassiz. The current river level (which is controlled upstream via the Seven Sisters Generating Station) is approximately 10 m below the top of the adjacent eastern riverbank near the WL site.* *Erosion potential for the WL site and surrounding area has been mapped based on the universal soil loss equation as being moderate for the gentle sloped region near the Winnipeg River, and negligible for remaining portions of the WL site (Agriculture and Agri-Food Canada 1999). It is noted that this method applies to sheet erosion (i.e., rain-derived) and does not necessarily apply to riverbank erosion. Erosional features have been found along the banks of the Winnipeg River.*

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						The Winnipeg River hosts six hydroelectric dams, as well as many lakes, with flows controlled by the Lake of the Woods Control Board. This watercourse is highly controlled and monitored and will be for the foreseeable future. Thus the position of the Winnipeg River is assumed to remain close to its current placement on the landscape for the foreseeable future (Golder 2021a). *The uncertainty in future erosional changes in the Winnipeg River was identified in the Geosynthesis Report (CNL 2022) Table 12 – Geoscience Verification Plan. To address the uncertainty in future geomorphological changes to the river and dam a simulation was completed to evaluate the potential changes to mass loadings resulting from a low river stage condition (i.e., higher hydraulic gradient between the WRDF and Winnipeg River due to lowering of the downstream river head boundary, which controls outflow in the model). The low river stage simulation had a minor influence on the simulated groundwater flow rates through the WRDF and local geosphere, though the change in hydraulic gradient in the bedrock pathway resulted in higher groundwater velocities and increased peak mass loading rates. The increases in peak mass loading rates were greatest for those solutes found outside of the reactor core (i.e., those not released through corrosion). Details of the simulation are provided in Section 6.5 Local Hydrogeology of the Decommissioning Safety Assessment Report (Golder 2021[a])"* **References**: *Agriculture and Agri-Food Canada 1999. Rural Municipality of Pinawa Information Bulletin 99-25. November 1999.* *Cherry et al. 1970. Hydrogeologic Regime of the Environmental Control Area and Vicinity. November 1970.* *CNL 2022. Geosynthesis for WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. January 2022.* *Golder 2021a. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2021b. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *McPherson 1968. Pleistocene Stratigraphy of the Winnipeg River in the Pine Falls – Seven Sisters Falls Area, Manitoba. April 1968.* *Robertson and Cherry 1985. Review of the Hydrogeology of the Radioactive Waste Management Site. WLDP-24100-041-000. February 1985.*
83.	CNSC	J. Brown	EIS - 6.3.1 Geology	6-71 to 6-106	**Comment:** There is an absence of tectonic setting, structural geology information in this section of the EIS. This aspect of geosphere characterization is used to assess the stability and suitability of the site. There have been numerous reports and papers published about the characteristics of the Lac du Bonnet batholith, which forms the bedrock upon which WR-1 structures were built. A cursory review of the literature by CNSC staff reveals several structural features and characteristics (which includes, but is not limited to, studies carried out at the Whiteshell Underground Research Laboratory (URL)) that at a minimum require documentation and synthesis – so that their impact on the project safety, if any, can be properly evaluated. Some examples of features that have been documented in references cited below: the nature, location, orientation of regional strike slip faults; the existence of fracture-filling dykes; nature of batholith contacts; brittle deformation and displacement on m-scale thrust faults (most of which are concealed by overburden in linear valley); reactivation of fracture discontinuities; lineaments visible on satellite imagery; subvertical fractures that	**Resolved As:** CNL has prepared a Geosynthesis Report (CNL 2022) that includes the requested tectonic setting and structural geological information in Section 4.6 and 2.5 respectively. Structural geological information was also included in the revised Section 6.3.1.5.2 of Environmental Impact Statement (EIS; Golder 2022). The Geosynthesis report provides information to support the Whiteshell Reactor 1 (WR-1) EIS in three areas: 1. A Geosynthesis of the information used to support the EIS and licence amendment application for decommissioning of WR-1; 2. Ensuring that CNSC EIS regulatory baseline geological and hydrogeological requirements of Appendix B.4 of Regulatory Document 2.9.1 (CNSC 2020) and Section 7.3.1 of Regulatory Document 2.11.1 Volume III (CNSC 2018) are met; and 3. Identification of geoscientific data uncertainties and an assessment of their relevance/significance to the decommissioning project. The Geosynthesis (CNL 2022) focuses on reviewing and summarizing of available geological, hydrogeological, and geomechanical information including published scientific literature, WL site characterization reports, information on the regional and local geology developed during the Canadian Nuclear Fuel Waste Management Program, government documentation of area soil and available mapping data from the Manitoba Geological Survey and Earthquakes Canada. Hydrogeological information is contained in the WR-1 Hydrogeological Study Report (Dillon 2018) but is briefly summarized in Section 3 of the Geosynthesis (CNL 2022) as well. Relevant information from the Geosynthesis has also been added in Section 6.3.1.5 of the EIS (Golder 2022) to describe both the regional and local geology, including a discussion of the Lac du Bonnet Batholith setting and geology, local structural geology, fracture and fault information including age linkages, lineament studies and seismic conditions of the local study area. Detailed summary of this information is presented in Section 2.5 of the Geosynthesis report (CNL 2022). The geologic information presented in Section 6.3.1 of the EIS (Golder 2022) and summarized in the Geosynthesis report (CNL 2022) informs the conceptual hydrogeological model, upon which the groundwater flow and solute transport modelling assessment was based. This includes the structural

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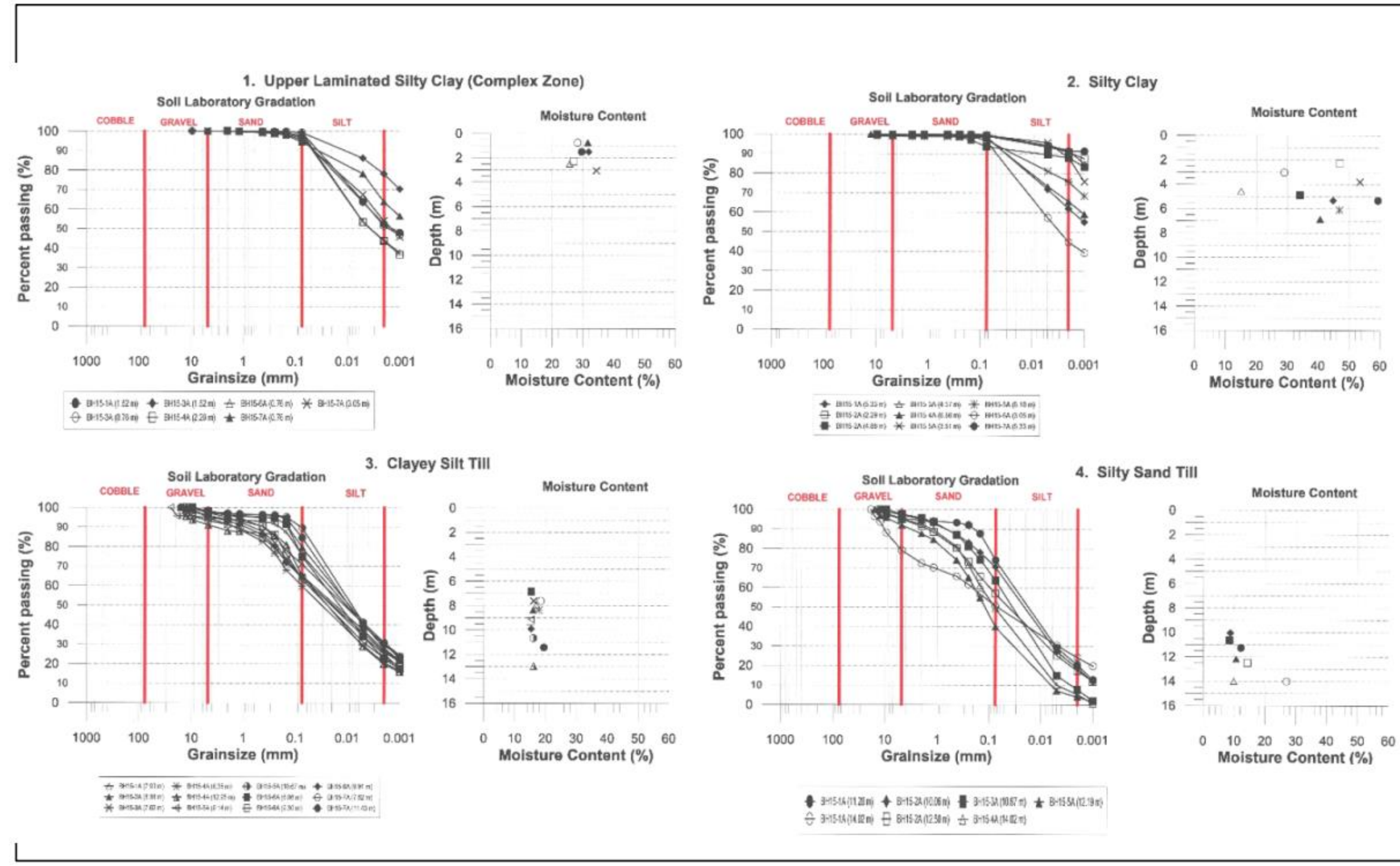
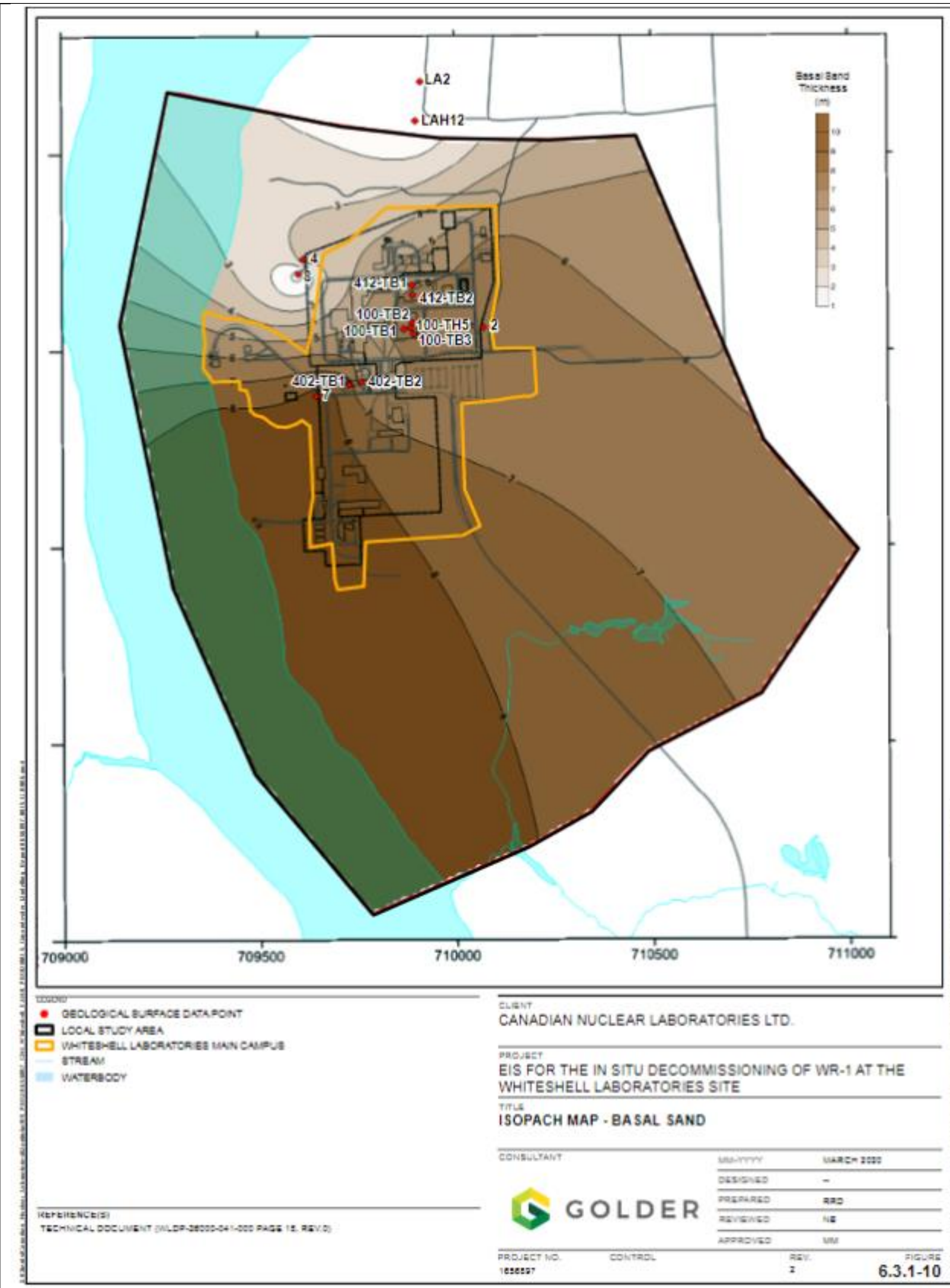
					are common on bedrock outcrops. **Expectation to Address Comment**: Structural information about the site, as indicated in REGDOC-2.9.1, should be included in order to assess site suitability. This information can be used to assess whether the scenario of an undiscovered fault (for example) be included in the safety assessment. This information is relevant for the time frame of safety assessment scenarios that are proposed in the Decommissioning Safety Assessment Report (DSAR), to assess the site's future evolution. References: Brown A, Soonawal NM, Everitt RA, Kamineni DC. 1988 Geology and geophysicas of the Underground Research Laboratory site, Lac du Bonnet Batholith, Manitoba. Canadian Journal of Earth Science. Volume 26, pages 404 to 425. Everrit R, McMurray J, Brown A, Davison C. 1996 Geology of the Lac du Bonnet Batholith, Inside and Out: AECL's underground research laboratory, Southeastern Manitoba – Field Trip Guidebook 85, Geological Association of Canada / Mineralogical Association of Canada Annual Meeting, Winnipeg, Manitoba.	geological description of the Lac du Bonnet Batholith, information about major discontinuities and fractures, as well as mass rock properties. All of this information was used in the groundwater model, which confirmed that the primary groundwater pathway is along the fractured upper bedrock. The Geosynthesis also identified residual uncertainty about site geological properties. Table 6-2 from the Geosynthesis Report outlines the areas of uncertainty identified that were evaluated as a part of development of the report (CNL 2022). The items of uncertainty identified in Table 6-2 of the Geosynthesis (CNL 2022) were then carried forward to the Groundwater Flow and Solute Transport Model Report (GWFSTMR; Golder 2021a) as Sensitivity Analyses to determine the potential impacts of the uncertainty. Specifically, the Geosynthesis recommends investigating the sensitivity of the conceptual model to: • an undiscovered "preferential pathway" through the bedrock (Sensitivity Case #1 in Golder 2021a). • increased hydraulic conductivity of the upper bedrock (Sensitivity Case #11 in Golder 2021a). • Low river stage increasing the hydraulic gradient under which the groundwater flow through the geologic layers (Sensitivity Case #13 in Golder 2021a. • Variation in sorption-partition coefficients resulting from uncertainties in bedrock mineralogy (Sensitivity Cases #5 and #6 in Golder 2021a). The general result is that the uncertainties identified in the Geosynthesis (CNL 2022) have little to no significant impact on the results of the assessment. The known site geologic characteristics documented in the Geosynthesis (CNL 2022) informed the hydrogeological model that formed the basis of the Normal Evolution Scenario for the Whiteshell Reactor Disposal Facility (WRDF) as described in Section 5.4.3.1 in the Decommissioning Safety Assessment Report (DSAR; Golder 2021b). Uncertainties with the geological setting identified in Table 6-2 of the Geosynthesis (CNL 2022), including potential existence of undiscovered faults, or preferential hydraulic pathways through the geosphere were included in the Features, Events and Processes analysis described in Section 5.4.2 of the DSAR (Golder 2021b). The ultimate result of the analysis presented in the DSAR considers that contributions of these uncertainties to be insignificant in Section 6.5 of the DSAR (Golder 2021b). **Change to EIS:** Relevant information from the Geosynthesis (CNL 2022) has been added in Section 6.3.1.5 of the EIS (Golder 2022) to describe both the regional and local geology. **Change to Geosynthesis:** Section 3 describes the hydrogeological conditions. Section 2.5 describes the structural bedrock geology. Table 6-2 in Section 6.3 Describes the uncertainties in the geotechnical data, and recommendations for how to address the uncertainty within the model scenario development and sensitivity analysis of the Solute Transport Model Report. **Change to DSAR:** Section 2.1.3 of the DSAR (Golder 2021b) was updated to reflect the geological information presented in the Geosynthesis report (CNL 2022). **References:** *CNL 2022. Geosynthesis for WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. January 2022.* *CNSC 2020. REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.2. September 2020. ISBN 978-0-660-06255-6.* *Dillon 2018. WR-1 Hydrogeological Study Report. WLDP-26000-REPT-004. Revision 1. November 2018.* *Golder 2021a. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2021b. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

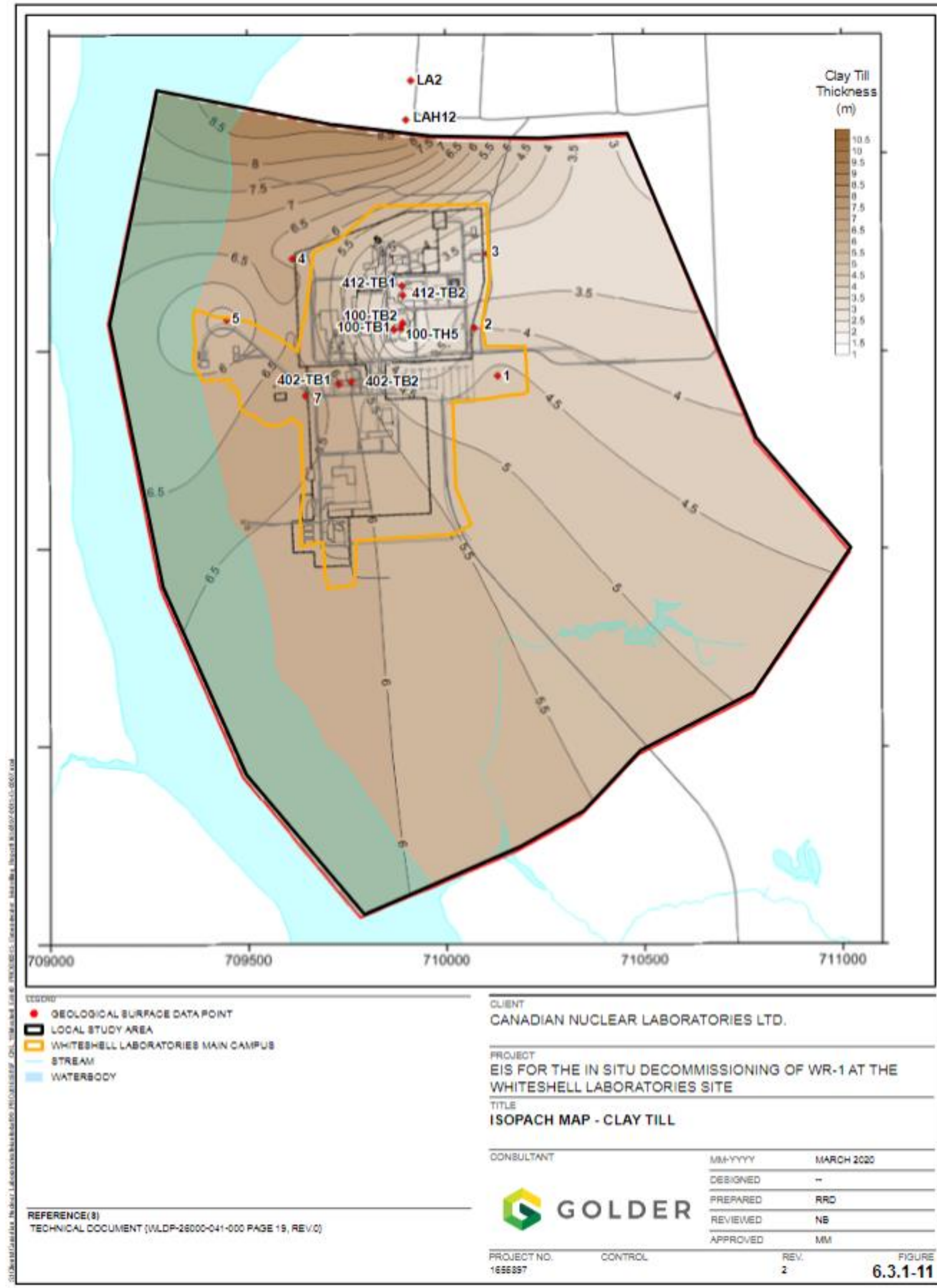
No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
84.	CNSC	J. Brown	EIS - 6.3.1 Geology	6-71 to 6-106	**Comment:** Geological data is missing or too descriptive, without evidence/observations to support statements made in the text, which are at times confusing or contradictory. For example: WN-series boreholes: P.6-77: baseline geological data were "collected from the results of recent drilling" described in Dillon 2017. The locations of the boreholes (names WN-1 and WN-2) are provided on Figure 6.3.1-3 (the scale is such that they are located in the same place) and the results very generally summarized on page 6-85. Where is the data for the WN series bedrock boreholes? It is not located in either the EIS or in the *Hydrogeological Study Report*. P.18 of the *Hydrogeological Study Report* describes two depth related zones in the bedrock, with "increased open-fractures in the upper 100m of bedrock", and goes on to describe an overlying (upper?) 10m competent zone of less fractured rock overlying a zone with "increased fracture frequency approximately 30m into bedrock". Then refers to the WN-series deep bedrock boreholes stating that the upper bedrock was relatively unfractured. It also states that these features are consistent with deeper bedrock characteristics at the URL to the northeast of the WL site. Where is the data for the WN-series boreholes? What are the actual fracture frequencies? What evidence / publications document the bedrock characteristics at the URL? This information should be synthesized and referenced. Geology: There is no reference for the geological information provided on the maps. The bedrock geology map (Figure 6.3.1-3) appears to be taken from the regional bedrock geology map for all of Manitoba, which was compiled at a scale of 1:1,000,000 (and so, not detailed). The southeastern quadrant (regional bedrock geology map EIS Figure 6.3.1-3) of the R shows the contact between the lac du bonnet batholith (unlabeled granite 12) and tonalite gneiss. This is the only bedrock feature that is illustrated in the RSA, and yet the nature of this contact is not described. Is it faulted? Intrusive? Ancient? Is this a potential zone of weakness that could affect the project? **Expectation to Address Comment:** As described above, provide additional geological information and data source(s).	**Resolved As:** CNL has prepared a Geosynthesis Report (CNL 2022) that includes the requested information on the bedrock geology and fracture information. This report provides information to support the Whiteshell Reactor 1 (WR-1) Environmental Impact Statement (EIS; Golder 2022) in three areas: 1. A Geosynthesis of the information used to support the EIS and licence amendment application for decommissioning of WR-1; 2. Ensuring that CNSC EIS regulatory baseline geological and hydrogeological requirements of Appendix B.4 of Regulatory Document 2.9.1 (CNSC 2020) and Section 7.3.1 of Regulatory Document 2.11.1 Volume III (CNSC 2018) are met; and 3. Identification of geoscientific data uncertainties and an assessment of their relevance/significance to the decommissioning project. This Geosynthesis (CNL 2022) focuses on summarizing the available geological, hydrogeological and geomechanical information including published scientific literature, WL site characterization reports, information on the regional and local geology developed during the Canadian Nuclear Fuel Waste Management Program, government documentation of area soil and available mapping data from the Manitoba Geological Survey and Earthquakes Canada. Specifically, the summarized data provided in the Geosynthesis draws from and cites numerous reports related to the Underground Research Laboratory geological program. Hydrogeological information is contained in the WR-1 Hydrogeological Study Report (Dillon 2018) but is briefly summarized in Section 3.2 of the Geosynthesis (CNL 2022). The requested data for the WN boreholes indicated in Figure 6.3.1-3 of the EIS is summarized in Section 2.5 of the Geosynthesis (CNL 2022) and provided in the EIS (Golder 2022) in Figure 6.3.1-5. The original source data compiled in the Geosynthesis, including estimates of fracture frequencies, is gathered from reports prepared on the WN boreholes by Lau et al. (1980a, b, c, d, 1982 and 1985a, b.) The bedrock geology information, including the fracture frequencies, composition of the Lac du Bonnet batholith, its phases, regional setting and contacts with adjacent formations, has been synthesized and discussed in Section 2.5 of the Geosynthesis (CNL 2022). Specific to fracture zone locations and frequencies, Figure 6.3.1-5 in the EIS (Golder 2022) provides an overview of the fracture pattern from borehole WN-1, deemed to be representative of the Lac du Bonnet batholith in the vicinity of URL and WR-1. Further detail on the fracture frequency over the studied depth of the batholith is provided in Section 2.5.4 of the Geosynthesis (CNL 2022). EIS Figures 6.3.1-2, 6.3.1-5, 6.3.1-6, 6.3.1-7, 6.3.1-8, 6.3.1-9, 6.3.1-10 in Section 6.3.1 have been revised or described in the text to include the reference to the appropriate data sources. **Change to EIS:** Relevant information from the Geosynthesis (CNL 2022), including soil and bedrock properties has been added in Section 6.3.1.5 of the EIS to describe both the regional and local geology. **References:** *CNL 2022. Geosynthesis for the WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. December 2021.* *CNSC 2018. REGDOC-2.11.1 Vol. 3 Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. May 2018. ISBN 978-0-660-25806-5* *CNSC 2020. REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.2. September 2020. ISBN 978-0-660-06255-6.* *Dillon 2018. WR-1 Hydrogeological Study Report. WLDP-26000-REPT-004. Revision 1. November 2018.* *Lau JSO, Bisson, JG 1980a. A Preliminary Report on the WN-1 Borehole Television Survey. Atomic Energy of Canada Limited, Whiteshell Nuclear Research Establishment. December 1980. TR-115-8* *Lau JSO, Bisson, JG 1980b. A Preliminary Report on the WN-2 Borehole Television Survey. Atomic Energy of Canada Limited, Whiteshell Nuclear Research Establishment. December 1980. TR-115-9* *Lau JSO, Bisson, J.G 1980c. A Preliminary Report on the WN-3 Borehole Television Survey. Atomic Energy of Canada Limited, Whiteshell Nuclear Research Establishment. December 1980. TR-115-10* *Lau JSO, Bisson JG 1980d. A Preliminary Report on the WN-4 Borehole Television Survey. Atomic Energy of Canada Limited, Whiteshell Nuclear Research Establishment. December 1980. TR-115-11* *Lau JSO, Bisson JG, Auger LF 1982. A Preliminary Report on the Borehole Television Surveys of Boreholes WN-5, WN-6, WN-7 and WN-8. Atomic Energy of Canada Limited, Whiteshell Nuclear Research Establishment. March 1982. TR-115-26*

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						Lau JSO, Auger LF, Bisson JG 1985a. A Preliminary Report on the WN-9 Borehole Television Survey. Atomic Energy of Canada Limited, Whiteshell Nuclear Research Establishment. December 1985. TR-115-47 *Lau JSO, Auger LF, Bisson JG 1985b. A Preliminary Report on the WN-10 Borehole Television Survey. Atomic Energy of Canada Limited, Whiteshell Nuclear Research Establishment. December 1985. TR-115-48*
85.	CNSC	G. Su / J. Brown	EIS - 6.3.1.4 Description of the Environment	6-77 to 6-102	**Comment:** The overburden soils require further characterization. In particular, their physical properties must be assessed. The sufficient physical properties of the surficial soils would help understand their other properties such as hydrogeological properties, erosion resistance, and mechanical behavior under dynamic loading (from, for example, earthquakes). **Expectation to Address Comment:** Include physical properties of the overburden soils such as, but not limited to granulometry, density, moisture content, grain size distribution curve for coarse-grained soils and consistency indices for fine-grained soils.	**Incorporated:** The description of the surficial soils and overburden geology in Section 6.3.1.5.2.2 of the Environmental Impact Statement (EIS; Golder 2022) was revised to include more detail on the surficial soil types found in the area, as well as detailed properties of the subsurface overburden strata. Results of grain size analysis on overburden samples taken from the recently drilled boreholes in the vicinity of Whiteshell Reactor 1 (WR-1; KGS Group 2016) was provided in Figure 6.3.1-9 of the EIS. A full characterization of the overburden soils is provided in Sections 2.4 and 4.2 of the Geosynthesis for the WR-1 Environmental Impact Statement (CNL 2022), as listed in Section 6.3.1.5.1 of the EIS (Golder 2022). Analysis of overburden under seismic loading and liquefaction potential have been provided in Section 4.7 of the Geosynthesis for the WR-1 Environmental Impact Statement (CNL 2022). Hydrogeological properties were provided in Section 3.2 of the Geosynthesis for the WR-1 Environmental Impact Statement, and further detailed in the WR-1 Hydrogeological Study Report (Dillon 2018). Within the Geosynthesis (CNL 2022), Table 6-2 – Geoscience Verification Plan outlines the uncertainties that are identified in the geological data, including soil erosion potential, and identifies the model sensitivity studies that verify whether the uncertainty is acceptable. **Change to EIS:** Additional text and figure were added to Section 6.3.1.5.2.2 of the EIS under the following sub-headings: "***Glacial Till (also referred to as Basal Sand or Basal Till)*** *Bedrock is overlain by a glacial till (referred to also as basal sand, silty sand till or basal till in other WR-1 in situ disposal documents) throughout the majority of the RSA* [Regional Study Area]*. The till varies from a silty coarse sand till to a clean medium to coarse sand (Cherry et al. 1970) and boulders are common above the bedrock surface. This unit is referred to as the "basal sand" in the area of the WR-1 Building (Dillon 2018) due to the increased sand content observed in this unit in other areas of the SSA* [Site Study Area] *(primarily the WMA* [Waste Management Area]*). Based on its grain-size distribution and hydraulic conductivity characteristics within the area of WR 1 it is not considered to be representative of sand.* *Based on the descriptions provided by McPherson (1968) and Robertson and Cherry (1985), the basal unit is characterized by variability in grain size. Results of grain size analysis on samples of this unit taken from the recently drilled boreholes in the vicinity of WR-1 (KGS Group 2016; plotted on Figure 6.3.1-9) indicated that this unit is primarily comprised of silt (content ranged from 26% to 56%), with the majority of most remaining particles categorized as fine sand (15% to 32%) and clay (5% to 24%). Water content for this unit ranged from 9% to 27%.* *In the WMA to the north of the LSA* [Local Study Area]*, this unit has been found to vary in thickness from 1 m to 7 m thick (AECL 2008). At the LSA, this unit varies in thickness from 3.6 m to 8.3 m . In other areas of the RSA this unit appears to thin towards the Winnipeg River; however, surrounding the SSA this unit appears to be thickest to the southwest and thins to the north. This unit is thinnest over the local bedrock high in the vicinity of monitoring well nest 4 and borehole 16-8. A basal sand isopach is shown on Figure 6.3.1-10.*

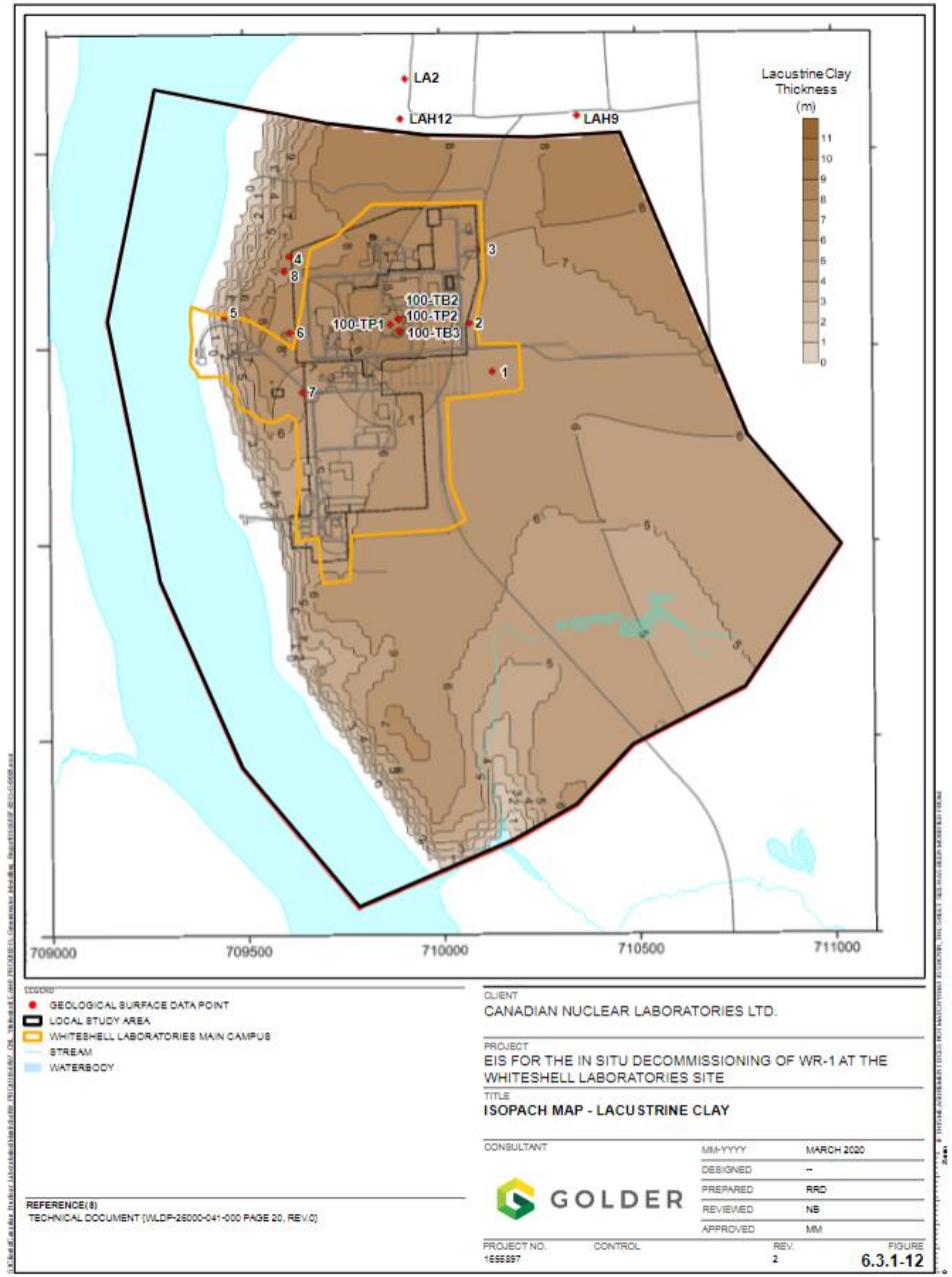
No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						 *Figure 6.3.1-9 – Grain Size Distribution Plots*


LA2
LAH12
412-TB1
412-TB2
100-TB2
100-TB1
100-TH5
100-TB3
402-TB1
402-TB2
Basal Sand Thickness
709000
709500
710000
710500
711000
LEGEND
GEOLOGICAL SURFACE DATA POINT
LOCAL STUDY AREA
WHITESHELL LABORATORIES MAIN CAMPUS
STREAM
WATERBODY
REFERENCE(S)
TECHNICAL DOCUMENT
CLIENT
CANADIAN NUCLEAR LABORATORIES LTD.
PROJECT
EIS FOR THE IN SITU DECOMMISSIONING OF WR-1 AT THE WHITESHELL LABORATORIES SITE
TITLE
ISOPACH MAP - BASAL SAND
CONSULTANT
GOLDER
MM-YYYY
MARCH 2020
DESIGNED
PREPARED
RRD
REVIEWED
NB
APPROVED
MM
PROJECT NO.
CONTROL
REV.
2
FIGURE
6.3.1-10

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						Glacio-Lacustrine Clay (also referred to as Clay Till) *The basal sand is overlain by a clay till unit containing sand and silty sand seams. The bulk porosity of this unit in the WMA was determined to be 0.23 indicating a high degree of consolidation (Robertson and Cherry 1985). This value is based on three samples of "clay loam" collected near the WMA as documented in Gillham et al. (1981). No porosity measurements have been completed in the LSA. Results of grain size analysis on samples of this unit taken from the recently drilled boreholes in the vicinity of WR-1 (KGS Group 2016; plotted on Figure 6.3.1-9) indicated that this unit is primarily comprised of clay (content ranged from 4% to 76%) and silt (21% to 57%) with most remaining particles categorized as fine sand (6% to 55%). Gravel content in upwards of 7% to 9% was noted in some samples. Water content for this unit ranged from 26% to 59%.* *In the WMA, this unit has been found to vary in thickness from 2 m to 5 m (AECL 2008). In the LSA, this unit varies in thickness from 3 m to 7 m. The clay till is generally thinnest in the central portion of the LSA and thickens to the northwest and southwest towards the Winnipeg River. A clay till isopach is shown on Figure 6.3.1-11.*


LA2
LAH12
Clay Till Thickness (m)
412-TB1
412-TB2
100-TB2
100-TB1
100-TH5
402-TB1
402-TB2
709000
709500
710000
710500
711000
LEGEND
GEOLOGICAL SURFACE DATA POINT
LOCAL STUDY AREA
WHITESHELL LABORATORIES MAIN CAMPUS
STREAM
WATERBODY
REFERENCE(S)
TECHNICAL DOCUMENT (WLDP-26000-041-000 PAGE 19, REV.0)
CLIENT
CANADIAN NUCLEAR LABORATORIES LTD.
PROJECT
EIS FOR THE IN SITU DECOMMISSIONING OF WR-1 AT THE WHITESHELL LABORATORIES SITE
TITLE
ISOPACH MAP - CLAY TILL
CONSULTANT
GOLDER
MM-YYYY MARCH 2020
DESIGNED --
PREPARED RRD
REVIEWED NB
APPROVED MM
PROJECT NO. 1656397
CONTROL
REV. 2
FIGURE 6.3.1-11

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						Transitional Glacio-Lacustrine Clay (Clay) and Glacio-Fluvial and Glacio-Lacustrine Sandy Silt (Surficial Interbedded Silt and Clay) *A glacio-lacustrine clay unit has been found to overlie the clay till unit throughout the LSA. This unit is transitional, with the lower portion more laminated with silty interbeds, and the upper portion more massive. A thin surficial interbedded silt and clay unit overlies these clays. These units have been grouped given their similar properties and relative thinness of the surficial unit.* *Results of grain size analysis on samples of this unit taken from the recently drilled boreholes in the vicinity of WR-1 (KGS Group 2016; plotted on Figure 6.3.1-9) indicated that this unit is primarily comprised of clay (content ranged from 44% to 92%), with the majority of remaining particles categorized as silt (6% to 55%). In all samples less than 5% of the material was categorized as having a grain size equivalent to fine sand or larger. Water content for this unit ranged from 26% to 59%.* *In the WMA this unit has been found to vary in thickness from 2 m to 8 m and is thickest in the Lagoon Area (AECL 2008). In the LSA, this unit is relatively uniform in thickness, varying from 5.5 m to 7.3 m. This unit is inferred to be absent adjacent to the Winnipeg River due to the erosional drop in topography towards the river. An isopach of the clay till and surficial silt and clay unit is shown on Figure 6.3.1-12. Contouring of this isopach is affected by the nature of the Digital Elevation Model for the LSA.*


LA2
LAH12
LAH9
Lacustrine Clay Thickness (m)
11
10
9
8
7
6
5
4
3
2
1
0
100-TB2
100-TP2
100-TB3
100-TP1
1
2
3
4
5
6
7
8
709000
709500
710000
710500
711000
LEGEND
GEOLOGICAL SURFACE DATA POINT
LOCAL STUDY AREA
WHITESHELL LABORATORIES MAIN CAMPUS
STREAM
WATERBODY
REFERENCE(S)
TECHNICAL DOCUMENT (WLDP-26000-041-000 PAGE 20, REV.0)
CLIENT
CANADIAN NUCLEAR LABORATORIES LTD.
PROJECT
EIS FOR THE IN SITU DECOMMISSIONING OF WR-1 AT THE WHITESHELL LABORATORIES SITE
TITLE
ISOPACH MAP - LACUSTRINE CLAY
CONSULTANT
GOLDER
MM-YYYY
MARCH 2020
DESIGNED
--
PREPARED
RRD
REVIEWED
NB
APPROVED
MM
PROJECT NO.
1656897
CONTROL
REV.
2
FIGURE
6.3.1-12

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						References: *CNL 2022. Geosynthesis for the WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. January 2022.* *AECL 2008. Hydrogeology of the WMA Lagoon and Landfill-Enhanced Monitoring Program. WLDP-03704-ENA-009. Revision 0. March 2008.* *Cherry et al. 1970. Hydrogeologic Regime of the Environmental Control Area and Vicinity. November 1970.* *Dillon 2018. WR-1 Hydrogeological Study Report. WLDP-26000-REPT-004. Revision 1. November 2018.* *Gillham et al. 1981. Barium and Radium Migration in Unconsolidated. May 1981.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *KGS Group 2016. Whiteshell Laboratories Projects Branch Comprehensive Final Report on Installation of 7 Groundwater Monitoring Well Nests. WLDP-35000-041-000-0014. March 2016.* *McPherson 1968. Pleistocene Stratigraphy of the Winnipeg River in the Pine Falls – Seven Sisters Falls Area, Manitoba. April 1968.* *Robertson and Cherry 1985. Review of the Hydrogeology of the Radioactive Waste Management Site. February 1985.*
86.	CNSC	G. Stoyanov	EIS - Section 6.3.1.6 Monitoring and Follow-up Section 6.3.2.8 Monitoring and Follow-up	6-106 6-140	**Comment:** For all new and existing barriers, please explain how CNL plans to monitor the effectiveness of the barriers. It is understood that this is through environmental monitoring program (e.g., sampling of the monitoring wells at site as the barriers themselves will be inaccessible). (CNL to please confirm). Provide confirmation if CNL have established limits/acceptable levels for the sampling results from the environmental monitoring that would indirectly demonstrate satisfactory performance of the barriers. In establishing the ability for migration of waste from its original position of immobilization inside the building structure towards the environment CNL should use, in addition to analytical modelling, site-specific data and site-specific studies that support the models. This should be established in a verifiable and traceable way. In case limits/acceptable levels for the sampling results from the environmental monitoring are exceeded, CNL should also provide information if they have contingency planning and mitigation measures in place and provide the documentation for those. Also, please clarify if CNL intends to use remote sensing technology to monitor the structural health of the barriers.	**Incorporated:** The primary means of monitoring Whiteshell Reactor Disposal Facility (WRDF) performance, including the combined performance of the barriers, is groundwater monitoring. Remote sensing technology will not be used to monitor the condition of the individual barriers as those sensors would require penetrations through the barriers, and would not be expected to last long enough to provide valuable input over the time periods being proposed. CNL's plans for monitoring of the WRDF over the period of Institutional Control is detailed in Section 11.1 of the Environmental Impact Statement (EIS; Golder 2022). Table 11.1-1 of the EIS in Section 11.1.1 has been revised to include the Monitoring and Follow-Up activities proposed for the Project. Some of these activities include visual inspections of the engineered cover, confirmatory air monitoring during closure work for particulate matter and radioactivity, groundwater sampling and quality testing to detect potential releases of contaminants from the WRDF, and monitoring the quality of water in the Winnipeg River and on-site ditches. These activities will be integrated into the existing Whiteshell Laboratories (WL) programs under the Integrated Environmental Monitoring Program (CNL 2020), which includes programs to address effluent monitoring, environmental monitoring, and groundwater monitoring. Specific radionuclide limits or sampling details for groundwater have yet to be determined; but the existing WL Environmental Assessment Follow-up Program (EAFP; CNL 2018a) outlined in Section 11.1.1 of the EIS has been expanded to include a WRDF-specific Work Package #10 that includes, among other things: - Review and integration of detailed WR-1 effluent monitoring requirements, groundwater monitoring requirements, and environmental monitoring requirements into the existing WL site programs, which will include setting the appropriate limits. - development of Whiteshell Reactor 1 (WR-1) specific monitoring and surveillance plan, and - preparation of remedial action plans for the Project to provide remedial actions that can be executed in a timely manner in case of unexpected monitoring results in alignment with CNL Environmental Incident Reporting, Investigation and Mitigation (CNL 2018b). The objectives of the EAFP will be to verify the accuracy of environmental assessment predictions, and determine the effectiveness of any measures implemented to mitigate potential adverse environmental effects. The requested approach of using site-specific data and studies is reflected in how CNL carries out its environmental monitoring program including verification and reporting, under the current site licence. WRDF will form part of that monitoring program, with details determined by CNL in collaboration with CNSC, engaged Indigenous Nations, and local governments and regulators. CNL will assess monitoring data results against established limits for parameters/contaminant of potential concern based on information in Detailed Safety Analysis Report (DSAR; Golder 2021). The limits established in the DSAR are supported by modelling based on site-specific data and conservative assumptions to bound uncertainty in the data. These limits are well below established benchmarks for the protection of humans and the environment. The monitoring program for the WRDF is adaptive in nature, and if monitoring results are different than the modelling predicts, there will be an investigation into the cause and additional monitoring measure, mitigation measures or environmental remediation measures will be undertaken. Section 11.3 was revised to describe this adaptive nature of the monitoring program.

No.	Department/ Agency	SME	Section Table or Figure	Pg. #	Information Request or Summary of Comment	Response by CNL
						Change to EIS: Section 6.3.1.6 was renumbered as 6.3.1.7 and was updated as follows: "*CNL will implement an Environmental Assessment Follow-up Program for the Project to verify the accuracy of the environmental effects and determine the effectiveness of mitigation that has or is to be implemented. This monitoring will be integrated with that for the existing Environmental Assessment Follow-up Program for the WL site, where practical. Monitoring and follow-up programs specific to soil quality are not identified for the Project as there are no predicted residual effects to soil quality; rather, monitoring will be implemented for other disciplines to verify effects predictions for soil quality. For example, environmental monitoring will be completed throughout the institutional control period to confirm that the WRDF barriers are functioning as intended. This monitoring will be integrated into the overall CNL WL Groundwater Monitoring Program to verify that changes to soil quality as a result of groundwater are negligible. In addition, CNL's Management and Monitoring of Emissions will include monitoring objectives for air quality to verify that air emissions during closure have a negligible effect on soil quality.*" Section 11.1.1 was updated to include the following: *"The current Environmental Assessment Follow-up Program for the site has been updated with "Work Package #10 Whiteshell Reactor Disposal Facility (WRDF) Enhanced Monitoring" that includes work tasks for review and integration of WR-1 Project groundwater, environmental, and effluent monitoring requirements into the WL Integrated Environmental Monitoring Program, development of WR-1 specific monitoring and surveillance plan, and the preparation of remedial action plans for the Project in alignment with Environmental Protection Program Environmental Incident Reporting, Investigation and Mitigation (CNL 2018c). This will provide remedial actions that can be executed in a timely manner in case of unexpected monitoring results.* Table 11.1-1 of EIS Section 11.2 has been significantly updated to focus on WR-1 specific monitoring activities; however cannot be reproduced here due to size. It has been attached to the bottom of this document for reference. Section 11.2 of the EIS has also been revised to describe the adaptive nature of the monitoring program and includes the following text in relation to response to a monitored parameter exceeding the established limits: *"Environmental monitoring of the entire WL site will continue as part of the Environmental Assessment Follow-up Program for the WL site. For the Environmental Assessment Follow-up Program for the Project, CNL will determine the initial monitoring locations and frequency of sampling based on the EIS, the WR-1 Environmental Risk Assessment and the Decommissioning Safety Assessment Report. The monitoring data will be assessed against established limits for concentrations of contaminants of potential concern. These concentration limits are well below established benchmarks for the protection of humans and the environment.* *If the Environmental Assessment Follow-up Program for the Project identifies that adverse environmental effects are greater than predicted or results for any monitored contaminants of potential concern are above the established limits, then CNL will investigate the results, which may include additional sampling and analysis to help determine/confirm the source and extent of the contamination. CNL would also 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, with engagement with First Nations and the Manitoba Métis Federation for openness and transparency. Any proposals on modifications to the monitoring program will be communicated to the CNSC. Where the need for revised mitigations is identified, they will be developed and implemented on a case-by-case basis by CNL staff, and may include soil removal and/or treatment of groundwater. As part of the Environmental Assessment Follow-up Program for the Project, CNL will prepare remedial action plans for responses to unexpected results as per the Environmental Protection Program Incident Reporting, Investigation and Mitigation [CNL 2018b]. This will ensure that remedial actions can be executed in a timely manner."* **References:** CNL 2018a. Environmental Assessment Follow-Up Program for Whiteshell Laboratories. WL-509246-STD-001. Revision 0. December 2018. CNL 2018b. Environmental Incident Reporting, Investigation and Mitigation. 900-509200-STD-005. Revision 0. January 2018. CNL 2020. Whiteshell Laboratories Integrated Monitoring Program Framework. WL-509200-OV-001. December 2020. *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

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87.	ECCC		EIS - 6.3.2.3.3 Assessment Cases	6-113	**Comment**: This section of the EIS states that: "Base Case – This scenario represents existing conditions and characterizes combined effects from previous and existing developments and activities. The Base Case reflects the effects of existing disturbances, such as forestry, transportation, agricultural, and residential and recreational development. Current effects from the existing WL facilities and operations, for example, are considered part of the Base Case. In addition, effects from the decommissioning and reclamation activities already completed at the WL site are also considered as part of the Base Case." ECCC notes that in each case of the assessment cases, 6.1.3.3; 6.2.1.3.3; 6.3.1.3.3, etc. in the base case assessment, CNL consistently states that: "Current effects from the existing WL facilities and operations, for example, are considered part of the Base Case. In addition, effects from the decommissioning and reclamation activities already completed at the WL site are also considered as part of the Base Case". In addition to the Base Case that characterizes the existing conditions that includes the impacts of site influences and past activities, there should also be a Reference Case that represents background values not influenced by WR-1 or other related activities at the WL site. The base reference case should be based on an undisturbed natural base state before the activities that required remediation. As such, the reference case data or information should be beyond the Whiteshell study area but environmentally analogous and reference case should not have been contaminated, remediated or disturbed by the WL site or other significant anthropogenic activities. Once the WR-1 is decommissioned it should not be a continued source of contaminants to the Winnipeg River in perpetuity. Therefore, while it may be useful to use the Base Case (as defined in the EIS) conditions to show change as a result of the project, it is inappropriate to compare post-closure phase assessment to the Base Case conditions, rather it should be compared to appropriate reference conditions. **Expectation to Address Comment:** Provide rationale for using a remediated environment as the base level or baseline data. A Reference Case should be developed based on reference site conditions that are not influenced by the past operations of WR-1 or WR-1 associated activities at the WL site and where other anthropogenic influences do not exist or are insignificant.	**Resolved As:** The scope of this assessment is limited to the In Situ Disposal approach for the WR-1 decommissioning. CNL has existing approval via Licence No. NRTEDL-W5-8.00/2024 (CNSC 2019) and the original Comprehensive Study Report (AECL 2001) to carry out decommissioning of the WR-1 reactor via full dismantling, therefore the Base Case for this assessment is the remediated site following full dismantling. Baseline data used in the assessment for the Base Case is representative of current conditions; the remediated environment is considered part of the Application Case (i.e., after decommissioning activities for the WR-1 Project are completed). Therefore, evaluation against a Reference Case that does not include any anthropogenic influences is not valid as the remainder of the Whiteshell Laboratories (WL) site will still be active for a period of time following completion of the WR-1 Project. The area of the WR-1 Building will be remediated as part of the closure phase (i.e., Application Case); thus comparison to a remediated landscape is appropriate. The base case environmental conditions presented in the Environmental Impact Statement (EIS; Golder 2022) are meant to represent a characterization of current (baseline) conditions of the site as described in Appendix B of REGDOC 2.9.1 (CNSC 2020). This includes cumulative effects of previous and current operational and decommissioning activities. However, determination of the impact of the final end state will include a comparison to background conditions, determined through the WL Integrated Environmental Monitoring Program (CNL 2020), by collecting samples from locations that are unaffected by past operations as well as to other reference values. Reference conditions prior to the WL site being developed included forested and agricultural lands. The site was located in an area of cleared bush interspersed with patches of muskeg and forest. The cleared land had been farmed prior to the WL site being established (Guthrie and Scott 1988). Hardwoods, primarily aspen and balsam poplar forests, marshland, and mixed forests dominated the WL site prior to development (Guthrie and Scott 1988). Agricultural lands surrounding the area were primarily for hay production, grazing, and cereal production (Guthrie and Scott 1988). Other land uses included forestry as there were extensive and productive softwood and hardwood forests in the region; however, much of the land surrounding the proposed WL site had moderate to severe limitations for forest production (Guthrie and Scott 1988). Common wildlife within the area prior to development of the WL site included moose, white-tailed deer, beaver, mink, coyote, fisher, lynx, red fox and weasel (Guthrie and Scott 1988). Based on the above information, the land use, forest types, and wildlife species in the 1960s has not been significantly changed to that of present day. The greatest magnitude of cumulative effects would have been when the forested areas were cleared for farmland prior to the 1960s. It is likely that there was a change in the community assemblage of wildlife species, with some populations decreasing (e.g., lynx, moose) and other increasing (e.g., white-tailed deer). Potential effects from forestry would have been small given that most of the forest within the vicinity of the proposed WL site had moderate to severely restricted production potential. In addition to human disturbance, other factors affect the population and resilience of wildlife species, such as climate change, effects to migration routes, and migration habitat. The overall size of the WL site is 4,375 ha; however, much of the forested land was retained undisturbed and is still present on-site. Baseline data summarized in the Comprehensive Study Report (AECL 2001) represents the effects from reference conditions to development of the WL site. The species commonly found in the area today are similar to those found in the area prior to the development of the WL site, which shows the resiliency of these species to change. The footprint of the WR-1 Building is approximately 0.07 ha; and it is located in an area that has been previously disturbed. Therefore, the Project is not expected to result in an incremental loss of wildlife habitat from current conditions at the WL site. Erosion and sediment control practices (e.g., silt fences, runoff management) applicable to the region and already in place at the Regional Study Area (RSA) will be used during decommissioning activities around disturbed areas, where appropriate. This will reduce the potential for effects on adjacent natural areas that provide suitable wildlife habitat. Consequently, the incremental cumulative change from the WR-1 Project (i.e., Reference to Base case to Application case) is determined to have no residual effect on the maintenance of self-sustaining and ecologically effective wildlife populations in the RSA. Similarly, the greatest magnitude in change to the surface water environment would have occurred when the landscape changed from forested to an agricultural and residential land use prior to establishment of WL site. Increased erosion and runoff from agricultural lands and direct discharges from local communities would have resulted in changes to surface water quality. These changes are representative of the existing conditions today. For the surface water assessment, it is more conservative to compare changes from the Project to existing conditions (Base Case) rather than reference conditions. This is because potential effects from the Project would be greater in magnitude when compared to the Base Case than at reference. The absolute change would be the same, but the magnitude of the effect is higher when compared to the Base Case. In addition to changes in the terrestrial and surface water environment, there is also a change in the socio-economic environment as a result of the WL site development. Prior to the development of the WL site, employment in the immediate vicinity of the WL site was primarily related to farming, trapping, forestry, and employment within the local communities. As a result of the WL site, roughly 1,100 direct jobs were created at its peak (AECL 2001). In addition, numerous indirect benefits, such as housing, hotels, restaurants, local businesses would have been experienced. Overall, the development of the WL site has had a positive effect on the socio-economic environment in the region.

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						Change to EIS: No changes were required to the EIS as a result of this comment. Section 6.3.2.3.3 has been renumbered as Section 6.3.2.4.3. **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *CNL 2020. Whiteshell Laboratories Integrated Monitoring Program Framework. WL-509200-OV-001. December 2020.* *CNSC 2019. Nuclear Research and Test Establishment Decommissioning Licence: Whiteshell Laboratories, NRTEDL-W5-8.00/2024. December 2019.* *CNSC 2020. REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.2. September 2020. ISBN 978-0-660-06255-6.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Guthrie and Scott 1988. Preoperational Environmental Study Report of the Whiteshell Nuclear Research Establishment Area. WNRE-756.*
88.	CNSC	G. Stoyanov	EIS - Section 6.3.2.6.1.2 Contaminant Release	6-138	**Comment:** This section of the EIS indicates that: "The assumption is that these materials will experience an increase in hydraulic conductivity as they degrade over time." This is generally true, but the rate at which this is assumed to occur has to be realistic and has to be supported by data/studies. This rate and its supporting information is not present in the EIS and supporting documentation. **Expectation to Address Comment:** Provide additional information which shows that the transportation model and its assumption(s) is well correlated with barrier degradation, where barrier degradation evolution itself is a well-established and supported model.	**Resolved As:** Modelling of the degradation of the Whiteshell Reactor Disposal Facility (WRDF) components such as the cover, grout and foundation is provided in the Groundwater Flow and Solute Transport Model Report (GWFSTMR; Golder 2021), as referenced in Sections 3.4.9.1.1 and 6.3.2.7.1.2 of the Environmental Impact Statement (EIS; Golder 2022). Section 5.0 of the GWFSTMR (Golder 2021) was revised to provide additional analyses of the impacts of uncertainty surrounding long term grout and foundation degradation rates. Specific to this comment, degradation rates and subsequent solute release rates have been described in Sections 4.1.3, 4.1.4, 4.1.5, and 4.1.6 of the GWFSTMR (Golder 2021). Table 4-4 in the GWFSTMR (Golder 2021) presents the full barrier degradation evolution of the model and includes grout, foundation walls, groundwater recharge rates through the soil cover and backfill. The information from the GWFSTMR has been summarized in the EIS Section 3.4.9.1.1: Reactor Core and Bioshield Components: *"Corrosion rates for the reactor materials were based on estimates from literature for an aerobic environment and ranged from 1.78E-3 m/yr for aluminum to 1.0E-8 m/yr for Ozhennite and Zr-Nb alloy. Details on the selection of corrosion rates and calculation of times required for complete dissolution of each reactor component are provided in Golder's groundwater flow and solute transport modelling document [Section 4.1.3 of Golder 2021].* *The selection of corrosion rates for the WR-1 components was based on the following information:* • *Analogous information of corrosion rates in aerobic humid conditions, which will be similar to the conditions expected in the Project.* • *The ISD environment is expected to be alkaline. Steel and other alloys are known to corrode very slowly in alkaline conditions.* *The corrosion rates used in the GWFSTMR were validated through the Wasteform Synthesis Report (Arcadis 2021) and it was concluded that the corrosion rates used in WR-1 assessment are generally consistent with the long term measurements. It was assumed that corrosion would occur on both sides of the reactor components.* *Information on barrier (concrete bioshield, grout fill, and foundation concrete) degradation was limited in the sources reviewed (Golder 2020), and the assumed step function used in the WR-1 assessment (based on information provided by Walton et al. [1990]; and Clifton et al. 1995) is considered justified. Simulations were completed as a part of the WR-1 assessment to evaluate the sensitivity of model results to the assumptions on degradation of grout and concrete. Results of these simulations were found to be relatively insensitive to the applied degradation rates."* Where uncertainty exists regarding the specific degradation rates, sensitivity analyses were completed and presented in Section 5.1 of the GWFSTMR (Golder 2021) to assess the potential variability in the simulated results as a function of uncertainty in the model input parameters, such as timescales of degradation of the cover, grout and foundation, as well as performance of grout. The specific scenarios are summarized below: Scenario 8 of the GWFSTMR (Golder 2021) evaluates the sensitivity of the system to the timescales associated with the degradation of the cover, grout and the foundation. These timescales were identified in Section 4.1.4 of the GWFSTMR (Golder 2021) as a potential source of uncertainty. As such, for Scenario 8, the time taken for each step of the degradation function was cut in half (i.e., the maximum flow rate through the building materials is reached in half the time from the base case simulation). Scenario 14 of the GWFSTMR (Golder 2021) evaluates the sensitivity of the system to rapid degradation of the grout, foundation and cap and cover barriers. In this scenario the hydraulic conductivity of the grout and engineered cover was increased an order of magnitude higher than the base case

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						model value after 100 years, and the hydraulic conductivity of the foundation was increased by 3 orders of magnitude to match the maximum conductivity of the surrounding geological units. This scenario is representative of a case in which the grout, the effect of grouting on the foundation, and the performance of the foundation as an effective barrier is limited to the first 100 years following decommissioning. The results of the sensitivity studies are presented in the GWFSTMR (Golder 2021), Section 5.2 Sensitivity Analysis Results: Scenario 8 – Timescales Associated with Degradation of Cover, Grout and Foundation: *"The simulated mass loadings rates from the bedrock pathway were relatively insensitive to changes in the timescales associated with degradation applied in the model. This is a reflection of the base model configuration, where the source mass was assumed to be distributed throughout the grout."* Scenario 14 – Grout Degradation: *"The more rapid degradation of the grout and associated degradation of the foundation resulted in significant (two orders of magnitude) increases to the rate of flow through the grout, foundation and backfill for the period up to 5,000 years following decommissioning, after which flows in this Scenario were identical to the Base Case simulation.* *Radionuclides associated with the reactor (such as C-14) were not sensitive to the increase in groundwater flows resulting from the more rapid degradation of the grout and foundation. Release of these radionuclides is governed by corrosion of the reactor components, hence limiting the effect of the degradation of the other barriers. For species contained only in the biological shield, such as Cl-36, the increased flow through the grout and foundation resulted in a maximum increase in peak mass loading value by a factor of less than two. The results for Sr-90 and Cs-137 presented no change from the base case (i.e., zero mass loading)."* In the GWFSTMR (Golder 2021) Appendix B - Plots of Simulated Mass Loading Rates at the Bedrock Pathway Outflow, the plots of C-14, I-129, and Cl-36 mass loading rates are provided in Figure B.9, B.23, and B.12 respectively. (Simulation 14 is compared to the Base Case in the grouping of results in each case in the lower left plot.)

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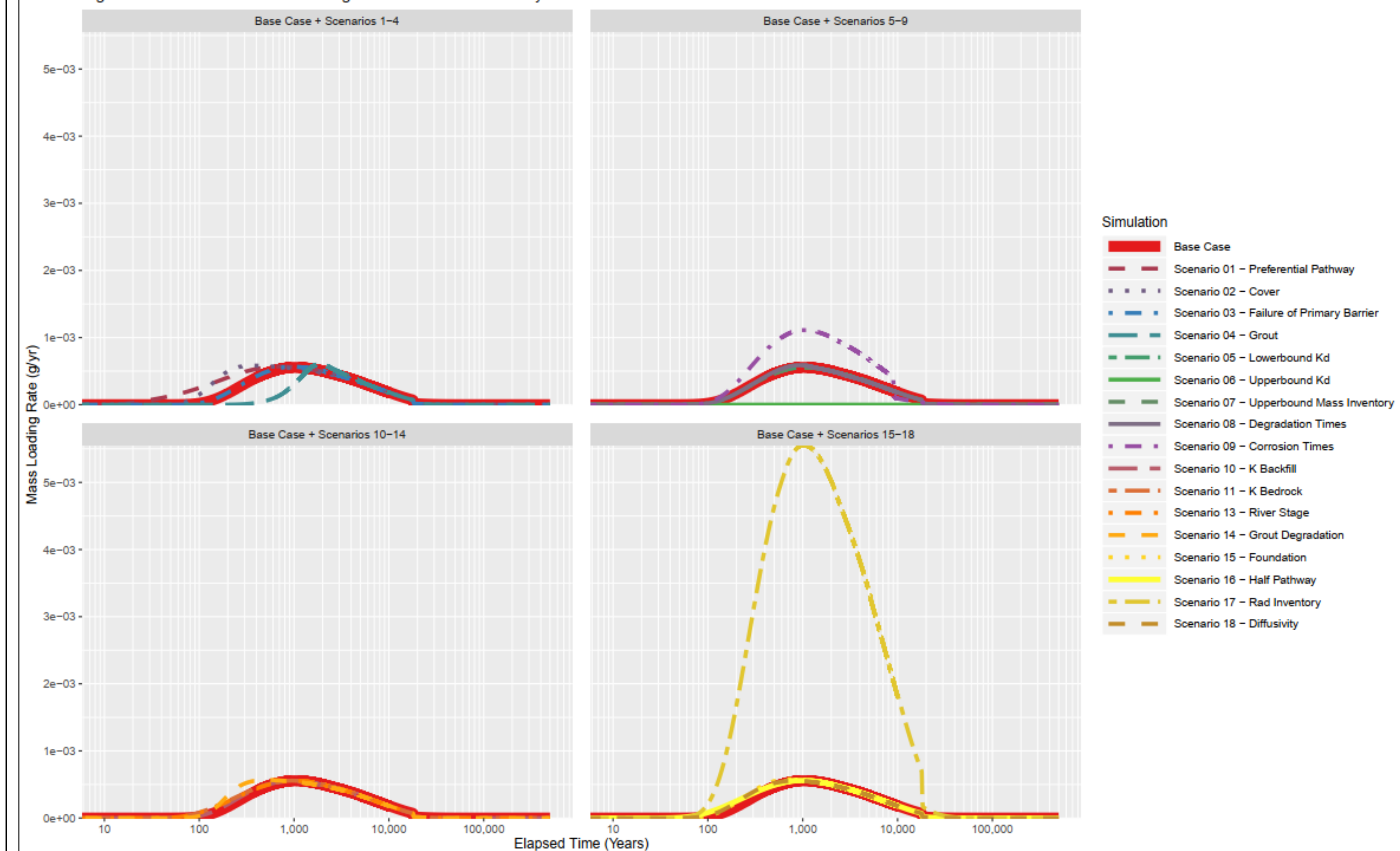
						Figure B.9: Simulated Mass Loading Rate at Bedrock Pathway Outflow Location for C14 

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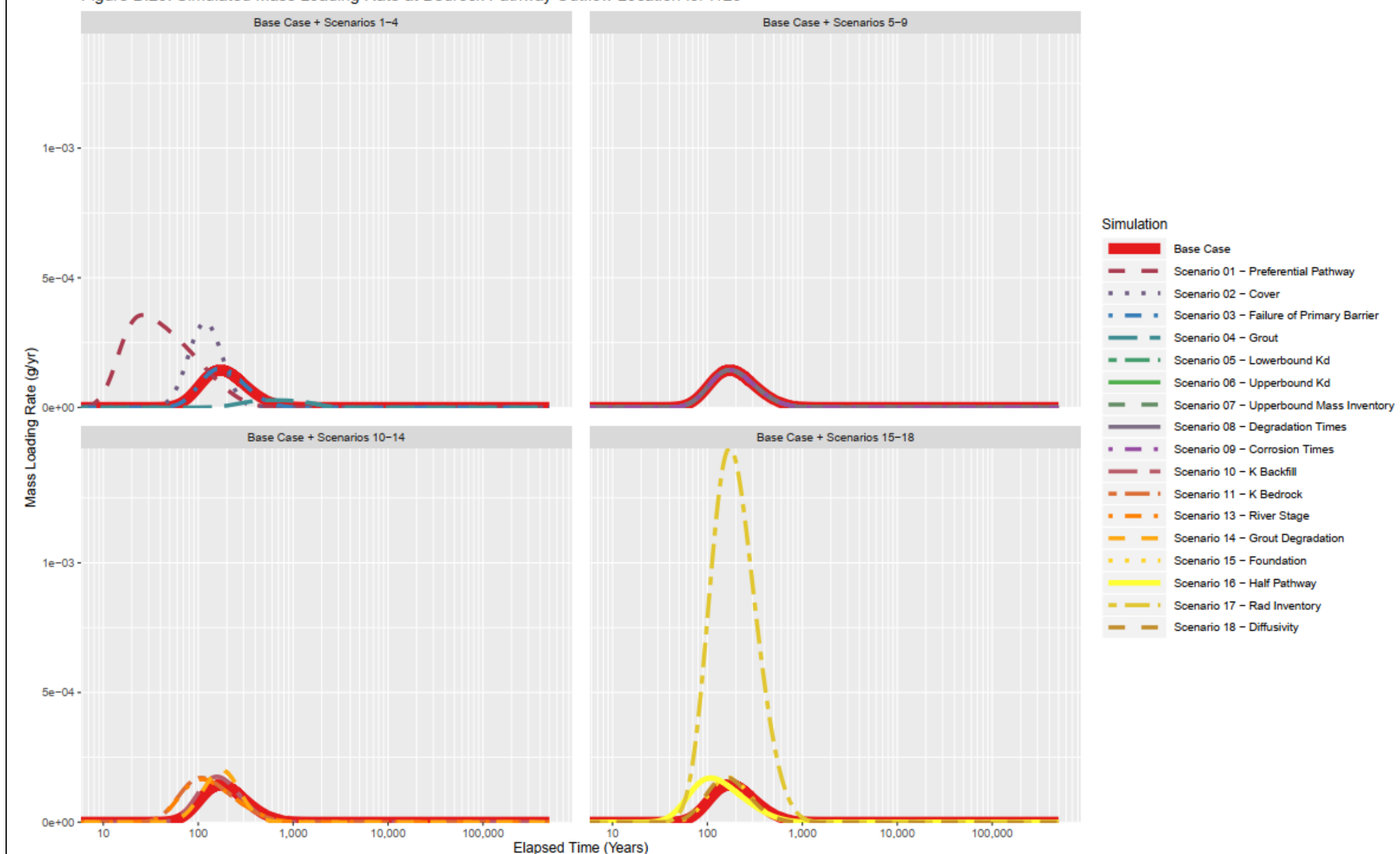
						Figure B.23: Simulated Mass Loading Rate at Bedrock Pathway Outflow Location for I129 

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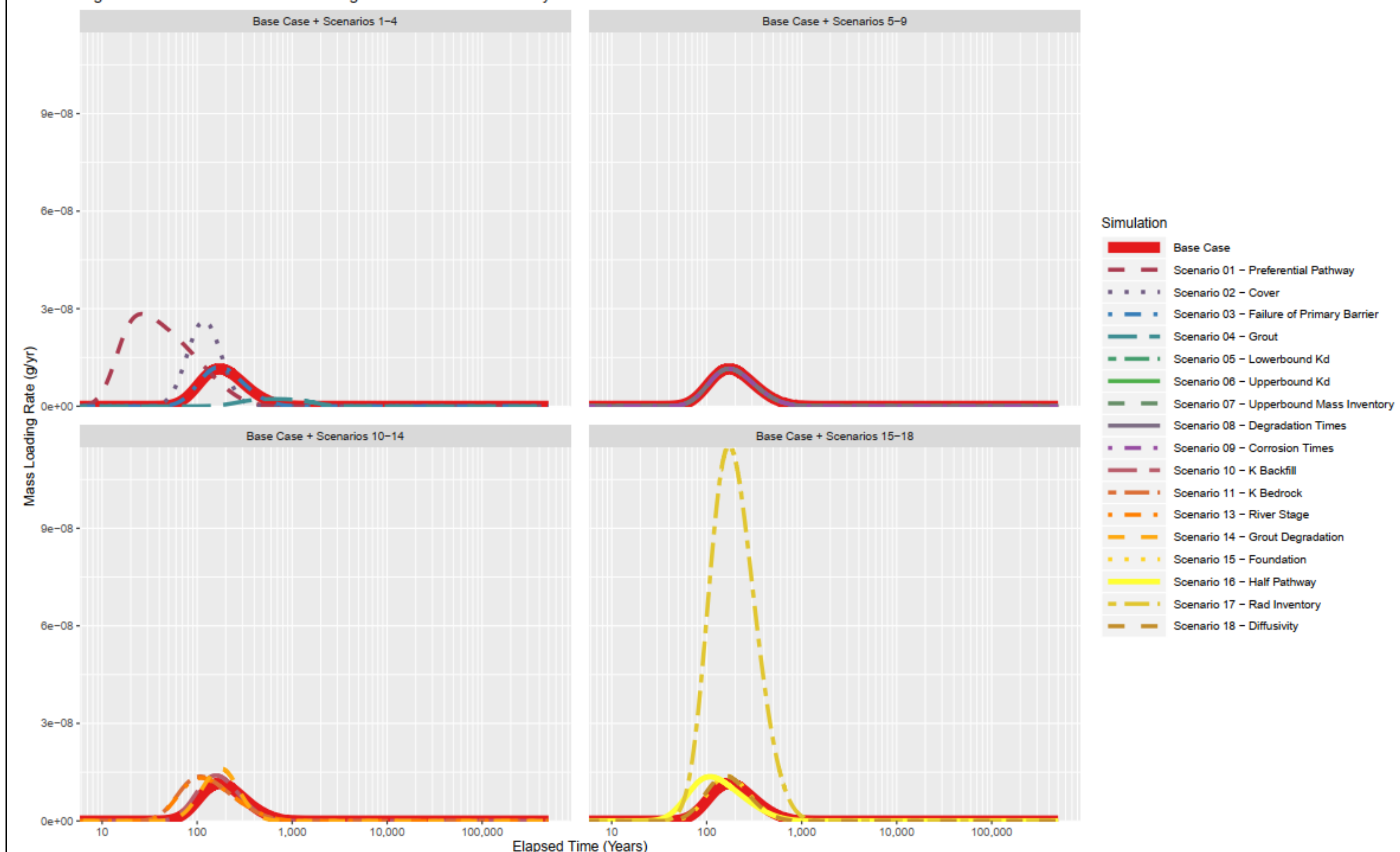
						Figure B.12: Simulated Mass Loading Rate at Bedrock Pathway Outflow Location for Cl36  These additional studies further reinforce the initial conclusions that: *"Peak mass loading rates and earlier arrival to peaks was found to be less sensitive to: the degradation rate of the engineering components (within the ranges assessed); a local failure of the foundation; increase in the hydraulic conductivity of the backfill; an increase in the rate of degradation of the grout and foundation; and removal of the foundation."* (Golder 2021, Section 6 Summary) **Change to EIS:** The findings of these additional analyses from Section 5 of the GWFSTMR (Golder 2021) were summarized in Section 6.3.2.8 of the Environmental Impact Statement (EIS; Golder 2022), and concluded that the peak mass loadings rates and earlier arrival to peaks was found to be less sensitive to the degradation rate of the engineered components (within the ranges assessed), increase in the hydraulic conductivity of the soil cover, an increase in the rate of degradation of the grout and foundation, or a compromised foundation. **References:** *Arcadis 2021. NPD and WR-1 In Situ Decommissioning Projects Waste Form Synthesis Report. 64-508760-REPT-017. Revision 1. July 2021.* *Clifton et al. 1995. Clifton JR, Pommersheim JM, Snyder L. 1995. Long term performance of engineered concrete barriers. Building and Fire Research Laboratory. National Institute of Standards and Technology publication 5690. July 1995.* *Golder 2020. CNL WR-1 Information Request No 48. Technical Memorandum. GAL-132-1656897. March 2020.*

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						Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021. *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Walton et al. 1990. Walton JC, Plansky LE, Smith RW 1990. Models for Estimation of Service Life of Concrete Barriers in Low-Level Radioactive Waste Disposal. Idaho National Engineering Laboratory, EG&G Idaho Inc. September 1990.*
					6.4 Surface Water Environment	
89.	ECCC		EIS - Section 6.4 Surface Water Environment Section 6.5 Aquatic Environment	6-145 6-207	**Comment:** Although there is some description of the presence of a significant wetland area along the eastern boundary of the WL complex, there is little detailed description of the biological or the physical characteristics of this habitat. The EIS states that the expected contaminant exposure pathway during the closure phase of the project is via atmosphere and deposition of both radionuclides and conventional contaminants onto the terrestrial environment. However, the potential effects on the wetlands during the closure phase have been omitted from the ecological risk assessment. Wetlands and connecting drainage pathways are typically highly productive, biologically diverse habitats that may sustain a diverse variety of sensitive species. **Expectation to Address Comment:** It is recommended that a full characterization of the wetland area near the WL complex is provided along with an updated ecological risk assessment which includes both radiological and conventional contaminants that the wetland area may be exposed to during the closure and post-closure phases.	**Resolved As:** As indicated in Section 6.7.2.7.2.1 of the Environmental Impact Statement (EIS; Golder 2022), subsection "Exposure Pathways", during post-closure phase, the primary pathway for releases will be through groundwater. As the groundwater flow direction is primarily towards the west, away from the wetlands on the east side of the Whiteshell Laboratories (WL) site, there is no reasonably foreseeable groundwater pathway to the wetland; therefore, this pathway was not considered in the assessment, and characterization of the wetland was not required. As indicated in Section 6.7.2.7.1.1 of the EIS (Golder 2022), subsection "Exposure Pathways", during the closure phase, the primary pathway for releases is via air emissions. Mitigation measures for fugitive dust emissions are provided in Table 6.2.1-10 (Pathways Analysis for the Air Quality Valued Component) and include the use of contamination immobilization agents, containment, ventilation and High-efficiency Particulate Air (HEPA) filters to control generation of airborne emissions during decontamination or removal of contaminated systems or structures. In addition, use of dust suppression methods during building demolition or soil remediation activities will be implemented to control airborne emissions and nuisance dust during building demolition or soil remediation. Consequently, air emissions are predicted to be below applicable air quality guidelines and/or standards as discussed in Section 6.2.1.7.2 (Application Case Results), and will not impact the surrounding terrestrial or aquatic environment. Doses from radiological air emissions are discussed in Section 6.7.2.7.1.2 and are predicted to be well below all benchmarks. The decommissioning approach presented in this EIS (Golder 2022) involves significantly less physical dismantling work during closure phase than proposed in the original CNSC-accepted Comprehensive Study Report (AECL 2001). This will result in less material handling and thus produce inherently less risk to the surrounding environment. CNL has completed the demolition of several buildings on the main campus to date. Air quality monitoring during demolition indicated no exceedances of weekly guidelines for fugitive dust emissions, and no exceedances for radiological contaminants. This demonstrates that the mitigations already in place for demolition work at CNL effectively eliminate the airborne pathway to the wetland as well. Therefore, with no pathway to the wetland either through groundwater or air deposition, the wetlands will not be adversely affected by the decommissioning of Whiteshell Reactor 1 (WR-1) and therefore no additional characterization of the wetland is required. **Change to EIS:** Section 6.4.2.7.1 was updated to reflect the explanation above: *"Residual effects of the Project are those effects that remain after implementation of all mitigation. During the post-closure phase groundwater will encounter materials from the reactor and migrate to the Winnipeg River. As such, the potential for groundwater seepage to the Winnipeg River is considered a primary pathway and carried forward to the residual effects analysis. It is noted that a relatively large area of the LSA* [Local Study Area] *is upgradient of the groundwater seepage flow path. Environmental features or VCs* [Valued Components] *that are upgradient of WR-1 are not considered as there is no complete exposure pathway. As the groundwater flow direction is primarily towards the west, away from the wetlands on the east side of the WL site, there is no reasonably foreseeable groundwater pathway to the wetland; therefore, this pathway was not considered in the assessment, and characterization of the wetland was not required."* The following text was added to the EIS in Section 6.4.2.6.2.2 (Secondary Pathways [Non radiological air emissions and dust emissions (including sulphur dioxide, nitrogen oxides [NOx/NO2] and particulate matter) and subsequent deposition]): *"Mitigation of fugitive dust emissions is provided in Table 6.2.1-10 (Pathways Analysis for the Air Quality Valued Component) and includes the use of contamination immobilization agents, containment, ventilation and High-efficiency Particulate Air (HEPA) filters to control generation of airborne emissions during decontamination or removal of contaminated systems or structures. In addition, use of dust suppression methods during building demolition or soil remediation activities will be implemented to control airborne emissions and nuisance dust during building demolition or soil remediation. Consequently, air emissions are predicted to be below applicable air quality guidelines and/or standards as discussed in Section 6.2.1.7.2 (Application Case Results), and will not impact the surrounding aquatic environment.*

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						CNL recently demolished a number of other buildings at the WL site. The mitigation listed above was applied and successfully reduced SPM [suspended particulate matter] *emissions which ultimately reduce subsequent deposition. It is expected that this same mitigation will also be effective during the demolition of the WR-1 Building. Therefore, with the implementation of CNL's Management and Monitoring of Emissions (CNL 2018) and through the implementation of dust management techniques for the Project, air and dust emissions and subsequent deposition are expected to result in local, minor changes relative to Base Case conditions. As such, this pathway is determined to result in a negligible effect on surface water quality."* The following text was added to the EIS in Section 6.5.6.2.2 (Secondary Pathways [Aquatic Environment]): "*Mitigation of fugitive dust emissions is provided in Table 6.2.1-10 (Pathways Analysis for the Air Quality Valued Component) and includes the use of contamination immobilization agents, containment, ventilation and High-efficiency Particulate Air (HEPA) filters to control generation of airborne emissions during decontamination or removal of contaminated systems or structures. In addition, use of dust suppression methods during building demolition or soil remediation activities will be implemented to control airborne emissions and nuisance dust during building demolition or soil remediation. Consequently, air emissions are predicted to be below applicable air quality guidelines and/or standards as discussed in Section 6.2.1.7.2 (Application Case Results), and will not impact the surrounding aquatic environment.* *CNL recently demolished a number of other buildings at the WL site. The mitigation listed above was applied and successfully reduced SPM emissions which ultimately reduce subsequent deposition. It is expected that this same mitigation will also be effective during the demolition of the WR-1 building. Therefore, with the implementation of CNL's Management and Monitoring of Emissions, air and dust emissions and subsequent deposition are expected to result in local, minor changes to soil quality relative to Base Case conditions."* The following text was added to the EIS in Section 6.6.6.2.2 (Secondary Pathways [Terrestrial Environment]): *"Mitigation of fugitive dust emissions is provided in Table 6.2.1-10 (Pathways Analysis for the Air Quality Valued Component) and includes the use of contamination immobilization agents, containment, ventilation and High-efficiency Particulate Air (HEPA) filters to control generation of airborne emissions during decontamination or removal of contaminated systems or structures. In addition, use of dust suppression methods during building demolition or soil remediation activities will be implemented to control airborne emissions and nuisance dust during building demolition or soil remediation. Consequently, air emissions are predicted to be below applicable air quality guidelines and/or standards as discussed in Section 6.2.1.7.2 (Application Case Results), and will not impact the surrounding terrestrial or aquatic environment* *CNL recently demolished a number of other buildings at the WL site. The mitigation listed above was applied and successfully reduced SPM emissions which ultimately reduce subsequent deposition. It is expected that this same mitigation will also be effective during the demolition of the WR-1 building. Therefore, with the implementation of CNL's Management and Monitoring of Emissions (CNL 2018), and through the implementation of the dust management techniques for the Project, air and dust emissions and subsequent deposition are expected to result in minor changes to soil quality relative to Base Case conditions. As such, this pathway is determined to result in a negligible residual effect on the maintenance of self-sustaining and ecologically effective wildlife populations in the RSA* [Regional Study Area]*."* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *CNL 2018. Management and Monitoring of Emissions. 900-509200-STD-009. Revision 0. March 2018.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
90.	ECCC		EIS - Section 6.4.1.3.1 Spatial Boundaries	6-147	**Comment:** The spatial boundary for the LSA does not include the Winnipeg River adjacent to the SSA on the justification that there are no direct effects expected on the river as a result of the project. It has been described that there are cooling water intake/discharge pipelines that currently connect the WR-1 to the river (Section 3.2.2.2). The intake and the discharge point occur in the river. Also, Section 3.2.2.5 describes that Active Drainage Sump 1 may receive much of the water collected in the drainage systems within the WR-1. It is not clear where the water collected in Sump1 might be released – one	**Resolved As:** This section of the Environmental Impact Statement (EIS; Golder 2022) evaluates the Project's impacts on the overall site drainage patterns and site drainage contribution to the Winnipeg River. The Local Study Area (LSA) is defined as the area within which there is potential for measurable changes resulting from the proposed In Situ Disposal of Whiteshell Reactor 1 (WR-1) at the Whiteshell Laboratories (WL) site (the Project) activities. The LSA was based on the area of the WL main campus that is currently drained by roadside ditches and storm sewers. All discharges (e.g., sumps, storm, process) flow to the single outfall station discharge. As stated in Section 6.4.1.4.1: *"The approximate size of the LSA is 29 ha. The LSA does not include the Winnipeg River as direct effects on hydrology from the Project on the Winnipeg River are not anticipated. For example, direct effects to Winnipeg River as a result of changes in hydrology are anticipated to be negligible as the drainage area of the LSA is several orders of magnitude smaller than that of the Winnipeg River (15,000,000 ha)."* Further, the Project's surface Site Study Area (SSA) comprises a small percentage of the overall LSA, and will not significantly affect the overall site surface hydrology. Groundwater is indeed currently collected in and pumped out from the Sub-Surface Active Drainage Sump in the WR-1 building to the outfall

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					possibility is that it might be discharged along with the cooling water discharge. This section also describes that the sub-surface drainage sump that collects groundwater outside of the WR-1 is discharged to the storm drainage system. It is understood that the stormwater is ultimately discharged to the river. Based on the above, under existing conditions and during closure and post-closure, the river may be directly and indirectly impacted by the WR-1. **Expectation to Address Comment:** Include in the LSA a reasonable portion of the river that is influenced (plume) by all significant outfalls associated with the WR-1 including the Whiteshell stormwater system. Identify the outfalls which may be considered as point discharges on the river in a map. Also, include the locations of the water sampling stations on the map.	station. This will continue during the Closure phase; however, these volumes (up to 23 m^3/day) are also several orders of magnitude less than the average Winnipeg River flow. During Post-Closure phase, there will be no operational groundwater extraction systems, and the outfall station will be taken offline. The site will be restored and graded in accordance with a site-wide stormwater management plan. Stormwater will be directed to the Winnipeg River utilizing existing topography's drainage paths (creeks) to the greatest extent possible. There will be no systems in place to divert groundwater from the Project location to surface discharge. Since there is no connection between the Project and local hydrology during Post-Closure phase, it was deemed not necessary to include the point discharges on the map. Sampling locations were deemed not necessary on Figure 6.4.1-1 as they are provided in Figure 6.4.2-3, in Section 6.4.2 of the EIS (Golder 2022) that deals with Surface Water Quality. Regarding the drainage from the Active Drainage system, all radiological drainage systems in the WR-1 facility, including from Active Sump A (radiological effluent sump), go through the Low-Level Liquid Waste Treatment system holding tanks, where the effluent is sampled, tested, and treated (filtration and pH adjustment) before being released to the process outfall. The process water outfall is also regularly monitored at a permanent monitoring station located on the western edge of the main site campus to verify that CNL WL effluent complies with the site derived release limits (DRLs). The Sub-Surface Drainage Sump (non-radiological effluent sump) is a concrete structure located outside of the north wall of the WR-1 building. The purpose of the Sub-Surface Drainage Sump is to collect groundwater from the weeping tiles located under and around the periphery of the WR-1 Building. A network of perforated pipe, embedded in free-draining crushed stone drained the groundwater from beneath the reactor ground slab and from the periphery of the basement walls into the sump. Since no radiological contamination is anticipated to enter this effluent from inside or outside of the WR-1 building, this sump is typically emptied to the stormwater management system. However, it is possible to route the groundwater effluent through the Low Level Liquid Waste Treatment system for sampling and treatment prior to release in the event of a spill outside of the WR-1 building; which was the intent of the original wording in Section 3.2.2.4 (formerly 3.2.2.5). It should be noted that the cooling water discharge lines mentioned in the comment are a closed system that is not connected directly to the active drain system, but is part of the Process Drain system. Neither the cooling water lines nor the Process Drain system return directly to the river but are also routed through the outfall station. During Closure phase of the project, CNL will be terminating all piping, including active drainage and process drainage, that leave the building and will be inserting a hydraulic break in all piping to prevent the development of a preferential pathway to the Winnipeg River. In the unlikely event that there was a leak through the hydraulic break, this scenario has been assessed as part of the sensitivity studies (sensitivity Case #1 – Preferential Pathway) in Section 5.1 and 5.2 of the Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2021) and shows no significant impacts on the overall impacts of the project. Outside of the WR-1 decommissioning project, CNL will be removing the cooling lines and the pumphouse through which they run as part of the overall WL Closure Project, further eliminating the potential for hydraulic pathways. **Change to EIS:** Section 6.4.1.3.1 was renumbered as Section 6.4.1.4.1. Section 3.2.2.5 is now renumbered as Section 3.2.2.4 and updated to clarify the roles and functions of Active Sump A and Sub-Surface Drainage Sump as described above. Section 3.2.2.1 was updated to state that *"Process and standby water was returned to the Winnipeg River through the process drainage system via the outfall station."* **References:** *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
91.	ECCC		EIS - Table 6.4.2-4	6-175	**Comment:** It is not clear what the frequency of the sampling was or how many stations were sampled or what the locations of these stations were or where the maximum and the minimum shown in the table were measured. Pine Falls is at the mouth of the Winnipeg River far downstream from the WL site, however, this far-field data seems to have been combined with the impacted water quality data near	**Resolved As:** Baseline Winnipeg River water quality information was provided in order to evaluate changes in surface water quality resulting from the operation of the Whiteshell Reactor Disposal Facility. River water data was preferentially taken upstream of the site, at the Whiteshell Laboratories (WL) Intake at the WL pumphouse. Not all parameters included in the assessment have historical data available from upstream of WL. For parameters not measured at the site, the closest alternative source at Pine Falls was used. The near-field data presenting the WL-impacted waters would not be relevant here as the intent is to provide a baseline data describing non-impacted water quality.

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					the WL site. It is unclear what the purpose of Table 6.4.2-4 is and the analysis shown within the table. It may be more meaningful if the data analysis is divided by proximity to the WL site – for example, for upstream of the WL site, adjacent (impacted) to the WL site and far-field downstream of the WL site. **Expectation to Address Comment:** Provide clarification on the purpose of the water quality data analysis and if appropriate, distinguish the data between upstream of the WL site, impacted by the WL site and far-field downstream of the WL site.	This is described in more detail in section 6.4.2.5.1 of the Environmental Impact Statement (EIS; Golder 2022): "*Background, or ambient water quality for the Winnipeg River exclusive of any potential WL site related influence is represented herein by two sampling locations – the WL Intake and the Powerview Dam. The WL Intake is located in the river at the WL site, upstream of any potential site-associated influence. Sampling at WL is completed by CNL. The Powerview Dam site is located on the river at the community of Powerview-Pine Falls approximately 26 km downstream of WL, well beyond the influence of the WL site. Sampling at the Powerview Dam is completed through a provincial government initiative by the Department of Sustainable Development. Water quality data collected over the period 2011 through 2019 (where available) at these two locations are summarized in Table 6.4.2-5 and Table 6.4.2-6. The data are associated with monthly sampling events and are summarized on a yearly basis. In the tables, data for the WL Intake station are prioritized over the Powerview Dam site - that is, where available, the data for the WL Intake are shown. The Powerview Dam data are provided to supplement the WL Intake data for specific constituents that are not captured in the WL Intake sampling program, in order to present a broader characterization of background conditions in the river. Notes provided with the tables identify the origin of the data shown for each constituent.*" Table 6.4.2-5 (formerly Table 6.4.2-4) includes the row titled "Sampling Location", which indicates the location where each parameter was measured. All of the measurements, including Minimum, Maximum and Average were measured at the location identified in that row, for each parameter. Table 6.4.2-5 provides the source of the data used in the table as CNL 2016, CNL 2017, CNL 2018, CNL 2019, CNL 2020 or WQMS 2016; WQMS 2020. The CNL source is given as the WL site intake, which is upstream of the process outfall station, and unaffected by site operations. The WQMS source is the provincial water quality monitoring station at Pine Falls, downstream of the WL site. Together they provide an appropriate representation of the existing water quality of the Winnipeg River. The CNL intake samples were collected in accordance with established procedures outlined in the Environmental Protection Program (CNL 2021) that forms part of the basis for the WL site licence issued by the CNSC as appropriate for decommissioning work at the WL site, including the decommissioning of Whiteshell Reactor 1 (WR-1). WQMS data was collected according to Environment and Climate Change Canada's standard practice and the data is considered appropriate for inclusion in the assessment. The notes for Table 6.4.2-5 in the EIS (Golder 2022) were updated to provide clarity on the location of the water quality sources. **Change to EIS:** Table 6.4.2-4 was renumbered as Table 6.4.2-5. The <u>underlined</u> text has been added to the notes for Table 6.4.2-5: *"WQMS 2016; 2020 indicates water quality from the provincial water sampling location at Pine Falls on the Winnipeg River <u>located downstream of the WL site.</u>* *CNL 2016b, 2017b, 2018b, 2019b, 2020b indicates water quality from the Whiteshell Laboratories intake on the Winnipeg River <u>located upstream of the process outfall station."</u>* **References:** *CNL 2016b. Water chemistry for the Winnipeg River Intake Water for Whiteshell Laboratories and Winnipeg River Levels at Whiteshell Laboratories data. Received 28 Nov 2016 from Golder Associates.* *CNL 2017b. Annual Safety Report: WL Annual Safety Review for 2016. WL-00583-ASR-2016. Revision 0. April 2017.* *CNL 2018b. Annual Safety Report: WL Annual Safety Review for 2017. WL-00583-ASR-2017. Revision 0. April 2018.* *CNL 2019b. Annual Compliance Monitoring Report: Whiteshell Laboratories Annual Compliance Monitoring Report for 2018. WL-00583-ACMR-2018. Revision 0. April 2019.* *CNL 2020b. Whiteshell Laboratories Annual Compliance Monitoring Report for 2019. WL-514300-ACMR-2019. Revision 0. April 2020.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *WQMS 2016. Water quality data for the Winnipeg River. Manitoba Sustainable Development, Winnipeg, Manitoba. Received December 15, 2016.* *WQMS 2020. Water quality data for the Winnipeg River. Manitoba Sustainable Development, Winnipeg, Manitoba. Received December 15, 2020.*

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92.	CNSC	D. Sauvé	EIS - Table 6.4.2-4	6-175	**Comment:** Canadian Council of Ministers of the Environment (CCME) water quality guidelines list a limit of 1ug/L for Cr(VI). Several measurements exceed this guideline; however, it is not clear if these measurements are for total Cr or if their charge states have been considered. **Expectation to Address Comment:** Please indicate if measurements for Cr(VI) have been made, if so, please consider posting them to this table. If not, consider either removing the guideline for Cr(VI) as it is not applicable to the total Cr measurements posted or provide a footnote explaining this.	**Resolved As:** Table 6.4.2-4 in the original comment was revised to Table 6.4.2-5 in the revised Environmental Impact Statement (EIS; Golder 2022). The values in Table 6.4.2-5 are for total chromium. No measurements for hexavalent chromium (CrVI) have been made. The guideline for that parameter was removed in Table 6.4.2-5. **Change to EIS:** Revisions to the EIS (Golder 2022) have resulted in a change in table numbers. *The Water Quality of the Winnipeg River between Whiteshell Laboratories and Pine Falls, 2011 to 2015, for Parameters that are Stable Metals* as Table 6.4.2-4 has been revised to table number 6.4.2-5: *The Water Quality of the Winnipeg River between Whiteshell Laboratories and Pine Falls, 2011 to 2019, for Parameters that are Stable Inorganics*. The CCME guideline for Cr(VI) was removed from Table 6.4.2-5. Chromium column was relabelled as Total Chromium. **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
93.	CNSC ECCC	Q. Zheng	EIS - Table 6.4.2-7	6-183	**Comment:** For the post-closure performance, it is stated in Table 6.4.2-7 that: "Environmental monitoring around the WL site is required and will continue for the project" and "Environmental monitoring around the WL site will continue for the project." This seems to imply that environmental monitoring will extend beyond the institutional control portion of the post-closure period. However, these statements contradict monitoring commitments made in Section 3.5.4.2 Post-Closure Activities of the EIS where it is stated that: "during active institutional control, long-term performance monitoring…will continue through to 2124…the passive institutional control period includes passive controls such as access restrictions…and will continue through 2024 to 2324." **Expectation to Address Comment:** Provide clarification with respect to the statement that environmental monitoring around the WL site will continue.	**Incorporated:** The intent of the statement that *"environmental monitoring around the WL site will continue"* is that the current Environmental Assessment Follow-Up Program (CNL 2018) in place at the WL site will continue after WR-1 closure and will include monitoring of the Whiteshell Reactor Disposal Facility (WRDF) for the duration of institutional control period. This is further detailed in Section 11.1.1 of the Environmental Impact Statement (EIS; Golder 2022), that describes how WRDF will be integrated into the current program and which aspects will be monitored. Details of the proposed monitoring activities are provided in Table 11.1-1. During previous revisions of the EIS (Golder et al. 2017) it was indicated in Section 6.1.4.2.2, that the 300 year period is an assumed duration of institutional control during which access restrictions will be in place, and included Active and Passive Institutional Control phases. In the current revision of the EIS (Golder 2022), this was simplified into a single proposed 100 year Institutional Control period that will include ongoing monitoring, surveillance and access controls. 100 years was selected as the limit beyond which the In Situ Disposal (ISD) structure must be safe without reliance upon human intervention. During the 100-year period, the peak release rate and dose rate from those contaminants are also expected to have occurred. Sampling during institutional control will verify these short-term results or signal the need for intervention. Section 3.5.4.2 in the EIS (Golder 2022) has been revised to be Section 3.4.9.2. This section was updated to provide clarification that the post-closure phase has two separate periods: institutional control and post-institutional control. Institutional controls are requirements placed on the licensee by the CNSC for the long-term safety of a decommissioned facility. During institutional control, long-term monitoring and maintenance active will continue, under the Environmental Assessment Follow-Up Program (CNL 2018). As indicated in Sections 11.1 and 11.2 of the EIS (Golder 2022), the institutional control period is proposed to be 100 years, but it will continue until the CNSC decides institutional controls are no longer needed. Table 6.4.2-7 in the EIS (Golder 2022) has been renumbered to Table 6.4.2-8, and the statement quoted in the comment were clarified to state that environmental monitoring around the WL site will continue for the Project during the institutional control period, meaning that the WRDF project monitoring will be integrated within the overall WL site monitoring program for the duration of the institutional control period, as described in more detail in Section 11.1.1 of the EIS (Golder 2022). Adaptive management and active controls are further clarified in the text of Section 11.2 of the EIS (Golder 2022), revised as indicated below. **Change to EIS:** Table 6.4.2-8 in Section 6.4.2.6.2 was revised to state the following under the "Post-Closure Performance (Project-related)" Project Activity: *"Follow-up monitoring will be completed during institutional control to verify effect predictions and to provide information for use in adaptive management to address potential unforeseen effects."* Section 3.4.9.2 of the EIS was revised to include: *"The post-closure phase has two separate periods: institutional control and post-institutional control. Institutional controls are requirements placed on the licensee by the CNSC for the long-term safety of a decommissioned facility. During institutional control, long-term monitoring and maintenance active will continue. CNL operates an Environmental Assessment Follow-up Program at the WL site that will be revised to include activities to manage monitoring for the Project. It will reflect the priorities and requirements that are necessary to sufficiently assess the ongoing performance of the WRDF. Since the*

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						groundwater flow surrounding WRDF is downward toward the bedrock, contamination releases, if any, would be expected to also be driven deeper with the groundwater. As such, the monitoring program will focus on groundwater contamination, though other sampling methods may also be included such as short-term air monitoring or vegetation samples to confirm that the Environmental Assessment Follow-up Program is comprehensive and appropriate. *Institutional control will continue until the CNSC agrees that it is no longer needed. This is consistent with similar United States Department of Energy projects such as:* • *Feed Materials Production Center in Ohio;* • *Mound Plant in Ohio; and* • *Rocky Flats Plant in Colorado.* *For assessment purposes, a period of 100 years (from 2027 to 2127) of institutional control was selected. This timeframe is based on the results of the groundwater flow and solute transport model, and the expected quantities of contaminants within the WRDF over time. For prominent contaminants of concern, such as tritium (hydrogen-3) and cobalt-60, the total activity of these nuclides remaining in the WRDF after 100 years quickly decreases to zero (Figure 3.4.9-4). During the 100-year period, the peak release rate and dose rate from those contaminants are also expected to have occurred. Sampling during institutional control will verify these short-term results or signal the need for intervention.* *It is recognized that institutional control could extend for hundreds of years beyond 2127; however, to assess the effects of an institutional control failure, a duration had to be selected. The 100-year period is a reasonable duration for the failure assessment given the results of the groundwater flow and solute transport model. Post-institutional control phase is assumed to occur after the year 2127."* The following text was added to Section 11.1.1 of the EIS: *"In the discipline assessments undertaken in Section 6.0 (Environmental Effects) of the Environmental Impact Statement (EIS), CNL has proposed monitoring and follow-up activities to be undertaken during the closure and post-closure stages of the Project. The Environmental Assessment Follow-up activities presented in this section provides a preliminary description of the activities and the framework for monitoring proposed for the Project. Each of the discipline-specific assessments presented in Sections 6.2 Atmospheric Environment through 6.9 Socio-economic Environment of the EIS proposes conceptual monitoring to be undertaken by CNL during the closure phase and the post-closure phase (i.e., institutional control period) of the Project, which are summarized in Table 11.1-1 in this Section. The monitoring activities are defined by the relevant project phase, consisting of:* ***Closure Phase****: Preparation and implementation of in situ disposal (ISD) includes grouting of below-grade structures and systems, removal of above-grade Whiteshell Reactor 1 (WR-1) building structures and systems, installation of the concrete cap and engineered cover, and environmental controls and final site restoration. These activities last from 2022 to 2027. During the closure phase, CNL will be responsible for implementing the commitments made in the Environmental Assessment Follow-up Program.* ***Post-closure Phase:*** *The post-closure phase has two discrete periods: institutional control and post-institutional control. Institutional control is estimated to last 100 years during which long-term monitoring and maintenance activities will continue to demonstrate compliance with the safety case assumptions. Passive controls such as access restrictions (e.g., physical barriers/fencing, signage, and land title instruments/deed restrictions) will remain in place until the end of the institutional control period. Although the duration of institutional control is estimated at 100 years, it is recognized that it will continue until the CNSC, or the appropriate authority at the time, agrees it is no longer needed.* *Post-institutional control occurs after year 2127 and continues indefinitely. The post-closure phase will continue indefinitely; however, the timeframe defined for assessment of potential effects as part of the normal evolution of the Project is 10,000 years. This time period encompasses the phase in which peak effects are anticipated."* **References:** *CNL 2018. Environmental Assessment Follow-Up Program for Whiteshell Laboratories. WL-509246-STD-001. Revision 0. December 2018.* *Golder et al. 2017. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 1. September 2017.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

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94.	CNSC	D. Sauvé	EIS - Section 6.4.2.5.2.1 No Linkage Pathways	6-186	**Comment:** It is stated that wastewater from decommissioning activities will be directed to existing surface water management facilities such as storm drains and that wastewater may be directed to areas with enough distance from the river to provide adequate infiltration of wastewater. Have current facilities been assessed for an increased volume of wastewater and are they equipped to remove potential contaminants from decommissioning activities? **Expectation to Address Comment:** Please reference the assessment or provide information which supports the claim that existing surface water management facilities are adequately equipped to address the potential for increased wastewater created from decommissioning activities. Are the surface water management facilities equipped to adequately decontaminate decommissioning wastewater?	**Resolved As:** Section 6.4.2.5.2.1 of the Environmental Impact Statement (EIS; Golder 2022) has been renumbered as 6.4.2.6.2.1 and revised to remove reference to directing decommissioning wastewater to existing surface water management facilities. The surface water management facilities are not adequately able to decontaminate all of the wastewater expected to be created during decommissioning. Wastewater from decommissioning activities, including inside WR-1 building, is collected and tested, and based on the results, is directed either to a Low Level Liquid Waste (LLLW) Treatment System, , domestic drain, processed drain or ditch systems, or is sent for evaporation and/or solidification and disposal. This process follows the requirements in the document Management and Monitoring of Emissions (CNL 2018). Section 6.4.2.6.2.1 has been updated to include the following information: • Wastewater from decommissioning activities is collected and tested, and based on the results, is directed either to the waste treatment center, domestic drain, processed drain or ditch systems, or is sent for evaporation and/or solidification and disposal. • Existing surface water management systems at the WL site will remain in place to manage site runoff. **Change to EIS:** Section 6.4.2.5.2.1 has been renumbered as Section 6.4.2.6.2.1 and was updated to state: "*Currently, wastewater from decommissioning activities is collected and tested and based on the results, is directed either to the waste treatment center, domestic drain, processed drain or ditch systems, or is sent for evaporation and/or solidification and disposal. This process follows the requirements in CNL's Management and Monitoring of Emissions [CNL 2018]. Wastewater directed to the ground or ditch system only occurs when the wastewater is below levels of concern for all contaminants.* *During the closure phase, existing stormwater management systems at the WL Site will remain in place to manage site runoff from precipitation. For example, surface water runoff from the site is collected by storm sewers and is discharged to the Winnipeg River. Stormwater is routinely monitored to ensure that stormwater quality is normal.*" **References:** *CNL 2018. Management and Monitoring of Emissions. 900-509200-STD-009. Revision 0. March 2018.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
95.	CNSC	D. Sauvé	EIS - Section 6.4.2.5.2.1 No Linkage Pathways	6-186	**Comment:** Stating "that wastewater may be directed to areas with enough distance from the river to provide adequate infiltration" gives the impression that wastewater will be released directly to soil and groundwater which will be used to dilute wastewater before reaching the river. Section 4.2.1 of REGDOC-2.9.1 states that "BATEA assessments of pollution prevention and control technologies for releases are necessary only where effects exceed or may exceed those identified in the ERA". However, upon review of the ERA the pathway of releasing wastewater to the ground does not seem to be assessed, therefore it is impossible to determine the risk associated with releasing wastewater to soil. **Expectation to Address Comment:** Please provide additional details and assessment of risk on the wastewater management strategy of directing wastewater to areas with enough distance from the river to provide adequate infiltration.	**Resolved As:** The statement regarding "wastewater may be directed to areas with enough distance from the river to provide adequate infiltration." Has been removed from the Environmental Impact Statement (EIS; Golder 2022). Section 6.4.2.5.2.1 has been renumbered as 6.4.2.6.2.1 and revised to remove reference to directing decommissioning wastewater to existing surface water management facilities. The surface water management facilities are not adequately able to decontaminate all of the wastewater expected to be created during decommissioning. Wastewater from decommissioning activities, including inside WR-1 Building, is collected and tested, and based on the results, is directed either to a Low Level Liquid Waste (LLLW) Treatment System,, domestic drain, processed drain or ditch systems, or is sent for evaporation and/or solidification and disposal. This process follows the requirements in the document Management and Monitoring of Emissions (CNL 2018). Section 6.4.2.6.2.1 has been updated to include the following information: • Wastewater from decommissioning activities is collected and tested, and based on the results, is directed either to the waste treatment center, domestic drain, processed drain or ditch systems, or is sent for evaporation and/or solidification and disposal. • Existing surface water management systems at the WL site will remain in place to manage site runoff. **Change to EIS:** Section 6.4.2.5.2.1 has been renumbered as Section 6.4.2.6.2.1 and was updated to state: "*Currently, wastewater from decommissioning activities is collected and tested and based on the results, is directed either to the waste treatment center, domestic drain, processed drain or ditch systems, or is sent for evaporation and/or solidification and disposal. This process follows the requirements in*

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						CNL's Management and Monitoring of Emissions [CNL 2018]. Wastewater directed to the ground or ditch system only occurs when the wastewater is below levels of concern for all contaminants. *During the closure phase, existing stormwater management systems at the WL Site will remain in place to manage site runoff from precipitation. For example, surface water runoff from the site is collected by storm sewers and is discharged to the Winnipeg River. Stormwater is routinely monitored to ensure that stormwater quality is normal."* **References:** *CNL 2018. Management and Monitoring of Emissions. 900-509200-STD-009. Revision 0. March 2018.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
96.	CNSC	D. Sauvé	EIS - Section 6.4.2.6.2 Application Case Results	6-196	**Comment**: This section of the EIS indicates that: "The assessment considered maximum surface water concentration in accordance with CNSC (2013) REGDOC 2.9.1." **Action required:** REGDOC-2.9.1 was updated in 2017.Please update the reference in all applicable sections of the EIS to reflect this and ensure the above statement is still in accordance with the updated document.	**Incorporated:** The reference in the Environmental Impact Statement (EIS; Golder 2022) has been updated accordingly to REGDOC-2.9.1 (CNSC 2020), as per the latest update, and the statement was confirmed to be in accordance with the updated standard. **Change to EIS:** The reference to REGDOC-2.9.1 has been updated to "REGDOC-2.9.1 (CNSC 2020)" in all applicable sections of the EIS. **References**: *CNSC 2020. REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.2. September 2020. ISBN 978-0-660-06255-6.*
97.	ECCC		EIS - Table 6.4.2-12 Table 6.5.5-2	6-197 6-229	**Comment:** In the analysis of predicted effects on aquatic biota for any phase of the project, it is important to consider that releases from the WL site, whether via surface water or via groundwater, are subject to the *Fisheries Act* since Winnipeg River is a fisheries water in Canada in which several fish species with socio-economic (i.e., Walleye, Northern Pike, Lake Whitefish, etc.) and conservation (i.e., Lake Sturgeon, Carmine Shiner) value are found. The *Fisheries Act* does not have provisions for a dilution zone in its general prohibition against the deposit of a deleterious substance. Therefore, the water quality at the final point of control is the relevant regulatory information used to determine whether the deposit via the discharge is deleterious to fish. In Table 6.4.2-12, the maximum groundwater concentrations of radionuclides are given in the post-closure phase of the project. Then a dilution factor of 1:1,300,000 is applied for a near-field site and 1:69,000,000 is applied for the Farm A intake site. The predicted maximum concentrations occurred at vastly different time periods ranging from 68 years to 500,000 years. Table 6.5.5-2 show the predicted dose to aquatic biota where the doses to the three fish species are identical at 4.03x10-6 mGy/d. This conclusion of radiological dose seems to have been based on the predicted concentrations after dilution in the	**Resolved As:** The Environmental Risk Assessment (ERA; EcoMetrix 2021) was completed following N288.6 (CSA Group 2012), which requires assessment of exposure in the areas where receptors will be exposed. CNL recognizes that sessile organisms, such as benthic invertebrates may be more directly exposed to groundwater, if located at the point of discharge; therefore, it has been conservatively assumed that benthic invertebrates at the site are exposed to direct groundwater without any dilution (EcoMetrix 2021, Section 7.2.1 Exposure Points). The Winnipeg River is large and provides considerable dilution for the predicted groundwater inflow (Table 6.4.2-12 of the Environmental Impact Statement (EIS; Golder 2022)). Ecological receptors such as fish and aquatic plants in the post-closure period were assumed to be located where the groundwater seep enters the Winnipeg River. Although the Fisheries Act prohibits the discharge of deleterious substances, the Act includes provision for the authorization of discharges for certain industries (e.g., metal mine, pulp and paper mills). In these instances, allowance for mixing zones is considered appropriate under the condition that the discharge is not acutely lethal. This same concept is also seen in provincial regulation (e.g., provincial operating permits and approvals). In this assessment we have allowed for nearfield mixing of the groundwater that is released from the Whiteshell Reactor Disposal Facility (WRDF), as this provides a realistic assessment of aquatic organism exposure, and follows the intent of federal and provincial regulation (EcoMetrix 2021, Section 7.2.1 Exposure Points). Exposure and predicted dose in Table 6.5.6-2 in the EIS was determined based on the assumption that the maximum loadings to the river for each contaminant of potential concern (COPC) during the post-closure period (as shown in Table 6.4.2-13) occurs at the same time irrespective of when the peak occurs. This simplification is conservative as not all peaks occur at the same time point, but are effectively assumed to do so for purposes of the assessment. The trend for the total dose from all sources, including aquatic biota, to each exposed human receptor for the Normal Evolution scenario is shown in Figure 6.7.1-8 of the EIS. A graph representing the dose trend showing the key radionuclide dose contribution to total dose was added to complement this information in Figure 6.7.1-9 of the EIS. Considering the conservatism in summation of peak loadings irrespective of time in the groundwater model, it is reasonable to conclude that doses arising from the WRDF will not be harmful to the environment. **Change to EIS:** A graph representing the dose trend showing the key radionuclide dose contribution to total dose was added to complement Figure 6.7.1-9 of the EIS. Table 6.4.2-12 was renumbered as 6.4.2-13.

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					Winnipeg River. It is stated in the 1st paragraph on p.6-229 that: "the Ecological Risk Assessment utilized groundwater release rates and dispersion modeling to estimate radionuclide concentrations in surface water to calculate dose rates to aquatic biota". It is also not clear whether the maximum concentrations predicted in Table 6.4.2-12 was used or a particular year was chosen and all the corresponding radionuclide concentrations predicted for that year was used for the dose calculation. **Expectation to Address Comment:** It is recommended that in the calculation of predicted dose to radionuclides, the dose be based on the maximum concentrations of radionuclides in groundwater before dilution in the river. Clarify how the predicted dose calculations accounted for the range of time periods when each radionuclide might reach its maximum concentration in groundwater. Provide a dose trend graph showing the dose contribution from the radionuclides of concern over time to describe the post-closure dose trends at the final point of control (i.e., based on groundwater).	Table 6.5.5-2 was renumbered as 6.5.6-2. **References:** *CSA Group 2012. N288.6-12: Environmental Risk Assessment at Class 1 Nuclear Facilities and Uranium Mines and Mills.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
98.	ECCC		EIS - Table 6.4.2-12	6-197	**Comment:** C-14 is stated to be the largest contributor to dose in the post-closure phase, that it is globally high in background, and that it is also generated naturally in the atmosphere due to cosmic radiation. While these statements are true, it is not clear whether the background and natural generation of C-14 can be attributed to the maximum groundwater concentration predicted in Table 6.4.2-12. Section 3 of the TSD entitled *WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates*, shows that C-14 is an activation product resulting from the operation of WR-1 and that it may be found in the reactor core, the reactor biological shield and the helium and heavy water system. Section 7 also summarizes that at 1000 years after reactor shutdown, the predominant radionuclides include C-14. **Expectation to Address Comment:** Delineate the C-14 in the groundwater post-closure.	**Resolved As:** The [Whiteshell Reactor 1] WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates document (CNL 2020) provides a total estimate of the C-14 in the WR-1 core in Table 12 of the report. This C-14 content in WR-1 is generated via neutron activation near the reactor core. No naturally produced or background C-14 is included in this estimate. The solute transport model in the Groundwater Flow and Solute Transport Model Report (GWFSTMR; Golder 2021) assumes background water quality to be clean (i.e., no additional source of C-14 is considered external to WR-1), and the only C-14 included in the model was from the WR-1 source term, as provided in the WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates document. Simulation of C-14 migration through the groundwater flow path was completed assuming that all C-14 from within WR-1 is dissolved in the groundwater. All mass in the source area (grout) is instantly converted to dissolve phase and has an infinite solubility as described in Table 3-1 Working Assumptions and Mechanisms in the Groundwater Flow and Solute Transport Models (Golder 2021). **Change to EIS:** Table number 6.4.2-12 referenced in the original comment has been revised to Table 6.4.2-13 in the current Environmental Impact Statement (EIS; Golder 2022). Section 6.4.2.7.1.1 was revised as follows: *"The solute transport model assumes background water quality to be clean (i.e., no additional source of carbon-14 is considered external to WR-1). Simulation of carbon-14 migration through the groundwater flow path was completed assuming that all carbon-14 from within WR-1 is converted to dissolved phase carbon-14 in the groundwater. Details are provided in the Groundwater Flow and Solute Transport Modelling Report (Golder 2021)."* **References**: *CNL 2020. WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates. WLDP-26100-041-000. Revision 2. October 2020.* *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.*

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99.	ECCC		EIS - Section 6.4.2.8 Table 6.4.2-16	6-203 to 6-204	**Comment:** The proposed follow-up and monitoring program for surface water is presented in Section 6.4.2.8 of the EIS. The post-closure monitoring program will provide data on whether the mitigation measures implemented are sufficiently protective of the environment. However, additional details and rationale on the follow-up and monitoring program are needed, including: information on monitoring frequency, sampling schedule, and justification of sampling locations. Table 6.4.2.-16 includes the potential environmental effect of: "changes to surface water quality from the release of solutes into the groundwater as the grout and reactor components gradually deteriorate over time during the post-closure phase." The conceptual monitoring program proposes to monitor the quality of the water in the Winnipeg River to evaluate whether the quality of the water is being affected by the in-situ decommissioning of the reactor facility. The closest proposed water quality monitoring station to the facility is 2 km downstream of the site boundary. Given that CNL acknowledges that the most likely pathway for surface contamination is discharge of contaminated groundwater, a water quality sampling location in the immediate receiving environment, as informed by the groundwater model, would be required to detect/quantify whether groundwater discharge is causing an impact to surface water quality. In addition, the monitoring plan proposes no sampling schedule, or monitoring frequency for the water quality monitoring in the Winnipeg River. **Expectation to Address Comment:** Provide an updated water quality monitoring program that includes a near-field sampling location in the immediate receiving environment that is capable of detecting potential contaminated groundwater inputs into the Winnipeg River. Provide details on the monitoring frequency and sampling schedule for the water quality monitoring program.	**Incorporated:** As per CNSC REGDOC 2.9.1 Appendix B 3.10 (CNSC 2020), "Paragraph 19(1)(e) of CEAA 2012 states that the EIS [Environmental Impact Statement] shall include a framework or preliminary program upon which EA [Environmental Assessment] follow up actions will be managed throughout the life of the project." The requested information is provided in Section 11.0 of the EIS (Golder 2022). Table 11.1-1 specifically has been revised to include additional requested details of the monitoring program objectives, suggested duration and frequency of monitoring, suggested implementation program, and triggers for further action for each Valued Component (VC), including groundwater (Hydrogeology). This table constitutes the preliminary program and framework upon which the final WR-1 Monitoring and Surveillance Plan will be based and integrated into the existing WL Environmental Assessment Follow-up Program (EAFP). The final EAFP will incorporate appropriate feedback from the CNSC and the public and be submitted to the CNSC for acceptance. Specific to the request for near-field sampling location, the proposed monitoring program will include a number of groundwater sampling wells near the Whiteshell Reactor Disposal Facility (WRDF) to confirm the WRDF performance, and that the changes to groundwater compositions are in line with the model predictions. This will allow CNL to monitor and assess any releases long before they enter the river water, due to slow movement of the groundwater. Remedial actions can be implemented if deviations from model predictions are observed, as outlined in Section 11.2 of the EIS: "*If the Environmental Assessment Follow-up Program for the Project identifies that adverse environmental effects are greater than predicted or results for any monitored contaminants of potential concern are above the established limits, then CNL will investigate the results, which may include additional sampling and analysis to help determine/confirm the source and extent of the contamination. CNL would also 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, with engagement with First Nations and the Manitoba Métis Federation for openness and transparency. Any proposals on modifications to the monitoring program will be communicated to the CNSC. Where the need for revised mitigations is identified, they will be developed and implemented on a case-by-case basis by CNL staff, and may include soil removal and/or treatment of groundwater. As part of the Environmental Assessment Follow-up Program for the Project, CNL will prepare remedial action plans for responses to unexpected results as per the Environmental Protection Program Incident Reporting, Investigation and Mitigation [CNL 2018]. This will ensure that remedial actions can be executed in a timely manner.*" As stated in Section 11.1.1 of the EIS, CNL will engage local municipal governments and regulators such as the Province of Manitoba, Fisheries and Oceans and Environment and Climate Change Canada, the CNSC, and the engaged First Nations and the Red River Métis in the review of the follow-up monitoring program. This will including consideration of additional monitoring locations where appropriate. **Change to EIS:** Section 6.4.2.8 was renumbered as Section 6.4.2.9. Table 11.1-1 of the EIS has been updated. Example text included in the table for the Hydrogeology VC is as follows: *EIS Section:* *Section 6.3 Geological and Hydrogeological Environment* *Valued Component:* *Hydrogeology* *Project Phase, Potential Effect and Conceptual Monitoring Program:* ***<u>Potential Source(s) of Effects:</u>*** • *Changes to groundwater quality from the release of solutes into the groundwater as the grout and reactor components gradually deteriorate during post-closure phases.* ***<u>Proposed Monitoring:</u>*** • *Water elevation measurements to determine groundwater flow direction and gradients.* • *Sampling to confirm groundwater quality to detect potential releases of constituents from the WRDF.* • *Initial sampling frequency will likely be twice per year (spring and fall).*

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						Trigger for Further Action: • *If groundwater parameters above applicable guidelines or upgradient groundwater, conduct soil and/or sediment sampling and analysis for contaminants of concern.* • *If significant unexpected changes to groundwater flow, employ geophysical methods to confirm integrity of the concrete cap and engineered barrier.* *Monitoring Program Objective* • *Verify effects predictions on groundwater from the Project.* • *Verify the effectiveness of mitigation.* • *Demonstrate compliance with regulatory requirements.* *Suggested Duration:* *Groundwater monitoring will continue through closure and post-closure. Semi-annual water level measurement and water quality measurements will be completed; however, the frequency of recurrence of water sampling will be reviewed based on performance data. The number and location of wells, and parameters measured, may change based on an annual review of the data.* *Implementing Program:* *Project groundwater monitoring will be integrated into the overall CNL WL Groundwater Monitoring Program and will be compliant with CSA N288.7-15: Groundwater Protection Programs at Class 1 Nuclear Facilities and Uranium Mines and Mills (CSA Group 2015).* **References**: *CNSC 2020. REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.2. September 2020. ISBN 978-0-660-06255-6.* *CSA Group 2015. N288.7-15: Groundwater Protection Programs at Class I Nuclear Facilities and Uranium Mines and Mills.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
100.	ECCC		EIS - Table 6.4.2-16	6-204	**Comment:** Table 6.4.2-16 indicates that: “the number of parameters and locations of sampling may change based on annual review of monitoring data.” However, no detail on this proposal for changes to the water quality sampling program is provided in the EIS. **Expectation to Address Comment:** Describe the circumstances and criteria that would be required to alter the water quality monitoring program (i.e., sampling locations, sampling frequencies, and/or parameters).	**Incorporated:** Clarification of circumstances and criteria that would require altering the water quality monitoring program is provided in Section 6.4.2.9: *“It is noted that data generated by the monitoring program will be evaluated on an ongoing basis within an adaptive management framework. Within this framework, modifications to the program may be appropriate to confirm data continue to fulfill program objectives. For example, should a contaminant of potential concern reach concentrations outside the range predicted in the EIS or Decommissioning Safety Assessment Report, including the findings from the Ecological Risk Assessment, the frequency of sampling may be increased and additional locations may be sampled to investigate the source of the increased concentrations. Conversely, cessation of a monitoring activity might be appropriate once it has been shown that an effect has stabilized or has been reduced to a level where it is no longer considered significant with respect to regulatory requirements or community concerns. Any proposals for modifications to the monitoring program and the rationale for the modifications will be communicated to the CNSC prior to implementation. Additional information on the Environmental Assessment Follow-up Program for the Project can be found in Section 11.0 Summary of Monitoring and Follow-up Programs.”* Table 6.4.2-16 has been renumbered as Table 6.4.2-17 and the Duration column was revised for clarity to state: • *Surface water and ditch system water will be sampled on a semi-annual basis at one upstream and two downstream locations. Frequency of recurrence will be assessed based on performance data.* • *Water quality monitoring will continue through closure phase and post-closure phase (i.e., during institutional control).* Adaptive Management of the monitoring program through the life of the project (closure and post-closure phases) is specifically covered in EIS Section 11.2 (Adaptive Management), which states that: *“Environmental monitoring of the entire WL site will continue as part of the Environmental Assessment Follow-up Program for the WL site. For the Environmental Assessment Follow-up Program for the Project, CNL will determine the initial monitoring locations and frequency of sampling based on the*

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						EIS, the WR-1 Environmental Risk Assessment and the Decommissioning Safety Assessment Report. The monitoring data will be assessed against established limits for concentrations of contaminants of potential concern. These concentration limits are well below established benchmarks for the protection of humans and the environment. *If the Environmental Assessment Follow-up Program for the Project identifies that adverse environmental effects are greater than predicted or results for any monitored contaminants of potential concern are above the established limits, then CNL will investigate the results, which may include additional sampling and analysis to help determine/confirm the source and extent of the contamination. CNL would also 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, with engagement with First Nations and the Manitoba Métis Federation for openness and transparency. Any proposals on modifications to the monitoring program will be communicated to the CNSC. Where the need for revised mitigations is identified, they will be developed and implemented on a case-by-case basis by CNL staff, and may include soil removal and/or treatment of groundwater. As part of the Environmental Assessment Follow-up Program for the Project, CNL will prepare remedial action plans for responses to unexpected results as per the Environmental Protection Program Incident Reporting, Investigation and Mitigation (CNL 2018c). This will ensure that remedial actions can be executed in a timely manner."* And "*Institutional controls are proposed to be in place for at least 100 years post closure, and the continuation of these controls would be based on regulatory input. Stopping a monitoring activity would occur once it can be shown that an effect has stabilized or has been reduced to a level where it is no longer considered significant by regulatory requirements or community concerns. Any proposals on modifications to the monitoring program will be communicated to the CNSC."* **Change to EIS:** Table 6.4.2-16 was renumbered as Table 6.4.2-17. Section 11.2, as quoted above, was revised with an updated description of how adaptive management of the environmental monitoring program will be carried out to reflect the evolving needs of the project, monitoring results, feedback from the Regulator, Indigenous Nations, or municipal governments. Table 11.1-1 of the EIS has been revised to include additional requested details of the monitoring program objectives, suggested duration and frequency of monitoring, suggested implementation program, and triggers for further action for each Valued Component, including surface water quality. This table constitutes the preliminary program and framework upon which the final Environmental Assessment Follow-up Program (EAFP) will be based. The final EAFP will incorporate appropriate feedback from the CNSC, local municipal government and Indigenous Nations and will be submitted to the CNSC for acceptance. Example text included in the table for the Surface Water Quality Valued Component is as follows: *EIS Section:* *6.4 Surface Water Environment* *Valued Component:* *Surface Water Quality* *Project Phase, Potential Effect and Conceptual Monitoring Program:* ***Potential Source(s) of Effects:*** • *Changes to surface water quality from the release of solutes into the groundwater as the grout and reactor components gradually deteriorate over time during the post-closure phases.* ***Proposed Monitoring:*** • *Monitor the quality of water in the Winnipeg River to evaluate whether the quality of the water is affected by the WRDF* [Whiteshell Reactor Disposal Facility]. • *Monitor the quality of water in on-site ditches to verify the hydrogeological model.* ***Trigger for Further Action:*** • *Investigation (e.g., sediment analyses) if parameters above predictions, applicable guidelines, or indication of poor maintenance.* • *Monitoring required for any unique events such as spills.*

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						Monitoring Program Objective • *Verify effects predictions related to surface water quality.* • *Demonstrate compliance with regulatory requirements.* *Suggested Duration:* • *Surface water and ditch system water will be sampled on a semi-annual basis at one upstream and two downstream locations. Frequency of recurrence will be assessed based on performance data.* • *Water quality monitoring will continue through closure phase and post-closure phase (i.e., during institutional control).* *Implementing Program:* • *Surface water monitoring in the receiving environment is already completed through CNL's WL Environmental Monitoring Program, which is compliant with CSA N288.4-10: Environmental Monitoring Programs at Class 1 Nuclear Facilities and Uranium Mines and Mills (CSA Group 2010). No new surface water quality monitoring is proposed for the Project.* **References:** *CNL. 2018. Environmental Incident Reporting, Investigation and Mitigation. 900-509200-STD-005. Revision 0.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
101.	ECCC		EIS - Table 6.4.2-13 Table 6.5.5-2	6-198 6-229	**Comment:** In the analysis of predicted effects on aquatic biota for any phase of the project, it is important to consider that releases from the WL site, whether via surface water or via groundwater, are subject to the *Fisheries Act* since Winnipeg River is a fisheries water in Canada in which several fish species with socio-economic (i.e., Walleye, Northern Pike, Lake Whitefish, etc.) and conservation (i.e., Lake Sturgeon, Carmine Shiner) value are found. The *Fisheries Act* does not have provisions for a dilution zone in its general prohibition against the deposit of a deleterious substance. Therefore, the water quality at the final point of control is the relevant regulatory information used to determine whether the deposit via the discharge is deleterious to fish. In Table 6.4.2-13, the maximum groundwater concentrations of non-radiological contaminants are presented with the predicted surface water concentrations at a near-field site and Farm A intake site which seems to have been calculated with a dilution factor similar to that applied for radionuclides. Several constituents in groundwater exceed aquatic toxicology benchmarks including cadmium, HB-40, lead and xylene. Additionally, there seems to be no consideration of PCBs given in the ERA or in the surface water quality assessment. CNL has made it clear that the ISD being proposed for the WR-1 includes the concurrent in situ burial of PCBs. **Expectation to Address Comment:** Include in the ERA the maximum groundwater concentrations predicted for the non-radiological contaminants and PCBs in the	**Resolved As**: The Environmental Risk Assessment (ERA; EcoMetrix 2021) was completed following CSA Standard N288.6-12 (CSA Group 2012), which requires assessment of exposure in the areas where receptors will be exposed. CNL recognizes that sessile organisms at the point of groundwater discharge, such as benthic invertebrates, may be more directly exposed to groundwater with minimal dilution and adjusted the assessment to reflect this. The Winnipeg River is large and provides considerable dilution for the predicted groundwater inflow (Table 6.4.2-12 of the Environmental Impact Statement (EIS; Golder 2022)). Ecological receptors such as fish and aquatic plants in the post-closure period were assumed to be located where the groundwater seep enters the Winnipeg River. Although the Fisheries Act prohibits the discharge of deleterious substances, the Act includes provision for the authorization of discharges for certain industries (e.g., metal mine, pulp and paper mills). In these instances, allowance for mixing zones is considered appropriate under the condition that the discharge is not acutely lethal. This same concept is also seen in provincial regulation (e.g., provincial operating permits and approvals). In this assessment we have allowed for nearfield mixing of the groundwater that is released from the Whiteshell Reactor Disposal Facility (WRDF), as this provides a realistic assessment of aquatic organism exposure, and follows the intent of federal and provincial regulation (EcoMetrix 2021, Section 7.2.1 Exposure Points). **Change to ERA:** The adjusted assessment for sessile organisms can be found in the ERA in Tables 7-8, 7-17, 7-18 and 7-19. There is no pathway for direct exposure to groundwater under normal evolution conditions for most of the receptors, except for sessile organisms, which have now been included. Drinking of onsite groundwater is considered as a disruptive event scenario in Appendix D of the ERA, as it is an unlikely scenario due to low-permeability soil conditions surrounding the WRDF (Section 8.6.3 of the Decommissioning Safety Assessment Report (Golder 2021)). No polychlorinated biphenyls (PCBs) would be left in place above exemption quantities, thus they were not included in the assessment. The maximum non-radiological groundwater contaminant concentrations are provided in Tables 5-2 and 7-3 in the ERA for post-closure. **Change to EIS:** Table 6.4.2-13 has been renumbered as Table 6.4.2-14. Table 6.5.5-2 has been renumbered as Table 6.5.6-2. The adjusted assessment for sessile organisms can be found in the EIS Section 6.7 in Tables 6.7.2-10 and 6.7.2-11, and Section 6.5.6.2.2 in Table 6.5.6-2 (Golder 2022). Fish are more mobile and are exposed to river water in a nearfield area. **References**: *CSA Group 2012. N288.6-12: Environmental Risk Assessment at Class 1 Nuclear Facilities and Uranium Mines and Mills.*

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					groundwater predictions during the post-closure phase as well as what is expected to be released from all potential final points of control under the existing conditions and during the closure phase.	*EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
					6.5 Aquatic Environment	
102.	CNSC	H. Flynn	EIS - Figure 6.5.3-1	6-211	**Comment:** Change the color of the RSA boundary as it is very similar in color to the SSA (WR-1) and can be confusing visually.	**Incorporated:** The comment has been acknowledged and the colour of the Regional Study Area (RSA) has been changed to provide a contrast to the colour of the Site Study Area (SSA) boundary. **Change to EIS:** Figure 6.5.3-1 of the Environmental Impact Statement (Golder 2022) has been renumbered as 6.5.4-1 has been updated. The RSA boundary color has been changed to provide a contrast to the SSA boundary. **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
103.	ECCC		EIS - Section 6.5.4.2.3 Radioactivity in Fish	6-219	**Comment:** Lake Sturgeon is a long-lived species that feeds primarily on benthic organisms and therefore is likely to consume significant amounts of sediment. The radiation dose predictions to the Lake Sturgeon should be conservative since it is a *Species At Risk Act* (SARA) species. However, it is not clear whether the "double" dose of benthic organisms which would have accumulated radionuclides along with the direct ingestion of sediments and the associated radionuclides have been accounted for. Furthermore, since it has been documented that there are pockets of sediments that have elevated contaminants, these should also be taken into consideration to ensure that the predictions are conservative. **Expectation to Address Comment:** Include conservatism in the radiological dose calculation for the Lake Sturgeon. Consider worst case conditions for radiological contaminants including the ingestion of sediments with elevated radioactivity and benthic organisms that are also contaminated with radioactivity.	**Resolved As:** It is not a common environmental risk assessment practice to specifically assess uptake to fish through ingestion of food or sediment (ingestion model for sturgeon does not exist). Instead a bioaccumulation factor (BAF) is used to estimate uptake from all exposure pathways (i.e., ingestion of sediment and food items, uptake from water). This latter approach is specified in Canadian Standards Association (CSA) Standard N288.6-12 (CSA Group 2012) and was followed in the Environmental Risk Assessment (ERA; EcoMetrix 2021). A BAF implicitly represents all pathways to the receptor and represents an equilibrium value between a species and its uptake environment. These BAFs are appropriate because they account for both long and short lived species and their potential bioaccumulation. Existing sediment contamination resulting from historic operation of the Whiteshell Laboratories (WL) site have been taken into account in calculating the radiological dose to the aquatic biota using appropriate conservatism. As stated in the Environmental Impact Statement (EIS; Golder 2022) Section 6.5.6.2.2, following Table 6.5.6-2: "*The dominant contributor to the total dose is caesium-137 due to external exposure to sediment; however, the caesium-137 sediment concentrations are based on existing conditions and do not result from the source-term in the post-closure period*". Conservative values were used in the model, as stated in Section 5.2.6.1 of the ERA: "*The 90th percentile of Cs-137 sediment data from 2010 to 2018 was used (2019 data were not used as all data were below an elevated detection limit), from the nearfield at the outfall (location OFL) and from the farfield near Farm A (location K14), at 323 and 34 Bq/kg (dw), respectively.*" The existing Cs-137 levels in river sediment were used in the ERA to assess radiological dose to ecological receptors. The radiological dose to the Lake Sturgeon is presented in Section 7.4.1 (Risk Estimation for Radiological COPCs [contaminants of potential concern]) of the ERA and includes both the internal dose and the external dose. The dose calculation to the Lake Sturgeon includes conservatism as it takes into account both existing sediment impacts from Cs-137 as well as project-related impacts from all radionuclides. **Change to ERA:** The ERA was updated to include assessment of existing radionuclide concentrations in sediment. Section 5.2.6.1 (Radiological Exposure Concentrations and Doses) of the ERA was revised to include *"Sediment near the WL effluent outfall has elevated levels of Cs-137 due to historical discharge and fallout (AECL 2001a). Therefore, existing Cs-137 concentrations, based on routine monitoring at the WL site of river bottom sediments, were added into the model to represent the cumulative effects of Project inputs and existing conditions. The 90th percentile of Cs-137 sediment data from 2010 to 2018 was used (2019 data were not used as all data were below an elevated detection limit), from the nearfield at the outfall (location OFL) and from the farfield near Farm A (location K14), at 323 and 34 Bq/kg (dw), respectively."*

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						Change to EIS: No changes to the EIS are required. Section 6.5.4.2.3 has been renumbered as Section 6.5.5.2.3. **References:** *AECL 2001a. Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report Volume 1: Main Report. WLDP-03702-041-000. Revision 2. March 2001.* *CSA Group 2012. N288.6-12. Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
104.	CNSC	H. Flynn	EIS - Section 6.5.4.2.4 Benthic Macroinvertebra tes	6-221	**Comment:** This section provides some basic background information on benthic species in the RSA. Section 4.1 Environmental Risk Assessment of REGDOC- 2.9.1 describes the types of science-based information required to support decision-making and to prioritize the implementation of mitigation measures. It appears that several studies were undertaken in the past to assess benthic invertebrates in the area of the WL site. **Expectation to Address Comment:** It would be useful to present the results of these studies, including a summary list of identified species.	**Resolved As:** CNL updated the EIS Section 6.5.5.2.4 with more detail on the benthic species using information from the already referenced studies. Recent information on benthic invertebrates adjacent to the Whiteshell Laboratories (WL) site is limited. As indicated in Section 6.5.5.2.4 (Benthic Macroinvertebrates and Zooplankton) of the Environmental Impact Statement (EIS; Golder 2022), *"A 2000 study found caesium-137 levels in clam shells and soft tissues collected downstream of the WL outfall to be slightly elevated compared to upstream (Atomic Energy of Canada [AECL] 2001b). There was considerable variation in levels with slight trends to higher tissue concentrations nearer to the outfall and higher concentrations in larger (older) clams. The effect of exposure from radionuclides in sediments on aquatic biota was estimated in 2000 using clams (AECL 2001b). The doses for the 99th and 99.9th percentile scenarios were 0.0106 milligray per day (mGy/day) and 0.0465 mGy/day (AECL 2001a), a small fraction of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR 2011) benchmark of 9.6 mGy/day and the limit at which no effect on aquatic populations would be expected."* The study did not investigate the presence of, or impacts to, a range of other potential benthic invertebrate species. The Environmental Risk Assessment (ERA; EcoMetrix 2021) assesses dose to benthic invertebrates from project-related impacts as well as existing sediment impacts, and is described in more detail below. Considering the conservatism in the estimation of releases, and in the groundwater model and ERA, it is reasonable to conclude that doses arising from the Project will be protective of the environment. **Change to ERA:** The ERA was updated to include Caesium-137, the radionuclide associated with the historical discharges, measured in existing sediment to evaluate the potential effects to benthic invertebrates in the Winnipeg River. Section 5.2.6.1 (Radiological Exposure Concentrations and Doses) of the ERA indicates *"Sediment near the WL effluent outfall has elevated levels of Cs-137 due to historical discharge and fallout (AECL 2001a). Therefore, existing Cs-137 concentrations, based on routine monitoring at the WL site of river bottom sediments, were added into the model to represent the cumulative effects of Project inputs and existing conditions. The 90th percentile of Cs-137 sediment data from 2010 to 2018 was used (2019 data were not used as all data were below an elevated detection limit), from the nearfield at the outfall (location OFL) and from the farfield near Farm A (location K14), at 323 and 34 Bq/kg (dw), respectively."* The dose to benthic invertebrates during post-closure presented in Section 7.4.1 (Risk Estimation for Radiological COPCs [contaminants of potential concern]) of the ERA includes exposure to both existing sediment impacts as well as Project-related impacts. **Change to EIS:** Section 6.5.4.2.4 has been renumbered as Section 6.5.5.2.4. Table 6.4.7-2 was updated with sediment quality data for 2017, 2018, and 2019 years. Section 6.5.5.2.4 was revised to clarify which information about the benthic organisms came from which of the already referenced studies. Additional information on the benthic organism populations was provided as well, as follows: *"Benthic invertebrate studies were undertaken on the Winnipeg River in the vicinity of the WL site by AECL (1973). The abundance and total beta activity of benthic organisms were determined during 1966 and 1967 upstream and downstream of the liquid effluent outfall. Tubificid worms, chironomid larvae and mayfly (Hexagenia spp.) nymphs were the most abundant species among a total of 20 benthic taxa collected. The radioactivity concentration ratios (total beta activity of organism/total beta activity of water) of these species was approximately 2. The range of individual diversity indices (d) obtained during the study was 2.45 to 2.94, indicative of mesotrophic conditions.* *Wong et al. (1996) undertook studies downstream of the WL site near Pine Falls. Benthic invertebrates were collected in sediment dredge samples from the Winnipeg River, upstream and downstream of the Pine Falls pulp mill, and examined in order to assess the effects of mill effluent. Considerable organic*

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						enrichment was evident in sediments below the mill outfall based on ratios of organic carbon to total nitrogen. The zone below the outfall exhibited the highest density of invertebrates and the community was dominated by species noted to be tolerant to pollution. The benthic community below the outfall was comprised of 67% oligochaetes, 20% chironomids and 3% mayflies and caddisflies combined. In contrast, at upstream reference sites, oligochaetes comprised 18%, chironomids 23% and mayflies and caddisflies 44%. Visible deformities were evident in the mentum and mandibles of chironomids (Chironomus) collected below the outfall and the preponderance of deformities tended to decrease with increasing distance downstream of the mill. It was concluded that there was serious organic pollution along the south shore of the Winnipeg River for at least 2.5 km below the outfall. *The distribution of aquatic snails and their association with aquatic plants in nearby Whiteshell Provincial Park was documented by McKillop (1996).* *Most recently, Manitoba Hydro (2011) undertook multi-year studies associated with the Pointe du Bois Generating Station that is situated approximately 55 km upstream of the WL site (see Figure 6.5.5-1). At Pointe du Bois, 42 sediment-dwelling macroinvertebrate taxa were collected. The majority of these were found in shallow habitats where sediments predominantly consisted of clay. Sediments in deeper habitats generally consisted of sand. For the most part, non-biting midges (Chironomidae) numerically dominated total benthic invertebrate abundance. Worms (Olichochaeta), amphipods (Amphipoda), mayflies (Ephemeroptera) and pea clams (Sphaeriidae) also were also common in sediments (Manitoba Hydro 2011). Macroinvertebrates collected in drift traps consisted of 64 discrete taxa, 44 of which were from the Class Insecta. During all years and within all study reaches, amphipods (Hyalellidae) and mites (Hydrachnidae) numerically dominated the non-insect group of the macroinvertebrates; whereas mayflies (Ephemeridae), stoneflies (e), caddisflies (Hydropsychidae) and non-biting midges (Chironomidae) were the numerically dominant insect groups."* **References:** *AECL 1973. Occurrence, Radioactivity, and Diversity of Winnipeg River Benthic Organisms in the Vicinity of Whiteshell Nuclear Research Establishment. Atomic Energy of Canada Limited Report, AECL-4221.* *AECL 2001a. Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report Volume 1: Main Report. WLDP-03702-041-000. Revision 2. March 2001.* *AECL 2001b. Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report Volume 2: Appendices. WLDP-03702-041-000. Revision 2. March 2001.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006, Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Manitoba Hydro. 2011. Pointe du Bois Spillway Replacement Project EIS.* *McKillop B. 1996. Geographic and Environmental Distribution of Freshwater Gastropods in Manitoba, Canada. Manitoba Museum of Man and Nature Occasional Series, No. 1, April: 1-37. Winnipeg, Manitoba.* *UNSCEAR 2011. Sources and Effects of Ionizing Radiation. Volume II Scientific Annex E – Effects of Ionizing Radiation on Non-Human Biota. 221-313.* *Wong et al. 1996. Wong PL, Armstrong L, Bezte CL, Wilkinson P, Lockhart WL. 1996. Analysis of the Effects of the Pine Falls Pulp Mill on the Benthic Invertebrates in the Winnipeg River, Manitoba. Winnipeg MB: Environmental Science Co-op Ltd.*
105.	CNSC	H. Flynn	EIS - Section 6.5.4.2.5 Fish Habitat	6-222	**Comment:** This section provides some basic background information on fish species and fish habitat in the RSA. Section 4.1 Environmental Risk Assessment of REGDOC- 2.9.1 describes the types of science-based information required to support decision-making and to prioritize the implementation of mitigation measures. It appears that fish habitat is assumed and not documented here. **Expectation to Address Comment:** Additional description of fish habitat (potentially including habitat maps) would be useful for assessing potential impacts. Please provide a more robust description of fish and fish habitat.	**Resolved As**: There are no in-water works proposed or direct disturbance to fish habitat anticipated due to the Project, thus the assessment presented in Section 6.5 of the Environmental Impact Statement (EIS; Golder 2022) concluded there are no physical changes to the Winnipeg River and associated fish habitat anticipated due to Whiteshell Reactor 1 (WR-1) decommissioning. The effects to fish are limited to radionuclide and non-radionuclide exposure in water and sediments through groundwater discharges, which is assessed by the Environmental Risk Assessment (ERA; EcoMetrix 2021 Section 7.2). Information on fish species and fish habitat is limited to existing information; however, this information was sufficient to develop a sufficient ecological receptor profile for the ERA (EcoMetrix 2021). Details on the fish habitat and fish species are provided in Section 2.3.6 of the ERA, and each fish species forming part of the receptor profile is further described in Appendix A.2 of the ERA. There were no negative effects identified on the quality or quantity of fish indicator species or fish Species at Risks, or the water quality (Section 6.5.6.2.2 of the EIS). As such, no additional fish habitat studies were completed as there is no effect on fish health, population or habitat as a result of the Project. Section 6.5.5.2.5 (Fish Habitat) was updated with some information on physical attributes surrounding the Winnipeg River from the ERA Section 2.3.6 on Aquatic Habitat, including references to the studies used in the Comprehensive Study Report (AECL 2001).

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						Change to EIS: Section 6.5.4.2.5 has been renumbered as Section 6.5.5.2.5, and updated to state: *"Gullies and ravines are found along the Winnipeg River. These gullies and ravines provide ideal habitat for beavers (Castor canadensis) and result in beaver ponds on-site. These ponds, however, are drained after a few years. The site also contains two sewage lagoons that support aquatic plants and animals. Man-made ditches that carry water during spring run-off are also present on the WL site but are not likely to provide an ideal aquatic habitat for plants and animals because they are dry in the summer (AECL 2001).* *Spawning habitat for several species, including Lake Sturgeon, Carmine Shiner, Walleye, Smallmouth Bass and suckers occurs 7 to 8 km upstream of the WL site, associated with the rapids downstream of the Seven Sisters Generating Station and Whitemouth Falls (see Figure 6.5.5-1)."* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report Volume 1: Main Report. WLDP-03702-041-000. Revision 2. March 2001.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006, Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
106.	CNSC	H. Flynn	EIS - 6.5.5.2 Results Table 6.5.5-1	6-224	**Comment:** Please **clarify the "Pathway Assessment" of "No Linkage" for the closure activities.** Provide additional detail regarding the mitigation to be implemented that will prevent site runoff to the Winnipeg River during closure activities. **Section 4.1 Environmental Risk Assessment of REGDOC- 2.9.1 describes the types of science-based information required to support decision-making and to prioritize the implementation of mitigation measures.** Section 6.5.5.2.3 should be updated if changes are made to the pathways assessments in Table 6.5.5-1.	**Resolved As:** Site runoff from the Local Study Area (LSA) identified in the Environmental Impact Statement (EIS; Golder 2022) does not have a direct, unmitigated link to the Winnipeg River, as described in Section 6.5.6.2.1 of the EIS. Section 6.5.6.2.1 was revised to further clarify how water effluents from the project site are managed by CNL to prevent site activities from impacting the environment. **Change to EIS:** Revisions to the EIS have resulted in a change of section numbers. Section 6.5.5.2 of the EIS has been revised to Section 6.5.6.2.1 and has been updated with the additional information regarding the management of site runoff during closure as follows: *"Drainage from the LSA is to the Winnipeg River. During closure phase activities, specifically those that are demolition-related, there is the potential for the transport of site runoff to the aquatic environment in the Winnipeg River in the vicinity of the WL site. Unabated, this runoff could negatively affect the aquatic environment through indirect habitat degradation (e.g., increase in suspended solids levels in water, increase in metal concentrations in water, swamping of the benthic environment through the settling of solids) that could result in reductions in diversity and abundance of aquatic biota in the nearshore area.* *All wastewater generated at the LSA is managed in accordance with CNL's Management and Monitoring of Emissions [CNL 2018a] and is discharged in accordance with CNL's Acceptability Criteria for Routine and Non-Routine Discharge of Liquids at CNL sites (CNL 2021). Wastewater from radiological drains and building sumps in nuclear buildings is collected by the Low Level Liquid Waste [LLLW] treatment systems in the individual buildings, where it is sampled, tested and approved for release to the Winnipeg River via the outfall station. Wastewater from non-radiological drains and process drains is directed to the stormwater system where it flows out to the outfall. Groundwater collected in building sumps of non-nuclear buildings is discharged into the stormwater system to the outfall station. Rainwater collected by the building roofs, paved areas, roads, and stormwater catchments is collected by the stormwater system and is directed to the outfall station. Building sanitary sewer systems drain to the site lagoon that consists of two interconnected cells, allowing water to flow freely between them. Annually, the cells are isolated from each other, so that the effluent in the secondary cell can settle and waste broken down. The secondary cell is then sampled and tested to ensure effluent water is safe to permit discharging into the ditch system that leads to the Winnipeg River. Mixed wastewater at the outfall is sampled and tested regularly.* *Wastewater produced by decommissioning activities where potential radiological hazards exist, including excavation dewatering, is collected at the site in totes where it is sampled and tested to determine a discharge pathway. Wastewater is directed to the ground or ditch system only when the wastewater is tested to confirm that all contaminants are below concern levels. Where contaminants are above the release levels, the water is processed in the LLLW systems and then discharged to the river.* *As per Management of Land, Habitat and Wildlife (CNL 2018b), any work within 30 m of rivers, streams and lakes must have preventative measures and mitigation in place. Best management practices already exist and will be fully implemented. General provisions adopted for work at CNL sites in or near a watercourse incorporate appropriate sediment retention measures such as silt curtains and straw bales.*

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						It is also noted that closure phase activities will occur well away from the river and its riparian zone and therefore no direct habitat loss, either in terms of quality or quantity, will result. Consequently, this interaction was determined to have no effect on the maintenance of self-sustaining and ecologically effective fish populations, including species at risk." **References:** *CNL 2018a. Management and Monitoring of Emissions. 900-509200-STD-009. Revision 0. March 2018.* *CNL 2018b. Management of Land, Habitat and Wildlife. 900-509200-STD-006. Revision 0. April 2018.* *CNL 2021. Acceptability Criteria for Routine and Non-Routine Discharge of Liquids at Canadian Nuclear Laboratories Sites. 900-509200-MCP-005. Revision 1. February 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
107.	CNSC	H. Flynn	EIS - Section 6.5.5.2 Results Table 6.5.5-1	6-224	**Comment:** Please clarify that the "Pathway Assessment" for post-closure performance is appropriate for both the aquatic environment VCs and for the surface water quality VC as described in Table 6.4.2-7. Should post-closure performance be considered "primary" in both tables? Section 6.5.5.2.3 should be updated if changes are made to the pathways assessments in Table 6.5.5-1.	**Resolved As**: In Section 6.4.2, the valued component (VC) is surface water quality. During the post-closure phase groundwater will encounter materials from the reactor and migrate to the Winnipeg River. As such, the potential for groundwater seepage to the Winnipeg River is considered a primary pathway and carried forward to the residual effects analysis. In Section 6.5, the VC is fish and fish habitat; therefore, changes to surface water quality are considered using the results of the Environmental Risk Assessment (ERA; EcoMetrix 2021). Since the dose and risk to fish are well below regulatory limits, the pathway is considered to be secondary and is expected to have a negligible residual effect on fish and fish habitat. **Change to EIS:** Table 6.4.2-7 has been renumbered as Table 6.4.2-8. Section 6.5.5.2 has been renumbered as Section 6.5.6.2. **References:** *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006, Revision 5. December 2021.*
108.	CNSC	H. Flynn	EIS - Section 6.5.5.2.2 Secondary Pathways	6-227	**Comment:** "Installation of the engineered cover at the WR-1 building may alter drainage rates and flow patterns." Section 4.1 Environmental Risk Assessment of REGDOC-2.9.1 describes the types of science based information required to support decision-making and to prioritize the implementation of mitigation measures. What are the current rate, predicted rate and range of natural variation in flow patterns, rates and discharge volumes in the SSA? **Expectation to Address Comment:** Provide details of the drainage, current flow rates, patterns and discharge volumes to be compared with predicted rate and range of natural variation in drainage rates. A more comprehensive summary of existing hydrology data are needed to make an assessment of proposed changes in hydrology and assessment of proposed mitigation.	**Resolved As**: Hydrology results are assessed in Section 6.4.1 of the Environmental Impact Statement (EIS; Golder 2022). Conclusions on the effect of the engineered cover on the drainage and flow patterns of the river are supported given the footprint of the engineered cap is considered to be relatively small (approximately 30 m by 30 m, or 0.07 hectares (ha)) when taken into account the drainage area it resides within (e.g., the Local Study Area is 29 ha, and the overall Winnipeg River drainage area is 15,000,000 ha). The results of the hydrology assessment in Section 6.4.1.5.2.3 are: *"The peak runoff rate from the SSA [WR-1 Site Study Area] for a 1:25-year rainfall event is 0.012 m^3/s and, for a 1:100-year event, it is 0.014 m^3/s. The runoff volume generated by the [WR-1 Site Study Area] for a 1:25-year; 24-hour event is approximately 20 m^3 and for a 1:100-year event it is 25 m^3. Flow contribution to the Winnipeg River from the SSA [WR-1 Site Study Area] is four or five orders of magnitude smaller than the river average flow."* Therefore, the construction of the cap and cover could not affect the quantity of surface water in the Winnipeg River. Further, the natural variation of flow patterns in the Winnipeg River is a cumulative effect of its drainage basin, which outweigh the plausible flows from the engineered cover. As such, the changes in hydrology do not require a direct assessment of significance in the Aquatic Environment section. Based on the assessment carried out in Section 6.4.1.5.2.3, the pathway of ***"•Installation of concrete cap and engineered cover at the WR-1 Building may alter drainage rates and flow patterns"*** in Section 6.4.1.6.2.2 was deemed to correctly conclude to have a minor measurable change to the environment, but no real effect on the quantity or quality of fish habitat in the post-closure phase. To further mitigate any potential impacts on the Winnipeg River from site runoff, as part of the closure of the WL site, a storm water management plan will be developed using best management practices and taking into consideration the impact of the site's drainage following the demolition of the infrastructure (e.g., buildings, roads, catch basins, storm drainage system). Alternate drainage works (e.g., swales, ditches, culverts) along with aligning landscaping to the lines and grades to ensure proper drainage is achieved would be an output of this plan. Typically, the storm water will be directed to the Winnipeg River utilizing existing topography's drainage paths (creeks) to the greatest extent possible.The storm water management plan will evaluate:

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						• the post-closure topography applying the appropriate runoff coefficients; • the impacts due to the reduction/elimination of existing drainage works; • the rainfall event impacts on peak flow rates to the new drainage works; and • the integration of remedial drainage works with the existing drains and creeks. **Change to EIS:** Section 6.5.5.2.2 has been renumbered as Section 6.5.6.2.2, and the paragraph under the bullet (**•Installation of concrete cap and engineered cover at the WR-1 Building may alter drainage rates and flow patterns)** was revised to state: *"Although the installation of the concrete cap and engineered cover at the WR 1 Building is expected to slightly alter the drainage rates and flow patterns and discharge volume to the Winnipeg River; the changes are expected to be within the natural range of variation (Section 6.4.1.5.2.3). As such, changes to the hydrology from the installation of the cover at closure is predicted to have a negligible effect on the maintenance of self sustaining and ecologically effective fish populations, including species at risk."* **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
					6.7 Human and Ecological Health	
109.	CNSC	RPD	EIS - Section 6.7.1.6 Residual Effects Analysis	6-296	**Comment:** In Table 6.1.2-1 of the EIS, worker health is identified as a VC. The rationale is that: "Workers are potentially exposed to both radiological and non-radiological hazards." As per CNSC's *Generic EIS Guidelines*, the EIS must present baseline information in sufficient detail to enable the identification of how the project could affect the VCs and an analysis of those effects, including mitigation measures, cumulative effects, follow-up monitoring program elements, etc. CNL has not identified or included an analysis of effects on worker health as a result of the project, due to radiological hazards; the rationale provided being that "doses to workers will be monitored and managed as part of CNL's Radiation Protection Program..." This statement alone is insufficient to demonstrate that the effects of the project on worker health, due to radiological hazards, have been analyzed, along with the identification of mitigation measures, cumulative effects, and follow-up monitoring program elements, as required by CNSC's *Generic EIS Guidelines*. **Expectation to Address Comment:** Update the EIS to include the analysis of effects as a result of the project, due to radiological hazards, for the VC, worker health. Mitigation measures, cumulative effects, and follow-up monitoring program elements must also be identified as necessary, as a result of the analysis.	**Resolved As:** On-site workers not involved in performing Whiteshell Reactor 1 (WR-1) closure activities were identified as receptors for potential radiological and non-radiological hazardous material exposures from environmental emissions during in situ disposal (ISD) activities, and the results of residual effects analysis have been provided in Section 6.7.1.7.1.2 of the Environmental Impact Statement (EIS; Golder 2022). The predicted maximum doses to an on-site worker not involved in performing closure activities during the closure phase are provided in Table 6.7.1-10. The doses were 6.04×10^{-3} mSv/a during demolition and 1.80×10^{-4} mSv/a during grouting, which are well below regulatory limits and dose constraints. On-site workers directly performing ISD activities will be Nuclear Energy Workers, protected by the radiation protection program and health and safety program in place under the WL Decommissioning Licence. An assessment of the radiological hazards and risks to these workers performing closures activities, exposure mitigating measures and monitoring of worker doses is provided in Section 7.1.2.1.1 of the Decommissioning Safety Assessment Report (DSAR; Golder 2021). Therefore this worker group has not been considered as a receptor for the Human Health Risk Assessment (HHRA) in the EIS, consistent with Section 1.6 of CSA Standard N288.6-12 (CSA Group 2012). The DSAR is referenced in Section 6.7.1.7.1.1 as a source of information on workers directly involved in decommissioning activities and an assessment of their risk. **Change to EIS:** Section 6.7.1.6 has been renumbered as Section 6.7.1.7. Table 6.7.1-10 has been updated to provide the predicted average and maximum doses during demolition and grouting to an on-site worker not involved in performing closure activities during the closure phase. **References:** *CSA Group 2012. N288.6-12. Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills.* *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
110.	CNSC	RPD	EIS - Section 6.7.1.6 Residual Effects Analysis	6-296	**Comment:** This section of the EIS notes that: "Nuclear Energy Workers and workers who lease businesses on site are not addressed…because their	**Incorporated:** The Environmental Impact Statement (EIS; Golder 2022) has been updated to remove the term "tenants" and reflect the fact that there are no businesses and related staff/workers on the Whiteshell Laboratories site any longer; and there is no plan for that to occur again. All workers on site are CNL staff or

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					radiation exposure is monitored and their doses during closure are controlled through CNL's Radiation Protection Program. However, on-site workers are assessed for radiological exposure". **Expectation to Address Comment:** Please provide the following: clarify the statement above; it is unclear what is meant by the statement "However, on-site workers are assessed for radiological exposure"; clarify which workers will be leasing businesses on site, and; identify how these workers' doses will be monitored and controlled.	contractors to CNL and are trained according to the Radiation Protection Program (CNL 2021a) for the work they perform. Doses to those people are controlled through the CNL Radiation Protection Program. The two types of CNL workers at the WL site are the workers directly involved in the Whiteshell Reactor 1 (WR-1) decommissioning work, and other on-site workers not involved in the WR-1 decommissioning work. Both are described in Section 6.7.1.7.1.1 of the EIS: *"On-site workers performing ISD* [In Situ Disposal] *activities will be Nuclear Energy Workers. Doses to these workers will be monitored and managed as part of CNL's Radiation Protection Program [CNL 2021a] and Occupational Safety and Health Program [CNL 2021b] in place under the WL Decommissioning Licence (NRTEDL-W5-8.00/2024). The application of the Radiation Protection Program provides that exposures will be kept As Low As Reasonably Achievable (ALARA) and below the effective dose limit of 100 mSv over 5 years, and below 50 mSv in any single year, with human factors taken into account. An assessment of the radiological hazards and risks to workers performing closures activities, exposure mitigating measures and monitoring of worker doses is addressed in Section 7.1 of the DSAR (*Decommissioning Safety Assessment Report; *Golder 2021) for the Project. Therefore, this worker group has not been considered as a receptor for the [Human Health Risk Assessment] HHRA in the EIS, consistent with Section 1.6 of CSA N288.6-12: Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills (CSA Group 2012).* *Other on-site workers (also classified as Nuclear Energy Workers the same as above, and subject to the same protections) not involved in performing closure activities were identified as a receptor for potential radiological exposures from environmental emissions during in situ decommissioning activities. Doses for other workers on-site, not directly involved in decommissioning activities, are assessed in Section 4.0 in the ERA (*Environmental Risk Assessment; *EcoMetrix 2021) for the Project. Decommissioning work will be conducted in accordance with requirements of the CNL Occupational Safety and Health Program Manual and CNL Work Permit System. The foundation of the safeguards against industrial hazards is qualified staffing and the implementation of proven and approved procedures through a system that requires continual improvement."* **Change to EIS:** Section 6.7.1.6 has been renumbered as Section 6.7.1.7. Section 6.7.1.7 has been updated to provide clarifications regarding types of onsite workers as described above. **References:** *CNL 2021a. Radiation Protection Program Description Document. 900-508740-PDD-001. Revision 2. July 2021.* *CNL 2021b. Occupational Safety and Health Program Description Document. 900-510400-PDD-001. Revision 3. October 2021.* *CSA Group 2012. N288.6-12. Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills.* *Golder 2021. Decommissioning Safety Assessment Report for the WR-1 In Situ Decommissioning of Whiteshell Reactor 1 Project. WLDP-26000-SAR-001. Revision 4. December 2021.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
111.	CNSC	RPD	EIS - Section 6.7.1.6 Residual Effects Analysis	6-297	**Comment:** With respect to the selection of radiological COPCs, CNL states that they have considered radionuclides that have been found in Whiteshell's airborne effluent or are reasonably expected to be found in airborne effluent. No source is provided for how these reasonably likely radionuclides were determined. **Expectation to Address Comment:** Identify and provide a reference for the radiological COPCs considered in this section.	**Incorporated:** The Derived Release Limit (DRL) report (CNL 2018) was one of the documents considered in selecting radiological contaminants of potential concern (COPC). This report lists radionuclides known to be in airborne effluent or "reasonably likely" to be present and is the basis for the Integrated Monitoring Program (CNL 2020a) . There are 5 radionuclides that were not in the DRL report that were brought in from the Source Term Characterization Report (CNL 2020b); Ca-41, Cl-36, Eu-155, Ni-59 and Np-239. They are associated with the bio-shield, primary heat transport (PHT) system, or reactor core. Text has been added to Section 6.7.1.7.1.1, sub-heading 'Contaminants of Potential Concern' to indicate where the information came from: *"As noted in the ERA (EcoMetrix 2021), the radionuclides that are considered for the closure period are primarily those that have been identified in the DRL Report [CNL 2018] and the source term characterization report (CNL 2020b). These radionuclides have been found in WL's airborne effluent or are reasonably expected to be found in the airborne effluent during closure activities."*. **Change to EIS:** Section 6.7.1.6 has been renumbered as Section 6.7.1.7. The text in Section 6.7.1.7.1.1, subsection (Contaminants of Potential Concern) has been revised to include references to these specific sources.

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						References: *CNL 2018. Derived Release Limits for CNL's Whiteshell Laboratories. WL-509211-RRD-001. Revision 5. December 2018.* *CNL 2020a. Whiteshell Laboratories Integrated Monitoring Program Framework. WL-509200-OV-001. Revision 1. December 2020.* *CNL 2020b. WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates. WLDP-26100-041-000. Revision 2. October 2020.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*
112.	HC CNSC	N. Kwamena	EIS - Section 6.7.1.6 Residual Effects Analysis	6-297	**Comment:** Provide more detail on how IMPACT was verified and validated, as well as information about any sensitivity analyses that were conducted in relation to the human health risk assessment (HHRA). In addition, with respect to the selection of radiological COPCs, please provide further detail on the operational controls and procedures that will be put in place to limit the release of airborne effluents. **Expectation to Address Comment:** Please revise accordingly.	**Resolved As:** IMPACT™ was verified in accordance with the Tool Qualification Report (EcoMetrix 2015 in the Environmental Risk Assessment [ERA]). A summary of the validation has been included in Section 1.5 of the Environmental Risk Assessment (EcoMetrix 2021) where the software is described in more detail. Six distinct verification/validation activities were planned and completed, as follows: 1. Review of software theory to ensure that it is correct and appropriate to the codepurpose and objectives; 2. Review of source code to ensure the inclusion of all required equations (asdocumented in the Software Theory) in a manner free from error, allowance for all required parameters, and correctness of embedded parameters. 3. Review of code/interface performance to ensure the availability and correct implementation of all required program functions (as per specifications); 4. Review of the database to ensure agreement of database parameters with those specified in the DRL guidance. 5. Generation and comparison of model output with the results of independent calculations to ensure correct implementation of equations in the code, and correct input/output (I/O) functionality; and 6. Generation and comparison of model output with the measured concentrations of radionuclides in environmental media in case studies of radionuclide releases at actual nuclear facilities Sensitivity analyses were not completed for the ERA, but uncertainty in the source term during the closure phase was captured with modelling of Maximum and Average values, consistent with CSA Standard N288.6-12 (CSA Group 2012). Additional controls in place to limit the release of airborne effluents have been included. Mitigations and controls to limit airborne emissions are provided in Table 6.7.2-5 of the Environmental Impact Statement (EIS; Golder 2022), as well as in Table 6.2.1-10, and include: ○ Implementation of CNL's *Environmental Protection* (CNL 2021), *Management and Monitoring of Emissions* (CNL 2018), and the WL Open Air Demolition Technical Basis document (CNL 2020), which includes operational control monitoring, air verification monitoring and environmental monitoring. ○ Implementation of dust management techniques to control dust generated by the Project, consistent with the Environmental Assessment Follow-up Program for the WL site. ○ Use of contamination immobilization agents, containment, ventilation and High Efficiency Particulate Air (HEPA) filters to control generation of airborne emissions during decontamination or removal of contaminated systems or structures. ○ Use of dust suppression methods during building demolition or soil remediation activities to control airborne emissions and nuisance dust during building demolition or soil remediation. Methods may include: ○ wetting techniques during demolition to limit mobility of dust; ○ wind restrictions during demolition to stop work or apply wetting techniques; and ○ hydro seeding during backfilling and landscaping to reduce soil erosion. ○ Road watering and chemical dust suppressant when necessary. Dust suppressant is already used annually at the site for select unpaved roads. ○ Removal of accumulations of particulates (e.g., dirt) on road as soon as possible. ○ On-site vehicles and equipment engines will meet Tier 3 emission standards, where possible, and be maintained in good working order. ○ Limit idling of vehicles on-site and speed on roads.

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						○ Use of tarps or 3 sided enclosures for raw material storage. **Change to EIS:** Section 6.7.1.6 has been renumbered as Section 6.7.1.7. No changes have been made to the EIS. **References:** *CNL 2018. Management and Monitoring of Emissions. 900-509200-STD-009. Revision 0. March 2018.* *CNL 2020. Whiteshell Laboratories Open-Air Demolition Technical Basis Document. WLDP-508740-TD-001. Revision 0. July 2020.CNL 2021. Environmental Protection. 900-509200-PDD-001. Revision 3. June 2021.* *CSA Group 2012. N288.6-12. Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills.* *EcoMetrix 2015. IMPACT™ 5.5.1 – Tool Qualification Report, Report to CANDU Owners Group. August 2015.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
113.	HC		EIS - Section 6.7.1.6 Residual Effects Analysis	6-297, 2nd paragraph	**Comment:** This paragraph of the EIS makes reference to "CSA N299.1-08: Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities". The correct number to reference for this CSA standard is CSA N288.1. **Expectation to Address Comment:** Please revise accordingly.	**Incorporated**: The Environmental Impact Statement (EIS; Golder 2022) has been revised accordingly to provide the correct reference. **Change to EIS:** Section 6.7.1.6 has been renumbered as Section 6.7.1.7. The reference has been updated in Section 6.7.1.7.1.1, and 6.7.2.7.1.1 of the EIS (Golder 2022) as follows: *"CSA N288.1-14: Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities" (CSA Group 2014)."* The reference has also been updated in all other sections of the EIS referencing the Canadian Standards Association N288.1-14 standard. **References:** *CSA Group 2014. N288.1-14: Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
114.	HC		EIS - Figure 6.7.1-3 Figure 6.7.1-4	6-300 6-301	Comment: The details and reference for the soil type used in the conceptual model for the HHRA is missing from this section of the EIS. **Expectation to Address Comment:** Provide details and a reference for the soil type that was used in the model for the Whiteshell area.	**Resolved As:** Description of the soil types in the area are provided in Table 6.3.1-6 (Baseline Soil Types and Substrates within the Local Study Area and Regional Study Area) of the Environmental Impact Statement (EIS; Golder 2022) based on information from the Manitoba Land Initiative (MLI 2013). The soil types shown in Table 6.3.1-6 of the EIS are consistent with the results from the WR-1 project-specific drilling program, monitoring well installation and the borehole logs documented in Section 3.2 (WL Main Campus Surficial Geology of the WR-1 Hydrogeological Study Report (Dillon 2018)). Both of these sources indicated predominately clay-based soils in the local study area. Further description of the soil characteristics is provided in Section 2.4 of the Geosynthesis for the WR-1 Environmental Impact Statement (CNL 2022). Section 2.3.4.1 (Surficial Geology) of the Environmental Risk Assessment (ERA; EcoMetrix 2021) describes the surficial geology at the site, indicating predominantly clay-based soils. Clay was used as the soil type in the ERA and in the Human Health Risk Assessment (HHRA) model implemented in IMPACT™. Canadian Standards Association (CSA) N288.1-14 (CSA Group 2014) provides specific recommended values for dry bulk density, erosion rate, and water content for different soil types. The recommended values for clay from CSA N288.1-14 were used in IMPACT™ and were provided in Appendix B (Exposure Factors Used in Calculations) of the ERA (EcoMetrix 2021).

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						Change to EIS: Notes to Table 6.7.1-9 Exposure Pathways for Receptors for Exposure to COPCs [Contaminants of Potential Concern] during Closure and Table 6.7.1-11: Exposure Pathways for Receptors for Potential Exposure to Radiological and Non-Radiological COPCs during Post--closure (Normal Evolution Scenario) were added that state *"Soil is considered to be clay as defined in the Hydrogeology Study Report (Dillon 2018)."* **Change to ERA:** Notes to Table 4-2 Complete Exposure Pathways for Receptors for Exposure to Radiological COPCs during Closure and Table 5-3 Complete Exposure Pathways for Receptors for Exposure to Radiological and Non-Radiological COPCs during Closure were added that state *"Soil is considered to be clay as defined in the Hydrogeology Study Report (Dillon 2018)."* **References:** *CNL 2022. Geosynthesis for WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. January 2022.* *CSA Group 2014. N288.1-14: Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities.* *Dillon 2018. WR-1 Hydrogeological Study Report. WLDP-26000-REPT-004. Revision 1. November 2018.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *MLI 2003. Soil Map Unit File by Municipality.*
115.	CNSC HC	RPD	EIS - Figure 6.7.1-3 Figure 6.7.1-4	6-300 6-301 (and all corresponding pathway models)	**Comment:** Several pathways identified in CSA N288.1 have not been considered in the conceptual model, including: transfer from the soil surface to the atmosphere transfer from surface water to aquatic animals, aquatic plants, and sediment transfer from aquatic animals to a harvester (i.e., a fisherman) transfer from air to surface water. **Expectation to Address Comment:** Include or justify not including the pathways identified above in the model and update this section of the EIS accordingly.	**Incorporated:** Figures 6.7.1-3 and 6.7.1-4 in Section 6.7.1.7.1.1 of the Environmental Impact Statement (EIS; Golder 2022) deal with releases during the Closure phase of the project. As described in Section 6.7.1.7.1.1 of the EIS, subheading "Exposure Pathways", soil to atmosphere is not considered in Canadian Standards Association (CSA) Standard N288.1 for atmospheric releases (CSA Group 2014) because transfer is predominately in the other direction (i.e., atmosphere to soil). In addition, the atmosphere is never corrected for losses to soil, so the atmospheric model is considered to be conservative. Therefore, the soil to atmosphere pathway was not included in the assessment for the closure phase. During the closure phase, releases to surface water are not expected, because water effluent from the Whiteshell Reactor 1 (WR-1) Building prior to grouting will be managed as per the current controls. Any release from the grouted Whiteshell Reactor Disposal Facility (WRDF) would occur after closure, and contaminant transport via groundwater to surface water would take additional time. Therefore, the Closure phase scenario considers atmospheric deposition only. This includes deposition to the soil and surface water (via a small pond) and transfer to groundwater (via infiltration through the soil), where transfer to aquatic biota, plants and subsequent human receptors is not likely. Transfer from air to a larger body of surface water (e.g., Winnipeg River) and from surface water to aquatic animals, aquatic plants or sediments, and subsequent transfer to human harvesters was not modelled, as transfer from the atmosphere to large bodies of water (including lakes or rivers) is considered negligible as per CANDU Owners Group Derived Release Limits (COG DRL; COG 2013). Section 6.7.1.7.2 of the EIS deals with releases during the Post-Closure Phase of the project. As described in Section 6.7.1.7.2.1 Methods, subsection "Exposure Pathways", the post-closure phase is not expected to result in airborne effluent, as the grouting will have been completed, the above-grade building will have been completely decommissioned and a concrete cap and engineered soil cover will have been installed over the WRDF. However, for volatile radionuclides (HTO, C-14, I-129), receptors will be exposed via the air pathway (inhalation and immersion) through volatilization from irrigated soil. During the post-closure phase, groundwater releases to surface water is the only likely pathway. Aquatic dispersion of the groundwater seep will carry contaminants to downstream locations on the Winnipeg River. Waterborne contaminants can be deposited in the sediment. River water and sediment will be the primary exposure media for the aquatic biota and humans. River water will also be used for irrigation. Therefore, exposure pathways were included in the post-closure assessment for the transfer from surface water to aquatic animals and plants and for the ingestion of surface water, groundwater and subsequent ingestion and immersion by humans of both surface waters and ingestion of aquatic biota.

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						Change to EIS: The following text was added to Section 6.7.1.7.1.1 Methods, subsection "Exposure Pathways": *"Atmospheric deposition to the Winnipeg River is considered negligible. This is consistent with the COG DRL guidance (COG 2013) which shows (assuming a modest flow rate for a lake of 0.1 m/s and an assumed water depth of 10 m) that the transfer of radionuclides from the atmosphere to large bodies of water (including lakes and rivers) is considered negligible. Rivers have larger flow rates than lakes; therefore, the conclusion for lakes that the atmospheric deposition pathway is negligible is applicable to rivers as well.* *In CSA N288.1-14 (CSA Group 2014) the release of radionuclides from surface soil to the atmosphere is considered negligible because transfer is predominately from the atmosphere to soil. This pathway was not included during closure for this reason."* **References:** *COG 2013. Derived Release Limits Guidance. COG-06-3090-R3-I. 2013-12.* *CSA Group 2014. N288.1-14: Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
116.	CNSC	RPD	EIS - Section 6.7.1.6, Residual Effects Analysis	6-304	**Comment:** CNL states that the predicted maximum dose to on-site worker during closure phase was 6.03×10^{-3} mSv/year during demolition and 1.21×10^{-5} mSv/y during grouting. No additional information has been provided in the EIS on which workers were considered as part of this dose assessment. Based on the TSD, *Decommissioning Safety Assessment Report*, it appears that this dose was calculated for an onsite receptor (e.g., personnel leasing office/business space on the WL site). **Expectation to Address Comment:** Provide additional context and supporting information within the EIS for the dose information provided for an on-site worker.	**Incorporated:** The Environmental Impact Statement (EIS; Golder 2022) Section 6.7.1.6 was renumbered as Section 6.7.1.7 and was updated to provide clarity regarding the on-site workers. The EIS has been updated to remove the term "tenants" and reflect the fact that there are no businesses and related staff/workers on the Whiteshell Laboratories site any longer; and there is no plan for that to occur again. All workers on site are CNL staff or contractors to CNL and are trained and monitored according to the Radiation Protection Program (CNL 2021a) for the work they perform. Doses to those people are controlled through the CNL Radiation Protection Program. The remaining on-site workers were assessed in two groups: 1. On-site workers not involved in performing closure activities were identified as a receptor for potential radiological exposures from environmental emissions during in situ disposal (ISD) activities. 2. Site workers performing Whiteshell Reactor 1 (WR-1) ISD activities will be Nuclear Energy Workers. They are protected by the Radiation Protection Program (CNL 2021a) and Health and Safety Program (CNL 2021b) in place under the WL Decommissioning Licence. An assessment of the radiological hazards and risks to these workers performing closures activities, exposure mitigating measures and monitoring of worker doses is provided in Section 7.1.2.1.1 of the Decommissioning Safety Assessment Report (DSAR; Golder 2021). Therefore this worker group has not been considered as a receptor for the Human Health Risk Assessment (HHRA) in the EIS, consistent with Section 1.6 of Canadian Standards Association (CSA) Standard N288.6-12 (CSA Group 2012). The DSAR is referenced in Section 6.7.1.7.1.1 as a source of information on workers directly involved in decommissioning activities and an assessment of their risk. **Changes to the EIS:** Section 6.7.1.7.1.1 *Receptor Selection and Characterization* was revised to clarify the two types of on-site workers: *"Radiological dose to workers at WR-1 may result from external exposure to radiation emitted from WR-1 during closure.* *On site workers performing ISD activities will be Nuclear Energy Workers. Doses to these workers will be monitored and managed as part of CNL's Radiation Protection Program and Occupational Safety and Health Program in place under the WL Decommissioning Licence (NRTEDL-W5-8.00/2024). The application of the Radiation Protection Program provides that exposures will be kept ALARA* [As Low As Reasonably Achievable] *and below the effective dose limit of 100 mSv over 5 years, and below 50 mSv in any single year, with human factors taken into account. An assessment of the radiological hazards and risks to workers performing closure activities, exposure mitigating measures and monitoring of worker doses is addressed in Section 7.1 of the DSAR (Golder 2021) for the Project. Therefore, this worker group has not been considered as a receptor for the HHRA in the EIS, consistent with Section 1.6 of CSA N288.6-12: Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills (CSA Group 2012).* *Other on-site workers (also classified as Nuclear Energy Workers the same as above, and subject to the same protections) not involved in performing closure activities were identified as a receptor for potential radiological exposures from environmental emissions during in situ decommissioning activities.*

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						Doses for other workers on site, not directly involved in decommissioning activities, are assessed in Section 4.0 in the ERA [Environmental Risk Assessment] *(EcoMetrix 2021) for the Project. Decommissioning work will be conducted in accordance with requirements of the CNL Occupational Safety and Health Program Manual and CNL Work Permit System. The foundation of the safeguards against industrial hazards is qualified staffing and the implementation of proven and approved procedures through a system that requires continual improvement."* Section 6.7.1.7.1.2 was revised to include the doses to other on-site workers not involved in closure activities in Table 6.7.1-10 (underlined):

Table 6.7.1-10: Summary of Total Dose during the Closure Phase Human Health Valued Components

Age Group / Exposure Scenario	Dose (mSv/a)	Percent of Dose Constraint	Percent of Public Dose Limit
Demolition			
Adult Harvester			
Demolition - Maximum	3.50×10^{-3}	1.40%	0.35%
Demolition - Average	9.19×10^{-4}	0.37%	0.09%
Child Harvester			
Demolition - Maximum	1.52×10^{-3}	0.61%	0.15%
Demolition - Average	4.00×10^{-4}	0.16%	0.04%
Infant Harvester			
Demolition - Maximum	6.66×10^{-4}	0.27%	0.07%
Demolition - Average	1.75×10^{-4}	0.07%	0.02%
Adult Farm F Resident			
Demolition - Maximum	3.46×10^{-3}	1.39%	0.35%
Demolition - Average	9.11×10^{-4}	0.36%	0.09%
Demolition			
Child (10-years old) Farm F Resident			
Demolition - Maximum	3.38×10^{-3}	1.35%	0.34%
Demolition - Average	8.89×10^{-4}	0.36%	0.09%
Infant (1-year old) Farm F Resident Cow's Milk			

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Demolition - Maximum	2.61×10^{-3}	1.04%	0.26%
Demolition - Average	6.86×10^{-4}	0.27%	0.07%
Infant (1-year old) Farm F Resident Formula Fed			
Demolition - Maximum	1.17×10^{-3}	0.47%	0.12%
Demolition - Average	3.07×10^{-4}	0.12%	0.03%
3-month Old Farm F Resident Nursing			
Demolition - Maximum	1.23×10^{-3}	0.49%	0.12%
Demolition - Average	3.23×10^{-4}	0.13%	0.03%
3-month Old Farm F Resident Formula Fed			
Demolition - Maximum	3.96×10^{-4}	0.16%	0.04%
Demolition - Average	1.04×10^{-4}	0.04%	0.01%
Demolition			
On-Site Worker			
Demolition - Maximum	6.04×10^{-3}	2.42%	0.60%
Demolition - Average	1.59×10^{-3}	0.64%	0.16%
Grouting			
Adult Harvester			
Grouting - Maximum	1.58×10^{-5}	<0.01%	<0.01%
Grouting – Average	8.82×10^{-6}	<0.01%	<0.01%
Child Harvester			
Grouting - Maximum	1.69×10^{-5}	<0.01%	<0.01%
Grouting – Average	9.40×10^{-6}	<0.01%	<0.01%
Infant Harvester			

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Grouting - Maximum	1.85×10^{-5}	<0.01%	<0.01%
Grouting – Average	1.04×10^{-6}	<0.01%	<0.01%
Adult Farm F Resident			
Grouting - Maximum	1.01×10^{-4}	0.04%	0.01%
Grouting – Average	5.69×10^{-5}	0.02%	<0.01%
Child (10-years old) Farm F Resident			
Grouting - Maximum	1.21×10^{-4}	0.05%	0.01%
Grouting – Average	6.79×10^{-5}	0.03%	<0.01%
Infant (1-year old) Farm F Resident Cow's Milk			
Grouting - Maximum	1.59×10^{-4}	0.06%	0.02%
Grouting – Average	8.88×10^{-5}	0.04%	<0.01%
Infant (1-year old) Farm F Resident Formula Fed			
Grouting - Maximum	1.23×10^{-4}	0.05%	0.01%
Grouting – Average	6.72×10^{-5}	0.03%	<0.01%
Grouting			
3-month Old Farm F Resident Nursing			
Grouting - Maximum	1.09×10^{-4}	0.04%	0.01%
Grouting – Average	6.30×10^{-5}	0.03%	<0.01%
3-month Old Farm F Resident Formula Fed			
Grouting - Maximum	8.91×10^{-5}	0.04%	<0.01%
Grouting – Average	4.89×10^{-5}	0.02%	<0.01%
Grouting			
On-Site Worker			

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						<table><tr><td>Grouting - Maximum</td><td>1.80 x 10⁻⁴</td><td>0.07%</td><td>0.02%</td></tr><tr><td>Grouting – Average</td><td>9.76 x 10⁻⁵</td><td>0.04%</td><td>0.01%</td></tr></table> **References:** *CNL 2021a. Radiation Protection Program Description Document. 900-508740-PDD-001. Revision 2. July 2021.* *CNL 2021b. Occupational Safety and Health Program Description Document. 900-510400-PDD-001. Revision 3. October 2021.* *CSA Group 2012. N288.6-12. Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
117.	HC		EIS - Section 6.7.1.6.2.2 Results	6-310, last paragraph	**Comment:** The following sentence in the EIS indicates [emphasis added]: "However, to assess the total radiation dose for each identified human receptor over the groundwater modelling timeframe, the modelling timeframe was split into five time windows based on **inspecting** the time of peak loading rates (0-60 years, 60-40,000 years, 40,000-175,000 years, 175,000 to 300,000, and 300,000 to 500,000 years)." The sentence uses the term "inspecting". Is it meant to indicate "expecting"? **Expectation to Address Comment:** Please revise accordingly.	**Incorporated:** The sentence regarding "five time windows" in Section 6.7.1.7.2.2 of the Environmental Impact Statement (EIS; Golder 2022) was removed as multiple time windows are no longer assessed and the text has been updated to indicate that as a conservative assumption, the maximum dose after a hypothetical Whiteshell Reactor Disposal Facility (WRDF) barrier failure was assessed at a single point in time, corresponding to the peak loading rate from groundwater to the Winnipeg River for each radionuclide. **Change to EIS:** Section 6.7.1.6.2.2 was renumbered as Section 6.7.1.7.2.2. The text in Section 6.7.1.7.2.2, sub-heading "Normal Evolution Scenario"has been revised as follows: *"The maximum dose was conservatively assessed at a single point in time, corresponding to the peak loading rate from groundwater to the Winnipeg River for each radionuclide. The total dose is presented in Table 6.7.1-13. However, to assess the total radiation dose for each identified human receptor over the groundwater modelling timeframe, a more realistic representation of predicted dose rate to human receptors over the post-closure phase from the Normal Evolution scenario is presented in Figure 6.7.1-8. The dose increases steadily with time, generally peaking around 1,000 years (due to contribution from carbon-14) after closure and is greatly reduced as time progresses. The exception is the 3-month old formula-fed infant where the dose peaks at the beginning of modelling and then again after 100,000 years. This is because the dose from tritium peaks towards the beginning of the modelling timeframe, and the dose from polonium-210 peaks after 100,000 years."* **References:** *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
118.	CNSC	RPD	EIS - Section 6.7.1.7 Prediction Confidence and Uncertainty	6-313	**Comment**: The EIS states that: "progeny-inclusive dose coefficients were developed for each radionuclide that has progeny expected to be at or above 10% of parent activity after 40 years of ingrowth". The EIS also indicates that: "this timeframe is used in CSA N288.1-14 for development of progeny-inclusive dose coefficients for sediment	**Incorporated:** The progeny-inclusive dose coefficients were calculated considering ingrowth of all the progeny in the decay chain. As per Canadian Standards Association (CSA) Standard N288.1-14 (CSA Group 2014), ingrowth was calculated over a 40-yr time frame for external Dose Conversion Factors (DCFs) for soil and sediment (Clause 4.3.7). While N288.1-14 does apply a progeny cut-off based on DCF-weighted activity (Clause 4.3.6), no cut-off was applied in generating new progeny-inclusive DCFs for the Environmental Risk Assessment (ERA; EcoMetrix 2021).

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					and soils exposure". However, this information was not found in CSA N288.1-14. **Expectation to Address Comment:** Provide a justification for the 10% progeny criterion or consider all progeny regardless of ingrowth percentage of parent activity.	**Change to EIS:** Section 6.7.1.7 was numbered as 6.7.1.8. Text has been revised accordingly in Section 6.7.1.8 to remove reference to the 10% threshold. Revised text is as follows: *"The IMPACT model was used to predict dose to identified human receptors during the closure and post-closure phases. The IMPACT model used is a steady state model; however, it includes time dependent equations to account for buildup in soil from irrigation, for all radionuclides released. It includes progeny buildup through use of progeny inclusive dose coefficients. Forty years of ingrowth was used to develop the progeny inclusive dose coefficients for each radionuclide, which is the timeframe is used in CSA N288.1-14 for development of progeny-inclusive dose coefficients for sediment and soil exposure. Exposure factors were based on best-available information from literature with preference for exposure factors identified in CSA N288.1-14. For parameters that did not have exposure factors in CSA N288.1-14, surrogate parameters were identified based on proximity in the periodic table, which is considered appropriate."* **References:** *CSA Group 2014. N288.1-14: Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*
119.	CNSC	H. Mulye	EIS - Section 6.7.2.2 Valued components	6-319	**Comment**: In the assessment of species at risk known to be present or potentially present at the Whiteshell site, a number of surrogate VC species were considered, although it is unclear what, if any, species-specific criteria were used in this selection/substitution. A surrogate receptor can be used to evaluate risk for a species at risk; however, the risk characterization must be cognisant of differences in the assessment endpoints (population vs. individual protection). Surrogate selection for species at risk may be done using published scientific literature [1][2] as well as other reliable sources such as the U.S. EPA [3] and the U.S. Fish and Wildlife Service [4]. **Expectation to Address Comment:** Please identify if any species-specific criteria were used in the selection of surrogate species for species at risk and provide supporting evidence to demonstration that the selection is based on available credible information that is scientifically defensible. **References:** [1] Weins, J.A., G.D. Hayward, R. S. Holthausen, and M.J. Wisdom (2008). Using surrogate species and groups for conservation planning and management. BioScience, 58 (3): 241-252. [2] Banks, J.E., A.S. Ackleh, and J.D. Stark (2010). The use of surrogate species in risk assessment: using life history data to safeguard against false negatives. Risk Analysis. 30 (2): 175-182. [3] Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones (1995). Use of surrogate species in assessing contaminant risk to endangered and threatened species. U.S. Environmental Protection Agency, Final Report – September, 1995. EPA/600/R-96/029. 78 pp. [4] Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke,	**Resolved As:** Habitat use and feeding habits were the primary selection criteria considered in selecting surrogate species, because species with similar habitats and feeding habits will reside in the same locations and receive similar exposures. Selection of surrogates favoured species that were known to be present at the WL site, but still represent all potential SARA listed species that could potentially be present in the area. Appendix A of the ERA provides a description of all species used as receptors in the assessment, including a description of what other species they are used as surrogates for. Specifically, American Robin, Loggerhead Shrike, Barn Swallow, Red Fox, Little Brown Myotis, Walleye, Horned Grebe were used as surrogates for various species at risk (as identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), the federal Species at Risk Act (SARA) or the Manitoba Endangered Species and Ecosystem Act (ESEA)) that have similar feeding habits and habitats. A full list of species at risk assessed directly or via surrogates is provided in Table 6-2 in Section 6.1.1.1 of the ERA. The assessment endpoint for species at risk is set an individual level, as stated in Section 6.1.2 of the ERA: *"the assessment endpoints for most VCs are at the population or community level. For Species at Risk the assessment endpoint is at the individual level. While exposure and risk estimates always pertain to individuals, for most VCs, when effects on individuals are predicted from contaminant levels in a certain location, further discussion of population or community effects (or lack thereof) is appropriate. For Species at Risk, it is considered that effects on even a few individuals represent an effect on the population."* When assessing the impacts to the receptors, the same dose benchmark was used for SARA and non-SARA species. CSA N288.6-12 does not identify the need to use different toxicity reference values when assessing SAR species. The difference between SARA and non-SARA species is in the interpretation of the results. If a dose to a SARA species exceeds the dose benchmark the results would be considered unacceptable and further investigation would be warranted since effects on even one individual for a SARA species would not be tolerated. If a dose to a non-SARA species exceeds the dose benchmark, then other considerations would be factored in to the overall conclusion such as spatial and temporal extent of exceedance, and the spatial extent of the population. A SARA-species is not more sensitive to radionuclides than a non-SARA species and therefore a different dose benchmark would not be warranted. The references provided by the CNSC discuss a variety of approaches that have been taken in evaluating surrogate species. It is clear from these papers that there is no standard approach. However, CNL took a logical approach to selection of surrogate species. This is explained in Sections 6.1.2 and 7.1.2 and in Tables 6-3 and 7-2 of the ERA. CNL reviewed the references provided by the CNSC in the original comment and determined the following: • Dwyer et al. (2005), based on EPA/600/R-96/029, evaluated the standard fish toxicity test species as surrogates for fish species at risk, in terms of their relative sensitivity to five chemicals. They found that the Rainbow Trout (surrogate) was as sensitive, or more sensitive, than species at risk, most of the time, based on LC50. This approach is difficult to apply in practice, since toxicity data for species at risk are generally lacking. • Banks et al. (2010) evaluated four fish species as surrogates for two species at risk, in terms of their life history parameters, and modelled population survival or extinction, given the same degree of toxic stress (reduced fecundity). They found that the model populations of surrogate species had the same modelled outcome as the species at risk under mild stress (10% loss of fecundity) and under significant stress (30% loss of fecundity), but

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					C.G. Ingersoll, J.L. Kunz, D.W. Whites, T. Augspurger, D.R. Mount, K. Hattala, and G.N. Neuderfer (2005). Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch. Environ. Contam. Toxicol, 48: 143-154.	sometimes different outcomes under intermediate levels of toxic stress. This approach is difficult to apply in practice because life history parameters are poorly known for species at risk and are usually not sufficient to support modelling of population outcomes. • Wiens et al. (2008) discusses various approaches to evaluating ecological similarity of species, as a basis for surrogate selection, in the context of conservation planning and management. The considerations are not relevant in the context of risk assessment, except insofar as a logical approach is advocated. **Change to EIS:** Section 6.7.2.2 was renumbered as 6.7.2.3. **References:** *Banks et al. 2010. The use of surrogate species in risk assessment: using life history data to safeguard against false negatives. Risk Analysis. 30 (2): 175-182.* *Dwyer et al. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch. Environ. Contam. Toxicol, 48: 143-154.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Wiens et al. 2008. Using surrogate species and groups for conservation planning and management. BioScience, 58 (3): 241-252.*
120.	ECCC		EIS - Figure 6.7.2-1 Environmental Risk Assessment, Figure 6.1	6-333 6.8	**Comment:** These identical figures have not included any aquatic species – waterfowl, fish, benthic invertebrates or aquatic vegetation. During the closure phase, it is described that site runoff will be managed by existing stormwater management system and dust generation during closure activities will be minimized with the implementation of dust suppression methods. However, there will likely continue to be some discharge through the various groundwater and surface water pathways to the river until such a time these pathways are closed. Furthermore, the existing conditions for the Aquatic Environment (Section 6.4 of the EIS) describe high concentrations of radionuclides in sediment near the outfall location identified as OFL in the river. Also, though Cs-137 is described to be at a low concentration downstream of the process sewer in Section 6.4.2.4.2.2 of the EIS, this implies that near the outfall the Cs-137 concentration is higher. Similarly, there are other radiological and conventional contaminants in the existing discharge points from the WR-1 and other components of the WL site that may have impact on the water quality of the Winnipeg River near the site. These existing pathways should be considered and represented in the ecological conceptual model. In addition to an ecological conceptual model for the closure and post-closure phases of the project, a model for the existing conditions should also be developed to use as a comparison for the later phases of the project. It follows that an ecological risk assessment for the existing conditions should be conducted at an equivalent level of detail as the closure and post-	**Resolved As:** During the Closure period, the only potential discharge will be to the atmospheric environment. As such, the aquatic environment was not considered in Figure 6.7.2-1 of the Environmental Impact Statement (EIS; Golder 2022). The ecological conceptual pathway model for the closure phase is further described in Section 4.1.3 Selection of Exposure Pathways of the Environmental Risk Assessment (ERA; EcoMetrix 2021) as per the CANDU Owners Group Derived Release Limits (COG DRL) guidance (COG 2013), which provides rationale for not modeling atmospheric deposition to large water bodies. A large water body is a lake or a river, as opposed to a small pond. The arguments in the COG DRL guidance rely on dilution driven by lake currents, with atmospheric deposition from a shoreline source. A modest flow rate of 0.1 m/s is assumed. Water depth of 10 m is assumed. It is noted that river flow rates are generally higher, and thus the conclusion for lakes that the atmospheric deposition pathway is negligible is also applied to rivers (COG 2013 [Page 405]). The ecological conceptual model that includes aquatic biota with linkages to existing sediment contamination resulting from previous discharges from the Whiteshell Laboratories (WL) site is provided in the Post-Closure assessment part of Section 6.7.2, specifically in Figure 6.7.2-3 of the EIS (Golder 2022). It is important to note that CNL is not excluding existing conditions and liquid discharges from other WL site operations from the assessment; rather these are already considered in the annual public dose calculations presented in the Annual Compliance Monitoring Report Whiteshell Laboratories Section 9.4.1.3 Liquid Effluents Monitoring (CNL 2020). The existing conditions of sediment and water were also addressed in the ERA Section 5.2.6.1 Radiological Exposure Concentrations and Doses (EcoMetrix 2021) and Section 6.4.2.5.2.2 Surface Water and Sediment Quality of the EIS (Golder 2022). The radiological dose predictions to human receptors included the inputs from the existing conditions including historical discharges to the river from the WL site, which are reported in Section 6.7.1.5.2 of the EIS. The radiological dose predictions to ecological receptors included inputs from existing sediment conditions, and are reported in Section 6.7.2.7.2. As stated in Section 6.7.2.7.2.1, subheading “Selection of Radiological COPCs”: *“The radionuclides that are considered in the ERA for the post-closure phase included those that have been historically been found in WL’s liquid effluent, are reasonably expected to be found in the grout and have the potential to migrate from groundwater to surface water during the post-closure phase (EcoMetrix 2021), or have been measured in river sediment.”* Discharges to the Winnipeg River are covered in Section 6.5.6.2.1 of the EIS (Golder 2022) that has been updated with the additional information regarding the management of site runoff during closure as follows: *“Drainage from the LSA* [Local Study Area] *is to the Winnipeg River. During closure phase activities, specifically those that are demolition-related, there is the potential for the transport of site runoff to the aquatic environment in the Winnipeg River in the vicinity of the WL site. Unabated, this runoff could negatively affect the aquatic environment through indirect habitat degradation (e.g., increase in suspended solids levels in water, increase in metal concentrations in water, swamping of the benthic environment through the settling of solids) that could result in reductions in diversity and abundance of aquatic biota in the nearshore area.* *All wastewater generated at the LSA is managed in accordance with CNL's Management and Monitoring of Emissions [CNL 2018] and is discharged in accordance with CNL’s Acceptability Criteria for Routine and Non-Routine Discharge of Liquids at CNL sites [CNL 2021]. Wastewater from radiological drains and building sumps in nuclear buildings is collected by the Low Level Liquid Waste (LLLW) treatment systems in the individual buildings, where it is*

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					closure phases. It is also unclear whether the OFL outfall is different from the process sewer outfall. **Expectation to Address Comment:** Develop the ecological conceptual model for the existing conditions that includes aquatic biota linkages to consider the influences of existing discharges to the Winnipeg River on the river's water quality. Also include aquatic biota including benthic invertebrates, benthic fish, aquatic plants and waterfowl in the closure phase ecological conceptual model. Conduct an ecological risk assessment based on the existing conditions and the existing conditions ecological conceptual model. The results of the existing conditions ERA should also be reported in the EIS. Clarify whether the OFL is a different outfall than the process sewer outfall.	*sampled, tested and approved for release to the Winnipeg River via the outfall station. Wastewater from non-radiological drains and process drains is directed to the stormwater system where it flows out to the outfall. Groundwater collected in building sumps of non-nuclear buildings is discharged into the stormwater system to the outfall station. Rainwater collected by the building roofs, paved areas, roads, and stormwater catchments is collected by the stormwater system and is directed to the outfall station. Building sanitary sewer systems drain to the site lagoon that consists of two interconnected cells, allowing water to flow freely between them. Annually, the cells are isolated from each other, so that the effluent in the secondary cell can settle and waste broken down. The secondary cell is then sampled and tested to ensure effluent water is safe to permit discharging into the ditch system that leads to the Winnipeg River. Mixed wastewater at the outfall is sampled and tested regularly."* The Outfall Location (OFL) is the same discharge station as WL process water outfall to the Winnipeg River, Figure 2: Effluent Monitoring Locations (CNL 2020). It discharges all liquid effluent from the site (waste treatment, process water, storm water) except domestic sewer effluent. The domestic sewer outfall directs domestic water to the lagoon. **References:** *CNL 2018. Management and Monitoring of Emissions. 900-509200-STD-009. Revision 0. March 2018.* *CNL 2021. Acceptability Criteria for Routine and Non-Routine Discharge of Liquids at Canadian Nuclear Laboratories Sites. 900-509200-STD-017. Revision 1. February 2021.* *CNL 2020. Whiteshell Laboratories Annual Compliance Monitoring Report for 2019 Under Licence NRTEDL-W5-8.00/2024. WL-514300-ACMR-2019. Revision 0. April 2020.* *COG 2013. Derived Release Limits Guidance. COG-06-3090-R3-I. 2013-12.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
121.	ECCC		EIS - Figure 6.7.2-3 Environmental Risk Assessment, Figure 7.2	6-339 7.10	**Comment:** These identical figures have not included a terrestrial predator (Red Fox) or a terrestrial prey (Meadow Vole) species. The aquatic plant is not connected to the sediment – note majority of aquatic plants will be rooted in sediment and hence this pathway is critical. The aquatic predator, Walleye, is not connected to a prey fish species. Only surface water is indicated as a pathway for contaminants for Walleye. A prey species like the Carmine Shiner is an important pathway for contaminants especially if it's biomagnifying. The Lake Sturgeon is not connected to benthic invertebrates in the conceptual model, however, the biological characterization in Appendix A of the ERA Technical Supporting Document clearly states that the majority of the food for Lake Sturgeon is benthic invertebrates. **Expectation to Address Comment:** Modify the ecological conceptual model for the post-closure period to ensure that a terrestrial prey and predator species are represented. Ensure there is a pathway between sediment and aquatic plants as well as pathways between Walleye to a prey species and Lake Sturgeon to benthic invertebrates. Lastly, ensure that the dose calculations for the ERA reflect these pathways.	**Resolved As:** Figure 7-2 in Section 7 of the Environmental Risk Assessment (ERA; EcoMetrix 2021) and Figure 6.7.2-3 in the Environmental Impact Statement (EIS; Golder 2022) deal with modelling ecological risk assessment during the post-closure period. As stated in Section 7.1.1 of the ERA, during post-closure period, the focus is on the aquatic and riparian Valued Components (VCs), because contaminant releases are only expected via groundwater to the surface water pathways. In the post-closure conceptual ecological model, those terrestrial animals were selected that would be most likely exposed via ingestion of aquatic prey, which is appropriate since the only release is to the Winnipeg river. The Red Fox and Meadow Vole species are both terrestrial species that would not be affected by groundwater release to the river. They are susceptible to exposure via direct contact and predator-prey ingestion of contaminants via release of contamination to air during closure. The ecological model of exposure for the closure period is provided in Figure 6-1 of the ERA, which includes the Red Fox and the Meadow Vole. Uptake to aquatic plants is modeled using Bioaccumulation Factors (BAFs) as per Canadian Standards Association (CSA) N288.6 (CSA 2012), which implicitly represents all pathways to the plants, including sediment (the dominant pathway is by uptake from water) and represents an equilibrium value between a species and its uptake environment. These BAFs are appropriate because they account for both long and short lived species and their potential bioaccumulation. The model was updated to use the existing sediment concentrations. The BAFs used are presented and discussed in the EIS (Golder 2022) Section 6.7.2.8 Prediction Confidence and Uncertainty. The BAFs used for the exposure assessment were taken from reputable sources (e.g., N288.1-14 [CSA 2014]) and are considered to be representative of the conditions found at the site. More details on the application of the BAFs is presented in the Ecological Receptor Profiles presented in Appendix A of the WR-1 ERA (EcoMetrix 2021). Regarding the pathways between Walleye and prey species, and Lake Sturgeon and benthic invertebrates, it is not a common ERA practice to specifically assess uptake to fish through ingestion of food or sediment (ingestion model for sturgeon does not exist). Instead a BAF is used to estimate uptake from all exposure pathways (i.e., ingestion of sediment and food items, uptake from water). This latter approach is specified in N288.6 (CSA 2012) and was followed in the ERA (EcoMetrix 2021), ensuring that sediment contamination is reflected in the lake sturgeon receptor. Figure 6.7.2-3 in the EIS (Golder 2022) is a summary of the assessment endpoints for all ecological valued components during the post-closure period, and includes VCs from Figure 7-2 of the ERA (EcoMetrix 2021).

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						Change to EIS: No change was necessary in the EIS as a result of this comment. **References:** *CSA Group 2012. N288.6-12. Environmental risk assessments at Class I nuclear facilities and uranium mines and mills.* *CSA Group 2014. N288.1-14: Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
					6.8 Land and Resource Use	
122.	CNSC	C. Cianci	EIS - Table 6.8.2-2	6-348	**Comment:** Consistent with the pathways analysis on pages 6-378 to 6-380, the measurement indicators in Table 6.8.2-2 should not only be limited to “relative abundance and distribution” of vegetation, fish and wildlife species but also consideration of changes to their habitat. **Expectation to Address Comment:** For consistency and transparency, given that consideration of changes to vegetation, fish and wildlife and their habitats are considered in the effects pathway analysis, the measurement indicators in Table 6.8.2-2 should be updated to include consideration of habitat.	**Incorporated:** Table 6.8.2-2 from the previous version of the Environmental Impact Statement (EIS; Golder et al. 2017) has been split into two separate tables, Table 6.8.1.3-2 (Assessment Endpoints and Measurement Indicators for the Traditional Land and Resource Use Assessment) and Table 6.8.2.3-2 (Assessment Endpoints and Measurement Indicators for the Other Land and Resource Use Assessment) in the latest revision of the EIS (Golder 2022). Section 6.8 from the previous version of the EIS (Golder et al. 2017) has been split into two sections in the latest revision of the EIS (Golder 2022); Section 6.8.1, which corresponds to Traditional Land and Resource Use, and Section 6.8.2, which corresponds to Other Land and Resource Use. The tables were updated as requested to include potential changes to habitat as a measurement indicator. **Change to EIS:** Table 6.8.2-2 from the previous version of the EIS (Golder et al. 2017) has been split into two separate tables, Table 6.8.1.3-2 (Assessment Endpoints and Measurement Indicators for the Traditional Land and Resource Use Assessment) and Table 6.8.2.3-2 (Assessment Endpoints and Measurement Indicators for the Other Land and Resource Use Assessment) in the latest revision of the EIS (Golder 2022) and includes the following changes: In Table 6.8.1.3-2: “Changes to vegetation, fish and wildlife habitat.” was added as a measurement indicator to the “Traditional Land and Resource Use by Indigenous Peoples” VC. “Changes to aquatic vegetation and fish habitat”, “Relative abundance and distribution of aquatic plant and fish habitat.”, and “Perceived and observed qualities of water, aquatic plant species, fish, and aquatic habitat by traditional users.” were added as measurement indicators to the “Winnipeg River” VC. In Table 6.8.2.3-2: “Changes to fish and wildlife habitat.” and “Relative abundance and distribution of vegetation and fish and wildlife habitat.” were added as measurement indicators for the “Outdoor Recreation and Tourism” VC. “Changes to fish habitat.” And “Relative abundance and distribution of fish habitat.” Were added as measurement indicators for the “Winnipeg River” VC.“ **References:** *Golder et al. 2017. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 1. September 2017.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

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123.	CNSC	C. Cianci	EIS - Figure 6.8.3-1	6-351	**Comment:** The narrative that defines the LSA on p. 6-349 indicates the following: "The LSA is intended to capture land and resource use within proximity of the WL site and extends approximately 1 km beyond the WL site boundaries with the exception of the western boundary, which follows Provincial Trunk Highway 11". Figure 6.8.3-1 does not seem to match this narrative as the western boundary is not depicted as following the Provincial Trunk Highway 11. **Expectation to Address Comment:** Please clarify the extent of the LSA on the western boundary and update the documentation accordingly.	**Incorporated:** The boundary of the Local Study Area (LSA) has been clarified in Section 6.8.1.4.1 of the Environmental Impact Statement (EIS; Golder 2022) and reference to Provincial Trunk Highway 11 was removed. Figure 6.8.3-1 was renumbered as Figure 6.8.1-1 and has been revised as a result of engagement with Indigenous Nations on traditional land use, specifically the Traditional Land Use Study by the Sagkeeng First Nation. The LSA and the Regional Study Area (RSA) for the Land and Resource Use assessments have been revised to reflect the feedback of the Indigenous Nations and are different from the spatial boundaries identified in other assessment sections. The RSA has been revised to include aquatic and terrestrial environments used for the assessments of Project effects on resources that support Indigenous land and resource use and extends downstream along the Winnipeg River from the Whiteshell Laboratories (WL) site to the Lake Winnipeg, for 100 m inland from the shoreline of the Winnipeg River. The LSA has been revised from 1 km to 5 km beyond the WL site boundary to reflect the Indigenous feedback on the Indigenous land and resource use within proximity of the WL site. **Change to EIS:** The following text has been revised in Section 6.8.1.4.1 of the EIS: " ▪ ***Site Study Area (SSA)*** *is the WR 1 Building and represents the Project footprint (i.e., where Project activities will be undertaken; 0.07 ha).* ▪ ***Local Study Area (LSA)*** *is defined as the area within which there is potential for measurable changes resulting from the proposed Project activities. The LSA is intended to capture traditional land and resource use within proximity of the WL site and extends approximately 5 km beyond the WL site boundaries (approximately 11,917 ha).* ▪ ***Regional Study Area (RSA)*** *represents the area where potential effects on traditional land and resource use are expected to be experienced at a broader scale and where indirect effects of the Project may interact with the effects of other existing or reasonably foreseeable projects. The RSA includes the RSAs for aquatic environment and the terrestrial environment as these are used for the assessments of Project effects on resources that support traditional land and resource use and also extends downstream on the Winnipeg River. Therefore, the south boundary of the RSA extends from the west shore of the Winnipeg River to the east fence on the property line about 400 m north of Provincial Highway 211. The eastern boundary of the RSA follows the fence on the property line to the north property line. The north boundary follows the north fence on the property line about 1.6 km and then turns north for about 400 m before turning west and extending to the west side of the Winnipeg River. To incorporate input from Indigenous Nations, the RSA was revised to include the Winnipeg River from the WL site downstream to Lake Winnipeg with a 100 m buffer on either side of the river to capture traditional land and resource use activities on either shore of the river (approximately 14,182 ha)."* **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
124.	CNSC	C. Cianci	EIS - Section 6.8.4.2.5 Traditional Land and Resource Use by Aboriginal Peoples	6-366	**Comment:** The final EIS should indicate **whether CNL has gathered any traditional knowledge from identified First Nation and Métis groups** to inform the EIS, including the identification of VCs, as per the guidance of REGDOC-3.2.2.	**Incorporated:** CNL gathered traditional knowledge through Traditional Knowledge and Land Use Occupancy Studies (TKLUOS) completed and provided to CNL by Sagkeeng First Nation (Firelight Research Inc. and Sagkeeng Anicinabe 2018), Manitoba Métis Federation (MMF; SVS 2019), and Black River, Hollow Water, and Brokenhead Ojibway Nation (Black River First Nation, Brokenhead Ojibway Nation, Hollow Water First Nation 2019). Wabaseemoong Independent Nations (WIN) submitted a Traditional Knowledge and Environmental Impact Assessment Report (WIN 2018). In addition, Traditional knowledge was also gathered from Sagkeeng First Nation's and the Red River Métis' harvester consumption survey, as well as Sagkeeng's Alternative Means Assessment (Sagkeeng Anicinabe and Firelight Research Inc. 2020) and Psychosocial Impact Assessment Report (Narratives 2020). More Information on the TKLUOS is located in Section 6.8.1.5.2.2 Traditional Land and Resource Use by Indigenous Peoples of the Environmental Impact Statement (EIS; Golder 2022). Traditional knowledge from the sources mentioned above informed the verified list of valued components (see subsection 4.2.4 Summary of Engagement as well the summary of interests and concerns tables [see Appendix 4.0-1 of the EIS] for each First Nation and the Red River Métis). CNL read each traditional knowledge study, and drafted a valued components (VCs) and summary of interests and concerns table for each Nation. To verify that CNL had accurately captured each Nation's VCs and interests and concerns, CNL sent a letter to each Nation with the draft documents attached, and requested that the Nations confirm CNL had accurately captured their VCs and interests and concerns. CNL worked with each Nation to revised the VCs and summary of interests and concerns until it accurately reflected the Nation's VCs and interests and concerns. For more information on CNL's verification process, refer to the summary of interests and concerns tables of EIS Appendix 4.0-1.

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						Traditional knowledge gathered through the TKLUOS informed the baseline conditions, and influenced the assessment of human health risks and VCs used in the EIS (Golder 2022). For example, Indigenous Nations raised concerns regarding the health of members in the vicinity of the Whiteshell Laboratories (WL) site that harvest animals, wild rice, and medicinal plants (such as calamus root [weekay] and cedar). To address this concern, CNL incorporated consumption of local plants and foods as an exposure pathway in the Environmental Risk Assessment (ERA; EcoMetrix 2021). CNL also conducted food intake studies with the MMF (SVS 2019) and Sagkeeng (CNL 2018), to verify current consumption rates on harvested foods. During this study, traditional harvested foods and medicines were identified by some Indigenous people and shared with CNL. This was specifically used in Section 6.7.1.7.2.1 of the EIS, and in the ERA (EcoMetrix 2021) to identify types and quantities of foods gathered around the WL site and helped inform radiological doses due to ingestion of harvested foods. The TKLUOS also informed the updated version of CNL's VCs selected for the Effects Assessment outlined in Table 6.1.2-1 of the EIS (Golder 2022). More specifically, CNL included cultural and archaeological sites, traditional land and resource use by Indigenous people, and Winnipeg River under the Land and Resource Use category and provided a rationale explaining why they were included. A portion of the table is provided below:

Cultural and Archaeological Sites	Cultural and archaeological sites are those sites protected under legislation and administered by the Manitoba Heritage Resource Branch. Cultural and archaeological sites are important for revealing past and present land use, cultural identity and relationships with other cultures and the social and biophysical environments. Potential alteration or loss of cultural and archaeological sites can have an effect on Indigenous people. Consideration of physical and cultural heritage is a requirement under Section 5 of the *Canadian Environmental Assessment Act (CEAA), 2012* (CEAA 2012). The cultural and archaeological sites VC is of known importance to Sagkeeng First Nation; the Manitoba Métis Federation; Brokenhead Ojibway Nation, Black River First Nation, and Hollow Water First Nation; and Wabaseemoong Independent Nations as identified through Traditional Knowledge and Land Use Studies, engagement with CNL, and verification discussions. Consideration of physical and cultural heritage is a requirement under Section 5 of the *Canadian Environmental Assessment Act, 2012*.
Traditional Land and Resource Use by Indigenous Peoples	Traditional Land and Resource Use is defined as the land and resource by Indigenous Peoples for traditional purposes, including hunting, fishing, trapping and gathering. Traditional land and resource use by Indigenous people is important for maintaining meaningful connections with cultural identity and community history, for food security, economic self-sufficiency, and the maintenance of individual and population health. Traditional land and resource use can also promote intergenerational connections within communities as knowledge is passed down from elders to community members, including youth. Potential changes to traditional land and resource use by Indigenous people can have an adverse effect on Indigenous people by preventing them from fully expressing their cultural identity and Treaty rights. The traditional land and resource use by Indigenous people VC is representative of the values identified by Sagkeeng First Nation; the Manitoba Métis Federation; Brokenhead Ojibway Nation, Black River First Nation, and Hollow Water First Nation; and Wabaseemoong Independent Nations, as identified through Traditional Knowledge and Land Use Studies, engagement with CNL, and verification discussions. Consideration of current land and resources use for traditional purposes is a requirement under Section 5 of *Canadian Environmental Assessment Act, 2012*.
Winnipeg River	The public and Indigenous peoples identified the importance of the Winnipeg River. A number of communities depend on the river for drinking water, recreation, cultural vitality, inter-generational knowledge transfer and food security. The river flows into the Lake Winnipeg, one of the largest lakes in the world. The eastern shore of the lake is included in a United Nations World Heritage Site proposal (Manitoba Wildlands 2008). This watershed is valued for many reasons by many people and groups. Indigenous peoples identified the Winnipeg River as a critical resource for traditional and rights-based activities, including harvesting of fish, waterfowl, plants and other animals. The river was identified as a source of drinking

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						water and as a transportation corridor. Further, Indigenous peoples recognize the sacredness of water, the interconnectedness of all life and the importance of protecting water. The Winnipeg River VC is of known importance to Sagkeeng First Nation; the Manitoba Métis Federation; Brokenhead Ojibway Nation, Black River First Nation, and Hollow Water First Nation; and Wabaseemoong Independent Nations as identified through Traditional Knowledge and Land Use Studies, engagement with CNL, and verification discussions. **Change to EIS:** Additional information on interests and concerns expressed by Indigenous Nations and how CNL incorporated the concerns is included in the new tables in each of the Section 6.0 subsections on specific environmental effects assessment: • Table 6.2.1-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Air Quality Assessment • Table 6.3.1-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Geological Environment Assessment • Table 6.3.2-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Hydrogeology Assessment • Table 6.4.1-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Hydrology Assessment • Table 6.4.2-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Surface Water Quality Assessment • Table 6.5.2-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Aquatic Environment Assessment • Table 6.6.2-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Terrestrial Environment Assessment • Table 6.7.1-1: Summary of Issues Raised During Engagement Activities Related to the Human Health Risk Assessment • Table 6.7.2-1: Summary of Issues Raised During Engagement Activities Related to the Ecological Risk Assessment • Table 6.8.1.2-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Traditional Land and Resource Use Assessment • Table 6.8.2.2-1: Summary of Key Interests and Concerns Raised by the Public During Engagement Activities Related to the Other Land and Resource Use Assessment • Table 6.9.2-1: Summary of Issues Raised During Engagement Activities Related to the Socio-economic Environment Section 6.8.1.5.2.2 (formerly 6.8.4.2.5) was significantly expanded with current and historic land use information gathered through various engagement activities and TKLUOS for each of the First Nations and the Red River Métis. The full scope of changes is impractical to list in this response, but the summary of changes is as follows: **Sagkeeng First Nation**: added a description of traditional and current use of Winnipeg River as a transportation system and means of access to traditional harvesting. Added a description of Sagkeeng Anicinabe Land Use and Occupancy Study Specific to Canadian Nuclear Laboratories' Proposed In Situ Decommissioning of the WR-1 Reactor at Whiteshell Laboratories (Sagkeeng Land Use and Occupancy Study; Firelight Research Inc. and Sagkeeng Anicinabe 2018), including identification of site-specific use values that were grouped into five categories of VCs. Added a description of historic impacts on Sagkeeng First Nation as a result of discrimination, residential schools, inability to exercise Aboriginal and treaty rights, and industrial development, including establishment of the WL site. **Brokenhead Ojibway Nation**: updated information sources about Brokenhead Ojibway Nation to include the recent TKLUOS titled api migizik pii pa gilot – When Eagles Call Traditional Knowledge and Land Use Study for the WR-1 Nuclear Reactor In Situ Decommissioning Project (Black River First Nation, Brokenhead Ojibway Nation, Hollow Water First Nation 2019). Added traditional land uses such as ancestral territory; travelling along the River; fishing; harvesting wild rice, berries and other plants; harvesting medicines; hunting, trapping and other harvesting; sacred sites and cultural gathering areas. Added description of engagement activities and interviews, description of current resource harvesting activities and land access issues. Added statements describing the cumulative effects on traditional land use from highways, pollution, dams, and industry, including the WL site. **Black River First Nation**: updated information sources about Black River First Nation to include the recent TKLUOS titled api migizik pii pa gilot – When Eagles Call Traditional Knowledge and Land Use Study for the WR-1 Nuclear Reactor In Situ Decommissioning Project (Black River First Nation,

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						Brokenhead Ojibway Nation, Hollow Water First Nation 2019). Added traditional land uses such as cattle and horse ranching, hunting, trapping, wild rice and plant harvesting. Added a description of traditional use of Black River and Winnipeg River for transportation. Added notes on the geographical distribution of traditional land use and harvesting. Added statements describing the cumulative effect on traditional land use from government restrictions, increased pollution, industrial farming and development, including the WL site. **Hollow Water First Nation**: updated information sources about Hollow Water First Nation to include the recent TKLUOS titled api migizik pii pa gilot – When Eagles Call Traditional Knowledge and Land Use Study for the WR-1 Nuclear Reactor In Situ Decommissioning *Project* (Black River First Nation, Brokenhead Ojibway Nation, Hollow Water First Nation 2019). Added traditional and historic land use areas and activities, including wild rice harvesting, hunting and fishing. Added description of engagement activities and interviews, description of current resource harvesting activities and land access issues. Added statements describing the cumulative effects on traditional land use resulting from government restrictions on hunting and trapping, reduced hunting grounds, pollution, dams, and industry, including the WL site. **Wabaseemoong Independent Nations**: updated information sources about Wabaseemoong Independent Nations to include a Traditional Knowledge and Environmental Impact Assessment Report (WIN 2018) that considered historical land use data and interviews. This study concludes that Wabaseemoong Independent Nations members use the Winnipeg River system for a range of purposes. **Red River Métis**: updated information sources about the Red River Métis to include traditional knowledge and land use study, titled Whiteshell Reactor #1 Decommissioning Manitoba Métis Traditional Knowledge, Land Use and Occupancy Study prepared by Shared Value Solutions (SVS 2019) for the MMF specifically for the WR-1 Project. Updated information about the Manitoba Métis Federation organization and structure. Added description of the geographic distribution of the Red River Métis traditional resource and land usage and confirmed that Red River Métis have existing and/or asserted harvesting rights in the vicinity of WL site. Added information from the TKLUOS on what type of traditional knowledge was gathered, updated current hunting and gathering practices, locations of sacred sites, and land and water access routes. **References:** *Black River First Nation, Brokenhead Ojibway Nation, Hollow Water First Nation 2019. api migizik pii pa giiot – when eagles call – Traditional Knowledge and Land Use Study for the WR-1 Nuclear Reactor In Situ Decommissioning Project. Final Report. 53525954. November 2019.* *CEAA 2012. Canadian Environmental Assessment Act.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Firelight Research Inc. and Sagkeeng Anicinabe 2018. Sagkeeng Anicinabe Land Use and Occupancy Study Specific to Canadian Nuclear Laboratories' Proposed In Situ Decommissioning of the WR-1 Reactor at Whiteshell Laboratories. 53529527. December 2018.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Manitoba Wildlands 2008. Proposed World Heritage Site Nomination Pimachiowin Aki With Land Interests. Version 1. September 2008.* *Narratives 2020. Sagkeeng Anicinabe Psychosocial Impact Assessment. WLDP-26000-041-000. October 2020.* *Sagkeeng Anicinabe and Firelight Research Inc. 2020. Sagkeeng Anicinabe's Alternative Means Assessment for the Environmental Assessment of Canadian Nuclear Laboratories' Proposed WR-1 Reactor Decommissioning Project. WLDP-26000-041-000. October 2020.* *SVS 2019. Whiteshell Reactor #1 Decommissioning, Manitoba Métis Traditional Knowledge, Land Use and Occupancy Study. 53525958. January 2019.* *WIN 2018. Traditional Knowledge and Environmental Impact Assessment. Decommissioning of Whiteshell Nuclear Reactor #1. 553595815. January 2018.*
125.	CNSC	C. Cianci	EIS - Section 6.8.4.2.5.1 Historic and Present Day Traditional Land Use	6-371 to 6-374	**Comment:** This section, which describes the potential interactions of the WR-1 project with trapping, hunting, fishing and harvesting activities, provides limited evidence that CNL has gathered up-to-date information regarding traditional land use activities in close proximity to the WL site directly from identified First Nation and Métis groups. The description of historic and present day traditional land use seems to be limited to information gathered from desktop reviews. **Expectation to Address**	**Incorporated:** CNL has expanded the description of historic and present day traditional land and use which is detailed in subsection 6.8.1.5.2.2 as well as expanded the information gathering process. For example, CNL incorporated the findings from four Traditional Land Use and Occupancy Studies and completed engagements directly on key interests and concerns and valued components, which included traditional land and resource use, and documented this in both subsection 6.8.1.5.2.2 and Appendix 4.0-1. The information below provides more detail on the information included in the Environmental Impact Statement (EIS; Golder 2022)related to traditional land and resource use and methods for gathering that information, such as extensive engagement with the Indigenous Nations, as well as methods of validating that information with the Indigenous Nations.

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					Comment: CNL must demonstrate **how it has or will be validating the traditional land use activities currently described in Section 6.8.4.2.5.1 with identified First Nation and Métis groups and organizations**. As per the requirements/guidance in REGDOC-3.2.2, CNL should demonstrate that through its engagement activities that it has asked identified First Nation and Métis groups regarding traditional land use activities in proximity to the CRL and project location and determine if the proposed project could have any potential impacts on those practices as per the requirements of CEAA 2012.	On August 3, 2016, CNL sent a Project Introductory letter to each First Nation and the Manitoba Métis Federation. In this letter CNL requested to engage with the Nations and the Red River Métis for the purpose of identifying, minimizing or avoiding "*adverse environmental effects before they occur, and incorporate environmental factors into decision-making.* *We would like to ensure that representatives of your community are informed of our project and have the opportunity to provide meaningful feedback on the following:* • *Whether the project may have environmental effect on any lands and/or resources currently used by First Nation and Métis peoples for traditional purposes;* • *Whether the project may have any perceived impacts on First Nation and Métis and Treaty Rights;* • *Whether local and traditional knowledge can assist in describing the existing environment; and* • *The view of First Nation and Métis communities on proposed valued ecosystems components (environmental attributes) that have been identified for the assessment."* A copy of this letter is located in Appendix E of the Indigenous Engagement Report (IER, CNL 2022). CNL validated and updated the information on traditional land use activities described in Section 6.8.1.5.2.2 of the EIS by gathering traditional knowledge through Traditional Knowledge and Land Use Occupancy Studies (TKLUOS) completed and provided to CNL by Sagkeeng First Nation (Firelight Research Inc. and Sagkeeng Anicinabe 2018), Manitoba Métis Federation (MMF; SVS 2019), and Black River First Nation, Hollow Water First Nation and Brokenhead Ojibway Nation (Black River First Nation, Brokenhead Ojibway Nation, Hollow Water First Nation 2019). Wabaseemoong Independent Nations submitted a Traditional Knowledge and Environmental Impact Assessment Report (WIN 2018). In addition, Traditional knowledge was also gathered from Sagkeeng First Nation's and the Red River Métis harvester consumption survey (CNL 2018) as well as Sagkeeng's Alternative Means Assessment (Sagkeeng and Firelight 2020) and Psychosocial Impact Assessment Report (Narratives 2020). Information relating to the TKLUOS is also location in the EIS Section 4.3 'Influence of Traditional Knowledge on the Environmental Assessment'. Traditional knowledge from the sources mentioned above informed the verified list of valued components (VCs) (Section 4.2.4 Summary of Engagement as well the summary of interests and concerns table (see Section 1.3 of Appendix 4.0-1 to Section 4.0) for each First Nation and the Red River Métis. CNL provided each Indigenous Nations with a copy of the 2019 Draft EIS to confirm CNL had adequately documented information related to each Nation and included the incorporation of each of the TKLUOS. Sagkeeng First Nation and the MMF reviewed the 2019 Draft EIS and provided feedback to CNL. Complete record of comments and CNL responses is recorded in tables located in Appendix B of the IER (CNL 2022) to track each Nation's comments and CNL's responses. To further validate that CNL correctly understood each First Nation's and the Manitoba Métis Federation's interests, concerns and VCs, CNL read each traditional knowledge study, and drafted a VCs and summary of interests and concerns table for each nation. To verify, CNL had accurately captured the Nation's VCs and interests and concerns, CNL sent a letter to each Nation with the draft documents attached, and requested that the Nations confirm CNL had accurately captured the Nation's VCs and interests and concerns. CNL worked with each Nation to revise the valued components and summary of interests and concerns until it accurately reflected the Nation's VCs and interests and concerns. This process was repeated in spring of 2022 when CNL updated the interest and concerns tables for each Nation and sent them to the Nations to confirm that CNL accurately captured their interests and concerns. The validated tables of interests and concerns and CNL responses are provided in Section 1.3 of Appendix 4.0-1 to Section 4.0 of the EIS. CNL also provided advanced copies of Section 6.8 of the EIS (Golder 2022) to Sagkeeng First Nation and the Manitoba Métis Federation for feedback and CNL incorporated their feedback where possible. Where CNL could not incorporate feedback, a detailed explanation was provided to the Nation. **Change to EIS:** The following text in Section 4.3 'Influence of Traditional Knowledge on the Environmental Assessment' of the EIS (Golder 2022) was revised to provide further clarity that the Traditional Knowledge studies were completed by the Indigenous communities: *"Four Traditional Knowledge, Land Use and Occupancy Studies (TKLUOS) for the Whiteshell Laboratories site have been completed. These studies are intended to document traditional use around the Project, local, and regional study areas.* *The MMF study, titled "Whiteshell Reactor #1 Decommissioning: Manitoba Métis Traditional Knowledge, Land Use and Occupancy Study" (SVS 2019), was provided to CNL in January 2019 while the Sagkeeng First Nation study, titled "Sagkeeng Anicinabe Land Use and Occupancy Study Specific to Canadian Nuclear Laboratories' Proposed In Situ Decommissioning of the WR-1 Reactor at Whiteshell Laboratories" (Firelight Research Inc. and Sagkeeng Anicinabe 2018), was provided in December 2018.* *The study done jointly by Black River First Nation, Brokenhead Ojibway Nation, and Hollow Water First Nation, titled "api migizik pii pa gilot – When Eagles Call Traditional Knowledge and Land Use Study for the WR-1 Nuclear Reactor In Situ Decommissioning Project" (Black River First Nation, Brokenhead*

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						Ojibway Nation and Hollow Water First Nation 2019), was provided to CNL in November 2019. The study by Wabaseemoong Independent Nations, titled "Traditional Knowledge and Environmental Impact Assessment - Decommissioning of Whiteshell Nuclear Reactor #1" (WIN 2018), was provided to CNL in January 2018. *CNL has supported the carrying out of these studies to assist in better understanding modern and traditional land and resource use near the WL site and Aboriginal and Treaty rights matters. The results of these studies informed the five column interests and concerns table for each Nation (see Appendix A) and list of valued components. CNL also used these studies to support the environmental assessment of the Project documented in Section 6.0. For each interest and concern in Section 1.3 of Appendix 4.0-1, CNL has included a reference to a section of the EIS where CNL made changes based on the Nation's interest or concern.* Additional information on interests and concerns expressed by Indigenous communities and how CNL incorporated the concerns is included in the new tables in each of the Section 6.0 subsections on specific environmental effects assessment: • Table 6.2.1-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Air Quality Assessment. • Table 6.3.1-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Geological Environment Assessment. • Table 6.3.2-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Hydrogeology Assessment. • Table 6.4.1-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Hydrology Assessment. • Table 6.4.2-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Surface Water Quality Assessment. • Table 6.5.2-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Aquatic Environment Assessment. • Table 6.6.2-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Terrestrial Environment Assessment. • Table 6.7.1-1: Summary of Issues Raised During Engagement Activities Related to the Human Health Risk Assessment. • Table 6.7.2-1: Summary of Issues Raised During Engagement Activities Related to the Ecological Risk Assessment. • Table 6.8.1.2-1: Summary of Key Interests and Concerns Raised During Indigenous Engagement Activities Related to the Traditional Land and Resource Use Assessment. • Table 6.8.2.2-1: Summary of Key Interests and Concerns Raised by the Public During Engagement Activities Related to the Other Land and Resource Use Assessment. • Table 6.9.2-1: Summary of Issues Raised During Engagement Activities Related to the Socio-economic Environment. Section 6.8.1.5.2.2 (Formerly 6.8.4.2.5) was significantly expanded with current and historic land use information gathered through various engagement activities and TKLUOS for each of the First Nations and the Red River Métis. The summary of changes is as follows: **Sagkeeng First Nation**: added a description of traditional and current use of Winnipeg River as a transportation system and means of access to traditional harvesting. Added a description of Sagkeeng Anicinabe Land Use and Occupancy Study Specific to Canadian Nuclear Laboratories' Proposed In Situ Decommissioning of the WR-1 Reactor at Whiteshell Laboratories (Sagkeeng Land Use and Occupancy Study; Firelight Research Inc. and Sagkeeng Anicinabe, 2018), including identification of site-specific use values that were grouped into five categories of VCs. Added a description of historic impacts on Sagkeeng First Nation as a result of discrimination, residential schools, inability to exercise Aboriginal and treaty rights, and industrial development, including establishment of the WL site. **Brokenhead Ojibway Nation**: updated information sources about Brokenhead Ojibway Nation to include the recent TKLUOS titled api migizik pii pa gilot – When Eagles Call Traditional Knowledge and Land Use Study for the WR-1 Nuclear Reactor In Situ Decommissioning Project (Black River First Nation, Brokenhead Ojibway Nation, Hollow Water First Nation 2019). Added traditional land uses such as ancestral territory; travelling along the River; fishing; harvesting wild rice, berries and other plants; harvesting medicines; hunting, trapping and other harvesting; sacred sites and cultural gathering areas. Added description of engagement activities and interviews, description of current resource harvesting activities and land access issues. Added statements describing the cumulative effects on traditional land use from highways, pollution, dams, and industry, including the WL site. **Black River First Nation**: updated information sources about Black River First Nation to include the recent TKLUOS titled api migizik pii pa gilot – When Eagles Call Traditional Knowledge and Land Use Study for the WR-1 Nuclear Reactor In Situ Decommissioning Project (Black River First Nation,

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						Brokenhead First Nation, Hollow Water First Nation 2019). Added traditional land uses such as cattle and horse ranching, hunting, trapping, wild rice and plant harvesting. Added a description of traditional use of Black River and Winnipeg River for transportation. Added notes on the geographical distribution of traditional land use and harvesting. Added statements describing the cumulative effect on traditional land use from government restrictions, increased pollution, industrial farming and development, including the WL site. **Hollow Water First Nation**: updated information sources about Hollow Water First Nation to include the recent TKLUOS titled api migizik pii pa gilot – When Eagles Call Traditional Knowledge and Land Use Study for the WR-1 Nuclear Reactor In Situ Decommissioning Project (Black River First Nation, Brokenhead Ojibway Nation, Hollow Water First Nation 2019). Added traditional and historic land use areas and activities, including wild rice harvesting, hunting and fishing. Added description of engagement activities and interviews, description of current resource harvesting activities and land access issues. Added statements describing the cumulative effects on traditional land use resulting from government restrictions on hunting and trapping, reduced hunting grounds, pollution, dams, and industry, including the WL site. **Wabaseemoong Independent Nations**: updated information sources about Wabaseemoong Independent Nations to include a Traditional Knowledge and Environmental Impact Assessment Report (WIN 2018) that considered historical land use data and interviews. This study concludes that Wabaseemoong Independent Nations members use the Winnipeg River system for a range of purposes. **Red River Métis**: updated information sources about the Red River Métis to include traditional knowledge and land use study, titled Whiteshell Reactor #1 Decommissioning Manitoba Métis Traditional Knowledge, Land Use and Occupancy Study prepared by Shared Value Solutions (SVS 2019) for the MMF specifically for the WR-1 Project. Updated information about the Manitoba Métis Federation's governance and structure. Added description of the geographic distribution of the Red River Métis traditional resource and land usage and confirmed that Red River Métis have existing, asserted, and/or harvesting rights in the vicinity of the WL site. Added information from the TKLUOS on what type of traditional knowledge was gathered, updated current hunting and gathering practices, locations of sacred sites, and land and water access routes. **References:** *Black River First Nation, Brokenhead Ojibway Nation, Hollow Water First Nation 2019. Api migizik pii pa giiot – when eagles call – Traditional Knowledge and Land Use Study for the WR-1 Nuclear Reactor In Situ Decommissioning Project. Final Report. 53525954. November 2019.* *CNL 2018. Aboriginal Food Intake Survey. Memo from Jesse Gordon to Brian Wilcox. WLDP-26000-021-000 50641749. September 2018.* *CNL 2022. Whiteshell Laboratories WR-1 Reactor Decommissioning Indigenous Engagement Report. WLDP-26000-REPT-002. Revision 8. December 2022.* *Firelight Research Inc. and Sagkeeng Anicinabe 2018. Sagkeeng Anicinabe Land Use and Occupancy Study Specific to Canadian Nuclear Laboratories' Proposed In Situ Decommissioning of the WR-1 Reactor at Whiteshell Laboratories. 53529527. December 2018.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Narratives 2020. Sagkeeng Anicinabe Psychosocial Impact Assessment. WLDP-26000-041-000. October 2020.* *Sagkeeng and Firelight 2020. Alternative Means Assessment for the Environmental Assessment of Canadian Nuclear Laboratories' Proposed WR-1 Reactor Decommissioning Project. WLDP-26000-041-000. October 2020.* *SVS 2019. Whiteshell Reactor #1 Decommissioning, Manitoba Métis Traditional Knowledge, Land Use and Occupancy Study. 53525958. January 2019.* *WIN 2018. Traditional Knowledge and Environmental Impact Assessment. Decommissioning of Whiteshell Nuclear Reactor #1. January 2018.*
126.	CNSC	C. Cianci	EIS - Section 6.8.5.2.2 Secondary Pathways	6-385, 1st paragraph	**Comment:** This section of the EIS indicates that: "The Local Government District of Pinawa has expressed a desire to develop economic activity at the Whiteshell Labs site to offset lost jobs due to closure of the site… This is a potential outcome for the WL site and will require agreement by AECL as the land owner, and potentially the Province of Manitoba…This may include transfer of the land to other parties following engagement with stakeholders, Aboriginal groups and the public. Future uses/zoning have not been determined, but it is assumed that the land will meet Canadian Council of Ministers of the Environment	**Resolved As:** CNL has been contracted by Atomic Energy of Canada Limited (AECL), a federal Crown corporation, to decommission the Whiteshell Laboratories (WL) site to an approved end-state criteria. AECL owns the lands, and as such, they are responsible for determining future use(s) of the site. This is outside the scope of this Environmental Assessment. It will be AECL's discretion about whether any land is transferred or used in other capacities such as leasing it for economic purposes. With regard to an approved end-state criteria, CNL has developed a draft Land-Use and End-State (LUES) Plan (CNL 2020), which is meant to apply to the entire WL site. In 2020 July, a draft of this document was provided to Canadian Nuclear Safety Commission (CNSC) staff and a meeting was held to discuss the document. Preparations are underway to engage the public, Indigenous Nations, and other stakeholders, currently scheduled for late 2022 to 2023. The LUES Plan will then be finalized and submitted to CNSC staff for acceptance. The LUES Plan defines the WL post-closure land-use categories and their allocation for the WL site lands, and provides a reference to screening criteria used for cleanup of the site, which are aligned with the Canadian Council of Ministers of the Environment (CCME) land use criteria.

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					(CCME) land use criteria." Several different possibilities and parties are mentioned in the EIS with respect to the future use(s) of the site. There is a lack of clarity on the process and the roles and responsibilities of these identified parties in determining the future use(s) of the site. **Comment:** If possible, please provide clarity on the process and the roles and responsibilities of the identified parties in determining the future use(s) of the site.	To provide additional clarity to the information in the Environmental Impact Statement (EIS; Golder 2022) Section 6.8, the following key roles and responsibilities were added in Sections 6.8.1.6.2.2 and 6.8.2.6.2.2: ▪ "AECL owns the site and has responsibility for all assets and liabilities. ▪ CNL is the contractor responsible to perform the decommissioning and site remediation of the WL site. ▪ CNL is preparing an Land-Use and End-State Plan defining the end state criteria in collaboration with stakeholders, Indigenous Nations and the public, and will submit it to the CNSC for acceptance. ▪ CNL informs and engages the public, Indigenous, and other key stakeholders such as the Province of Manitoba." Given that the WL site is, and will remain, under the responsibility of AECL, it will have ultimate responsibility for its long term monitoring. AECL has indicated that it intends to contract CNL to carry out this work, as stated in Section 11.1.1 of the EIS: "*As the proponent of the Project, CNL will be responsible for implementing and managing the proposed follow-up monitoring program. AECL, as the owner of the site, is responsible for providing funding to CNL for the management and operation of its sites as per contractual arrangement, including funding for the follow-up monitoring program, with these costs included in CNL's submission of a decommissioning financial guarantee and accompanying cost estimate that has been submitted to the CNSC as per the WL site licence. CNL will be responsible for the delegation of resources to develop, implement and integrate the programs identified in Table 11.1-1.*" **Change to EIS:** Section 6.8 from the previous version of the EIS (Golder *et al.* 2017) has been split into two sections in the latest revision of the EIS (Golder 2022); Section 6.8.1, which corresponds to Traditional Land and Resource Use, and Section 6.8.2, which corresponds to Other Land and Resource Use. Section 6.8.5.2.2 was renumbered as 6.8.1.6.2.2 and 6.8.2.6.2.2, and updated to include the key roles and responsibilities identified above. **References:** *CNL 2020. DRAFT WL Closure Land-Use and End-State Plan. WL-508350-PLA-001. Revision D2.* *Golder et al. 2017. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 1. September 2017.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
					6.9 Socio-economic Environment	
127.	CNSC	C. Cianci	EIS - Section 6.9 Socio-Economic Environment	6-389 to 6-447	**Comment:** As required under paragraph 5(2)(b) of CEAA 2012, the EIS should provide a description and analysis of how changes to the environment caused by the project could affect 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, as they pertain to non-Aboriginal peoples. That is to say, the EIS should describe the indirect socio-economic effects that occur as a result of change that the project may cause to the environment. While Section 6.9 Socio-Economic Environment of the EIS provides specific discussion and analysis of the indirect effects on health and socio-economic conditions, there is no clear linkage in the descriptions of the VCs and effects pathway analysis between the indirect effect and the direct environmental effect. **Expectation**	**Incorporated:** Section 6.9 Socio-economic Environment of the Environmental Impact Statement (EIS; Golder 2022) was revised to provide clarification on the direct and indirect linkages and the result of these effects on health and socio-economic conditions. While Canadian Environmental Assessment Act (CEAA) 2012 does not explicitly describe a difference between direct and indirect effects, CNL has categorized the effects pathways into No Linkage Pathways, Secondary Pathways, and Primary Pathways, as described in Section 6.9.6.1. No Linkage Pathways do not have any direct or indirect effects. Secondary Pathways include direct and indirect effects that are not expected to arise from effects on the environment, but are still included due to their significance to the people. Primary Pathways include direct and indirect effects. This was clarified in the revised description of the pathways in Section 6.9.6.1 of the EIS. The assessment itself does not differentiate between direct and indirect effects as all effects are assessed in the same manner; however, where appropriate the effects were discussed in terms of direct and indirect effects. Because there is no direct environmental change that has a linkage to socio-economic effects, CNL revised the assessment results to state that there are no Primary Pathways. To address the significance of potential direct and indirect socio-economic effects to the public and Indigenous Nations, CNL revised all No Linkage Pathways to Secondary Pathways in order to better describe Project interactions and mitigations in place. **Change to EIS:** Section 6.9 has been updated to provide clarification on the direct and indirect linkages and the result of these effects on health and socio-economic conditions. Specifically, the assessment method description in Section 6.9.6.1 has been expanded to note that Secondary Pathways include those effects that would not arise as a result of direct or indirect changes to the environment. The following sentences (underlined) were added to Section 6.9.6.1 on Secondary Pathway and Primary Pathway bullets:

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					to Address Comment: Please provide clarification and describe, in the "Socio-economic Environment" assessment, the linkages between the indirect socio-economic effects identified and the project-related changes to the environment that result in these indirect effects on health and socio-economic conditions.	*"**Secondary pathway** – the pathway could result in a measurable minor change to measurement indicators identified for socio-economic VCs [Valued Components], but would have a negligible residual effect on socio-economic VCs relative to Base Case values and is not expected to contribute cumulatively to other Project effects or to the effects of other past, present or reasonably foreseeable developments to cause a significant effect. Secondary pathways may also include Project effects that were identified as important to people during Project engagement, but that do not specifically fall under the requirements of the Canadian Environmental Assessment Act, 2012 (CEAA 2012). This pathway includes direct or indirect socio-economic effects that are not expected to arise as a result of direct effects on the environment, but were included as a secondary pathway due to their importance to people, as required in paragraph 5(2)(b) of CEAA 2012.* ***Primary pathway** – the pathway is likely to result in an environmental change to measurement indicators identified for socio-economic VCs relative to the Base Case that could contribute to residual effects to socio-economic VCs. This includes direct and indirect effects stemming from changes to the environment, as required in paragraph 5(2)(b) of CEAA 2012."* The results of the assessment were updated (underlined text) in Section 6.9.6.2.2 of the EIS to add discussion of direct and indirect effects where appropriate for the following pathway headings (please note that only the affected sentences are provided here): • **Changes to the current decommissioning plan will generate different employment opportunities.** • **Changes to the current decommissioning plan will generate different contracting activities.** *"The implications of the change in decommissioning activities associated with WR-1 [Whiteshell Reactor 1] does not necessarily alter the number of new employment and/or contracting opportunities during the closure phase, but rather indirectly changes the nature of the employment and/or contracting opportunities available."* *"Considering the economic development activities undertaken by the municipalities and RMs [Rural Municipalities] in the LSA [Local Study Area], the Project's indirect effects on employment and income, and business opportunities are expected to be negligible relative to the overall closure of the site despite the accelerated timeline."* • **The suitability of the site for future business ventures may change as a result of the presence of long-lived radioactive material as part of ISD [In Situ Disposal].** • **The use of ISD as the decommissioning method for WR-1 will change the proportion of the site for unrestricted use.** *"With negligible effects predicted to the biophysical environments, the assessment does not indicate the potential for direct or indirect effects to the well-being of Indigenous Nations."* *"The availability of land for future uses does not stem directly from environmental effects of the Project, but rather from the indirect effect of zoning restrictions that will be required for the WL [Whiteshell Laboratories] site into the distant future."* • **The presence of long-lived radioactive material as part of ISD may affect community well-being for Indigenous Nations through the changes to the suitability of the site for future uses, the continued inability to exercise stewardship and governance over land and resource management decisions.** *"With negligible effects predicted to the biophysical environments, the assessment does not indicate the potential for direct or indirect effects to the well-being of Indigenous Nations because of the Project-related changes to the environment."* **References:** *CEAA 2012. Canadian Environmental Assessment Act, 2012. S.C. 2012, c. 19, s. 52. July 2012.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
					7.0 Accidents and Malfunctions	
128.	CNSC ECCC	N. Kwamena	EIS - Section 7.0 Accidents and Malfunctions	7-1 to 7-33	**Comment**: The EIS largely focuses on the possible release of radiological hazards and provides little information respecting non-radiological hazards. No fate and behaviour or dispersion modelling was provided for either radiological releases or non-radiological releases to support the analyses of	**Resolved As:** No supporting modelling of non-radiological accidents or malfunctions was performed to support the Environmental Impact Statement (EIS; Golder 2022). The EIS draws on the existing approved Comprehensive Study Report (CSR; AECL 2001) and WL Emergency Response Plan (CNL 2018) for the wider Whiteshell Laboratories (WL) decommissioning, which form the basis for the CNSC-issued site licence, as appropriate for decommissioning work at the WL site. In Situ Disposal (ISD) of Whiteshell Reactor 1 (WR-1) does not present any additional hazards, as it aligns with existing decommissioning practices and

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					accidents and malfunctions and the associated conclusions. Fate and behaviour, and dispersion modelling form the basis of emergency preparedness and response planning as they define the temporal and geo-spatial boundaries for accidents and malfunctions. In the absence of this information, it cannot be determined if the applicant's emergency preparedness plans and associated response capacities are commensurate with the geographical extent of the expected impacts from accidents and malfunctions. This information would inform a determination of the extent of expected environmental consequences that would lead to an assessment of significance of any residual effects. **Expectation to Address Comment:** It is recommended that CNL provide any supporting modelling that may have been conducted in support of their emergency preparedness and response planning.	no new hazards or hazardous materials are being introduced as a result of ISD of WR-1 that would fall outside the scope of existing emergency response plans. The EIS text in Section 7.3 (Accidents and Malfunctions) was updated to reflect this. **Change to EIS:** Section 7.3 of the EIS was updated as follows: *"The CSR (AECL 2001) outlined the accidents and malfunctions relevant to the overall decommissioning of WL, identified the expected effects of each scenario, and described mitigations to be put in place as part of the emergency response to those events. Closure activities for the proposed ISD of WR-1 are encompassed by current operating conditions and approved emergency preparedness and response planning identified in the CSR, specifically the Emergency Preparedness Program (CNL 2020) and WL Site Emergency Response Plan (CNL 2018), which form the basis of the CNSC-issued site decommissioning licence. The types of hazards anticipated during closure activities are aligned with similar hazards under existing conditions. The procedures, controls and proven mitigative measures in the Emergency Response Plan are considered to appropriately limit the consequence of these hazards such that they would not increase from existing conditions. If new hazards are identified during the execution of the Project, the WL Site Emergency Response Plan (CNL 2018) will be updated accordingly."* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *CNL 2018. Whiteshell Laboratories Site Emergency Response Plan. WL-508730-ERP-001. Revision 5. April 2018.* *CNL 2020. Emergency Preparedness. 900-508730-PDD-001. Revision 2. January 2020.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
129.	CNSC	N. Kwamen a	EIS - Section 7.1.1 Hazard Identification	7-2 and 7-3	**Comment**: The methodology section of the "Accident and Malfunctions" assessment of the EIS states that the: "likelihood, consequence and mitigating factors were discussed to determine which hazards were "credible events" (credible events are defined as having a reasonable probably (sic) of occurring." However, there is no clear definition (or threshold) of what is meant by reasonable probability for the purposes of the assessment? **Expectation to Address Comment:** Clearly outline the threshold for how credible events were determined.	**Incorporated:** Discussion of "credibility" of events has been removed from the current revision of Section 7 of the Environmental Impact Statement (EIS; Golder 2022). During the hazard and risk identification phase (Section 7.2.1 of the EIS), events that can impact the safety of the worker, environment, or the public were identified. All of these events are deemed credible, meaning they have some statistical likelihood of occurring. Statistical threshold ranges have been clarified as ranging between "Almost Certain" and "Highly Unlikely" and are now provided in Table 7.2.2-1. The likelihood of the individual accident and malfunction scenarios in Section 7.3 was evaluated based on industry and operational experience of the Project team, using historical statistics and performance indicators. **Change to EIS:** Section 7 of the EIS (Golder 2022) has been significantly revised and updated to clarify the process of assessing accidents and malfunctions during closure. Section 7.1.1 was renumbered as 7.2.1. The text in the original comment was removed for clarity and alignment with the revised Decommissioning Safety Assessment Report (DSAR; Golder 2021). Section 7.2 of the EIS was updated with the description of the assessment approach and how the risk associated with accidents and malfunctions was identified, measured and evaluated. Section 7.2.2 (Risk Measurement) has been updated to include: "*Likelihood and consequence severity were estimated based on industry and operation experience, Project-specific conditions, and the knowledge base of the Project team.* *The process of estimating the likelihood index includes consideration of past performance indicators and safety statistics for site operations and similar closure work performed at the WL site in the last 10 years. Likelihood can be described as how often the hazard scenario might occur (Table 7.2.2-1). The likelihood index ranges from a "Highly Unlikely" event to an "Almost Certain" event and is more formally defined through the events per year value. Order of magnitude of events per year values are defined for each likelihood level. For example, the "Possible" level ranges from more than 1 event in 100 years up to 1 event in 10 years. The categories selected for the likelihood index reflect the Project timescales and type of hazards that may arise. The likelihood of events occurring beyond 1000 years is more related to disruptive events during posts-closure, which is assessed in the DSAR (Golder 2021) and in Section 6.7 Human and Ecological Health.*

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<tr><th>No.</th><th>Department/ Agency</th><th>SME</th><th>Section Table or Figure</th><th>Pg. #</th><th>Information Request or Summary of Comment</th><th>Response by CNL</th></tr>
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Table 7.2.2-1: Likelihood Index
<table>
<tr><th>Index</th><th>A
Almost Certain</th><th>B
Very Likely</th><th>C
Possible</th><th>D
Unlikely</th><th>E
Highly Unlikely</th></tr>
<tr><td>Events per Year</td><td>>1 occurrence in 1 year</td><td>≤1 occurrence in 1 year and >1 occurrence in 10 years</td><td>≤1 occurrence in 10 years and >1 occurrence in 100 years</td><td>≤1 occurrence in 100 years and >1 occurrence in 1,000 years</td><td>≤1 occurrence in 1,000 years</td></tr>
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References:
Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021
Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.
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<tr><td>130.</td><td>CNSC</td><td>N. Kwamena</td><td>EIS - Section 7.1.1 Hazard Identification</td><td>7-2 and 7-3</td><td>Comment: The EIS states that the hazards associated with the project are grouped into four categories: radiological hazards, non-radiological hazards, internal initiating events and occupational hazards and external initiating events. Further, based on the methodology described in the EIS, it is not clear which hazards were considered in the assessment and which ones were carried forward to determine potential risk as it appears all the hazards listed in the subsequent sections were carried forward.
Expectation to Address Comment: Clarify which hazards were considered in the assessment and which of the four groups they belong to. Additionally, clarify the methodology used to assess whether a hazard was credible and therefore required further assessment. Those hazards which were not carried forward for further assessment should also be identified and explanation provided for why these were not deemed credible.</td><td>
Incorporated:
Section 7 of the Environmental Impact Statement (EIS; Golder 2022) has been significantly revised and updated to clarify the process of assessing accidents and malfunctions during closure. Section 7.1.1 was renumbered as 7.2.1 and updated with the description of the assessment approach to hazard identification. The text in the original comment was removed for clarity and alignment with the revised Decommissioning Safety Assessment Report (DSAR; Golder 2021).
The text in the comment applied to the discussion of the Features, Events, and Processes (FEPs), which has since been removed from Section 7.0 of the EIS (Golder 2022). A significant clarification was made in Section 5.4.1 and 5.4.2 of the DSAR to state that FEPs primarily relate to the post-closure assessment modeling. FEPs help to configure the assessment model for the post-closure phase and determine which disruptive events are modeled. The FEPs categories were clarified as either Internal or External to the Project. Detailed analysis of FEPs, including methodology by which the hazards were assessed as credible or screened out, is provided in Appendix C of the DSAR (Golder 2021). As per Section 5.4.2.1 of the DSAR:
“The FEPs to be considered were classified as Internal or External to the Project. External FEPs are those beyond the control of Project execution, originating outside the Project. External FEPs include geological processes and events, climatic processes and events, and future human interaction. Internal FEPs include engineered control features, subgeological surround, surface environment, human behaviour, source-term characteristics, solute transport factors, and exposure pathway factors.
Following the development of the FEPs list, a screening analysis was completed to determine the applicability of each potential FEP on the safety of the Project. Specific FEPs were screened out if:
1) FEP is not applicable to the waste types to be encountered, Project design, or environmental setting;
2) there is an extremely low likelihood that the FEP would occur; and/or
3) the FEP would have low consequence and negligible impact (CNSC 2018a).
The FEPs that were not screened out were carried forward into the safety assessment with the relevant factors encompassed in the assessment scenarios (refer to Table 5.4.3-1).
The FEPs developed for the closure phase were influenced by the “What-if” questions raised during the HAZOP exercise (see Section 5.4.1). Most of these FEPs were addressed through existing procedures that would be in place during closure work that would mitigate the risks or uncertainty introduced by a specific FEP. Therefore, these FEPs were excluded from the safety assessment. The FEPs included in the safety assessment for the closure phase were related to exposure to airborne emissions from closure activities (Section 7.0).
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						The FEPs that were carried forward into the post-closure phase assessment of the WRDF [Whiteshell Reactor Disposal Facility] *guided the development of the groundwater flow and solute transport model and the ERA* [Environmental Risk Assessment]*. They helped determine the parameters to be included in the models, as well as key events and processes to be modelled through the sensitivity analyses."* **Change to EIS:** Since Section 7.0 (Accidents and Malfunctions) in the EIS (Golder 2022) addresses the hazards during the closure activities, a discussion of FEPs leading to hazards in the long term was no longer appropriate in this Section. Accidents and malfunctions occurring during post-closure (former Sections 7.3.7 (WR-1 ISD Structural Failure) and 7.3.8.2 (Human Intrusion and Human Habitation)) were relocated to Section 6.7.1.7.2.1 that discusses various disruptive events that can affect the Normal Evolution Scenario of the WR-1 Disposal Facility. Section 7.2.1 was updated to clarify the process for identifying the potential hazards, which included review of existing documentation, Whiteshell Reactor 1 (WR-1) records, reports, lessons learned, and engagement input. Hazards contained in WR-1 were classified as either Radiological or Non-Radiological to help determine the consequences of accidents involving these hazards. Section 7.2.2 was updated to clarify that during the hazard and risk identification phase, events that can impact the safety of the worker, environment, or the public were identified. All of these events are deemed credible, meaning they have some statistical likelihood of occurring. Statistical threshold ranges have been clarified as ranging between "Almost Certain" and "Highly Unlikely" and are now provided in Table 7.2.2-1. The likelihood of the individual accident and malfunction scenarios in Section 7.3 was evaluated based on industry and operational experience of the Project team, using historical statistics and performance indicators. Section 7.2.2 was updated with: *"The process of estimating the likelihood index includes consideration of past performance indicators and safety statistics for site operations and similar closure work performed at the WL site in the last 10 years. Likelihood can be described as how often the hazard scenario might occur (Table 7.2.2-1). The likelihood index ranges from a "Highly Unlikely" event to an "Almost Certain" event and is more formally defined through the events per year value. Order of magnitude of events per year values are defined for each likelihood level. For example, the "Possible" level ranges from more than 1 event in 100 years up to 1 event in 10 years. The categories selected for the likelihood index reflect the Project timescales and type of hazards that may arise. The likelihood of events occurring beyond 1000 years is more related to disruptive events during posts-closure, which is assessed in the DSAR (Golder 2021) and in Section 6.7 Human and Ecological Health.*

Table 7.2.2-1: Likelihood Index

Index	*A Almost Certain*	*B Very Likely*	*C Possible*	*D Unlikely*	*E Highly Unlikely*
Events per Year	*>1 occurrence in 1 year*	*≤1 occurrence in 1 year and >1 occurrence in 10 years*	*≤1 occurrence in 10 years and >1 occurrence in 100 years*	*≤1 occurrence in 100 years and >1 occurrence in 1,000 years*	*≤1 occurrence in 1,000 years*

Section 7.2.3 Risk Evaluation was updated to explain that the consequence severity and likelihood evaluation includes consideration of environmental design features and mitigation. Section 7.2.3 was updated with:

"As mentioned in Section 7.2.1, where potential adverse effects are identified from an accident or malfunction, feasible environmental design features and/or mitigation practices are implemented to avoid and minimize these potential adverse effects. Mitigation includes prevention measures that would minimize the probability of the scenarios occurring, and control measures to mitigate the severity of consequence from and accident or malfunction. Estimating the likelihood and consequence severity of an accident and malfunction includes consideration of the environmental design features and/or mitigation practices implemented for a particular hazard."

Change to DSAR:

Section 5.4.1 and 5.4.2 of the DSAR (Golder 2021) have been significantly revised to reflect the clarification provided above.

References:

CNSC 2018a. REGDOC-2.11.1 Vol. 3 Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. May 2018. ISBN 978-0-660-25806-5

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						Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021. *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
131.	MSD		EIS - Section 7.2.2 Non-Radiological Hazards	7-7	Comment: With respect to the 2nd paragraph in Section 7.2.2, Non-Radiological Hazards, provide the quantity and type of materials that contain PCBs and asbestos within the WR-1 building. What portion of this is going to be removed for offsite disposal?	**Incorporated:** Sections 3.3.3.2 and 7.2.1.2 (formerly 7.2.2) of the Environmental Impact Statement (EIS; Golder 2022) were revised to include additional information regarding hazardous substances, including polychlorinated biphenyls (PCBs) and asbestos. **Change to EIS:** Section 7.0 was significantly revised for clarity. Section 7.2.2 was renumbered as 7.2.1.2. A new Section 3.3.3.2 on Non-Radiological Hazards was added to the EIS that includes: ***"3.3.3.2.1 Asbestos*** *Both friable and non-friable ACM [asbestos containing material] is present in the WR-1* [Whiteshell Reactor 1] *Building. Quantities and locations of ACMs are given in the B100/WR-1 Restricted Area Asbestos Abatement Work Plan (AECL 2015). The term friable is applied to a material that can be readily reduced to dust or powder by hand or moderate pressure. Therefore, ACMs that are friable have a much greater potential for airborne release when disturbed.* *In 2014, much of the asbestos was removed from the non-restricted access areas of WR-1. The restricted access areas of the WR-1 Building still contain ACMs that will remain for encapsulation within the ISD* [In Situ Disposal] *envelope (i.e., asbestos has been removed from Level 500 and above, and minimal disruption of material will occur during dismantling required prior to grouting)."* and ***"3.3.3.2.3 Polychlorinated Biphenyls*** *As part of the B100 industrial hazards characterization, light ballasts in fluorescent light fixtures suspected of containing PCBs were found in the WR-1 Building (Pinchin 2007). All light ballasts will be examined for PCB containing material, with those identified as PCB containing being removed in accordance with CNL's PCB Waste Management at WL [CNL 2021a] prior to grouting and demolition.* *A more extensive examination was later performed for PCB containing materials [CNL 2021b]. Table 3.3.3-2 below provides the locations where PCBs in concentrations above the solid exemption quantity of 50 mg/kg (SOR/2008-273, c. 2, s. 5.) or suspected of exceeding the solid exemption quantity were found. These PCB containing materials will be removed in accordance with CNL's Waste Management Program [2021c] prior to grouting or demolition.* ***Table 3.3.3-2: Polychlorinated Biphenyl Locations*** ***Room*** — ***Description*** *414/601 - Crawlspace/Reactor Hall* — *Wire in cable trays* *516 - Heating & Air Conditioning Room* — *Flex duct* *516 - Heating & Air Conditioning Room* — *Foam duct insulation* *630 - Corridor* — *Caulking - outer window (glazing tape, black)* *651 - Office (outside)* — *Caulking - outer doors/windows (white)* *If additional PCB-suspect materials are encountered, additional samples may be taken to confirm their exemption or identify them for removal. All PCB-containing waste material generated at the WL site will be sent to an off-site hazardous waste processing facility for treatment and disposal. Waste with both radiological and other hazardous properties may require segregation or use of a treatment facility to be acceptable for disposal."*

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						Section 7.2.1.2 was revised to include the text: *"No PCBs are planned to be left in place for ISD that exceed exemption quantities. CNL has conducted an examination to identify potential PCB containing equipment and materials [CNL 2021b]. These PCB containing materials will be removed in accordance with CNL's Waste Management Program prior to grouting or demolition. If additional PCB-suspect materials are encountered, additional samples may be taken to confirm their exemption or identify them for removal. All PCB-containing waste material generated at WL site will be sent to an off-site hazardous waste processing facility for treatment and disposal. Waste with both radiological and other hazardous properties may require segregation or use of a treatment facility to be acceptable for disposal.* *Asbestos containing materials located in the ISD portion of the WR-1 Building will be left in place and disposed of in situ. The asbestos containing material is primarily piping and tank insulation. The estimated amount of asbestos containing material to be disposed of in-situ is 1,000 m^3 [CNL 2021b]. All asbestos containing material located in the portion of the building to be demolished will be removed following the CNL asbestos remediation procedure and adhering to provincial and federal regulations. The estimated amount of asbestos containing material to be removed from the WR-1 building is 801 m^3 [CNL 2021b]. Most of this material will be considered radioactively contaminated waste and will be packaged for storage/ disposal at the Chalk River Laboratories site.* *With respect to the liquid drained from the reactor systems, an estimated residual percentage is assumed to remain in the system after draining/flushing."* Additional detail on removal of asbestos is provided in Section 3.4.6.3: "*Radiologically contaminated asbestos, if present, will be packaged for storage at an approved waste management facility. Radiologically clean asbestos will be removed and will be disposed of in accordance with Occupational Safety and Health and Waste Management requirements at an approved off-site landfill. Decommissioning activities will be undertaken in compliance with the site decommissioning licence requirements and executed in a manner protecting workers, the public and the environment*. **References:** *AECL 2015. B100/WR-1 Restricted Area Asbestos Abatement Work Plan. WLDP-26411-WP-004. Revision 0. June 2015.* *CNL. 2021a. PCB Waste Management at WL. WL-508600-PRO-728. Revision 0. May 2021.* *CNL 2021b. Whiteshell Laboratories Detailed Decommissioning Plan: Volume 6 – Whiteshell Reactor #1: Building 100. Revision 5. October 2021* *CNL 2021c. Waste Management. 900-508600-PDD-001. Revision 3. March 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Pinchin 2007. Industrial Hazards Characterization Nuclear Facilities Buildings. WLDP-20010-HA-001. February 2007.* *SOR/2008-273, c. 2, s. 5. PCB Regulations.*
132.	ECCC		EIS - Section 7.2.2 Non-Radiological Hazards 7.3 Accidents and Malfunctions	7-7 7-8 to 7-29	**Comment**: Although the EIS lists hazardous materials that are present within the WR-1 Building as including asbestos, lead, PCBs, mercury, mould and various chemicals, there is no supporting detail on potential sources, quantities, rate, form or characteristics relating to these substances. Table 7.2.1-2 lists over a dozen other hazardous substances where only general locations and quantities are indicated. In the absence of this information, it cannot be determined if the CNL's emergency preparedness plans and associated response capacities are commensurate with the environmental risks that the proposed activities present. **Expectation to Address Comment:** It is recommended that CNL provide additional information relating to all hazardous substances known to be on the project site, including sources, quantities, rate, form and characteristics. This	**Resolved As:** Additional information related to the potential sources, quantities, forms, and characteristics of hazardous substances in the Whiteshell Reactor 1 (WR-1) Building, including asbestos, lead, polychlorinated biphenyls (PCBs), mercury, mould and various chemicals is were taken from the WR-1 Characterization Report (CNL 2020). This additional information on the potential sources, forms, and characteristics of the hazardous substances have been added to the Environmental Impact Statement (EIS; Golder 2022), specifically in the new Section 3.3.3.2 and is summarized in Table 3.3.3-2. Is it also described in Section 7.1.2.3 of the EIS. Safe removal of these existing hazardous materials is encompassed by the existing decommissioning licence and the CNSC-accepted Comprehensive Study Report (CSR; AECL 2001). **Change to EIS:** Section 3.3.3.2 was created in the EIS (Golder 2022) to describe and summarize the hazardous substances currently present in the WR-1 Building. Table 3.3.3-2 was provided to summarize the description, location, form and quantity of the hazardous materials. A similar table (Table 7.2.1-2 shown below) was prepared for Section 7.2.1.2. Section 7.2.2. has been renumbered as Section 7.2.1.2 and revised to the following to clarify which hazardous materials from Table 7.2.1-2 of the EIS will be present at the time of decommissioning:

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					information would help to understand the full magnitude of the accident and malfunction scenarios presented.	*"Non-radiological hazards present during the decommissioning of the WR-1 Building include conventional industrial hazards, chemical hazards, biological hazards and fire hazards. Conventional industrial hazards associated with the decommissioning activities include working at heights, working in confined spaces, working with energized systems, hoisting and rigging, and falling objects. Dismantling and demolition of the WR-1 Building will involve the use of cranes and movement of heavy loads. The use of saws, drills and compressors represent potential sources of physical injury to the operators. Changes in site conditions (e.g., excavations and trenching) also represent potential sources of physical injury. These conventional hazards are discussed further in Section 7.3.1. Hazardous materials present within the WR-1 Building include asbestos, lead, polychlorinated biphenyl compounds (PCBs), mercury, mould and various chemicals.* *A select number of non-radiological contaminants are identified as a potential concern and are evaluated in the ERA (EcoMetrix 2021). These include: potassium hydroxide, boron, lead, xylene, palladium, chromium, cadmium, organic coolant (HB-40) and mercury. The hazardous materials within the WR-1 Building are summarized in Table 7.2.1-2. Details on derived non-radiological waste inventories are provided in the ERA (EcoMetrix 2021).* *No PCBs are planned to be left in place for ISD* [In Situ Disposal] *that exceed exemption quantities. CNL has conducted an examination to identify potential PCB containing equipment and materials (CNL 2021a). These PCB containing materials will be removed in accordance with CNL's Waste Management Program prior to grouting or demolition. If additional PCB-suspect materials are encountered, additional samples may be taken to confirm their exemption or identify them for removal. All PCB-containing waste material generated at the WL* [Whiteshell Laboratories] *site will be sent to an off-site hazardous waste processing facility for treatment and disposal. Waste with both radiological and other hazardous properties may require segregation or use of a treatment facility to be acceptable for disposal.* *Asbestos containing materials located in the ISD portion of the WR-1 Building will be left in place and disposed of in situ. The asbestos containing material is primarily piping and tank insulation. The estimated amount of asbestos containing material to be disposed of in-situ is 1,000 m^3 (CNL 2021a). All asbestos containing material located in the portion of the building to be demolished will be removed following the CNL asbestos remediation procedure and adhering to provincial and federal regulations. The estimated amount of asbestos containing material to be removed from the WR-1 building is 801 m^3 (CNL 2021a). Most of this material will be considered radioactively contaminated waste and will be packaged for storage/disposal at the Chalk River Laboratories site. With respect to the liquid drained from the reactor systems, an estimated residual percentage is assumed to remain in the system after draining/flushing.* *In cases where hazardous materials could not be directly quantified (e.g., chromium plating on various components), conservative assumptions have been made to provide a reasonable estimate. For several contaminants (e.g., xylene), there is no confirmation of their presence within WR-1 and their inclusion in this inventory is precautionary, to ensure the effects of the discovery of detectable quantities is not significant. Any additional non-radiological contaminants of potential concern identified during decommissioning will be assessed and remediated as needed to ensure there are no significant effects to the environment.*

<table>
<tr><th>No.</th><th>Department/ Agency</th><th>SME</th><th>Section Table or Figure</th><th>Pg. #</th><th>Information Request or Summary of Comment</th><th>Response by CNL</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>
Table 7.2.1-2: Non-radiological Hazards Associated with Main Systems and Components of the WR-1 Building
<table>
<tr><th>Chemical/Material</th><th>Expected Locations</th><th>Quantity (kg)</th><th>Form</th></tr>
<tr><td>HB-40[(a)]</td><td>Primary Heat Transport (PHT) System; Auxiliary Organic System and Gas System; Fuel Wash Down system, calandria tubes, tanks</td><td>87,700</td><td>Liquid in system low points</td></tr>
<tr><td>Lead</td><td>Throughout the WR-1 Building</td><td>40,800</td><td>Solid, Various shielding uses (sheets and bricks)</td></tr>
<tr><td>Xylene</td><td>Spent Fuel Handling and Storage System; Wash Down System – Trapped in system low points or blockages</td><td>1.9</td><td>Liquid/Vapour,</td></tr>
<tr><td>Boron</td><td>Heavy Water System; Auxiliary Systems, including Boron Addition System – Low points/Joints where residual solutes collect.</td><td>0.0009</td><td>Solids/Solutes</td></tr>
<tr><td>Palladium</td><td>Organic Supply System, Helium System – Low points/Joints where residual solutes collect</td><td>15.5</td><td>Solids/Solutes</td></tr>
<tr><td>Potassium Hydroxide</td><td>Chemical Addition Tank in the Concrete Cooling System –Low points/Joints where residual solutes collect</td><td>0.01</td><td>Solids/Solutes</td></tr>
<tr><td>Cadmium</td><td>Ion chamber Component and as plating on Fuel Storage Block</td><td>91.4</td><td>Solid/Plating</td></tr>
<tr><td>Chromium</td><td>Various Thermocouples and as Plating on various components (Condenser Tubes; Boiler Tubes)</td><td>148</td><td>Solid/Plating</td></tr>
<tr><td>Mercury</td><td>Drains low points and joints throughout the WR-1 Building</td><td>0.33</td><td>Liquid/Vapour</td></tr>
<tr><td>Beryllium</td><td>WR-1 – Fuel Elements</td><td>Limited</td><td>Trace solid residuals</td></tr>
<tr><td>Platinum</td><td>FLUX Detectors</td><td>Limited</td><td>Trace solid residuals</td></tr>
<tr><td>Magnesium Oxide</td><td>FLUX Detectors</td><td>Limited</td><td>Trace solid residuals</td></tr>
<tr><td>Gadolinium Nitrate</td><td>SLOWPOKE Demonstration Reactor Liquid Absorber Safety System</td><td>Limited</td><td>Trace solid residuals</td></tr>
<tr><td>Ozone Depleting Substances</td><td>Multiple systems</td><td>Limited</td><td>Trace solid residuals</td></tr>
<tr><td>Multiple Ion Exchange Columns</td><td>Heavy Water System, Distilled Water System, Spent Fuel Bay Circulation System, Concrete Cooling System, Boron Addition System, SLOWPOKE Demonstration Reactor Auxiliary Systems, WR-1 L2 Loop, Fast Neutron Loop</td><td>Limited</td><td>Trace solid residuals</td></tr>
</table>
Note:
a) Organic coolant, also known as OS-84 or HB-40, has been drained and properly disposed of; however, residual coolant anticipated to coat the PHT system, and found in some tanks and some calandria tubes. The used organic coolant is potentially contaminated from fuel failure events and corrosion products. The properties of the organic coolant are known to change with irradiation; therefore, residual amounts are expected to be in the form of a viscous liquid sludge, or a dried coating. The volume of organic coolant remaining was very conservatively estimated by assuming 30% of the total organic cooling system volume remains. Subsequent source term investigations indicate that the volume remaining is much lower. ”
References:
AECL 2001. Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.
CNL 2020. WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates. WLDP-26100-041-000. Revision 2. October 2020.
CNL 2021a. Whiteshell Laboratories Detailed Decommissioning Plan: Volume 6 – Whiteshell Reactor #1: Building 100. Revision 5. October 2021
EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.
Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.
</td></tr>
<tr><td>133.</td><td>CNSC</td><td>RPD</td><td>EIS - Section 7.3 Accidents and Malfunctions</td><td>7-8 to 7-34</td><td>Comment: Dose estimates were not provided for accidents and malfunctions described in Section 7.3 of the EIS. Expectation to Address Comment:</td><td>Incorporated:
Dose estimates for Material Handling Accidents and Fire and Explosion accidents were not provided in the Environmental Impact Statement (EIS; Golder 2022), as the EIS draws on the existing approved Comprehensive Study Report (CSR; AECL 2001) and the Emergency Response Plan (CNL 2018) for the</td></tr>
</table>

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					Please provide the following: dose estimates to workers and the public as a result of a bounding materials handling accident or provide adequate justification for not including this in the EIS. Dose estimates to workers and the public as a result of fires and explosions or provide adequate justification for not including this in the EIS.	wider Whiteshell Laboratories (WL) decommissioning. The CSR and Emergency Response Plan form part of the basis for the WL site licence issued by the CNSC as appropriate for decommissioning work at the WL site, including the decommissioning of Whiteshell Reactor 1 (WR-1). The In Situ Disposal (ISD) of WR-1 outlined in the EIS does not present any additional hazards, as it aligns with existing decommissioning practices and no new hazards or hazardous materials are being introduced as a result of ISD of WR-1 that would fall outside the scope of the existing CSR and emergency response plans. **Change to EIS:** Section 7.3 of the EIS (Golder 2022) (Accidents and Malfunctions) was updated as follows: *"The CSR (AECL 2001) outlined the accidents and malfunctions relevant to the overall decommissioning of WL, identified the expected effects of each scenario, and described mitigations to be put in place as part of the emergency response to those events. Closure activities for the proposed ISD of WR-1 are encompassed by current operating conditions and approved emergency preparedness and response planning identified in the CSR, specifically the Emergency Preparedness Program (CNL 2020) and WL Site Emergency Response Plan (CNL 2018), which form the basis of the CNSC-issued site decommissioning licence. The types of hazards anticipated during closure activities are aligned with similar hazards under existing conditions. The procedures, controls and proven mitigative measures in the Emergency Response Plan are considered to appropriately limit the consequence of these hazards such that they would not increase from existing conditions. If new hazards are identified during the execution of the Project, the WL Site Emergency Response Plan (CNL 2018) will be updated accordingly."* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *CNL 2018. Whiteshell Laboratories Site Emergency Response Plan. WL-508730-ERP-001. Revision 5. April 2018.* *CNL 2020. Emergency Preparedness. 900-508730-PDD-001. Revision 2. January 2020.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
134.	ECCC		EIS - Section 7.3.5 System and Equipment Failure	7-15, 1st paragraph	**Comment:** The EIS indicates: "As secondary containment and Emergency Preparedness Plans already exist, these hazards associated with Project activities are limited to onsite personnel who are working on the Project and do not pose a threat to the public or the environment." It is important to understand the full extent of the preventive measures and design safeguards that are in place in order to assess whether they are commensurate with the environmental risks posed by the accident and malfunction scenarios. **Expectation to Address Comment:** Provide additional information that details secondary containment design and capacity for all structures at the WL site that contain radiological and non-radiological hazardous substances.	**Incorporated:** Section 7.3.5 (Specifically 7.3.5.1) of the Environmental Impact Statement (EIS; Golder 2022) was updated to refer to the Whiteshell Laboratories (WL) Environmental Protection Program (CNL 2021) and relevant procedure and policies, specifically Management and Monitoring of Emissions (CNL 2018a), that describe the use of secondary containment as standard design features of equipment containing hazardous materials. The exact design of the containment varies from equipment to equipment, but in general takes the form of spill trays and ventilation ducts connected to effluent collection systems, or spill trays with sufficient volume capacity to contain the potential spill. The relevant section of the Management and Monitoring of Emissions (CNL 2018a) procedure is quoted below. *"Section 6.1.3.2 – Secondary Containment* *(shall) Secondary containment systems shall be provided for containers or systems containing radioactive or non-radioactive contaminants (e.g., chemicals, oils, solvents, or other hazardous or nuclear substances) that are stored outdoors or indoors near a storm drain or open draining trench. Note: Containers stored in an approved cabinet as per Safe Storage and Handling of Hazardous Products [46]* (CNL 2018b) *meet this requirement and therefore do not require additional containment. Where a secondary containment system is required:* • *It shall be capable of collecting [47] [48]* (US Environmental Protection Agency; CCME 2003) *:* • *For single containers: a volume of at least 110 percent of the primary container;* • *For an arrangement of multiple containers: a volume equal to 10 percent of the aggregate volumes of all containers or 110 percent of the largest container, whichever is greater; or* • *For secondary containers that will be receiving rain or snow: a volume equal to 10 mm of rainfall or snowmelt (approximately 10 cm of snow) in addition to the stated volumes above (see Appendix B for an example on compensating for added precipitation volume);* • *It should be kept free of water, snow and ice at all times. Uncontrolled drainage from a secondary containment system shall not take place. Accumulated rainwater or snowmelt may be discharged from a secondary containment system to a water collection system (e.g., sanitary, storm, process) or to ground in accordance with any site-specific discharge criteria for the receiving collection system;*

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						• *It should be designed to prevent contact of the containers with the liquids resulting from spills. In other words, the containers should be elevated or the containment system should be sloped; and* • *The implementation of a leak detection system shall be considered for those secondary containment systems located outside of areas with normal traffic. Such a system can be as complex as an arrangement of sensors and alarms or as simple as a daily visual inspection log sheet."* **Change to EIS:** Section 7.0 has been significantly revised to focus on potential accidents and malfunctions during closure. Accidents and malfunctions occurring during post-closure (former Sections 7.3.7 (WR-1 ISD Structural Failure) and 7.3.8.2 (Human Intrusion and Human Habitation)) were relocated to Section 6.7.1.7.2.1 and 6.7.1.7.2.2 that discuss various disruptive events that can affect the Normal Evolution Scenario of the Whiteshell Reactor Disposal Facility. Section 7.3.5 of the EIS has been updated to include reference to the WL Environmental Protection Program and relevant procedure and policies. The following text was added to Section 7.3.5.1: *"Procedures developed under CNL's Environmental Protection Program [CNL 2021], and Management and Monitoring of Emissions (CNL 2018b), describe the use of secondary containment as standard design features of equipment containing hazardous materials. For instance, CNL's Management and Monitoring of Emissions (CNL 2018[a]) indicates that secondary containment systems shall be provided for containers or systems containing radioactive or non-radioactive contaminants (e.g., chemicals, oils, solvents, or other hazardous or nuclear substances) that are stored outdoors or indoors near a storm drain or open draining trench."* **References:** *Canadian Council of Ministers of the Environment (CCME) 2003. Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.* *CNL 2018a. Management and Monitoring of Emissions. 900-509200-STD-009. Revision 0. March 2018.* *CNL 2018b. Safe Storage and Handling of Hazardous Products. 900-510400-MCP-008. Revision 0. February 2018.* *CNL 2021. Environmental Protection. 900-509200-PDD-001. Revision 3. June 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *US Environmental Protection Agency. Code of Federal Regulations - Containment. 40CFR part 264.175(b).*
135.	ECCC		EIS - Section 7.3.6 Fires and Explosions	Page 7-16, 3rd paragraph	**Comment:** The EIS indicates that: "Controls are in place to limit the potential for liquid borne contamination as the result of firefighting to spread to the surrounding environment." The EIS Executive Summary indicates on p.xxix [emphasis added]: "The engineered cover system will be designed to limit water infiltration, to direct any infiltrationx water away from the grouted structure, to resist degradation, and will be graded to promote drainage from the site to the Winnipeg River, **similar to the rest of the WL site**." It is important to understand the full extent of the controls that are in place to limit the potential for liquid borne contamination to spread to the surrounding environment in order to assess whether they are commensurate with the environmental risks posed by the fire and explosion scenario. **Expectation to Address Comment:** Provide details on all of the preventive measures and design safeguards (both passive and active) that are in place to limit the potential for liquid borne	**Incorporated:** The text in the Environmental Impact Statement (EIS) Executive Summary (Golder 2022) describes the grading of the Whiteshell Reactor Disposal Facility (WRDF) site to promote drainage to the Winnipeg River in the post-closure phase, after all of the grouting and demolition work is complete and only a fully buried and covered concrete and grout block remains. At that point, a fire at the WRDF, which would be capable of releasing radioactive materials is not a realistic scenario. The text in Section 7.3.6 of the EIS (Golder 2022a) describes the CNL fire response procedures, actions and priorities if a fire occurs during the closure phase of the Whiteshell Reactor 1 (WR-1) Project. Additional description of the passive and active means of safeguarding contaminated runoff to the environment was provided in Section 7.3.6.1. As part of CNL's environmental protection program, there are requirements and processes in place for the Management of Land, Habitat and Wildlife (CNL 2018a). This procedure outlines the mitigation strategies and actions that are to be employed to prevent contaminated run-off from the site to receiving waters. A post-closure storm water management plan is being developed and regular site inspection and grounds maintenance is included as tasks in Table 1 of the Environmental Assessment Follow-Up Program (CNL 2018b). A remedial action plan for responses to unexpected results will be prepared as well, as indicated in Table 1 of the Environmental Assessment Follow-Up Program (CNL 2018b), and a follow-up framework for all potential effects, including those from Whiteshell Reactor 1 (WR-1) is provided in Table 2 of the Environmental Assessment Follow-Up Program (CNL 2018b). **Change to EIS:** Section 7.0 has been significantly revised to focus on potential accidents and malfunctions during closure. Accidents and malfunctions occurring during post-closure (former Sections 7.3.7 (WR-1 ISD Structural Failure) and 7.3.8.2 (Human Intrusion and Human Habitation)) were relocated to Section 6.7.1.7.2.1 and 6.7.1.7.2.2 that discuss various disruptive events that can affect the Normal Evolution Scenario of the WRDF.

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					contamination, such as contaminated firefighting water runoff, to migrate to the surrounding environment, including to the Winnipeg River.	Section 7.3.6.1 was revised to include the following text under the "Fires" sub-heading: *"Wastewater generated from fire suppression activities in the event of a fire would come from internal fire suppression activities or exterior suppression activities. Interior wastewater could result from the activation of sprinkler systems within the building or the application of portable hose streams. Controls are in place to limit the potential for liquid borne contamination as the result of firefighting to spread to the surrounding environment. Most rooms in the WR-1 Building have floor drains, allowing water to be collected and then sampled for non-radiological and radiological contaminants. The floor drains terminate in one of two sumps located in the WR-1 Building, the Organic Sump and the conventional sump. The organics sump is connected to the drains of any room that had organic coolant flowing in or through it to capture any potential releases of organic material separately from the main water collection system in the WR-1 Building. Based on analytical results, the water can either be transferred directly into barrels or filtered and pumped into the conventional sump system for final dispositioning. Water collected by the conventional sump system is transferred to wastewater reservoirs inside the WR-1 Building until it can be sampled. Once the samples are collected the water can be released as per protocol or held back for treatment. In this respect interior wastewater generated in the event of a fire is contained and controlled.* *The other potential for wastewater generated would be from exterior fire response on the facility in the form of runoff. This is less likely considering there is very little material left in the building* that *is capable of burning or to burn for long enough to generate enough heat to create the conditions that require exterior fire suppression. The combination of the lack of fuel load and the fact that the structure is of non-combustible construction under negative air pressure means that fire in this location would likely only be fought with interior fire suppression activities. In the event of exterior fire response, runoff could make its way from the roof of the facility down the exterior walls to the ground around the building. Any soils around the WR-1 Building affected by a fire would be tested after the event against established Canadian Council of Ministers of the Environment (CCME) soil quality standards, and remediated accordingly.* *As part of CNL's Environmental Protection Program, there are requirements and processes in place for the Management of Land, Habitat and Wildlife [CNL 2018a] which includes mitigation strategies and actions that are to be employed to prevent contaminated run-off from the site to receiving waters. For example, in cases where runoff is of sufficient quantity to reach the roadway, road drains, which are connected to the site storm sewer system would capture the runoff. The runoff would then be sent to the Outfall where runoff is continuously monitored. A post-closure storm water management plan is being developed for the Project and regular site inspection and grounds maintenance is included as tasks under Work Package #10 in the Environmental Assessment Follow-Up program."* **References:** *CNL 2018a. Management of Land, Habitat and Wildlife. 900-509200-STD-006. Revision 0. April 2018.* *CNL 2018b. Environmental Assessment Follow-Up Program For Whiteshell Laboratories. WL-509246-STD-001. Revision 0. December 2018.* *Golder 2022a. Environmental Impact Statement for the In Situ Decommissioning of WR-1 at the Whiteshell Laboratories – Executive Summary. WLDP-26000-ENA-002. Revision 4. December 2022.* *Golder 2022b. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories. WLDP-26000-ENA-001. Revision 4. December 2022.*
136.	CNSC	N. Kwamena	EIS - Section 7.3.6 Fires and Explosions	7-16 to 7-18	**Comment**: In the assessment of fire in Section 7.3.6 of the EIS, no consideration appears to have been given to the environmental (or offsite) effects of a fire due to decommissioning activities at WR-1. Depending on environmental conditions, a fire or explosion at the site might trigger a forest fire or other event that may have offsite implications. **Expectation to Address Comment:** Offsite (environmental) impacts of a fire or explosion at WR-1 should be included in the "Accident and Malfunction" assessment of the EIS or its exclusion be justified.	**Incorporated:** Potential off-site environmental effects from a fire on-site include the release of radiological and non-radiological air emissions to the environment, and triggering an off-site forest fire. Section 7.3.6 (Fires and Explosions) of the Environmental Impact Statement (EIS; Golder 2022) notes that the entire Whiteshell Reactor 1 (WR-1) structure operates under a negative air pressure ventilation system and as a result, the release of radiologically contaminated air from a fire inside of WR-1 has a low probability. Further mitigation is in place to limit adverse effects if a fire were to occur (e.g., High-efficiency Particulate Air [HEPA] filtration system). Whiteshell Laboratories (WL) Emergency Response Plan (CNL 2018) includes emergency preparedness strategies for both on and off-site incidents. In the extremely unlikely event of an on-site fire associated with WR-1 triggering an off-site forest fire, the Emergency Response Plan identifies external organizations that would work with CNL during such an event including the Manitoba Emergency Measures Organization and the Local Government District of Pinawa, Emergency Coordinator and Pinawa Fire Department. The EIS (Golder 2022) draws on the existing approved Comprehensive Study Report (CSR; AECL 2001) and the WL Emergency Response Plan (CNL 2018) for the wider WL decommissioning. The CSR and Emergency Response Plan have been accepted by the CNSC as appropriate to authorize decommissioning work at WL, including the decommissioning of WR-1. The In Situ Disposal (ISD) of WR-1 outlined in the EIS does not present any

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						additional hazards, as it aligns with existing decommissioning practices and no new hazards or hazardous materials are being introduced as a result of ISD of WR-1, that would fall outside the scope of existing CSR and emergency response plans. Therefore, based on the above, potential off-site environmental effects from a fire on-site have been considered as part of the EIS in Section 7.2.6 (Fires and Explosions). **Change to EIS:** The EIS (Golder 2022) text in Section 7.3 (Accidents and Malfunctions) was updated as follows: *“The CSR (AECL 2001) outlined the accidents and malfunctions relevant to the overall decommissioning of WL, identified the expected effects of each scenario, and described mitigations to be put in place as part of the emergency response to those events. Closure activities for the proposed ISD of WR-1 are encompassed by current operating conditions and approved emergency preparedness and response planning identified in the CSR, specifically the Emergency Preparedness Program (CNL 2020) and WL Site Emergency Response Plan (CNL 2018), which form the basis of the CNSC-issued site decommissioning licence. The types of hazards anticipated during closure activities are aligned with similar hazards under existing conditions. The procedures, controls and proven mitigative measures in the Emergency Response Plan are considered to appropriately limit the consequence of these hazards such that they would not increase from existing conditions. If new hazards are identified during the execution of the Project, the WL Site Emergency Response Plan (CNL 2018) will be updated accordingly.”* Section 7.3.6.1 (Hazard Identification), subsection “Fires” of the EIS was updated with the following text: *“A fire could also result in radiological and non-radiological air emissions to the environment. The release of radiologically contaminated air from a fire inside of WR-1 has a low probability. The entire WR-1 structure operates under a negative air pressure ventilation system. This means all the air in the facility flows from the least contaminated areas to the most contaminated areas before being vented from the building. The building is equipped with a HEPA filtration system that would be engaged in the event of a fire in a contaminated space to filter the air prior to releasing it to the atmosphere. The air exiting the stack is also monitored to detect if any radiological releases have occurred to the environment. The effect of the soot and ash on the soils and flora would be evaluated against established soil quality standards and remediated accordingly, as per direction from CNL Environmental Protection Specialists.”* and *“CNL’s WL Site Emergency Response Plan (CNL 2018) includes emergency preparedness strategies for both on and off-site incidents. In the extremely unlikely event of an on-site fire associated with WR-1 triggering an off-site forest fire, the Emergency Response Plan identifies external organizations which would work with CNL during such an event including the Manitoba Emergency Measures Organization and the Local Government District of Pinawa, Emergency Coordinator and Pinawa Fire Department.”* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *CNL 2018. Whiteshell Laboratories Site Emergency Response Plan. WL-508730-ERP-001. Revision 5. April 2018.* *CNL 2020. Emergency Preparedness Program. 900-508730-PDD-001. Revision 2. January 2020.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
137.	ECCC		EIS - Section 7.3.6 Fires and Explosions	7-17, 2nd and 3rd paragraphs	**Comment:** The EIS indicates: “If a fire does occur, the Fire Response Involving Radioactive Material (CNL2013) at WL manages the hazards for emergency personnel involved in fire suppression and/or rescue activities that potentially involve radioactive materials (AECL 2013).” The following paragraph also indicates: “CNL’s Emergency Preparedness Program is designed to respond to any emergency at the WL site. The Emergency Preparedness Program provides guidelines for CNL’s emergency management staff to ensure that adequate staff and materials are available to meet the requirements of provincial and	**Incorporated:** Supporting detail regarding CNL’s Emergency Preparedness Program’s ability to handle a fire or explosion scenario, WL Fire Protection Program, along with specific response capabilities and times, staff and equipment, exercise regimes, as well as proposed environmental monitoring during events has been provided in the revised Section 7.3.6 of the Environmental Impact Statement (EIS; Golder 2022). To help support that CNL’s emergency preparedness plans and associated response capacities are sufficient for the proposed activities, it should be noted that CNL has been carrying out decommissioning activities in accordance with the approved procedures for the Environmental Protection Program and Whiteshell Laboratories’ (WL’s) Emergency Preparedness Program for over 20 years with a proven track record for incident prevention and management. The activities proposed for Whiteshell Reactor 1 (WR-1) decommissioning are not significantly different from other decommissioning work being safely carried out on site. Past performance metrics provided in Section 7.3.6.2 of the EIS demonstrate that CNL has been very effective in preventing and managing fire-related accidents and incidents, including those affecting the environment. When real-life events occur, CNL uses an Operating Experience

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					municipal emergency plans. The program provides the earliest possible coordinated response to reduce the effects from an emergency to workers, the public, and the environment, as well as restore normal operations as quickly as possible to site." It is important to understand the full extent of CNL's emergency response and post-incident remediation and monitoring capacities in order to assess whether the expected effectiveness of those mitigation efforts may lead to possible residual environmental effects. **Expectation to Address Comment:** Provide supporting details in respect of fire and explosion response capacities, in terms of both on-site equipment and trained personnel, including any exercise regimes and 24/7 response times. Provide information on CNL's Emergency Preparedness Program in specific relation to any post-fire or post-explosion environmental effects mitigation, remediation and monitoring activities and capacities. Provide a response to the expected effectiveness of CNL's Emergency Preparedness Program in specific relation to environmental effects mitigation, remediation and monitoring activities for accident and malfunction scenarios.	Process to integrate the experience and lessons learned during addressing the events into the relevant processes, including Emergency Preparedness and Environmental Protection programs. **Change to EIS:** Section 7.0 has been significantly revised to focus on potential accidents and malfunctions during closure. Accidents and malfunctions occurring during post-closure (former Sections 7.3.7 (WR-1 ISD Structural Failure) and 7.3.8.2 (Human Intrusion and Human Habitation)) were relocated to Section 6.7.1.7.2.1 and 6.7.1.7.2.2 that discuss various disruptive events that can affect the Normal Evolution Scenario of the WR-1 Disposal Facility. Section 7.3.6.1 of the EIS has been revised to include the following information under the "Fires" sub-heading: *"Under Environmental Incident Reporting, Investigation and Mitigation, unplanned events, such as fire, are investigated until the cause of the incident has been identified and any adverse effects to the environment have been documented, or until due diligence has been demonstrated. This document also outlines all reporting responsibilities placed on CNL in the event of a fire. The environmental impacts are then mitigated to the extent practical to minimize adverse environmental impacts. Mitigative actions shall be directed on a case-by-case basis by the Facility Authority in consultation with Environmental Management staff."* and *"CNL's WL Site Emergency Response Plan (CNL 2018b) includes emergency preparedness strategies for both on and off-site incidents. In the extremely unlikely event of an on-site fire associated with WR-1 triggering an off-site forest fire, the Emergency Response Plan identifies external organizations which would work with CNL during such an event including the Manitoba Emergency Measures Organization and the Local Government District of Pinawa, Emergency Coordinator and Pinawa Fire Department.* *At the WL site, a full-time well-trained fire protection team is employed to ensure rapid and appropriate response to fires involving or potentially involving radiological material. CNL's Emergency Preparedness Program (CNL 2020) is designed to respond to any emergency at the WL site, including fire and explosions. The Emergency Preparedness Program provides guidelines for CNL's emergency management staff to ensure that adequate staff and materials are available to meet the requirements of provincial and municipal emergency plans, as well as training and exercise requirements. The program provides the earliest possible coordinated response to reduce the effects from an emergency to workers, the public and the environment, as well as restore normal operations as quickly as possible to site.* *The monitoring system within the WR-1 Building underwent upgrades in 2011, and is monitored directly at the Security Monitoring Room, providing rapid notification for first responders of any fire event. The response time for the WL on-site Emergency Services Operations, which includes the fire brigade, is under the industry standard set by* [Canadian Standards Association] *CSA N393-13: Fire Protection for Facilities that Process, Handle, or Store Nuclear Substances (CSA Group 2013), as verified by a third-party Fire Response Needs Analysis (Jensen Hughes 2019). The initial response to the facility would include one Fire Engine, one Pumper/Tanker and a minimum of 5 fire fighters. Upon a confirmed fire in any facility on site all off duty Emergency Services Operations members and the Pinawa Fire Department are called in for support. Further details on the fire protection staffing and response times are provided in the Fire Response Needs Analysis (Jensen Hughes 2019).* *The Emergency Services Operations training is skills focused, diving into specific response topics. All members of the WL Emergency Services Operations undergo specialised "Group 4 Enhanced" radiological training, WR-1 Building orientation and specific radiological response procedures/guidelines training. This training is over and above their already rigorous industrial fire training (CNL 2017) which meets or exceeds the* [National Fire Protection Association] *NFPA 1081 Standard for Facility Fire Brigade Member Professional (NFPA 2018). Each member of the Emergency Services Operations fire brigade are required to complete annual qualifications in various aspects of their training, including most aspects of the NFPA 1081 and On the Job Training topics. Each crew of first responders is required to participate in Environmental Monitoring and Protection Program exercises as required. The Environmental Monitoring and Protection program exercises focus on interoperability, combining the First Responder's response with various other groups to ensure smooth responses anywhere across the site. Both the Emergency Operations Center and Building Emergency Teams, including fire response teams, are tested and evaluated according to the WL exercise and drill plan, which is a five-year guideline from which the annual exercise schedule is created (CNL 2018). These exercises serve to validate the expected effectiveness of the emergency preparedness procedures, and provide an opportunity to adjust the response procedures to better fit the risk levels. The Emergency Services Operations training is skills-focused, diving into specific response topics.* *Along with the general skills and procedures that the Emergency Services Operations fire brigade use for their responses, the WR-1 Building has specific Pre-Fire Plans which are primarily used by the Incident Commander in establishing a safe and appropriate response to emergency events within the WR-1 Building (CNL 2019). The few contaminated spaces within the building are locked and responders have no access to these spaces without a facility operator present. Most of these spaces also contain sprinkler systems that are activated via a fusible link. Several of these spaces also have fog nozzles that con be operated remotely as a back-up to the sprinkler systems.* *Confirmed fire in the WR-1 Building would also result in the activation of the WL* [Emergency Operations Center] *EOC. The role of the EOC is to support the Incident Commander in their operations at the emergency site and to look after all the other issues that arise outside the emergency site, both on and off*

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						the WL site. The WL EOC is structured based on the Incident Command System which is the industry standard across North America. In addition to the standard EOC positions, the WL EOC is also staffed by members of Occupational Safety and Health, Environmental Protection, Radiation Protection and Health Physicists and its' Facility Managers." Section 7.3.6.1 of the EIS has been revised to include the following information under the "Explosions" sub-heading: *"The WR-1 Building is in a "Storage and Surveillance" state, with the reactor having been shut-down and de-fuelled for over 30 years. The building has had no fissile material in it for at least 20 years. When the last of the fuel was removed from the reactor, the organic coolant was also drained and removed. In the past 3 years, staff has been moved out of the building and offices and labs have been decommissioned. This decommissioning includes the removal of all office furniture, non-structural walls and partitions and flooring and ceiling materials. The building is now occupied only by the Project team and facility operators in a couple of office spaces next to the control room. Access to the building is controlled, with access to the reactor hall and below-grade areas controlled by locks. There is no superfluous material stored in the building and only a minimal amount of flammable materials stored in the appropriate storage cabinets for routine maintenance and compliance work.* *Given the current state of the building and the lack of any material, nuclear or otherwise, capable of creating an 'explosive' atmosphere, the risk of an explosion in the WR-1 Building is not considered feasible. There is therefore no current risk posed to employees, the public or the environment from an explosion from the WR-1 Building. As there is no explosion hazard posed by the WR-1 Building there is no corresponding emergency preparedness procedures for this particular hazard. During decommissioning, cutting of sealed components, which may be specifically targeted so that grout will infiltrate them and reduce voids, may pose an explosion hazard if they contain combustibles. During grouting, metals and alloys (i.e., aluminium) exposed to high pH (e.g., an improperly specified or mixed grout) produce hydrogen, which could potentially reach an explosive concentration above the grout surface. As the introduction of these items could create a localised explosion hazard and an ignition hazard for any remaining combustible products, special approval for these items will be provided within CNL's Fire Protection Program (CNL 2018) and additional mitigation measures put in place.* *Environmental monitoring of the site will continue as part of the WL Environmental Assessment Follow-up Program (CNL 2018c). During incident response, CNL will assess monitoring data against established limits for contaminants of potential concern based on information in the* [Decommissioning Safety Assessment Report] *DSAR (Golder 2021)., including the findings from the Environmental Risk Assessment (EcoMetrix 2021). These limits are concentrations that are well below established benchmarks for the protection of humans and the environment. Cessation of a monitoring activity would occur only once it can be shown that an effect has stabilized or has been reduced to a level where it is no longer considered significant by regulatory requirements or community concerns. Any proposals on modifications to the monitoring program will be communicated to the CNSC. A progress report will be prepared each year and will include a summary of the environmental monitoring results and the safety considerations of the contaminants left in-situ."* Section 7.3.6.2 (Risk Measurement and Evaluation) of the EIS has been revised to include the following information: *"A four-tier classification of emergencies is used to assist the Emergency Preparedness Program in preparing and implementing responses. From 2015 to 2019, there were no reportable fire events. Therefore, the likelihood of a fire or explosion occurring as a result of an accident or malfunction, considering the controls and mitigation in place, is **Highly Unlikely**. Controls are in place to limit the potential for liquid contamination to spread to the surrounding environment as the result of firefighting activities. For airborne emissions from a fire, the WR-1 building is equipped with a HEPA* [High-efficiency Particulate Air] *filtration system that would be engaged in the event of a fire to filter the air prior to releasing it to the atmosphere. The air exiting the stack is also monitored to detect if any radiological releases have occurred to the environment. As such, the consequence severity of such an incident is considered to be Low for the environment and the public. The consequence of a fire or explosion is considered to be **High** for worker safety.* *A consequence severity of **High**, combined with a likelihood of **Highly Unlikely**, results in a risk evaluation of **Moderate**. Monitoring and management actions are already in place at the WL site for these hazards and will continue for the Project."* **References:** *CNL 2017. WL Industrial Fire Brigade Requirements (NFPA 600). 151-508720-GL-001. Revision 0. October 2017.* *CNL 2021. Fire Protection Program. 900-508720-PDD-001. Revision 3. June 2021.* *CNL 2018b. Whiteshell Laboratories Site Emergency Response Plan. WL-508730-ERP-001. Revision 5. April 2018.* *CNL 2018c. Environmental Assessment Follow-Up Program For Whiteshell Laboratories. WL-909246-STD-001. Revision 0. December 2018.* *CNL 2019. B100 Emergency Procedures. WL-508730-EP-110. Revision 7. August 2019.* *CNL 2020. Emergency Preparedness Program Description Document. 900-508730-PDD-001. Revision 2. January 2020.* *CSA Group 2013. N393-13: Fire Protection for Facilities that Process, Handle, or Store Nuclear Substances.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP26000-REPT-006. Revision 5. December 2021.*

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						Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021. *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Jensen Hughes 2019. Fire Response Needs Analysis. Canadian Nuclear Laboratories. Whiteshell Laboratories. 151-508720-041-000. March 2019.* *NFPA 1081 2018. Standard for Facility Fire Brigade Member Professional Qualifications.*
138.	ECCC		EIS - Section 7.3.7 WR-1 ISD Structure Failure Decommissioning Safety Assessment Report, Appendix 5.1.2-1 CNL WR-1 In Situ Decommissioning Activities Hazard Identification and CNL WR-1 In Situ Decommissioning Activities Accidents and Malfunctions, Section 4.2.7	7-19, 2nd paragraph 8	**Comment:** The EIS indicates: "CNL will use an experienced grout supplier with an appropriate QA Program for execution of the grouting program." Appendix 5.1.2-1 of the *Decommissioning Safety Assessment Report* indicates: "Use of an experienced grout supplier with an appropriate QA Program can ensure adequate grout performance." It is important to assess any contingency plans that would be relied on should the work of the selected grout supplier or the performance of the grout compound be found to be sub-standard at any point during the encapsulating process as a failure of either could compromise the long-term integrity of the structure and thus could lead to residual environmental effects. **Expectation to Address Comment:** Provide complete details on the work experience of the selected grout supplier/installer with specific references to their grouting experience encapsulating radiologically contaminated materials. Include any grout formulation issues they may have encountered for such projects, success rates of any adaptations and important lessons learned. Provide any contingency plans that would be relied on should the work of the grout supplier be found to be sub-standard, and/or should the selected grout supplier not be able to provide their services through to project completion. Provide a contingency plan that would be relied on in the event that grout compound performance is found to be sub-standard.	**Resolved As:** Decommissioning activities will be governed by the CNL corporate management system, and more specifically the Whiteshell Decommissioning Quality Assurance Plan (CNL 2018), required under the existing decommissioning licence. Decommissioning planning is a continuous, iterative process completed to confirm that the requirements of the Whiteshell Laboratories (WL Decommissioning Quality Assurance Plan will be met prior to execution of the decommissioning work evaluated. In addition to being subject to an internal review and verification in accordance with WL's Quality Assurance Plan, an independent review by CNL's Safety Review Committee (SRC) will be completed. It is recognized that Quality Assurance is paramount in the establishment of the engineered materials that will fulfil its design function. As part of grout formulation design, Savannah River National Laboratory (SRNL) was contracted by CNL to provide operational experience. Savannah successfully decommissioned the P and R Reactors in situ at the Savannah River Site in 2011. SRNL developed and tested special grout composition capable of stabilizing residual contaminants and modelled the structural stability of the in situ disposal (ISD) structure. For the Whiteshell Reactor 1 (WR-1) decommissioning, the methods and approach adopted have been used for similar facilities in Canada and internationally, and all relevant lessons learned are being considered in Project planning. SRNL is a multipurpose lab dedicated to environmental remediation and understanding the behaviour of elements as they flow through the environment, and they engage and share information with several other labs that do similar work (Oak Ridge National Laboratory, Idaho National Laboratory, Pacific Northwest National Laboratory, Los Alamos National Laboratory) and agencies/regulators. For example, in January of 2019, SRNL participated in the Technical Information Exchange meeting where best practices and challenges of ISD were discussed with joint government agencies and regulators from around the world (US, UK, Canada and Japan). Based on their experience with reactor grouting projects, SRNL prepared a grout formulation test plan specific to the WR-1 project (SRNL 2018). The plan included a qualification of raw materials, preliminary grout mix design and a full range of quality control and performance tests according to various technical standards. CNL contracted a division of Golder Associates with significant experience with in-situ grouting of industrial and mining facilities to fabricate and test various grout formulations based on the SRNL grout formulation and test plan. Through this testing, ingredient materials were investigated and tested, and the grout formulation was refined and confirmed to produce the required fresh and cured grout properties. This was documented in the Phase 1000 Grout Testing Report (Golder 2022a) produced by Golder Associates for CNL. CNL has further contracted Golder Associates to prepare a preliminary grout fill plan (Golder 2021a). This plan includes an overview of all steps required to procure, manufacture, deliver, place and test the grout fill material for the WR-1 ISD project. The detailed grout plan is not complete at this phase of the project. The detailed grout design, procurement of a qualified contractor, fabrication, and placement, and testing will be done according to CNL's Engineering Change Control process during the execution phase of the Project, following the CNSC licensing decision. Specific to contingency planning, the Detailed Safety Assessment Report (DSAR; Golder 2021b) evaluated a scenario that assumed that the grout rapidly degrades, which can simulate a number of grout issues, including sub-standard fabrication and placement. Section 6.2 of the DSAR discusses the evaluation of grout against various sensitivity analysis runs that examined the effectiveness of grout to contain and isolate contaminants. The results of these sensitivity analyses showed that there was no appreciable difference in peak loadings or the timing of peak loadings resulting from grout deficiencies or rapid degradation. Doses and risks from this scenario would not be appreciably different from the base case. This confirms that while the grout provides benefits, its complete failure still allows the disposal system to provide protection of the public and the environment. The quality of the work completed will be evaluated continuously throughout the project, as specified in the WL Decommissioning Quality Assurance Plan. This plan encompasses quality assurance practices and procedures stipulated in the detailed grout plan including qualification and oversight requirements for a grout supplier. The grouting contractor has not been selected yet. As part of a Request for Proposal, CNL will require that grout suppliers provide a contingency plan so that services are provided through to project completion. The minimum Quality Assurance requirements for the Project have not been finalized yet, but will likely be ISO 9001. **Change to EIS:** No changes have been made to the Environmental Impact Statement (EIS; Golder 2022b) as a result of this comment. Section 7 has been significantly revised to focus on potential accidents and malfunctions during closure. Accidents and malfunctions occurring during post-closure (former Sections 7.3.7

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(WR-1 ISD Structural Failure) and 7.3.8.2 (Human Intrusion and Human Habitation)) were relocated to Section 6.7.1.7.2.1 and 6.7.1.7.2.2 that discuss various disruptive events that can affect the Normal Evolution Scenario of the WR-1 Disposal Facility.

References:

CNL 2018. Quality Assurance Plan Whiteshell Decommissioning. WLD-508300-QAP-001. Revision 2. November 2018.

Golder 2021a. WRDF Preliminary Grout Fill Plan. WLDP-26000-PLA-004. Revision 0. May 2021.

Golder 2021b. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.

Golder 2022a. CNL Whiteshell Reactor 1 - Phase 1000 Grout Formulation Testing Report. WLDP-26000-REPT-012. Revision 1. May 2022.

Golder 2022b. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.

SRNL 2018. Grout Formulation Test Plan for WR-1 Reactor Facility Decommissioning Project. SRNL-L3200-2017-00155. January 2018.
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<tr><td>139.</td><td>CNSC</td><td>RPD</td><td>EIS - Section 7.3.8.2 Human Intrusion and Human Habitation</td><td>7-25</td><td>
Comment: Exposure to the (1) drill crew at the wellhead, (2) residents near to the site, (3) core transportation personnel, and (4) laboratory technicians from a human intrusion scenario involving exploratory drilling were mentioned in the EIS but no dose estimates were provided.
Expectation to Address Comment: Provide dose estimates to receptors following a human intrusion scenario involving exploratory drilling.
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Incorporated:

Section 7.0 of the Environmental Impact Statement (EIS; Golder 2022) has been significantly revised to focus on potential accidents and malfunctions during closure. Accidents and malfunctions occurring during post-closure (former Sections 7.3.7 (WR-1 ISD Structural Failure) and 7.3.8.2 (Human Intrusion and Human Habitation)) were relocated to Section 6.7.1.7.2.1 and 6.7.1.7.2.2 that discuss various disruptive events that can affect the Normal Evolution Scenario of the Whiteshell Reactor Disposal Facility (WRDF).

Dose estimate to the drill crew and residents near to the site were evaluated in Appendix D of the Environmental Risk Assessment (ERA; EcoMetrix 2021) through the driller and trespasser receptors, respectively. The results of these evaluations are summarized in Section 6.7.1.7.2.2 (Results), subsection “Human Intrusion (Exploration Borehole)” of the EIS. Doses to the core transportation personnel and laboratory technicians were considered to be bound by the dose calculations for the first two receptors as they would have a reduced exposure time and the dominant contributor to the total dose is cobalt-60 through groundshine (i.e., from the drilled material improperly disposed of onsite).

As presented in Human Intrusion (Exploration Borehole) part of Section 6.7.1.7.2.2 (Results), subsection ‘Human Intrusion (Exploration Borehole)’, of the EIS (Golder 2022):

“The total dose to a drill crew member (adult exposed during drilling the borehole) was below both the lower 1 mSv/a IAEA [International Atomic Energy Agency] reference level for Disruptive Events and the upper 20 mSv/a IAEA reference level for Disruptive Events. It was also considered that trespassers could interact with the site following a human intrusion (Adult, child, infant and 3-month old assumed to be spending 1 hour a day on-site). The dose predictions for these human receptors were below both the upper (20 mSv/a) and lower (1 mSv/a) IAEA reference level for Disruptive Events (Table 6.7.1-17). The dominant contributor to the total dose is niobium-94 through groundshine (i.e., from the drilled material improperly disposed of on-site). Doses to the core transportation personnel and laboratory technicians were bounded by the dose calculations for the first two receptors as they would have a reduced exposure time.

Table 6.7.1-17: Summary of Total Radiological Dose for Trespassers under Human Intrusion Conditions
<table>
<tr><th>Age Group</th><th>Dose (mSv/a)</th><th>Percent of Public Dose Limit (for Normal Evolution scenarios)</th><th>Percent of IAEA Reference Level for Disruptive Events</th></tr>
<tr><td>Adult</td><td>1.98×10^{-1}</td><td>20%</td><td>1%</td></tr>
<tr><td>Child</td><td>2.01×10^{-1}</td><td>20%</td><td>1%</td></tr>
<tr><td>Infant</td><td>3.19×10^{-1}</td><td>32%</td><td>2%</td></tr>
</table>
</td></tr>
</table>

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						(continued below)

3-Month Old	*2.86 x 10^{-1}*	*29%*	*1%*
Driller	*6.35 x 10^{-3}*	*1%*	*0%*

mSv/a = millisieverts per year

The doses to human receptors that could be exposed to the non-radionuclides identified as potentially occurring at elevated concentrations (i.e., HB-40, lead) as a result of a human intrusion event occurring during post-closure were calculated based on total concentration (background plus Project contribution). The HQ [Hazard Quotient] *for HB-40 exceeded the target values for both the adult and the toddler for soil ingestion and soil dermal contact (i.e., exposure as a result of material being improperly disposed of on-site). The HQ for lead exceeded the target values for the adult and the toddler through soil ingestion, soil dermal contact and dust inhalation (i.e., exposure as a result of material being improperly disposed of on-site) and was exceeded for the driller through soil ingestion and soil dermal contact. Hazard quotients are summarized in Table 6.7.1-18. HQs greater than 0.2 (per pathway) are not statistical probabilities of harm occurring. Instead, they are a simple statement of whether (and by how much) an exposure dose exceeds the reference dose.*

The TRVs [Toxity Reference Values] *for HB-40 and lead incorporate safety factors to account for uncertainty, making the results conservative. The HB-40 TRV incorporates a safety factor of 1,000 and the lead TRV incorporates a safety factor of 2 (EcoMetrix 2021). In this scenario, it was assumed that an exploration borehole was drilled through the engineered cover, grout, reinforced concrete, and WRDF from ground surface to bedrock. The waste emplacement strategy and design of the engineered cover is more robust than a typical hazardous waste landfill; therefore, the likelihood of installing an exploration borehole directly into the WRDF, as well as extruding the highest concentrations is low.*

Table 6.7.1-18: Summary of Hazard Quotients for Human Intrusion Conditions

Age Group	*Parameter*	*HQ by Pathway (unitless)*			*Total*
		Soil Ingestion	*Soil Dermal Contact*	*Dust Inhalation*	
Adult	*HB-40*	***3.52***	***4.57 x 10^{-1}***	*1.16 x 10^{-1}*	***4.09***
	Lead	***3.41 x 10^{2}***	***2.21 x 10^{1}***	***1.12 x 10^{1}***	***3.74 x 10^{2}***
Toddler	*HB-40*	***2.05 x 10^{-1}***	***2.34 x 10^{1}***	*5.40 x 10^{-2}*	***4.93 x 10^{1}***
	Lead	***1.99 x 10^{1}***	***1.13 x 10^{1}***	***5.23***	***3.65 x 10^{1}***
Driller	*HB-40*	*6.62 x 10^{-3}*	*7.55 x 10^{-2}*	*NA*	*8.21 x 10^{-2}*
	Lead	***6.42 x 10^{-1}***	***3.66***	*NA*	***4.30***

Note:

Bold and shaded *values indicate HQ greater than 0.2.*

The assessment demonstrates that human intrusion into the WRDF could result in exposures to human receptors to HB-40 and lead in waste material brought to the surface at levels where risk cannot be ruled out. As such, while this is a very unlikely worst-case scenario, reasonable effort is warranted to reduce the probability of these unplanned events from occurring. During the post-institutional control period, passive controls will still be in place including the limited footprint, the WRDF composition being relatively impervious and made of material of no economic value, and the land use restriction acting to reduce the likelihood of a human intrusion event."

Change to EIS:

The content of Section 7.3.8.2 of the EIS (Golder 2022) has been moved to Section 6.7.1.7.2.2 (Results), Subsection "Human Intrusions (Exploration Borehole)" and was updated to reflect the results described above.

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						References: *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
140.	CNSC	RPD	EIS - Section 7.3.8.2 Human Intrusion and Human Habitation	7-25	**Comment**: According to the EIS: "The dominant contributor to the total dose is carbon-14 taken up through ingestion of local terrestrial plants and animals, and aquatic animals." However, according to Table D-9 of the ERA, ingestion of water is the dominant contributor, which is expected. **Expectation to Address Comment:** Provide clarification and make appropriate corrections.	**Incorporated:** Section 7.0 of the Environmental Impact Statement (EIS; Golder 2022) has been significantly revised to focus on potential accidents and malfunctions during closure. Accidents and malfunctions occurring during post-closure (former Sections 7.3.7 (WR-1 ISD Structural Failure) and 7.3.8.2 (Human Intrusion and Human Habitation)) were relocated to Section 6.7.1.7.2.1 and 6.7.1.7.2.2 that discuss various disruptive events that can affect the Normal Evolution Scenario of the Whiteshell Reactor Disposal Facility. "Unplanned Human Habitation (Well in Plume)" scenario has been renamed as "Well In Plume" since human habitation itself is not a disruptive event and is included as part of the normal evolution scenario. The "Well in Plume" scenario described in Section 6.7.1.7.2.2 of the EIS was updated with the dose contributions as a result of ingesting the water with radiological parameters presented in Table D-9 of the Environmental Risk Assessment (ERA; EcoMetrix 2021) that apply to a Disruptive Event "Well in Plume" Scenario. Dose contribution explanation in Paragraph 2 of the "Well in Plume" subsection in Section 6.7.1.7.2.2 of the EIS was revised to state "*The dominant contributor to the total dose is from tritium through ingestion of water (i.e., drinking the groundwater). For carbon 14, the time of maximum mass loading to the Winnipeg River occurs in approximately 1,000 years"* thus aligning the ERA and the EIS conclusions **Change to EIS:** Section 6.7.1.7.2.2 has been updated as above to be consistent with the results presented in Appendix D of the ERA (EcoMetrix 2021). **References:** *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
141.	CNSC ECCC	N. Kwamena	EIS - Section 7.4 Risk Evaluation of Accidents and Malfunction	7-29	**Comment:** The EIS indicates: "The potential accidents and malfunctions, applicable mitigation and estimates of residual risks following the implementation of the risk mitigation actions, are summarized in Table 7.4-1. None of the accidents and malfunctions described in Section 7.3 were classified as High (red) risk level, requiring additional assessment work to inform Project design or execution, as shown in the Project Risk Matrix (Table 7.1-3)." The same passage goes on to indicate: "Occupational accidents, material handling accidents, fires and explosions were all identified as High priority level during closure." Table 7.4-1 indicates High (orange) Risk Matrix Priority Levels for all of: occupational accidents, material handling accidents, fires and explosions, and WR-1 ISD structure failure. Table 7.1.3-1 indicates that "More detailed risk analysis may be required" for the risk level of High (orange). It is important to reconcile potential contradictions in leveled risk classifications in order to fully understand and appreciate CNL's priorities in relation to environmental emergency management	**Incorporated:** Section 7.0 of the Environmental Impact Statement (EIS; Golder 2022) has been significantly revised to clarify the process used to assess accidents and malfunctions during closure. The text in the original comment located in Section 7.4 was revised for clarity and alignment with the revised assessments carried out in Section 7.3. Section 7.2 was significantly updated with a revised and clarified description of the assessment methods and how the risk associated with accidents and malfunctions was identified, measured and evaluated. The likelihood and consequence measurement approach has been clarified and categories have been updated in Section 7.2.2 (Risk Measurement) to the following: "*After identifying accidents and malfunctions, the consequence severity and the likelihood (frequency) of occurrence associated with each scenario was estimated using a risk matrix that was developed for the Project. The matrix includes a Likelihood Index (Table 7.2.2-1) and a Consequence Severity Index (Table 7.2.2-2). Likelihood and consequence severity were estimated based on industry and operation experience, Project-specific conditions, and the knowledge base of the Project team.* *The process of estimating the likelihood index includes consideration of past performance indicators and safety statistics for site operations and similar closure work performed at the WL* [Whiteshell Laboratories] *site in the last 10 years. Likelihood can be described as how often the hazard scenario might occur (Table 7.2.2-1). The likelihood index ranges from a "Highly Unlikely" event to an "Almost Certain" event and is more formally defined through the events per year value. Order of magnitude of events per year values are defined for each likelihood level. For example, the "Possible" level ranges from more than 1 event in 100 years up to 1 event in 10 years. The categories selected for the likelihood index reflect the Project timescales and type of hazards that may arise. The likelihood of events occurring beyond 1000 years is more related to disruptive events during post-closure, which is assessed in the DSAR* ([Decommissioning Safety Assessment Report] *Golder 2021) and in Section 6.7 Human and Ecological Health.*

<table>
<tr><th>No.</th><th>Department/ Agency</th><th>SME</th><th>Section Table or Figure</th><th>Pg. #</th><th>Information Request or Summary of Comment</th><th>Response by CNL</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>and the protection of the surrounding environment.
Expectation to Address Comment: Explain why additional assessment work to inform project design or execution was deemed to be not required for the high-priority accident and malfunction scenarios of material handling accidents, and fires and explosions.</td><td>
Table 7.2.2-1: Likelihood Index
<table>
<tr><th>Index</th><th>A
Almost Certain</th><th>B
Very Likely</th><th>C
Possible</th><th>D
Unlikely</th><th>E
Highly Unlikely</th></tr>
<tr><td>Events per Year</td><td>>1 occurrence in 1 year</td><td>≤1 occurrence in 1 year and >1 occurrence in 10 years</td><td>≤1 occurrence in 10 years and >1 occurrence in 100 years</td><td>≤1 occurrence in 100 years and >1 occurrence in 1,000 years</td><td>≤1 occurrence in 1,000 years</td></tr>
</table>
> = greater than; ≤ less than
The process of estimating the consequence severity index includes a consideration of existing CNL programs, procedures and policies that are in place to mitigate potential hazards. The consequence severity index ranges from “Negligible” to “Very High,” and is applied to two categories of consequences: 1) environment; and 2) worker and public safety. Therefore, there are a total of 2 risk matrices combined in the Project Risk Matrix. A description of the consequence levels from “Negligible” to “Very High” for each of the two categories is presented in Table 7.2.2-2. Consequence severity considers anticipated and public perceived risks, including longevity of consequences. For the environment, the consequence severity index also acts as a surrogate to describe the magnitude of an environmental effects.
Table 7.2.2-2: Consequence Severity Index
<table>
<tr><th>Category</th><th>1
Negligible</th><th>2
Low</th><th>3
Moderate</th><th>4
High</th><th>5
Very High</th></tr>
<tr><td>Environment</td><td>Negligible environmental effect</td><td>Short-term effects (<1 month; effects are restricted to on-site</td><td>Reversible or repairable effect (less than one year in duration); local effects, off site</td><td>Long-term effect (e.g., 10 years in duration), local or regional effect off-site</td><td>Long-lasting with long-lasting (>10 years) or irreversible environmental effects</td></tr>
<tr><td>Worker and Public Safety</td><td>Medical treatment not required</td><td>Minor first aid injuries with no lost time</td><td>Reversible injury with lost time</td><td>Severe injuries with long-lasting effects and/or disability</td><td>Fatalities, or multiple disabilities</td></tr>
</table>
”
The risk evaluation process in Section 7.2.3 has been updated to demonstrate how the likelihood and consequence assessments in Section 7.2 were combined to produce the Project Risk Level Matrix (Table 7.2.3-1) and updated Risk Matrix Priority Levels were provided in Table 7.2.3-2 as follows:
“As mentioned in Section 7.2.1, where potential adverse effects are identified from an accident or malfunction, feasible environmental design features and/or mitigation practices are implemented to avoid and minimize these potential adverse effects. Mitigation includes prevention measures that would minimize the probability of the scenarios occurring, and control measures to mitigate the severity of consequence from and accident or malfunction. Estimating the likelihood and consequence severity of an accident and malfunction includes consideration of the environmental design features and/or mitigation practices implemented for a particular hazard.
Each scenario is assigned a Risk Matrix Priority Level according to the likelihood and consequence severity ranking. Risk evaluation requires determining risk priority according to the Project Risk Level Matrix (Table 7.2.3-1). The colour ranking system for each risk level in the Project Risk Matrix and the associated management actions are shown in Table 7.2.3-2. The risks are ranked according to three priority levels, ranging from low (green) to moderate (yellow) to high (red). Evaluation of the individual identified accidents and malfunctions is presented in Section 7.3 and summarized in Section 7.4.
</td></tr>
</table>

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						Table 7.2.3-1: Project Risk Level Matrix

Index		Consequence Severity 1 Negligible	2 Low	3 Moderate	4 High	5 Very High
Likelihood	A Almost Certain	Low	Moderate	Moderate	High	High
	B Very Likely	Low	Low	Moderate	High	High
	C Possible	Low	Low	Moderate	Moderate	High
	D Unlikely	Low	Low	Low	Moderate	High
	E Highly Unlikely	Low	Low	Low	Moderate	Moderate

Table 7.2.3-2: Risk Matrix Priority Levels

Risk Level		Management Action
(red)	High	High-risk scenarios have High to Very High severity with likelihood ranging from Almost Certain to Unlikely. For high-risk scenarios, additional mitigation measures are required to lower the severity of the potential effects of an accident and malfunction.
(yellow)	Moderate	Moderate-risk scenarios have Low to Very High severity with likelihood ranging from Almost Certain to Highly Unlikely. In many cases, risk reduction activities will reduce the risk associated with these scenarios, but may require monitoring and active management.
(green)	Low	Low-risk scenarios have Negligible to Moderate severity with likelihood ranging from Almost Certain to Moderate. These risks may require monitoring in certain cases but are not considered to require active management.

”

Accidents and malfunctions occurring during post-closure (former Sections 7.3.7 (WR-1 ISD Structural Failure) and 7.3.8.2 (Human Intrusion and Human Habitation)) were relocated to Section 6.7.1.7.2.1 and 6.7.1.7.2.2 that discuss various disruptive events that can affect the Normal Evolution Scenario of the Whiteshell Reactor Disposal Facility.

The analysis of the remaining seven accident and malfunction scenarios has been updated in Sections 7.3.1 to 7.3.7 to provide:

- a discussion of the hazard identification, detailing the potential sources of hazards, initiating events, impacts to worker, public and the environment, and associated mitigations in place to limit the likelihood of occurrence and magnitude of consequences; and
- a discussion on the risk measurement (likelihood and consequence) and ultimate Risk Matrix Priority Level.

The previous approach was to determine the risk likelihood, consequence and ultimate Risk Matrix Priority levels for each of the accidents, with some of them resulting in “High” Risk Matrix Priority Levels. Mitigating factors were then applied in the discussion to state that the residual risks were within regulatory requirements. This approach was revised in the current risk measurement process in Sections 7.3.1 through 7.3.7, which now includes a consideration of mitigating factors in determining the likelihood and consequence severity, thus providing a post-mitigation risk evaluation. The resulting Risk Matrix Priority Levels are summarized in Table 7.4-1, with none of the risks identified reaching a “High” category. The highest category is “Moderate” indicating that the risks may require monitoring and active management. This is done routinely for all work performed at CNL sites. All work at the WL site is planned in accordance with the WL Integrated Work Control (CNL 2022) process that ensures that all work steps are identified and reviewed against possible hazards and risks, consequences are considered, and appropriate engineered and procedural controls are applied.

Section 7.4 was updated as follows:

“The Project Risk Level Summary (Table 7.4-1) is a resource for communicating results, prioritizing risks for risk management and facilitating implementation of the most effective risk mitigation options. The risk management actions and mitigation for potential accidents and malfunctions, including applicable CNL processes and procedures to implement these actions and mitigation, are summarized in Table 7.4-1. Estimates of residual risk following the implementation of the management actions and mitigation is also provided in Table 7.4-1. Some hazards have both an Environment component and a Worker and Public Safety component that may have different consequence severity levels. The highest consequence severity between Environment and Worker and Public Safety was used to determine the Risk Matrix Priority Level.

None of the hazard scenarios in Table 7.4-1 were classified as High (red). The environmental design features and mitigation measures to be implemented are known to be effective based on past performance and safety statistics for site operations and similar closure work performed at the WL site in the last 10 years. The highest category is “Moderate” indicating that the risks may require monitoring and active management. This is done routinely for all work performed at CNL sites. All work at the WL site is planned in accordance with the WL Integrated Work Control (CNL 2022) process that ensures that all

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						work steps are identified and reviewed against possible hazards and risks, consequences are considered and appropriate engineered and procedural controls are applied." **Change to EIS**: Section 7.0 was revised as per the discussion above. Table 7.4-1 has been updated to present the residual Risk Matrix Priority Level with consideration of mitigations applied. Risk Matrix Priority Levels were all confirmed to be Low to Moderate. **References**: *CNL 2022. WL Integrated Work Control Process. WL-508310-PRO-002. Rev 2. February 2022.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
142.	CNSC	N. Kwamena	EIS - Table 7.4-1 Section 7.3.3 Material Handling Accidents Section 7.3.5 System and Equipment Failure	7-30 to 7-33 7-13 to 7-14 7-15 to 7-16	**Comment**: The summary of the "Accidents and Malfunctions, Mitigation Actions and Residual Risk Estimates" for the material handling accidents and system and equipment failure accident and malfunctions as summarized in Table 7.4-1 are not consistent with the text in Sections 7.3.3 Material Handling Accidents and 7.3.5 System and Equipment Failure. **Expectation to Address Comment:** Correct Table 7.4-1 to be consistent with the text in Sections 7.3.3 Material Handling Accidents and 7.3.5 System and Equipment Failure.	**Incorporated:** Section 7.4 of the Environmental Impact Statement (EIS; Golder 2022) was significantly revised. The previous approach was to determine the risk likelihood, consequence and ultimate Risk Matrix Priority levels for each of the accidents, with some of them resulting in "High" Risk Matrix Priority Levels. Mitigating factors were then applied in the discussion to state that the residual risks were within regulatory requirements. This approach was revised in the current risk measurement process in Sections 7.3.1 through 7.3.7, which now includes a consideration of mitigating factors in determining the likelihood and consequence severity, thus providing a post-mitigation risk evaluation. The resulting Risk Matrix Priority Levels are summarized in Table 7.4-1, with none of the risk identified reaching a "High" category. The highest category is "Moderate" indicating that the risks may require monitoring and active management. This is done routinely for all work performed at CNL sites. All work at the Whiteshell Laboratories (WL) site is planned in accordance with the WL Integrated Work Control (CNL 2022) process that ensures that all work steps are identified and reviewed against possible hazards and risks, consequences are considered, and appropriate engineered and procedural controls are applied. The revisions in Section 7.0 to complete the changes above resulted in changes to both the Table 7.4-1, and text for the accident and malfunction scenarios in Sections 7.3.1 through 7.3.7. CNL confirmed that the conclusions of each Section 7.3.1 through 7.3.7 are consistent with Table 7.4-1. **Change to EIS:** Table 7.4-1 has been updated to present the residual Risk Matrix Priority Level with consideration of mitigations applied. The post-mitigation risk priority levels were corrected for: • Conventional Occupational Accidents: Previously "High" has been revised to "Moderate" • Spills and Leaks: Previously "Moderate" has been revised to "Low" • Material Handling Accidents: Previously "High" has been revised to "Moderate" • Off-Site Transportation: Previously "Moderate" has been revised to "Low" • System and Equipment Failure: Previously "Moderate" has been revised to "Low" • Fires and explosions: Previously "High" has been revised to "Moderate" • Aircraft Crash: Previously "Low" was maintained at "Low" Section 7.3.7 and 7.3.8 (except 7.3.8.1) from the 2017 version of the EIS (Golder et al. 2017) were moved to Section 6.7.1.7.2.2 Results (Human Health Residual Effects, Post Closure Phase) of the current version of the EIS (Golder 2022). Section 7.3.8.1 Aircraft Crash was renumbered as 7.3.7. **References:** *CNL 2022. WL Integrated Work Control Process. WL-508310-PRO-002. Rev 2. February 2022.* *Golder et al. 2017. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 1. September 2017.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

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143.	ECCC		EIS - Table 7.4-1	7-31	**Comment:** The "Mitigation" column indicates: "Emergency Preparedness Program has emergency plans for off-site accidents". No emergency management information has been provided in relation to off-site accidents. It is important to understand the full extent of CNL's off-site emergency response and post-incident remediation and monitoring capacities in order to assess whether the expected effectiveness of off-site emergency management efforts may lead to off-site residual environmental effects. **Expectation to Address Comment:** Provide all emergency response plans (ERP) and emergency response assistance plans (ERAP) for radiological and non-radiological off-site accidents. Provide a response as to the expected effectiveness of CNL's Emergency Preparedness Program in specific relation to environmental effects mitigation, remediation and monitoring activities for accident and malfunction scenarios that occur off-site.	**Resolved As:** The Mitigation column refers to the Emergency Response Plans and Emergency Preparedness Program for specific accidents. The detailed discussion of how these programs apply to specific accidents is provided in discussion of specific accidents described in Sections 7.3.1 through 7.3.7 of the Environmental Impact Statement (EIS; Golder 2022). A general description of those programs is provided below. Following closure, there are no off-site effects predicted for any accident or malfunction scenarios. During closure, some hazardous materials from Whiteshell Reactor 1 (WR-1) will be shipped to other off site locations for storage or disposal. Some of the materials will be radioactively contaminated. In order for CNL to ship radioactive materials in Canada (CNL 2018b), CNL maintains an Emergency Response Assistance Plan (ERAP) that is registered with Transport Canada (Filed in CANUTEC as ERAP Number 2-1456). As part of the ERAP, both Chalk River Laboratories (CRL) and the Whiteshell Laboratories (WL) maintain teams of Radiological Protection staff and response vehicles that can respond to off-site radiological emergencies. These teams operate under specific procedures to respond to accidents that have the potential to disperse contamination to people or the environment (CNL 2021a, CNL 2018b). Whether or not the materials are owned by CNL, the teams will support first responders in the area with radiological assessments and information/resources needed to protect the responders, the public and the environment. This response is part of the mutual aid response assistance agreement between CNL, Bruce Power, Ontario Power Generation, Hydro Quebec and New Brunswick Power (per the Mutual Initial Response Assistance Agreement [CNL 2018a]). The CNL team is expected to report to the Local Authority having jurisdiction over the emergency (typically a local fire department or police service) and support them with the emergency response portion of the event. This includes performing ongoing radiological assessments as well as providing guidance on how to protect themselves, other responders and the public in general. The team will also be responsible for implementing mitigating measures to attempt to prevent the further spread of contamination to the environment. Once the emergency is dealt with, CNL will assume responsibility for the remediation of the site, employing decontamination practices determined to be appropriate for restoring the site to pre-accident conditions (CNL 2021b). Contaminated materials will be removed to a CNL location for proper long term remediation. Environmental Monitoring of the site will continue as long as required to ensure the event has not had any adverse impacts to the environment. Any deployment of the off-site response team will result in the automatic activation of the Emergency Operations Centre (EOC) at CNL. The role of the EOC is to support the team with access to subject matter experts and additional CNL or contracted resources as required. The EOC is staffed by members of Occupational Safety and Health, Environmental Protection, Radiation Protection and Health Physicists, and its Facility Managers. All WL resources can be called upon by the EOC to support the emergency response and remediation activities. The Whiteshell Emergency Operations Centre Operating Procedure (CNL 2017b) establishes the EOC Operations structure and response framework. The EIS was updated to provide references to the Emergency Response Plan for WL decommissioning (CNL 2018d, CNL 2020). **Change to EIS:** Section 7.0 has been significantly revised to focus on potential accidents and malfunctions during closure. Accidents and malfunctions occurring during post-closure (former Sections 7.3.7 (WR-1 ISD Structural Failure) and 7.3.8.2 (Human Intrusion and Human Habitation)) were relocated to Section 6.7.1.7.2.1 and 6.7.1.7.2.2 that discuss various disruptive events that can affect the Normal Evolution Scenario of the Whiteshell Reactor Disposal Facility. The discussion above was added to Section 7.2.4 (Off-site Transportation Accidents).References to the Emergency Response Plan for WL decommissioning have been provided in the updated Section 7.3, as well as subsections 7.3.1 through 7.3.7. **References:** *CNL 2021a. Transportation Accidents Involving Hazardous/Dangerous Goods. 900-508730-MCP-002. Revision 1. October 2021.* *CNL 2017b. Whiteshell Emergency Operations Centre Operating Procedure. WL-508730-PRO-559. Revision 5. October 2017.* *CNL 2018a. Mutual Initial Response Assistance Agreement. CW-508730-110-000-0001. Revision 1. March 2018.* *CNL 2021b. Response to Off-Site Transportation Accidents Involving Radioactive Material. EMP-508730-PRO-008. Revision 0. October 2021.* *CNL 2018c. Whiteshell Laboratories Site Emergency Response Plan. WL-508730-ERP-001. Revision 5. April 2018.* *CNL 2020. Emergency Preparedness. 900-508730-PDD-001. Revision 2. January 2020.* *ERAP # 2-1456. Accessible via CANUTEC department of Transport Canada under ERAP Number 2-1456. (Maintained in a dashboard format only, not a standalone document. See "IR 143 ERAP Reference - Supporting Documents" in References).* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

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144.	ECCC		EIS - Table 7.4-1	7-32	**Comment:** For the accident and malfunction scenario of "fires and explosions" the environmental consequences severity column indicates "n/a". It is important to fully understand and appreciate CNL's approach to environmental consequences and associated environmental protection plans in order to assess whether the plans are commensurate with the credible environmental risks. **Expectation to Address Comment:** Provide an explanation that supports the "n/a" rating for environmental consequences with specific attention to air quality that may be impacted by toxic smoke, to surface water quality and pathways thereto that may be impacted by contaminated firefighting water runoff that may potentially migrate off the project site towards the Winnipeg River. Also, include an assessment of any potential impacts to fish and fish habitat, aquatic species and to migratory birds as defined in Section 5 of CEAA 2012.	**Resolved As:** Section 7.0 of the EIS (Golder 2022) has been significantly revised to focus on potential accidents and malfunctions during closure. Section 7.2.6 has been updated to revise the environmental consequence severity for a fire and explosions scenario and additional rationale has been provided on management of firefighting water and air emissions as discussed above.Table 7.4-1 has been updated to present the residual Risk Matrix Priority Level with consideration of mitigations applied. An assignment of N/A was included with respect to environment in Table 7.4-1 if it was considered that there was no potential or a negligible pathway of effect to the environment (e.g., occupational accident, equipment failure). This may be if the potential emissions are confined within the Whiteshell Reactor 1 (WR-1) Building. Specific to the "Fires and Explosions" accident scenarios, the Environmental Consequence Severity in Table 7.4-1 was revised from "N/A" to "Low". The discussion of this scenario in Section 7.3.6.1 was revised to state that risks to the environment during a fire and/or fire response activities at WR-1 can be categorized as potential emissions to air, potential emissions to drains, or potential emissions to ground. These are addressed in the individual Fire Pre-Plans used by the Incident Commander in establishing a safe and appropriate response to emergency events within the WR-1 Building (CNL 2019). Additional text was provided in Section 7.3.6 that addresses the issue of firefighting water. Wastewater generated from fire suppression operations in the event of a fire would come from internal fire suppression activities or exterior suppression activities. Interior wastewater could result from the activation of sprinkler systems within the building or the application of portable hose streams. Most rooms in the WR-1 facility have floor drains, all of which terminate in one of two sumps located in WR-1, the organic sump and the conventional sump. The organic sump is connected to the drains of any room that had organic coolant flowing in or through it in order to capture any potential releases of organic material separately from the main water collection system in WR-1. This water is collected and then sampled for non-radiological and radiological contaminants. Based on analytical results, the water can either be transferred directly into barrels or filtered and pumped into the conventional sump system for final dispositioning. Water collected by the conventional sump system is transferred to wastewater reservoirs inside WR-1 until it can be sampled. Once the samples are collected the water can be released as per protocol or held back for treatment. In this respect interior wastewater generated in the event of a fire is contained and controlled. The other potential for wastewater generated would be from exterior fire response on the facility in the form of runoff. This is less likely considering there is very little material left in the building that is capable of burning, let alone burning for long enough to generate enough heat to create the conditions that require exterior fire suppression. The combination of the lack of fuel load and the fact that the structure has only concrete floors and negative air pressure means that fire in this location would likely only be fought with interior fire suppression activities. In the event of exterior fire response runoff could make its way from the roof of the facility down the exterior walls to the ground around the building. Any soils around WR-1 impacted by a fire would be tested after the event against established Canadian Council of Ministers of the Environment (CCME) soil quality standards for this location, and remediated accordingly. In cases where water runoff is sufficient, runoff may make its way to the roadway. Radiological concerns regarding the runoff are low on the exterior of the building however non-radiological contaminants found in typical building fire runoff can easily be prevented from entering road drains. Road drains are connected to the site storm sewer system. If water did enter the storm sewer system it would enter the Outfall where runoff is continuously monitored as it leaves the site towards the Winnipeg River. In addition to potential emissions to ground, a fire could impact the environment around WR-1 in the form of emissions to air. There are two types of potential air emissions to consider when discussing a fire in a decommissioning reactor building, radiological and non-radiological emissions. The release of radiologically contaminated air from a fire inside of WR-1 has a low probability. The entire WR-1 structure operates under a negative air pressure ventilation system. This means all the air in the facility flows from the least contaminated areas to the most contaminated areas before being vented from the building. The building is equipped with a High-efficiency Particulate Air (HEPA) filtration system that would be engaged in the event of a fire in a contaminated space to filter the air prior to releasing it to the atmosphere. The air exiting the stack is also monitored to detect if any radiological releases have occurred to the environment. The impact of the soot and ash on the soils and flora would be evaluated against established soil quality standards and remediated accordingly, as per a CNL Environmental Protection Specialist's direction. During incident response, CNL-WL will assess monitoring data against established limits for parameters/contaminant of potential concern based on information in the Detailed Safety Assessment Report including the findings from the WR-1 Environmental Risk Assessment. These limits are concentrations well below established benchmarks for the protection of humans and the environment. Cessation of a monitoring activity would occur once it can be shown that an effect has stabilized or has been reduced to a level where it is no longer considered significant by regulatory requirements or community concerns. Under Environmental Incident Reporting, Investigation and Mitigation (CNL 2018), unplanned events, such as fire, are investigated until the cause of the incident has been identified and any adverse impacts to the environment have been documented, or until due diligence has been demonstrated. This document also outlines all reporting responsibilities placed on CNL in the event of a fire. The environmental impacts are then mitigated to the extent

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						practical to minimize adverse environmental impacts. Mitigative actions shall be directed on a case-by-case basis by the Facility Authority in consultation with Environmental Management staff. **Change to EIS:** Table 7.4-1 was revised to correctly illustrate the risk priority level after existing mitigation is considered so it aligns with the text in the specific accident sections (Sections 7.3.1 to Section 7.3.7). Within Table 7.4-1 of the EIS (Golder 2022), the environmental consequence severity for a fire has been revised to Low, and additional rationale added to the text in Section 7.3.6.1. Overall Risk Matrix Priority Level for the Fire and Explosions has been revised from "High" to "Moderate". **References:** *CCME 1999. Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment.* *CNL 2018. Environmental Incident Reporting, Investigation and Mitigation. 900-509200-STD-005. Revision 0. January 2018.* *CNL 2019. B100 Emergency Procedures. WL-508730-EP-110. Revision 7. August 2019.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
					8.0 Summary of Cumulative Effects	
145.	CNSC	RPD	EIS - Section 8.3 Summary of Cumulative Effects	8-9	**Comment**: The EIS states: "The preliminary exposure assessment for radiological contamination of the ditch resulted in a dose of 0.16 mSv/a at the predicted peak concentration of technetium-99." No details were provided on how this was determined. **Expectation to Address Comment:** Provide the methodology and assumptions used to estimate this dose.	**Incorporated:** The methodology and assumptions used to estimate the dose resulting from contamination in the ditches around the Waste Management Area (WMA) is detailed in Appendix C1.4.1 of the Comprehensive Study Report (AECL 2001). The scenario evaluates the potential for radionuclide migration from the WMA via the preferred near-surface lateral migration via the surrounding ditch network. The radionuclide release modeling indicated that three radionuclides could migrate as far as the ditch surrounding the WMA: ^{3}H, ^{99}Tc, and ^{14}C. ^{99}Tc was the only radionuclide that was determined to be potentially present in the ditches in non-zero concentration in 20 years from the assessment, with ^{3}H and ^{14}C being lost to the atmosphere. The receptor pathway was selected to include a cow that is assumed to be grazing in a ditch open for access by cattle, which obtained 10% of its annual water intake and 10% of its forage intake from the ditch. This is quite conservative given that cattle could only access the ditch in non-winter months and the ditch would represent only a small fraction of the vegetation a cow might access in the area. It is further assumed that all the soil ingested by the cow comes from the ditch, to allow conservatively for ingestion of the soil as a salt source. It is assumed that the critical individual obtains all his/her milk and meat from a cow with these habits. Transfer factors to model this pathway are taken from Zach and Sheppard (1992), with the exception of human food consumption values which are derived from Health Canada intake surveys (Health Canada 1994). Per unit concentration in water (Bq/L), the corresponding committed effective dose is 2.24×10^{-9} Sv/a. This value compares well with the corresponding value of 4.60×10^{-7} Sv/a listed by Posiva (2000) as their all-inclusive pathways dose factor. With the conservative case of low Kd, the water concentration in the ditch at 60 years was 2.5×10^{4} Bq ^{99}Tc m^{-3}, which corresponds to a dose of 0.056 µSv/a, well below guideline values. At the peak concentration of 7.2 x 107 Bq ^{99}Tc m^{-3}, the dose is 0.16 mSv/a, which is above the guideline value of 0.05 mSv/a, however, this exposure is unlikely because it implies one cow effectively tethered to the ditch for 10% of the year. **Change to EIS:** The methodology and assumptions were summarized above, but were not added to the EIS (Golder 2022) since this assessment is not part of the scope of the EIS. Section 8.3.6.1 of the EIS was updated with a reference to Section 6.7.1 (Human Health) of the EIS where this information is first presented, as well a reference to the Comprehensive Study Report (AECL 2001) where the assessment was performed. The updated text in Section 8.3.6.1 reads as follows (<u>changes underlined</u>): *"The preliminary exposure assessment for radiological contamination of the ditch, when these losses were conservatively ignored resulted in a dose of 0.16 millisieverts per year (mSv/a) at the predicted peak concentration of technetium-99 <u>(Section 6.7.1 Human Health; Appendix C of AECL 2001)</u>."* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report Volume 2: Appendices. WLDP-03702-041-000. Revision 2. March 2001.*

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						Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022. *Health Canada 1994. Human Health Risk Assessment for Priority Substances. Environmental Health Directorate. Ottawa, Ontario.* *Posiva OY 2000. Dose Rate Estimates for the Olkiluoto Site Using the Biospheric Models of SR97. Working Report 2000-20.* *Zach R and Sheppard SC 1992. The Food-Chain and Dose Submodel, CALDOS, for the Assessment of Canada's Nuclear Fuel Waste Management Concept. Atomic Energy of Canada Limited. AECL-10165. COG-91-195.*
					10.0 Assessment of Effects of the Environment on the Project	
146.	ECCC		EIS - Section 10.1.2 Extreme Rainfall Events, Snowmelts and Flooding	10-1	**Comment:** Precipitation estimates have been presented in the EIS up to a maximum of 100 year precipitation events. A peak flooding event in the Winnipeg is considered for a 100 year return event and dismissed as not having the potential to impact the project. These assessments seem to be focused on the post-closure scenario where an engineered cover has been placed over the entombed reactor. Furthermore when considering a long term project in geologic timescales, considering only 100 year return events seems inadequate. **Expectation to Address Comment:** It is recommended that the flooding assessment consider the worst case scenario associated with spring melt coinciding with a probable maximum precipitation event during the closure and the post-closure phase. It is further recommended that the closure phase considered should be prior to the engineered cover being installed.	**Incorporated:** The text in Section 10.2.2 (previously Section 10.1.2) of the Environmental Impact Statement (EIS; Golder 2022) has been updated to include the worst case scenario for the flooding assessment. During the Closure Phase decommissioning activities are encompassed by the existing Emergency Preparedness and Response plan (CNL 2018, CNL 2020), and the site design event (e.g., water conveyance structures and collection sumps) is 1 in 100 year 24-hour precipitation event. The assessment further considered the potential failure of the Seven Sister Dam in conjunction with a maximum precipitation event, referring to the Comprehensive Study Report (AECL 2001) previously completed for the site and decommissioning activities. The previous assessment work concluded that the WR-1 Building / WL Site would not be flooded even if the Seven Sister Dam fails. During the Post-Closure Phase, the detailed design of the engineering cover and surrounding drainage features, including grade to promote positive drainage from the site during post-closure, have been prepared using the site design event consistent with that of recent, similar projects and commensurate with the 100 year design life span of the concrete cap and engineered cover. A 100 year return event is used for the post-closure phase as it is the design span of the proposed institutional controls, after which the facility relies on passive design features. As the worst case scenario of a dam break combined with a maximum precipitation event does not result in flooding of the WR-1 building as demonstrated in the Comprehensive Study Report, a major precipitation event isn't likely to affect the site either. Uncertainty regarding a major future event causing complete erosion of the engineered cover over the WRDF was evaluated in Scenario 8 of the sensitivity analysis in Section 5 of the Groundwater Flow And Solute Transport Modelling report (GWFSTM; Golder 2021a). The scenario evaluated the sensitivity of the release model to a complete degradation of the engineered cover and the foundation by allowing the maximum water infiltration into the WRDF as permitted by the local geology. The results of Scenario 8 demonstrated that degradation of the engineered cover does not significantly affect the release rates from the WRDF, and therefore should not affect the safety of the facility, since the release rates are controlled by the slow corrosion of the reactor metals. The EIS and the current Decommissioning Safety Assessment Report (DSAR; Golder 2021b) have been developed based on conservative and generic design parameters derived from previously completed detailed design work for similar projects. **Change to EIS:** The following text has been added in Section 10.2.2 of the EIS: *"Flooding of the WL site due to a rise in the Winnipeg River is remote and has been previously evaluated in the Comprehensive Study Report for the WL Decommissioning Project (AECL 2001). A failure of the Seven Sisters Dam, which is upstream of the WL site, is considered a bounding scenario for a potential rise in river levels due to extreme rainfall events (1 in 100-year precipitation event). Flood levels of the Winnipeg River at the WL site following a failure of the Seven Sisters Dam were estimated to take 1.5 hours to reach a peak at 7 m above normal water levels (AECL 2001, Section 6.5). As such, a flooding incident of this magnitude would affect the shoreline of the Winnipeg River adjacent to the WL site, but it would not flood the WL site. The risk to the Project from flooding is therefore considered to be of low probability and of low consequence (negligible physical or biological effects). Consequences of potential flooding, such as a power outage, are encompassed by CNL's Emergency Preparedness Program (CNL 2020).The assessment work concluded that B100/the WL site would not be flooded.* *During Closure Phase, decommissioning activities are encompassed by the existing Emergency Preparedness and Response plan, and the site design event (e.g., water conveyance structures and collection sumps) is a 1 in 100-year 24-hour precipitation event. The detailed design of the concrete cap and engineered cover have been prepared using the site design event consistent with that of recent, similar projects and commensurate with the 100 year design lifespan of the concrete cap and engineered cover. A rise in river level in response to ice jams or extreme rainfall events is considered a possible – occasional event (1 in 100 years to 1 in 1,000 years) based on historical occurrence data. Further, Manitoba Hydro has contingency plans for comprehensive notification, warning, and response systems in case an emergency condition is detected.* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.*

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						CNL 2018. Whiteshell Laboratories Site Emergency Response Plan. WL-508730-ERP-001. Revision 5. April 2018. *CNL 2020. Emergency Preparedness Program. 900-508730-PDD-001. Revision 2. January 2020.* *Golder 2021a. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow And Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2021b. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
147.	CNSC Natural Resources Canada (NRCan)		EIS - Section 10.3 Seismic Events (and associated references)	10-4	**Comment:** The most current references available were not used in this section of the EIS. **Expectation to Address Comment:** Specifically, the NRCan references can be updated to the most recent information. It is recommended that CNL: cite the National Building Code of Canada (NBCC) 2015 hazard values: http://www.earthquakescanada.nrcan.gc.ca/hazard-alea/interpolat/index-en.php and replace the mention of zones. extract the current database of earthquakes (1985 – present) at http://www.earthquakescanada.nrcan.gc.ca/stndon/NEDB-BNDS/bull-en.php	**Incorporated:** The references have been updated and the seismic hazard values have been included in Section 10.4 Seismic Events (previously Section 10.3) of the Environmental Impact Statement (EIS; Golder 2022). Additional information regarding seismic activity is also provided in Section 4.6 of the Geosynthesis Report (CNL 2022) and a Memo from *J. Van Meter to J. Miller* (CNL 2018) summarizing the seismic hazard for the CNL Whiteshell Laboratories (WL). This additional information provides details on the peak ground acceleration (PGA) at the WL site based on data from 2005, 2010, and 2015. The seismic hazard at the WL site has decreased for every probability of exceedance since 2005. The PGA is approximately 0.10 for the 1 in 10,000-year probability of exceedance. **Change to EIS:** The National Building Code of Canada (NBCC; NBCC 2015) reference has been updated to 2015 and the text in Section 10.4 has been updated as follows: *"Detailed information on earthquakes that have occurred in Canada is contained in publications of Earthquakes Canada of Natural Resources Canada and their predecessor organizations. A seismic zoning map for Canada has been developed on the basis of these studies and is used in the NBCC 2015 (NRCan 2019).* *A seismic hazard analysis was completed for the WL site. In 1995, the NBCC placed the WL site (and all of Manitoba) within a Seismic Zone 0, a zone that has a probability of exceedance of 0.0021. The peak ground acceleration (PGA; i.e., the maximum acceleration that a rigid structure would experience if it was located on bedrock) data from NBCC was considered for the years 2005, 2010 and 2015. The trend since 2005 is that for every probability of exceedance, the seismic hazard at the WL site has decreased (NBCC 2015). For the 1 in 10,000-year probability of exceedance, the PGA is approximately 0.10 g. Comparatively, the 0.10 g PGA represents a light (almost moderate) earthquake for which one wouldn't normally expect structural damage for NBCC designed buildings and components (CNL 2022)."* **References:** *CNL 2018. Memo, J. Van Meter to J. Miller. Whiteshell Seismic Hazard. WLDP-26000-021-000-0009. June 2018.* *CNL 2022. Geosynthesis for WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. January 2022.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *NBCC 2015. National Building Code of Canada 2015. NRCC No. 56190.* *NRCan 2019. 2015 National Building Code of Canada Seismic Hazard Maps. Updated March 2019; Accessed March 2020.*
148.	CNSC	G. Su / J. Brown	EIS - 10.3 Seismic events	10-4	**Comment:** There is no review of the seismic record. The two paragraphs devoted to describing seismic events require further development, and supporting documentation. A seismic hazard assessment should be supported by a documentation of the geological environment, including the tectonic setting and regionally important structures. It is inappropriate to claim the site is aseismic based on a short period of measurements of seismicity in the region. The	**Incorporated:** A seismic hazard assessment was prepared by a CNL Civil Engineer and the results were incorporated into the groundwater model and the Post-Closure Safety Assessment as required. A memo summarizing the analysis was prepared (CNL 2018). Additional details on the geological environment are provided in the Geosynthesis Technical Document (CNL 2022). The project assessment timeframe was selected to be 10,000 years as presented in Section 6.1.4.2.2 of the Environmental Impact Statement (EIS; Golder 2022). The seismic analysis for Whiteshell Reactor 1 (WR-1) (1 in 10,000 year event, peak ground acceleration of approx. 0.10 g) indicates that there will be no cracking or displacement of any portion of the facility (CNL 2018). Subsequent Cone Penetrometer Testing at the Whiteshell Laboratories (WL) site confirmed there is no significant liquefaction risk at the WL site (KGS Group 2019).

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					seismic hazard of the site should be determined / assessed with consideration of the timeframe that is defined for the project. **Expectation to Address Comment:** Determine the seismic hazard corresponding to the defined timeframe and assess its impact on the facility.	To support the EIS, CNL has prepared a Geosynthesis (CNL 2022) that summarizes the available tectonic, geological, hydrogeological and geomechanical information including published scientific literature, WL site characterization reports, information on the regional and local geology developed during the Canadian Nuclear Fuel Waste Management Program, government documentation of area soil and available mapping data from the Manitoba Geological Survey and Earthquakes Canada. Section 4.6 of the Geosynthesis report provides a detailed description of the site seismicity, based on the seismic hazard assessment (CNL 2018) and site tectonic setting. Section 5.4.3.2 of the Decommissioning Safety Assessment Report (Golder 2021) discusses the disruptive events where the environment could affect the Project which includes seismicity (Section 5.4.3.2.7). **Change to EIS:** The text of Section 10.4 Seismic Events (previously Section 10.3) now reads: *“Major earthquakes (i.e., seismic events) are related to movements at tectonic plate boundaries. The province of Manitoba is the least earthquake-prone area in Canada ([Atomic Energy of Canada Ltd] AECL 2001). Seismic activity in the prairie region south of 60 degrees north (°N) is predominantly confined to southern Saskatchewan in a zone that continues into Montana (AECL 2001). Furthermore, the Canadian Nuclear Fuel Waste Management Program studied seismic stability in Northwest Ontario and Eastern Manitoba and found, based on a detection level of 2.5 on the Richter scale, that the [Whiteshell Laboratories] WL site and the southern two-thirds of Manitoba are aseismic (Wetmiller et al. 1996). The conclusion was based on data collected by the Geological Survey of Canada and the AECL through the operation of a network of seven seismograph stations in eastern Manitoba and northern Ontario from 1982 to 1995.* *Detailed information on earthquakes that have occurred in Canada is contained in publications of Earthquakes Canada of Natural Resources Canada and their predecessor organizations. A seismic zoning map for Canada has been developed on the basis of these studies and is used in the [National Building Code of Canada] NBCC 2015 (NRCan 2019).* *A seismic hazard analysis was completed for the WL site. In 1995, the NBCC placed the WL site (and all of Manitoba) within a Seismic Zone 0, a zone that has a probability of exceedance of 0.0021. The peak ground acceleration (PGA; i.e., the maximum acceleration that a rigid structure would experience if it was located on bedrock) data from NBCC was considered for the years 2005, 2010 and 2015. The trend since 2005 is that for every probability of exceedance, the seismic hazard at the WL site has decreased (NBCC 2015). For the 1 in 10,000-year probability of exceedance, the PGA is approximately 0.10 g. Comparatively, the 0.10 g PGA represents a light (almost moderate) earthquake for which one wouldn’t normally expect structural damage for NBCC designed buildings and components (CNL 2022).* *Liquefaction occurs when vibrations or water pressure within a mass of soil cause the soil particles to lose contact with one another. As a result, the soil behaves like a liquid, has an inability to support weight and can flow down very gentle slopes. This condition is usually temporary and is most often caused by an earthquake vibrating water-saturated fill or unconsolidated soil. Liquefaction most often occurs when three conditions are met: loose, granular sediment or fill; saturation by groundwater; and strong shaking. A similar process can occur in some types of low plasticity silts and clays termed cyclic loading for strong earthquakes. Liquefaction is possible for cohesionless soils for M=4 to 6 earthquakes, which can produce ground shaking levels up to VIII on the Modified Mercalli Intensity. Therefore, liquefaction is not seen as an issue for the WL site due to the essentially aseismic conditions of Eastern Manitoba, and the consolidated nature of the overburden geology (CNL 2022). Furthermore, the WR-1 Building was constructed directly on bedrock, which further reduces the risk of liquefaction having an effect on the Project. Cone penetration testing has been completed at site to assess the liquefaction potential of the overburden soils at the WL site. In general, the high plastic clayey overburden soils present at the site are not susceptible to cyclic liquefaction (KGS Group 2019).”* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *CNL 2018. J. Van Meter to J. Miller. Whiteshell Seismic Hazard. WLDP-26000-021-000-0009. June 2018.* *CNL 2022. Geosynthesis for WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. January 2022.* *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *KGS Group 2019. Cone Penetration Testing Investigation for Whiteshell Main Campus – Final. WLDP-26000-041-000 #51257474. December 2019.* *NBCC 2015. National Building Code of Canada 2015. NRCC No. 56190.*

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						NRCan 2019. 2015 National Building Code of Canada Seismic Hazard Maps. Updated March 2019. *Wetmiller et al. 1996. Comparison of seismic ground motions at surface and underground for understanding / developing design of nuclear fuel waste repositories, September 1996.*
					11.0 Summary of Monitoring and Follow-Up Programs	
149.	CNSC	C. Cianci Q. Zheng	EIS - Section 11.0 Summary of Monitoring and Follow-up Programs	11-1 to 11-3	**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 *Generic EIS Guidelines* (p.19) specifies that the EIS should include: 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 (reporting frequency, methods and format), description of any contingency procedures or plans or adaptive management provisions. The information presented in the summary provided in Section 11.0 lack sufficient detail on the information requirements above. **Expectation to Address Comment:** Please outline a framework or preliminary plan, which describes the scope, objectives and proposed approach for developing the details with respect to the design and implementation of the follow-up program. Please include further details on: the roles and responsibilities for the program and its review process, by regulatory agencies, Aboriginal peoples, and the public, the reporting methods that will be used, including reporting frequency, methods and format a general framework with respect to how contingency and adaptive management plans will be incorporated in both the follow-up program's design and implementation.	**Incorporated:** Sections 11.1, 11.2 and 11.3 of the Environmental Impact Statement (EIS; Golder 2022) have been expanded to include the requested information. The key information is summarized below: In each of the discipline assessment sections (6.2 through 6.9) of the EIS (Golder 2022), CNL has proposed monitoring and follow-up activities to be undertaken during the closure and post-closure stages of the Whiteshell Reactor 1 (WR-1) Project at the Whiteshell Laboratories (WL) site. These activities will serve to address the uncertainties associated with the effects predictions and the performance of mitigation, verify the predicted environmental effects, identify any unanticipated effects and facilitate implementation of adaptive management to limit these effects. Section 11.1.1 states that CNL will implement a Monitoring and Surveillance Plan for the In Situ Decommissioning of WR-1 to verify the accuracy of environmental effects and determine the effectiveness of mitigation that has or is to be implemented. Follow-up, surveillance and monitoring activities proposed for the WR-1 Project will be carefully integrated with the existing Environmental Assessment Follow-up Program for the WL site (CNL 2018a) being implemented under Licence No. NRTEDL-W5-8.00/2024. The Environmental Assessment Follow-up Program for the WL site (CNL 2018a) serves to evaluate the risk to relevant human and non-human biota receptors resulting from exposure to contaminants and stressors related to the WL site and its activities, and recommends further monitoring or assessment as needed based on the results, to clarify risks or reduce uncertainties. The current Environmental Assessment Follow-up Program for the site has been updated with *"Work Package #10 Whiteshell Reactor Disposal Facility (WRDF) Enhanced Monitoring"* that includes work tasks for review and integration of the Project groundwater, environmental, and effluent monitoring requirements into the WL Integrated Environmental Monitoring Program (CNL 2020), development of a WR-1 specific monitoring and surveillance plan, and the preparation of remedial action plans for the Project in alignment with Environmental Protection Environmental Incident Reporting, Investigation and Mitigation (CNL 2018b). This will provide remedial actions that can be executed in a timely manner. Wherever possible, existing programs will be adapted to meet the objectives of monitoring the predictions in the environmental assessment for the Project. Once the WL site has been decommissioned, monitoring to support the areas of institutional control will continue, as well as any other requirements identified in the Environmental Assessment Follow-up Program for the WL site. Table 11.1-1 of the EIS summarizes the conceptual monitoring program for the Environmental Assessment Follow-up Program for the Project. The information provided within the EIS is in alignment with the requirements in the Generic Guidelines for the Preparation of an EIS (CNSC 2016). CNL will develop a Monitoring and Surveillance Plan for the In Situ Decommissioning of WR 1 at the WL Site (the Project) and integrate it into the existing Environmental Assessment Follow-up Program for the WL site. The Monitoring and Surveillance Plan will document the Environmental Assessment Follow-up activities for the Project and will include sufficient information on the type, quantity and quality of information required to reliably verify effects predicted by the environmental assessment and confirm the effectiveness of mitigations. Wherever possible, existing programs (i.e., Effluent Verification Monitoring Program, Groundwater Monitoring Program, and Environmental Monitoring Program) will be adapted to meet the objectives of monitoring the prediction in the environmental assessment for the Project. The Monitoring and Surveillance Plan and the Environmental Assessment Follow-up activities for the Project will be prepared consistent with the Canadian Standards Association's Standards, as applicable: ▪ N288.4-10 (Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills [CSA Group 2010]); ▪ N288.5-11 (Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills [CSA Group 2011]); and ▪ N288.7-15 (Groundwater Protection Programs At Class I Nuclear Facilities and Uranium Mines and Mills [CSA Group 2015]). As the proponent of the Project, CNL will be responsible for implementing and managing the proposed follow-up monitoring program. Atomic Energy of Canada Limited (AECL), the owner of the site, is responsible for providing funding to CNL for the management and operation of its sites as per contractual

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						arrangement, including funding for the follow-up monitoring program, with these costs included in CNL's submission of a decommissioning financial guarantee and accompanying cost estimate that has been submitted to the CNSC as per the WL site licence. Environmental monitoring of the entire WL site will continue as part of the Environmental Assessment Follow-up Program for the WL site. For the Environmental Assessment Follow-up Program for the Project, CNL will determine the initial monitoring locations and frequency of sampling based on the EIS, the WR-1 Environmental Risk Assessment and the Decommissioning Safety Assessment Report. The monitoring data will be assessed against established limits for concentrations of contaminants of potential concern. These concentration limits are well below established benchmarks for the protection of humans and the environment. If the Environmental Assessment Follow-up Program for the Project identifies that adverse environmental effects are greater than predicted or results for any monitored contaminants of potential concern are above the established limits, then CNL will investigate the results, which may include additional sampling and analysis to help determine/confirm the source and extent of the contamination. CNL would also evaluate whether they result in changes to the conclusions in the EIS. If changes are confirmed, then CNL will evaluate the need for revised mitigation actions and management practices to manage effects, with engagement with Indigenous Nations for openness and transparency. Any proposals on modifications to the monitoring program will be communicated to the CNSC. Where the need for revised mitigations is identified, they will be developed and implemented on a case-by-case basis by CNL staff, and may include soil removal and/or treatment of groundwater. As part of the Environmental Assessment Follow-up Program for the Project, CNL will prepare remedial action plans for responses to unexpected results as per the Environmental Protection Program Incident Reporting, Investigation and Mitigation (CNL 2018b). This will ensure that remedial actions can be executed in a timely manner. CNL will prepare a progress report each year that will include a summary of the environmental monitoring results and the safety considerations of the waste left in situ. As part of CNL's engagement with the local municipal governments and regulators, the CNSC and First Nations and the Manitoba Métis Federation, CNL will incorporate their feedback on the monitoring program and expand it where appropriate. CNL is committed to reviewing and adapting the existing Environmental Assessment Follow-up Program for the WL site to incorporate Traditional Knowledge that has been collected through the environmental assessment for the Project, as well as through ongoing engagement and relationship building, in order to provide each Nation with the information that is relevant and important to them. In particular, the program will be modified to include monitoring of traditional foods as identified by Indigenous peoples. For example, a recommendation on CNL's environmental protection program was to include mushroom collection into the sampling program. CNL has since adjusted its environmental protection program to include mushroom collection and CNL continues to look for additional ways to improve their monitoring program. CNL will continue to work with First Nations and the Manitoba Métis Federation as the Environmental Assessment Follow-up Program for the Project evolves to address concerns and incorporate them into the program as appropriate. As indicated above, CNL is proposing that the preliminary follow-up program for the WR-1 Project is modelled after and incorporated into the existing Environmental Assessment Follow-up Program for the WL site (CNL 2018a). Follow-up programs developed under the Canadian Environmental Assessment Act (CEAA 2012) are designed and implemented to achieve the following key goals, Section 3.1 page 3-1 (CNL 2018a): • Verify the accuracy of the Environmental Assessment, and • Determine the effectiveness of any mitigation measures that have been implemented. The overall objectives of the follow-up activities for the WL Closure Project are to: • Optimize the monitoring and surveillance program already in place at WL, • Verify/Confirm that appropriate mitigation measures are implemented, • Verify effects predictions, • Identify effects of the project that may not have been predicted, • Develop appropriate responses to unforeseen events, • Offset loss of potential nesting habitat and monitor use of compensatory habitat, and • Monitor wildlife mortality (including birds, reptiles and mammals) and use information for adaptive management. To achieve those objectives, a number of activities are being implemented, including monitoring, surveillance and inspection, all of which require planning, data collection, analysis, evaluation and reporting. There are four (4) specific components of the follow-up program that include ten (10) work packages as follows, WR-1 Project included (**underlined**):

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						Environmental • Work Package #1 Routine Effluent and Environmental Monitoring Program. • Work Package #2 Air and Meteorology. Interim Storage and End-State Support • Work Package #3 Fitness-for-Service of Waste Management Area (WMA) Facilities. • Work Package #4 Confirmation of Hydrogeological Conditions at the WMA. • Work Package #5 Interim Remediation of WMA Facilities. • Work Package #6 Inactive Landfill Enhanced Monitoring. • Work Package #7 Sewage Lagoons Enhanced Monitoring. • Work Package #8 River Sediments Enhanced Monitoring. Public Communications • Work Package #9 Establish and Maintain Project Communications Mechanisms. In-Situ Disposal and End-State Support • Work Package #10 Whiteshell Reactor Disposal Facility (WRDF) Enhanced Monitoring. **Change to EIS:** Section 11.0 was significantly revised to capture the discussion above. Section 11.2 (Adaptive Management) specifically was updated to describe the program review process by regulatory agencies, Indigenous Nations, and the public, and a general framework with respect to how contingency and adaptive management plans will be incorporated in both the follow-up program's design and implementation. Section 11.4 (Indigenous Engagement and Participation in Environmental Monitoring) was updated to describe CNL's plans on engaging with the Indigenous Nations and encouraging their participation in the environmental monitoring programs for the WR-1 Project and overall WL site. The section was also updated to discuss how CNL intends on updating its environmental monitoring program with Indigenous traditional knowledge, in order to provide the Indigenous Nations with more relevant information. **References:** *CEAA 2012. Canadian Environmental Assessment Act, 2012. S.C. 2012, c. 19, s. 52. July 2012.* *CNL 2018a. Environmental Assessment Follow-Up Program for Whiteshell Laboratories. WL-509246-STD-001. Revision 0. December 2018.* *CNL 2018b. Environmental Incident Reporting, Investigation and Mitigation. 900-509200-STD-005. Revision 0. January 2018.* *CNL 2020. Whiteshell Laboratories Integrated Monitoring Program Framework. WL-509200-OV-001. Revision 1. December 2020.* *CNSC 2016. Generic Guidelines for the Preparation of an Environmental Impact Statement. May 2016.* *CSA Group 2010. N288.4-10 Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills. (reaffirmed 2015). May 2010.* *CSA Group 2011. N288.5-11 Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills. April 2011.* *CSA Group 2015. N288.7-15 Groundwater Protection Programs At Class I Nuclear Facilities and Uranium Mines and Mills. June 2015.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
150.	CNSC	C. Cianci	EIS - Section 11.3 Engagement and Communication	11-3	**Comment:** A number of Indigenous groups, including the Sagkeeng First Nation and Wabaseemoong Independent Nations, have expressed an interest in being engaged in on-going monitoring activities for the WR-1 project and WL site in general, especially as	**Incorporated:** CNL plans to work collaboratively with each engaged First Nations and the Manitoba Métis Federation on the follow-up monitoring program for Whiteshell Reactor 1 (WR-1) Project and the Whiteshell Laboratories (WL) site. CNL has committed to working with each engaged Indigenous Nation on reviewing and expanding the existing WL site environmental monitoring program as well as on developing an initiative which will allow Indigenous Nations to participate in environmental monitoring at the WL site. CNL is working to secure these commitments through signing relationship agreements

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					it relates to their traditional land use activities (e.g., fishing). In addition, Section 12 of CNSC's *Generic EIS Guidelines* (p.19) specifies that the description of the follow-up program in the EIS should include discussion on possible opportunities for the proponent to include the participation of the public and Aboriginal groups, during the development and implementation of the program. **Expectation to Address Comment:** Please clarify whether CNL has considered the possibility of collaborating and engaging with interested Indigenous communities on environmental monitoring activities specific to the WR-1 project and the WL site more generally. If applicable, and consistent with Section 12 of CNSC's *Generic EIS Guidelines*, provide details on possible opportunities for Indigenous communities to be engaged in monitoring.	with each engaged Indigenous Nation. These relationship agreements provide capacity funding to support the development and implementation of these engagements and initiatives. In addition, CNL is facilitating the involvement of Indigenous Nations in CNL's Environmental Protection Program's field sampling collection during the spring, summer, and fall months. This is described in an updated Section 11.4 (Indigenous Engagement and Participation in Environmental Monitoring) of the Environmental Impact Statement (EIS; Golder 2022): "*During Project engagement activities (Section 4.0 Indigenous Engagement), the First Nations and the Manitoba Métis Federation expressed concerns about the potential long-term effects of the Project on the environment. They indicated that the health of the environment, species relied on for fishing and harvesting, and the risk to people in the area of the WL site are of great concern. They also expressed an interest in being actively involved in the development and implementation of an ongoing monitoring program and made a number of recommendations on how the current monitoring program could be amended to include components significant to the First Nations and the Manitoba Métis Federation. The following section outlines ongoing engagements and commitments to support meaningful discussion of and involvement in the future environmental monitoring and follow-up programs (CNL 2022) for the Project and the WL site.* *CNL recognizes that the First Nations and the Red River Métis are stewards of the land and holders of Traditional knowledge who have a great interest in participating in monitoring at the WL site. CNL has thus committed to:* ▪ *Engaging with each Nation and the Manitoba Métis Federation on their specific interest and concerns regarding monitoring for the Project and the existing WL site Environmental Assessment Follow-up Program; and* ▪ *Working collaboratively with the engaged First Nations and the Manitoba Métis Federation to develop an initiative which will allow Indigenous Nations to participate in environmental monitoring at the WL site.* *The goal of the initiative is to help address concerns regarding protection of the environment, health of people, confidence in the health of country foods, and reduction of stigma associated with the Project. In general, key elements of the initiative may include:* ▪ *Expansion and evolution of the monitoring program at WL, through incorporation of feedback, recommendations, and Traditional knowledge.* ▪ *Opportunities for community monitors, youths and Elders from each First Nation and the Red River Métis to collect samples on site and in the surrounding area, including capacity development and training in environmental monitoring; and* ▪ *Collaborate on ecological restoration and address specific interests and concerns related to monitoring at the site.* *Each Nation may have different preferences for how to participate in the initiative and CNL commits to development of a program that is flexible to the needs of each Nation. Some communities may be satisfied with CNL's annual reporting, while others may wish to participate by observing CNL monitoring, or may wish to develop their own community led monitoring programs, separate from CNL's program. CNL will encourage cooperation between communities to minimize redundancy and unnecessary duplication of effort and cost."* CNL is committed to collaborating and engaging with interested Indigenous Nations on environmental monitoring activities specific to the WR-1 project and the WL site. As CNL is undertaking decommissioning of the WL site in addition to the proposed WR-1 decommissioning, it is important to the Indigenous Nations and CNL that these relationships endure, grow, and adapt to future activities. As such, CNL is currently working in collaboration with AECL, the Manitoba Métis Federation (MMF), and local First Nations to establish an Indigenous Advisory Committee and relationship agreements that include liaison positions, and to create mechanisms to develop and implement initiatives that will help address each Nation's unique interests and concerns related to the Project and the Whiteshell Laboratories Closure Project overall. Ongoing engagement activities will be reported on annually in the Environmental Assessment Follow-up Program (EAFP) Report. Section 4.2.5.2 of the EIS (Golder 2022) was updated with several longer-term initiatives relevant to the WR-1 Project and WL site more generally, to address WL site issues, concerns and interests, including environmental monitoring activities: " ***Supporting Long-term Monitoring –*** *All the First Nations and the Manitoba Métis Federation have expressed an interest in being more involved in CNL's environmental protection program. Specifically, the Manitoba Métis Federation expressed an interest in actively participating in monitoring both in the environmental protection program and decommissioning activities (outside the scope of the EA). CNL will work closely with the First Nations and the Manitoba Métis Federation to support their involvement in environmental monitoring at the WL site. This initiative will extend beyond the timeline and scope of the EA for WR-1 and will be a part of the larger site environmental remediation Project. Currently, CNL is with working with Sagkeeng to develop a scope of work for a Community Environmental Monitoring Program.* ***Indigenous Advisory Committee –*** *CNL has received interest from three First Nations and the Manitoba Métis Federation to move forward with the establishment of an Indigenous Advisory Committee (IAC). Two workshops were held to develop a draft term of reference and guide for the IAC. The*

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						purpose of the IAC includes but is not limited to foster a working relationship between Indigenous Nations, CNL, and AECL to collaborate and engage with CNL and AECL regarding the Whiteshell Laboratories Closure Project, and on other topics of mutual interest and concern. The IAC will also provide advice and guidance, and amplify the voice of Indigenous Nations to CNL and/or AECL management, to influence organizational change, and add Indigenous input into areas of the project and company including procurement, communication and engagement, long-term legacy monitoring, integration of Traditional knowledge. CNL has taken steps to work with the First Nations and the Manitoba Métis Federation to move this initiative forward. Like the Indigenous Stewardship Initiative, the intent of this committee extends beyond the scope of the EA for WR-1. CNL will continue to solicit interest and make efforts to put this committee in place in 2022." CNL also confirmed its commitment to continued engagement with and involvement of Indigenous Nations with the ongoing Environmental Assessment Follow-up Program for the WR-1 and WL site in general in Section 11.2 of the EIS (Golder 2022): *"In addition to incorporating the monitoring actions of this EIS into the Environmental Assessment Follow-up Program for the site, CNL is committed to reviewing and adapting the existing Environmental Assessment Follow-up Program for the WL site to incorporate Traditional Knowledge that has been collected through the environmental assessment for the Project, as well as through ongoing engagement and relationship building, in order to provide each community with the information that is relevant and important to them. In particular, the program will be modified to include monitoring of traditional foods as identified by Indigenous peoples. For example, a recommendation on CNL's environmental protection program was to include mushroom collection into the sampling program. CNL has since adjusted its environmental protection program to include mushroom collection and CNL continues to look for additional ways to improve their monitoring program. CNL will continue to work with First Nations and the Red River Métis as the Environmental Assessment Follow-up Program for the Project evolves to address concerns and incorporate them into the program as appropriate.* *A progress report will be prepared each year and will include a summary of the environmental monitoring results and the safety considerations of the waste left in situ. As part of CNL's engagement with the local municipal governments and regulators, the CNSC and First Nations and the Manitoba Métis Federation, CNL will incorporate their feedback on the monitoring program and expand it where appropriate."* **Change to EIS:** Sections 4.2.5.2 and 11.0 of EIS (Golder 2022) have been revised to include the information provided above. **References:** *CNL 2022. Whiteshell Laboratories WR-1 Reactor Decommissioning Indigenous Engagement Report. WLDP-26000-REPT-002. Revision 8. December 2022.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
151.	CNSC	RPD	EIS - Table 11.0-1	11-8	**Comment:** The conceptual monitoring program for human and ecological health monitoring for air quality is limited to dust and to tritium in air. Other radionuclides that could affect air quality should be monitored as well. **Expectation to Address Comment:** Relating to the EA monitoring and follow-up programs, CNL should expand the conceptual monitoring program for Section 6.7 Human and Ecological Health, to include monitoring for potential radionuclides that could affect air quality.	**Incorporated:** The environmental monitoring described in Section 6.7 of the Environmental Impact Statement (EIS; Golder 2022) was expanded to make reference to air quality monitoring. The air monitoring equipment (filters) that are used to monitor for dust during demolition or other dust generating activities are tested for gross alpha, beta and gamma radiation, thus capturing other radionuclides that could affect air quality. **Change to EIS:** Table 6.7.1-25 has been revised to clarify radiation air monitoring under the Project Phase, Potential Effect and Conceptual Monitoring Program column: *"Monitoring for air quality as noted above (i.e., for dust, gross alpha, beta and gamma radiation monitoring of the filters)."* Table 11.1-1 has been revised to add this information. The following text has been included in the table for the valued component "Human health and Ecological health": ▪ *"Passive tritium in air network monitoring (semi-annual change out) will be included as part of the Environmental Assessment Follow-up Program for the Project. Monitoring locations (approximately 4 of them) will be selected to be within the main upriver and downriver windrose sectors, at the site boundary and on-site mainly to monitor airborne tritium plumes potentially originating from the WRDF [Whiteshell Reactor Disposal Facility]."* **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

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					Appendices	
					Appendix 1.0-1 Concordance Table	
152.	ECCC		Appendices - Appendix 1.0-1	20	**Comment**: Section 6.2.2.8 Residual Effects Classification and Determination of Significance – Greenhouse Gases and Section 6.2.2.9 Monitoring and Follow-up – Greenhouse Gases are listed in the concordance table (Appendix 1.0-1) but do not exist in the EIS (p.6-60 to 6-69). **Expectation to Address Comment:** Revise EIS and related documentation as appropriate.	**Incorporated:** The Environmental Impact Statement (EIS; Golder 2022) and the related documentation have been revised accordingly. The Monitoring and Follow-up section is Section 6.2.2.8 of the revised EIS (Golder 2022) and there is no Residual Effect Classification and Determination of Significance section for Greenhouse Gases Assessment as no primary pathways were identified). **Change to EIS:** Appendix 1.0-1 Concordance with Regulatory Guidelines has been revised accordingly to remove the listing of Sections 6.2.2.8 and 6.2.2.9. **References:** *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
153.	CNSC	J. Brown	Appendices - Appendix 1.0-1	35	**Comment**: Section 6.3.1.4, as listed in the concordance table, is shown to be the section that will provide the information to meet the geology requirement for the EIS. The required information is either not included, incomplete, or not referenced (e.g., but not limited to geotechnical properties of the overburden, structural geology specifically documenting fractures and faults, petrology, complete geological model, seismic hazard assessment). **Expectation to Address Comment:** Include the required information, for consistency with REGDOC-2.9.1. This is also information that will be used to assess the long-term safety case for the project.	**Incorporated:** Section 6.3.1.5 (previously Section 6.3.1.4) of the Environmental Impact Statement (EIS; Golder 2022) was revised to reference and summarize the Geosynthesis Technical Document (CNL 2022) that was prepared to provide information to support the Whiteshell Reactor 1 (WR-1) Project, including ensuring that CNSC EIS regulatory baseline geological and hydrogeological requirements of Appendix B.4 of REGDOC-2.9.1 (CNSC 2020) are met. Table 6-1 of the Geosythesis (CNL 2022) summarizes how the Geosythesis and the EIS (Golder 2022) address the baseline geological and hydrogeological characterization requirements. Geotechnical properties of overburden are described in Section 4.2 of the Geosynthesis (CNL 2022). Structural geology including fractures and faults are described through lineament studies in Section 2.5.5 of the Geosynthesis and further structural details are provided in Sections 2.5.1, 2.5.2, and 2.5.4. The petrology of the Lac du Bonnet batholith is described in Section 2.5.2 of the Geosynthesis. Section 2.7 of the Geosynthesis provides a high level geological model of the Whiteshell Laboratories (WL) site and outlines uncertainties. Section 4.6 of the Geosynthesis provides a summary of the seismic hazard assessment for the WL site; the WL site is essentially aseismic. Please see Table 6-1 of the Geosynthesis for information on how the other baseline geological and hydrogeological characterization requirements are met. **Change to EIS:** Section 6.3.1.5 (previously Section 6.3.1.4) of the EIS (Golder 2022) was revised to reference and summarize the Geosynthesis Technical Document (CNL 2022) that was prepared to provide information to support the WR-1 Project, including ensuring that CNSC EIS regulatory baseline geological and hydrogeological requirements of Appendix B.4 of REGDOC-2.9.1 (CNSC 2020) are met. **References:** *CNL 2022. Geosynthesis for WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. January 2022.* *CNSC 2020. REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.2. September 2020. ISBN 978-0-660-06255-6.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
					Appendix 6.2-2 Emissions Estimates	
154.	ECCC		Appendices - Section 4.1.1.2 Demolition	15	**Comment:** PM_{10} emissions from demolition were calculated using the method from Chapter 3 of the WRAP Fugitive Dust Handbook (Western Governors' Association, 2006). This assumes open-air demolition, while components to be demolished and buried	**Resolved As:** As indicated in Section 6.1.1 of the Environmental Impact Statement (EIS; Golder 2022), decommissioning and dismantling of the majority of the above grade portion of the building, including the ventilation stack is out of scope of this EIS, and is already authorized through the existing CNSC site licence and is covered in the 2001 Comprehensive Study Report (AECL 2001).

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					below-grade include the PHT system and vent stack, which include hazardous non-radiological contaminants (e.g., lead, cadmium, asbestos) and radiological contaminants (assuming activation products remain embedded in cladding and concrete walls, etc.). Table 5.3.2-4 of the Decommissioning Safety Assessment Report (p.165) states that: "Fission, corrosion and activation products may be encountered." Larger emissions than anticipated could also occur. This indicates the potential for release of hazardous non-radiological and radiological contaminants during demolition. **Expectation to Address Comment:** Define the criteria for moving from the enclosed/filtered decontamination phase to the open-air demolition phase, and the monitoring of radiological and non-radiological contaminants. As to the criteria for moving from the enclosed/filtered to the open-air phase, explain its relation to air quality during the demolition phase.	The only portion of the Primary Heat Transport (PHT) system that will be disassembled is the portion that is above ground; and only a few select components of it will be incorporated in the grouted portion of the facility. The remaining components of the above-grade PHT system will be packaged and sent for offsite disposal. The PHT section will be dismantled under controlled conditions, with High-efficiency Particulate Air (HEPA) ventilation in place, likely while the existing building structure and systems are still intact around it. Releases from dust or gaseous emissions are expected to be negligible because these particulates are anticipated to be captured in the remnant organic coolant (oil) within the system. The majority of the structure surrounding the PHT is made of steel not concrete, which also inhibits the collection of dust and particulates on the PHT system. No part of the ventilation stack will be included for below-grade entombment. Remaining radiological, industrial, and environmental hazards will be remediated as practical and required for building demolition. The goal is to remove or remediate radiologically contaminated areas and systems so that the building and non-grouted reactor areas can be released for demolition as clean (non-contaminated). A Radiological Clearance Survey of the building will be performed to demonstrate remaining areas and systems are clean, confirm areas that are contaminated, and/or identify areas that are not feasible to demonstrate as clean. Contaminated areas that are not feasible to remove, remediate, or demonstrate as clean, will be identified and marked for segregation during demolition. An assessment will be done on whether such building areas or systems pose a risk for cross-contamination of clean building areas and the subsequent need to be managed as radioactive waste. The magnitude of potential dispersion of contamination during demolition and the need to implement contamination controls will be assessed in accordance with the Whiteshell Laboratories (WL) Open-Air Demolition Technical Basis Document (CNL 2020). To control the radiological air emissions, the criteria for moving from enclosed decontamination to open-air demolition is determined using the WL Open Air Demolition Technical Basis document (CNL 2020). This document outlines the methodology by which the remaining activity that is left in the building for the demolition is correlated to the method of demolition and doses to adjacent receptors are determined. Based on the dose constraints and Derived Air Concentrations a screening level will be assigned to the demolition work, ranging from Level 1 where no additional modeling or special precautions are necessary to Level 3, where in-depth modeling will be required and demolition controls will be subject to approval by the Radiation Protection and Environmental Protection program managers. Generally, open-air demolition is not performed above Level 3 dose constraints. To control the non-radiological air emissions, CNL Environmental Protection staff follow CNL's Management and Monitoring of Emissions (CNL 2018a) protocol. CNL has also committed to Total Suspended Particulate (TSP) monitoring during demolition as part of the Environmental Assessment Follow-up Program (CNL 2018b). Specifically, Ambient Air Quality is measured during site building demolitions. This is part of CNL's commitment as part of the existing site licence and the Comprehensive Study Report (AECL 2001). The Ambient Air Quality Criteria for the province of Manitoba is 400 ug/m^3 for a 24-hour period set in the Objectives and Guidelines for Various Air Pollutants: Ambient Air Quality Criteria (Manitoba Conservation 2005). This level was set by Manitoba Conservation to protect the health of the general public. The filters that are used to determine the TSP are also monitored for alpha, beta and gamma radiation to confirm no unexpected release of radioactivity, with an alert level set at 0.03 Bq/m^3 alpha or 100 Bq/m^3 for beta (Manitoba Conservation 2005). These levels were set to confirm that radioactivity in air concentrations remained well below 8 DAC/hr. Workplace air samplers are used in areas where worker exposure to radioactivity may be a concern. To mitigate both radiological and non-radiological contamination dispersion, CNL has established decontamination practices and contamination control techniques. These have been used during other open-air demolition of nuclear facilities at the WL site and provided effective means of controlling fugitive air emissions. Mitigation of fugitive emissions includes the use of contamination immobilization agents, containment, ventilation and HEPA filters to control generation of airborne emissions during decontamination or removal of contaminated systems or structures. Dust suppression methods during building demolition and soil remediation will be implemented to control airborne emissions and nuisance dust. **Change to EIS:** Section 6.2.1.6.2.2 of the EIS was updated with the following text from the explanation above: *"Radiological, industrial, and environmental hazards will be remediated as practical and required for building demolition. The goal is to remove or remediate radiologically contaminated areas and systems so that the building and non-grouted reactor areas can be released for demolition as clean (non-contaminated). A Radiological Clearance Survey of the building will be performed to demonstrate remaining areas and systems are clean, confirm areas that are contaminated, and/or identify areas that are not feasible to demonstrate as clean. Contaminated areas that are not feasible to remove, remediate, or demonstrate as clean, will be identified and marked for segregation during demolition. An assessment will be done on whether such building areas or systems pose a risk for cross-contamination of clean building areas and the subsequent need to be managed as radioactive waste. The magnitude of potential dispersion of contamination during demolition and the need to implement contamination controls will be assessed in accordance with the WL Open-Air Demolition Technical Basis Document (CNL 2020).* *To control the radiological air emissions, the criteria for moving from enclosed decontamination to open-air demolition will be determined using the WL Open Air Demolition Technical Basis document (CNL 2020). This document outlines the methodology by which the remaining activity that is left in the building for the demolition is correlated to the method of demolition and doses to adjacent receptors are determined. Based on the dose constraints and Derived Air Concentrations a screening level will be assigned to the demolition work, ranging from Level 1 where no additional modeling or special*

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						precautions are necessary to Level 3, where in-depth modeling will be required and demolition controls will be subject to approval by the Radiation Protection and Environmental Protection program managers. Generally, open-air demolition is not performed above Level 3 dose constraint." **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *CNL 2020. Whiteshell Laboratories Open-Air Demolition Technical Basis Document. WLDP-508740-TD-001. Revision 0. July 2020.* *CNL 2018a. Management and Monitoring of Emissions. 900-509200-STD-009. Revision 0. March 2018.* *CNL 2018b. Environmental Assessment Follow-Up Program for Whiteshell Laboratories. WL-509246-STD-001. Revision 0. December 2018.* *Manitoba Conservation 2005. Objectives and Guidelines for Various Air Pollutants: Ambient Air Quality Criteria.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
					Technical Supporting Documents	
					Environmental Risk Assessment Report	
155.	CNSC	N. Kwamena	ERA - General	N/A	**Comment:** REGDOC-2.9.1 indicates that environmental protection measures are commensurate to the risk of a given activity. CNL indicates that atmospheric releases are limited to the terrestrial environment and concludes that an ERA for the aquatic environment is not necessary. **Expectation to Address Comment:** Provide the rationale of why atmospheric releases would be limited to the terrestrial area and not extend to the Winnipeg River.	**Incorporated:** Atmospheric releases are limited to the terrestrial area and not extended to the Winnipeg River as CANada Deuterium Uranium (CANDU) Owners Group (COG) Derived Release Limits (DRL) Guidance (COG 2013) shows that the transfer of radionuclides from the atmosphere to large bodies of water (including lakes and rivers) is considered negligible. **Change to ERA:** Section 4.1.3 of the Environmental Risk Assessment (ERA; EcoMetrix 2021) has been revised to include the following rationale: *"Atmospheric deposition to the Winnipeg River is considered negligible. This is consistent with the COG DRL guidance (COG, 2013) which shows (assuming a modest flow rate for a lake of 0.1 m/s and an assumed water depth of 10 m) that the transfer of radionuclides from the atmosphere to large bodies of water (including lakes and rivers) is considered negligible. Rivers have larger flow rates than lakes; therefore, the conclusion for lakes that the atmospheric deposition pathway is negligible is applicable to rivers as well."* **References:** *COG 2013. Derived Release Limits Guidance. COG-06-3090-R3-I. Revision 3. 2013.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*
156.	HC		ERA - Executive Summary	xvi	**Comment:** The executive summary of the *Environmental Risk Assessment* document indicates: "Gamma spectrometry of the sediment samples confirmed the presence of uranium and thorium progeny. All samples are below the Nuclear Substance and Radiation Devices Regulations Clearance Level for naturally occurring uranium and thorium progeny. Beta activity in the sediment samples includes contributions from naturally occurring potassium-40 and from cesium-137. The majority of the beta activity for all locations continues to be from naturally occurring potassium-40." Only NORM is identified as being detected by gamma spectrometry, although Cs-137 is clearly present if it is contributing to the beta activity.	**Incorporated:** This quoted text is from the Environmental Impact Statement (EIS) - Executive Summary (Golder et al. 2017); it is not present in the Environmental Risk Assessment (ERA; EcoMetrix 2017). For the 2019 sampling, caesium-137 and potassium-40 were identified through the gamma spectroscopy analysis (Bureau Veritas 2020). With the exception of samples from three of the twelve locations, all caesium-137 activity levels were below the detectable level. **Change to EIS - Executive Summary:** The Surface Water Assessment section of the EIS - Executive Summary (Golder 2022a) has been revised as follows to include a complete list of radionuclides identified through the gamma spectroscopy analysis: *"As part of the routine monitoring at the Whiteshell Laboratories site, river bottom sediments were collected from 12 locations along the Winnipeg River, ranging from 0.8 kilometres upstream to 13.1 kilometres downstream of the outfall. The alpha activity in these samples is due to naturally occurring isotopes such as uranium-238 or thorium-232 and their progeny as both upstream and downstream samples contain similar levels. Gamma spectrometry of the sediment samples identified the presence of caesium-137 and potassium-40. Beta activity in the sediment samples is mostly from naturally occurring potassium-40, with a smaller amount from caesium-137. With the exception of samples from three of the twelve locations, all caesium-137 activity levels were below the detectable level."*

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					Expectation to Address Comment: Include a complete list of radionuclides identified through the gamma spectroscopy analysis.	**Change to EIS:** Section 6.4.2.5.2.2 of the EIS (Golder 2022b) has been revised as follows to include a complete list of radionuclides identified through the gamma spectroscopy analysis: *"Gamma spectrometry of the samples identified the presence of caesium-137 and potassium-40. The gross beta activity in sediment ranged from 333 to 1133 Bq/kg in 2019 at the twelve sampling locations (CNL 2020a). The previous five years average minimums and maximums ranged from 283±119 to 1,504±206 Bq/kg. The gross beta activities measured in 2019 for most sediment samples are higher than averages for the previous five years, with no trends observed. Beta activity includes contributions from naturally occurring potassium-40 and from caesium-137. Aliquots of samples collected in 2019 were submitted for strontium-90 analysis, and results indicated that strontium-90 makes an insignificant contribution to radioactivity in sediments. The majority of the beta activity for all locations continues to be from naturally occurring potassium-40 (CNL 2020a). The NSRDR [Nuclear Substance and Radiation Devices Regulations] Clearance Level for potassium-40 is 10,000 Bq/kg."* **Change to ERA:** No changes to the ERA are required. **References:** *Bureau Veritas 2020. SMO Results River Sediment (2019). 191-509252-450-000. Revision 0. March 2020.* *CNL 2020a. Environmental Monitoring in 2019 at Whiteshell Laboratories. WL-509243-ACMR-2019. Revision 0. June 2020.* *EcoMetrix 2017. WR-1 at the Whiteshell Laboratories Site Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 1. September 2017.* *Golder et al. 2017. Environmental Impact Statement for the In Situ Decommissioning of WR-1 at the Whiteshell Laboratories - Executive Summary. WLDP-26000-ENA-002. Revision 1. September 2017.* *Golder 2022a. Environmental Impact Statement for the In Situ Decommissioning of WR-1 at the Whiteshell Laboratories – Executive Summary. WLDP-26000-ENA-002. Revision 4. December 2022.* *Golder 2022b. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
157.	CNSC	M. Ilin	ERA - Section 2.0 Site Description	2.10	**Comment**: Clause 6.2.2 of the CSA standard N288.6-12 recommends that a detailed description of the site be included in the ERA. The standard makes a reference to Annex C Site Characterization Components, which provides the number and range of characteristics and parameters that could be considered as part of site characterization, for example: 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, anticipated contaminant behaviour etc. This information does not appear to be present in the ERA report, however, itis necessary to fully assess all potential environmental pathways which may be impacted by the ISD. **Expectation to Address Comment:** The ERA document should provide a description of site characterization components indicated above for consistency with the CSA N288.6-12 as appropriate.	**Resolved As:** The site characterization elements listed in Clause 6.2.2.1 of Canadian Standards Association (CSA) N288.6 (CSA 2012) have been included in the Environmental Risk Assessment (ERA; EcoMetrix 2021). Annex C of CSA N288.6 is an informative annex to the standard and is not a mandatory part of the standard. Since the ERA is a supporting document to the Environmental Impact Statement (EIS; Golder 2022), the majority of the site characterization information is included in Section 6.0 of the EIS, supported by the Geosynthesis Report (CNL 2022) and Hydrogeological Study Report (Dillon 2018), and only a summary of relevant recommended site characterization elements is provided in Section 2.0 of the ERA. The site characterization elements listed in Clause 6.2.2.1 have been described in the ERA as follows: • Current site location and layout – this is described in Section 2.1 (Site Overview and Historical Context) and Section 2.2 (Engineered Site Facilities) of the ERA. • Known releases to environmental media – this is described in Section 3.0 (Source Term Characterization) of the ERA as it warranted a separate section. • Past, present, and future uses and operations – this is described in Section 2.1 (Site Overview and Historical Context) and Section 2.3.8 (Human Land Use) of the ERA. • Geological and hydrological setting – this is described in Section 2.3.4 (Geology and Hydrogeology) and Section 2.3.5 (Hydrology) of the ERA. • Meteorological and climate setting – this is described in Section 2.3.1 (Current Climate and Current Climate Trends) of the ERA, with wind rose details in Section 4.2.5.1.1 (Meteorological Data). • Environmental setting – this is described in Section 2.3.3 (Topography and Surface Drainage), Section 2.3.6 (Aquatic Habitat and Biota), and Section 2.3.7 (Terrestrial Habitat and Biota) of the ERA.

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						• Existing contamination (if applicable) and background concentration information relevant to the site – known background concentrations relevant to the exposure assessment are included for surface water (Table 5-2 [Human Health Screening of Non-Radionuclides in Surface Water]) and sediment (Section 5.2.6.1 [Radiological Exposure Concentrations and Doses]) in the Winnipeg River. • Human setting – this is described in Section 2.3.8 (Human Land Use) of the ERA. • Available data and its intended uses within the context of the assessment – All data used in the exposure assessment are presented, with references, in Appendix B (Exposure Factors Used in Calculations) of the ERA, including the soil characteristics mentioned by the reviewer. • Residual uncertainty related to site characteristics – this is included in Section 2.4 (Uncertainty in Site Characterization) of the ERA. In CSA N288.6, the list of site characterization elements in Clause 6.2.2.1, and the more detailed list in Annex C, are to be discussed "as applicable". They are not intended as required elements of the site characterization. The idea is to provide a basis for the conceptual model of exposure at the site. The authors believe there are sufficient site characterization data in the ERA to support this model. **Change to ERA:** No changes to the ERA are required. **References:** *CNL 2022. Geosynthesis for WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. January 2022.* *CSA Group 2012. N288.6-12 Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills. (reaffirmed 2017). June 2012.* *Dillon 2018. WR-1 Hydrogeological Study Report. WLDP-26000-REPT-004. Revision 1. November 2018.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
158.	CNSC	RPD	ERA - Section 3.1.1.1 Release during Demolition Prior to Grouting Section 3.1.1.2 Release during Grouting	3.8 to 3.10	**Comment**: Sections 3.1.1.1 and 3.1.1.2 of the ERA reference the maximum and average particulate release rates (Table 6.2.1-9 and Table 6.2.1-10, respectively in the EIS). However, these tables in the EIS are not radionuclide particulate release rates. **Expectation to Address Comment:** Provide clarification.	**Resolved As:** The tables in the 2017 Environmental Impact Statement (EIS; Golder et al. 2017) are particulate release rates (Note: Reference should be to Table 6.2.1-10 and Table 6.2.1-11 in the 2017 EIS). In the 2017 Environmental Risk Assessment (ERA; EcoMetrix 2017), the total inventory of each radionuclide was assumed to be dispersed over the mass of grout or the mass of demolition material. This gives a radionuclide concentration (Bq/g), which is multiplied by particulate release rates (g/s) (listed in Table 6.2.1-10 and Table 6.2.1-11 of the 2017 EIS) to derive the release rate of radionuclides on particulate (Bq/s). This is conservative in that the entire inventory of radionuclides is made available for release with dust particulate. In reality, much of the inventory will be fixed on surfaces of Whiteshell Reactor 1 (WR-1) structures. Additionally, decontamination practices and contamination control techniques provide additional mitigation. **Change to ERA:** Sections 3.1.1.1 and 3.1.1.2 of the 2021 ERA (EcoMetrix 2021) have been revised to provide more detail on how the release rate of radionuclides on particulate were derived in alignment with the above response. Additionally, the associated tables are now Tables 6.2.1-11 and 6.2.1-12 of the EIS (Golder 2022); this has been reflected in the 2021 ERA (EcoMetrix 2021). **References:** *EcoMetrix 2017. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 1. September 2017.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder et al. 2017. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 1. September 2017.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

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159.	CNSC	RPD	ERA - Section 3.1.1.1 Release during Demolition Prior to Grouting Section 3.1.1.2 Release during Grouting	3.8 to 3.10	**Comment:** A total of 20.1% of the radionuclide inventory from the PHT system is assumed to be released. **Expectation to Address Comment:** Explain how this is a conservative assumption or consider a more conservative option.	**Resolved As:** This is a conservative assumption as 20.1% of the total remaining mass of the Primary Heat Transport (PHT) system is above-grade and will be disassembled (this is the only portion of the PHT system that will be disassembled); therefore, the entire above-grade portion of the radioactivity inventory is made available for release. In reality, much of the inventory will be fixed on surfaces of Whiteshell Reactor 1 (WR-1) structures. Additionally, decontamination practices and contamination control techniques provide mitigation, dust or gaseous emissions are expected to be captured in the remnant organics (oil) with the PHT system, and the system is made of steel not concrete, which inhibits the collection of dust and particulates on the system. During grouting, the remaining radioactivity inventory of the PHT system (79.9%; below-grade) was made available for release. This is conservative as much of the inventory will be fixed on surfaces of WR-1 structures, and decontamination practices and contamination control techniques provide mitigation. Also, the modelling is conservative in that the maximum and average dust release rates during grouting are assumed to occur over the entire one-year grouting period, even though grouting is expected to occur for only 109 days over this period. **Change to ERA:** Section 3.1.1.1 of the Environmental Risk Assessment (ERA; EcoMetrix 2021) was revised as follows to explain how this is a conservative assumption: *"The remaining components of the PHT system that will be placed below grade are the two heat exchangers (each are 5.1 m long; 6.6 Mg; 1.5 m^3) and the remaining two outlet headers (each are 2.7 m long; 3.4 Mg; 0.1 m^3) (CNL 2021b). Therefore, the mass of the PHT to be disassembled is 20 Mg. The total mass of the remaining components of the PHT (above and below grade) is 99.3 Mg (Appendix L of CNL 2021b, all items identified as Phase 1 Decommissioning have already been previously removed); therefore, the abovegrade portion of the PHT represents approximately 20.1% of the total remaining PHT mass.* *It was assumed that the above-grade inventory of each radionuclide (20.1% of the PHT inventory) is dispersed over the mass of the demolition material (20 Mg). Therefore, the maximum and average particulate release rates in g/s (Table 6.2.1-11 and Table 6.2.1-12, respectively in the EIS [Environmental Impact Statement] (Golder 2022)) were multiplied by 20.1% of the radionuclide inventory from the PHT at year 30 (Tables 17 and 19 in CNL 2020a) in Bq/g to estimate the release rate per radionuclide (in Bq/s) that could be expected during demolition activities in the closure phase. As shutdown occurred in 1985 and decommission activities will take place 30 to 40 years after, the closest year available for the inventory was used. For the PHT this was year 30.* *This assumption is conservative in that the entire above-grade portion of the inventory of radionuclides is made available for release with dust particulate. In reality, much of the inventory will be fixed on surfaces of WR-1 structures. In addition, decontamination practices and contamination control techniques provide mitigation. In addition, dust or gaseous emissions are expected to be captured in the remnant organics (oil), within the system. In addition, the structure is made of steel not concrete, which also inhibits the collection of dust and particulates on the PHT system."* Section 3.1.1.2 of the ERA (EcoMetrix 2021) was revised as follows: *"It was assumed that the below-grade inventory of each radionuclide is dispersed over the mass of the grouting material. Therefore, the maximum and average particulate release rates in g/s (Table 6.2.1-11 and Table 6.2.1-12 in the EIS (Golder 2022)) were multiplied by the estimated radionuclide concentration in grout, to obtain a release rate in Bq/s. The inventory from the reactor core, biological shield, active ventilation system, and remaining 79.9% of radionuclide inventory from the PHT system at year 30 (in Bq/g) were used to estimate the radionuclide concentration. It was assumed in Section 3.1.1.1 that 20.1% of the PHT activity was released during demolition prior to grouting.* *This assumption is conservative in that the entire inventory of radionuclides is made available for release with dust particulate. In reality, much of the inventory will be fixed on surfaces of WR-1 structures. In addition, decontamination practices and contamination control techniques provide mitigation. The modelling is also conservative in that the maximum and average dust release rates during grouting are assumed to occur over the entire one-year grouting period, even though grouting is expected to occur for only 109 days over this period."* **References:** *CNL 2020a. WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates. WLDP-26100-041-000. Revision 2. October 2020.* *CNL 2021. Whiteshell Laboratories Detailed Decommissioning Plan: Volume 6 – Whiteshell Reactor #1: Building 100. WLDP-26400-DDP-001. Revision 5. October 2021.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

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160.	CNSC	RPD	ERA - Section 3.1.1.1 Release during Demolition Prior to Grouting Section 3.1.1.2 Release during Grouting	3.8 to 3.10	Comment: The ERA indicates that radionuclide inventories at year 30 were used to estimate radionuclide release rates prior to and during grouting. It is also indicated that CNL determined the radionuclide specific surface contamination levels based on radionuclide inventory at 40 years. Expectation to Address Comment: Explain why 30 years was used in parts of the ERA while 40 years was used in others.	**Resolved As:** Inventories at 30 years were used in parts of the Environmental Risk Assessment (ERA; EcoMetrix 2017) while inventories at 40 years were used in others because, for each system, the closest available inventory year to the time of the planned decommissioning activity was used. For the Primary Heat Transport (PHT) system during demolition prior to grouting, the closest conservative year was 30. The 40-year time frame was only used for the active ventilation system during grouting as grouting was planned to occur closer to 40 years after shutdown of the reactor, which occurred in 1985. Now that approximately 5 years has passed since the 2017 ERA, grouting is planned to occur even closer to 40 years after shutdown of the reactor. **Change to ERA:** Section 3.1.1.1 of the ERA (EcoMetrix 2021) was revised as follows to clarify why the 30-year inventory was used for the PHT system: *"It was assumed that the above-grade inventory of each radionuclide (20.1% of the PHT inventory) is dispersed over the mass of the demolition material (20 Mg). Therefore, the maximum and average particulate release rates in g/s (Table 6.2.1-11 and Table 6.2.1-12, respectively in the EIS [Environmental Impact Statement] (Golder 2022)) were multiplied by 20.1% of the radionuclide inventory from the PHT at year 30 (Tables 17 and 19 in CNL 2020a) in Bq/g to estimate the release rate per radionuclide (in Bq/s) that could be expected during demolition activities in the closure phase. As shutdown occurred in 1985 and decommission activities will take place 30 to 40 years after, the closest year available for the inventory was used. For the PHT this was year 30."* Section 3.1.1.2 of the ERA (EcoMetrix 2021) was revised as follows to clarify why the 40-year inventory was used for the active ventilation system: *"The estimated radionuclide inventory was obtained from CNL (2020a) for the reactor core (Table 12), biological shield (Table 15) and the PHT system (Tables 17, 19 and 20), and active ventilation system, approximately 30 to 40 years following shutdown. For the active ventilation system total surface contamination was assumed to be 40 Bq/cm^2. CNL determined the radionuclide specific surface contamination levels based on radionuclide inventory from Table 17 in CNL (2020a) at 40 years, the closest year available. The total surface area of active ventilation system that will remain below grade was estimated as 665,830,000 cm^2; therefore, the total activity is 2.66E+10 Bq."* **References:** *CNL 2020a. WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates. WLDP-26100-041-000. Revision 2. October 2020.* *EcoMetrix 2017. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 1. September 2017.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
161.	CNSC	RPD	ERA - Section 3.1.1.1 Release during Demolition Prior to Grouting	3.8	**Comment:** The estimated release rate per radionuclide from demolition activities during the closure period assumes that the radionuclide inventory is mixed evenly with the demolished material. **Expectation to Address Comment:** Explain why this is conservative or consider a more conservative assumption.	**Resolved As:** This is conservative because the entire above-grade portion of the radioactivity inventory is made available for release. In reality, much of the inventory will be fixed on surfaces of Whiteshell Reactor 1 (WR-1) structures. Additionally, decontamination practices and contamination control techniques provide mitigation; dust or gaseous emissions are expected to be captured in the remnant organics (oil) within the Primary Heat Transport (PHT) system, and the system is made of steel not concrete, which inhibits the collection of dust and particulates on the system. With all of this considered, the estimated releases are expected to be higher than the actual releases observed during demolition prior to grouting. **Change to ERA:** Section 3.1.1.1 of the Environmental Risk Assessment (ERA; EcoMetrix 2021) was revised as follows to explain why the estimated releases are conservative: *"This assumption is conservative in that the entire above-grade portion of the inventory of radionuclides is made available for release with dust particulate. In reality, much of the inventory will be fixed on surfaces of WR-1 structures. In addition, decontamination practices and contamination control techniques provide mitigation. In addition, dust or gaseous emissions are expected to be captured in the remnant organics (oil), within the system. In addition, the structure is made of steel not concrete, which also inhibits the collection of dust and particulates on the PHT system."* **References:** *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*

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162.	CNSC	RPD	ERA - Section 3.1.1.2 Release during Grouting	3.10	**Comment:** The ERA states: “While there can be higher and lower concentrations in different parts of the ISD envelope, the average concentration on the particles released is relevant to the average dose received by receptors as a result of particle release and transport. The uniform mixing calculation represents this average concentration.” CSA N288.6-12 states: “Estimates of the average…and upper range of exposure concentration data should be presented.” **Expectation to Address Comment:** Include upper ranges of exposure concentration data.	**Incorporated:** The average and upper range of release rates (Bq/s) are provided in Tables 3-8 to 3-11 of the Environmental Risk Assessment (ERA; EcoMetrix 2021). These were used to estimate the average and upper doses (mSv/a) of Tables 4-16 to 4-23 of the ERA (EcoMetrix 2021). There is conservatism in the release rates (Bq/s), and hence the doses (mSv/a), as the entire below-grade portion of the radioactivity inventory is made available for release. In reality, much of the inventory will be fixed on surfaces of Whiteshell Reactor 1 (WR-1) structures. Additionally, decontamination practices and contamination control techniques provide mitigation, and average and upper dust release rates during grouting are assumed to occur over the entire one-year grouting period, even though grouting is expected to occur for only 109 days over this period. **Change to ERA:** The quoted text in the Information Request was removed from Section 3.1.1.2 of the ERA (EcoMetrix 2021) as it incorrectly implies that upper ranges of exposure concentration data were not included. The text of Section 3.1.1.2 of the ERA (EcoMetrix 2021) was also revised to explain how the estimated releases are conservative: *“It was assumed that the below-grade inventory of each radionuclide is dispersed over the mass of the grouting material. Therefore, the maximum and average particulate release rates in g/s (Table 6.2.1-11 and Table 6.2.1-12 in the EIS [Environmental Impact Statement] (Golder 2022)) were multiplied by the estimated radionuclide concentration in grout, to obtain a release rate in Bq/s. The inventory from the reactor core, biological shield, active ventilation system, and remaining 79.9% of radionuclide inventory from the PHT [Primary heat Transport] system at year 30 (in Bq/g) were used to estimate the radionuclide concentration. It was assumed in Section 3.1.1.1 that 20.1% of the PHT activity was released during demolition prior to grouting.* *This assumption is conservative in that the entire inventory of radionuclides is made available for release with dust particulate. In reality, much of the inventory will be fixed on surfaces of WR-1 structures. In addition, decontamination practices and contamination control techniques provide mitigation. The modelling is also conservative in that the maximum and average dust release rates during grouting are assumed to occur over the entire one-year grouting period, even though grouting is expected to occur for only 109 days over this period.”* **References:** *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
163.	CNSC	M. Ilin	ERA - Section 3.1.1.3	3.13	**Comment:** In the ERA, tritium releases to the atmosphere are considered as releases of HTO only. Are there any other tritium forms that may be reasonably expected to be released due to ISD (tritiated hydrogen, for example)? Although it is indicated that tritium will be released from the helium and heavy water system, its inventory following shutdown is not immediately available as opposed to other radionuclides (Section 3.1.1). **Expectation to Address Comment:** Provide clarity within the ERA with regard to potential tritium releases and its inventory.	**Resolved As:** Yes, elemental tritium (HT) may be released; however, it has been assumed that all tritium is in the form of tritiated water vapour (HTO) since HTO partitions better to other media than HT. As indicated in Canadian Standards Association (CSA) N288.1 (CSA 2014), HT is weakly absorbed by the body; therefore, any doses resulting from release of HT are due to the very small fraction, approximately 0.004% of HT that is converted to HTO in the human body. Correct, the tritium inventory following shutdown is not immediately available in Section 3.1.1 of the Environmental Risk Assessment (ERA; EcoMetrix 2021) as opposed to other radionuclides because most of the tritium inventory following shutdown was removed as part of Phase 1 decommissioning when the heavy water moderator was drained (AECL 1996). Additionally, unlike for the other radionuclides, the tritium inventory was not used to estimate the average and maximum tritium release rates as the helium and heavy water system is being purged through air flow to remove any additional tritium in the system and it is expected that tritium will be released during closure activities at a rate similar to recent tritium purging rates. The total inventory of tritium at 50 years following shutdown is provided in Table 4-2 of the Groundwater Flow and Solute Transport Modelling Report (GF&STMR; Golder 2021) and is used to estimate the groundwater releases of tritium during the post-closure phase. **Change to ERA:** The following text was added to Section 3.1.1.3 of the ERA (EcoMetrix 2021) to clarify why all tritium was assumed to be in the form of HTO: *“Tritium during characterization studies was measured as total tritium. It has been assumed that tritium is in the form of HTO (tritiated water vapour) – this is a conservative assumption since HTO partitions better to other media than HT (elemental tritium). As indicated in CSA N288.1-14, HT is weakly absorbed by the body; therefore, any doses resulting from release of HT are due to the very small fraction, approximately 0.004% of HT that is converted to HTO in the human body.”*

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						References: *AECL 1996. The WR-1 Reactor Phase 1 Decommissioning Interim Endstate Report - Facility Description. RC-1290. Revision 1. March 1996.* *CSA Group 2014. N288.1-14 Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities. (reaffirmed 2019). March 2014.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.*
164.	CNSC	N. Kwamena	ERA - Section 3.1.1.3 Release of Tritium	3.13	Comment: The tritium release rate during grouting during the closure period was estimated based on a CNL study conducted on tritium releases during couponing activities associated with the radiological characterization in the helium and heavy water system. The release rate of 1.28E10 Bq/week was characterized as a conservative estimate compared to the average weekly tritium release for the five-year period 2011-2015. Additional details should be provided to indicate that the activities associated with couponing are similar to those that will take place during the closure phase and therefore the release rate is conservative for the purposes of the assessment. **Expectation to Address Comment:** Provide additional supporting information that the release rate for tritium during the closure phase is sufficiently conservative. The uncertainty in this assumption should also be discussed.	**Resolved As:** During closure, the release rate of tritium during grouting is uncertain, therefore conservative assumptions were made based on the release rates collected by CNL to predict the rates during grouting. The operations include cutting penetrations in the existing systems, resulting in vibrating and localized heating, similar to characterization activities, but the release rate is expected to be less than it is during characterization activities because the grout will tend to re-absorb any tritium released. Moreover, the vibrating and heating activities during grouting are unlikely to occur for the full duration of the grouting phase. As a conservative assumption, releases during grouting were set to the maximum observed during characterization activities, as described in the Environmental Risk Assessment (ERA; EcoMetrix 2021). Furthermore, the releases were assumed to be entirely in the form of HTO (tritiated water vapour), the most biologically available form. Therefore, the maximum release from the characterization studies is considered conservative for grouting. The conservative nature of the assumed release has been described in Section 3.1.1.3 of the ERA. **Incorporated:** Section 3.1.1.3 of the ERA (EcoMetrix 2021) has been updated to provide additional information regarding the conservative assumptions taken for the tritium release rates. Table 3-12 in Section 3.1.1.3 has been updated to include the tritium release rates for 2016, 2017, 2018, and 2019, thus providing a new average which has also been updated in Table 3-13. **Change to ERA:** The following text was added in paragraph 3 of Section 3.1.1.3: *"Tritium during characterization studies was measured as total tritium. It has been assumed that tritium is in the form of HTO (tritiated water vapour) – this is a conservative assumption since HTO partitions better to other media than HT (elemental tritium). As indicated in CSA [Canadian Standards Association] N288.1-14 [(CSA Group 2014)], HT is weakly absorbed by the body; therefore, any doses resulting from release of HT are due to the very small fraction, approximately 0.004% of HT that is converted to HTO in the human body."* Table 3-12 in Section 3.1.1.3 has also been updated to include the tritium release rates for 2016, 2017, 2018, and 2019, thus providing a new average as well. The average tritium release rate in Table 3-13 for the closure activity "Demolition prior to Grouting" has been updated from 1.95E+03 Bq/s in the 2017 ERA (EcoMetrix 2017) to 1.84E+03 Bq/s in the latest revision of the ERA (EcoMetrix 2021). **References:** *CSA Group 2014. N288.1-14 Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities. (reaffirmed 2019). March 2014.* *EcoMetrix 2017. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 1. September 2017.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*
165.	CNSC	N. Kwamena	ERA - Table 3-1	3.2	**Comment:** Table 3-1 Project Activities, Components and Emission Sources during Closure is not consistent with the text in Section 3.1.1 Radiological Releases and Table 3.2. Demolition is identified to be a source or radiological releases during the closure period. This includes demolition of the main reactor hall, above grade portion of 50T reactor hall bridge crane and the ventilation stack. Table 3.1 should be	**Resolved As:** Section 3.1.1, paragraph 3, of the Environmental Risk Assessment (ERA; EcoMetrix 2021) was updated to explain that there will be negligible release of radionuclides to the atmosphere from demolition of the above grade structures after grouting is complete. At this point, all contamination will be grouted below grade. It is expected that there will be negligible release of radionuclides to the atmosphere during Whiteshell Reactor 1 (WR-1) building decommissioning activities after grouting since CNL intends to characterize, survey, and decontaminate or immobilize any residual contamination prior to demolition.

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					corrected to indicate that demolition of these later project components have the potential for radiological releases. **Expectation to Address Comment:** Correct Table 3.1 to indicate that the demolition of the main reactor hall, above grade portion of 50T reactor hall bridge crane and the ventilation stack have the potential for radiological releases.	To help control the air emissions, the criteria for moving from enclosed decontamination to open-air demolition will be determined using the Whiteshell Laboratories Open Air Demolition Technical Basis document (CNL 2020). This document outlines the methodology by which the remaining activity that is left in the building for the demolition is correlated to the method of demolition and doses to adjacent receptors are determined. Based on the dose constraints and Derived Air Concentrations, a screening level will be assigned to the demolition work, ranging from Level 1 where no additional modelling or special precautions are necessary to Level 3, where in-depth modelling will be required and demolition controls will be subject to approval by the Radiation Protection and Environmental Protection program managers. Generally, open-air demolition is not performed above Level 3 dose constraint. It should be noted that the demolition work for the WR-1 In Situ Disposal Project is bounded by the assessment of full demolition of WR-1 performed in the approved Comprehensive Study Report (AECL 2001). As indicated in Section 6.2.1.6.2.2 of the Environmental Impact Statement (EIS; Golder 2022), *"The Comprehensive Study Report included consideration of the WR-1 Building in the original evaluation of residual effects to air quality (see Section 6.3.1 of AECL 2001). Although the decommissioning strategy has changed for WR-1 from a complete removal of the facility to in situ disposal, activities related to the decommissioning of the reactor are expected to be less disruptive than those assessed in the Comprehensive Study Report (AECL 2001) for the currently approved decommissioning approach (i.e., complete removal of the facility)."* **Change to ERA:** Section 3.1.1 (Radiological Releases) was updated with the following: *"During demolition of above-grade structures after grouting, it is expected that there will be negligible release of radionuclides to the atmosphere. It is expected that demolition of above grade structures will occur for 2 years after grouting is complete. This includes removal of the non-grouted building structures, equipment, and services contained within 1 m of the building footprint, including the non-grouted 600 Level and 500 Level flooring, the above-grade portion of the active ventilation system, and remaining slowpoke demonstration reactor (SDR) materials (CNL 2021b). CNL intends to characterize, survey, and decontaminate or immobilize any residual contamination prior to demolition to ensure that there is negligible release of radionuclides to the environment. Therefore, after grouting, contamination will be below grade and no release and subsequent exposure modelling has been performed for the demolition post grouting phase."* **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project – Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *CNL 2020. Whiteshell Laboratories Open-Air Demolition Technical Basis Document. WLDP-508740-TD-001. Revision 0. July 2020.* *CNL 2021b. Whiteshell Laboratories Detailed Decommissioning Plan: Volume 6 – Whiteshell Reactor #1 Building 100. WLDP-26400-DDP-001. Revision 5. October 2021.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
166.	HC		ERA - Table 3-6	3.6	**Comment:** Several of the half-lives identified for radionuclides in Table 3-6 do not seem to correspond to the known values for physical half-life, including Pu-238, Pu-241, Am-241, and C-60. Using these values in calculations to support the assessment would lead to incorrect conclusions. **Expectation to Address Comment:** If incorrect values were used in the calculations, update the calculations and Table 3-6 accordingly, with the use of the appropriate half-life values.	**Incorporated:** The table has been revised to include the appropriate half-life values for the radionuclides. The errors in the half-life values listed in the table were a data entry issue and had no effect on the calculations performed in the modelling. **Change to ERA:** Table 3-6 in the Environmental Risk Assessment (ERA; EcoMetrix 2021) has been updated as shown below: **Table 3-6: Estimated Radionuclide Inventory in Primary Heat Transport System Following Shutdown (Bq)**

Radionuclide	$t_{1/2}$ (years)	10 years	30 years	50 years
Sr-90	28.8	5.10E+11	3.10E+11	1.90E+11
Cs-137	30.2	7.60E+11	4.80E+11	3.00E+11
Eu-154	8.6	1.90E+10	3.90E+09	8.10E+08

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<tr><th>No.</th><th>Department/ Agency</th><th>SME</th><th>Section Table or Figure</th><th>Pg. #</th><th>Information Request or Summary of Comment</th><th>Response by CNL</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>
<table>
<tr><td>Eu-155</td><td>4.8</td><td>7.90E+09</td><td>4.80E+08</td><td>2.90E+07</td></tr>
<tr><td>Tc-99</td><td>2.11E+05</td><td>1.30E+08</td><td>1.30E+08</td><td>1.30E+08</td></tr>
<tr><td>I-129</td><td>1.57E+07</td><td>2.80E+05</td><td>2.80E+05</td><td>2.80E+05</td></tr>
<tr><td>U-235</td><td>7.0E+07</td><td>5.76E+05</td><td>5.76E+05</td><td>5.76E+05</td></tr>
<tr><td>U-238</td><td>4.5E+09</td><td>1.24E+07</td><td>1.24E+07</td><td>1.24E+07</td></tr>
<tr><td>Np-237</td><td>2.14E+06</td><td>9.40E+05</td><td>1.10E+06</td><td>1.20E+06</td></tr>
<tr><td>Np-239</td><td>0.0065</td><td>1.90E+07</td><td>1.90E+07</td><td>1.90E+07</td></tr>
<tr><td>Pu-238</td><td>88</td><td>2.90E+09</td><td>2.50E+09</td><td>2.10E+09</td></tr>
<tr><td>Pu-239</td><td>24110</td><td>6.10E+09</td><td>6.10E+09</td><td>6.10E+09</td></tr>
<tr><td>Pu-240</td><td>6561</td><td>8.70E+09</td><td>8.70E+09</td><td>8.70E+09</td></tr>
<tr><td>Pu-241</td><td>14</td><td>5.30E+11</td><td>2.00E+11</td><td>7.70E+10</td></tr>
<tr><td>Am-241</td><td>432</td><td>1.10E+10</td><td>2.10E+10</td><td>2.50E+10</td></tr>
<tr><td>Am-243</td><td>7370</td><td>1.90E+07</td><td>1.90E+07</td><td>1.90E+07</td></tr>
<tr><td>Cm-244</td><td>18.1</td><td>4.40E+08</td><td>2.10E+08</td><td>9.60E+07</td></tr>
<tr><td>Co-60</td><td>5.3</td><td>3.33E+09</td><td>2.43E+08</td><td>1.78E+07</td></tr>
<tr><td>Ag-108m</td><td>438</td><td>-</td><td>1.62E+06</td><td>1.50E+06</td></tr>
</table>
References:
EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.
</td></tr>
<tr><td>167.</td><td>HC</td><td></td><td>ERA - Section 3.1.1 Radiological Releases</td><td>3.13</td><td>Comment: The following sentence of the EIS indicates [emphasis added]: “This assumption is based on a study CNL conducted on tritium releases during couponing activities associated with radiological characterization in the helium and heavy water system (CNL 2015b).” The term “couponing” is not explained or defined. Expectation to Address Comment: Define the term “couponing” in the documentation for clarity purposes.</td><td>
Resolved As:
Couponing is a term used to describe the cutting out or removing of a piece of material from the reactor system components such as pipes and tanks for the purposes of testing and material characterization. Often the couponing produces a disk of material from a hole saw or a slice of a pipe from making two cuts.
Change to ERA:
The text in the Environmental Risk Assessment (ERA; EcoMetrix 2021) Executive Summary and Section 3.1.1 (Radiological Releases) has been revised to say “characterization” in place of “couponing”.
References:
EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site – Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.
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168.	CNSC	M. Ilin	ERA - Section 3.2.1 Radiological Release	3.16	**Comment**: It is stated that: "Aquatic dispersion of radon-222 was excluded as it is expected to volatilize rapidly to air". This statement raises a number of questions. First, this is the only place in the ERA document where radon is indicated as a radionuclide expected to be potentially released from the ISD. Why have radon loadings been considered for the post-closure period only and for aquatic dispersion only? Second, what is the source of radon and why the sources as well as the radon inventory have not been described in the report? Third, what kind of criteria was used to exclude the exposure to radon that rapidly volatilize to air and whether the potential exposure to this radon has been considered in the report? Finally, it is not clear why uranium-238 is missing in the list of radiological parameters in Table 3-16 while other uranium isotopes and daughters (like radium-226, radon-222, lead-210 etc.) are present. **Expectation to Address Comment:** Clarification is needed to address the several questions and comments raised above in order to address the potential exposure to radiological releases from the ISD.	**Resolved As:** Radon was not included as a contaminant of potential concern (COPC) in the closure phase, since it was not identified as part of the radionuclides associated with the main systems and components at the Whiteshell Reactor 1 (WR-1) building (see Table 3-3 in the Environmental Risk Assessment [ERA; EcoMetrix 2021]). During post-closure phase, radon (Rn-222) was included as a radionuclide with potential for release due to ingrowth during groundwater transport. U-238 was identified in Table 17 (Estimate of fission product and actinide radioactivity released into the PHT [primary heat transport]) in the source term report (CNL 2020); therefore, all radionuclides in the U-238 decay chain were included in the solute transport model. U-238 has been added to Table 3-16 in the ERA (EcoMetrix 2021). However, noble gases (including radon) are not considered relevant for release to water since they are chemically inert and do not enter environmental compartments other than air, as described in Canadian Standards Association (CSA) N288.1-14 (Clause 5.1.8) (CSA Group 2014). The ERA model follows this approach. The 2017 ERA (EcoMetrix 2017) had the following statement in Section 3.2.1 (Radiological Release): "*Mass loadings from the groundwater model of radon-222 (Rn-222) are provided but aquatic dispersion was excluded as it is expected to volatilize rapidly to air.*" The latest ERA (EcoMetrix 2021) provides additional text in Section 3.2.1 (Radiological Release) as follows: *"Mass loadings from the groundwater model of radon-222 (Rn-222) are provided but aquatic dispersion was excluded as radon is expected to volatilize rapidly to air. This assumption is consistent with Clause 5.1.8 of CSA N288.1-14 which indicates that noble gases, including Rn-222, are not considered relevant for release to water since they do not enter environmental compartments other than air. Doses from noble gases released with liquid effluent are expected to be negligible. The ERA model follows this approach."* The estimated contribution of Rn-222 from WR-1 to the soil surrounding WR-1 is De Minimius (so small as to be negligible or trivial) particularly when compared to the natural levels of Rn-222 in the soils in Canada and the Canadian Shield. The current Canadian guideline for radon in indoor air for dwellings is 200 Bq/m^3 (Health Canada 2017). The peak inventory of radon within the Whiteshell Reactor Disposal Facility considering ingrowth is estimated to be less than 200 Bq (CNL 2021). Conversely, the peak mass loading rate for radon to the Winnipeg River is estimated to be 4.82E-12 g/yr (see Table 3-16 of the ERA [EcoMetrix 2021]). This equates to approximately 2.74E+04 Bq/yr. According to a 2017 report by Statista Research Department, the average size of a Canadian home is 1,792 ft^2 (~166 m^2) (Paradise Developments 2021). Assuming a room ceiling height of 2.1 m in accordance with the minimum ceiling height requirement of National Building Code of Canada (NRCC 2015), this gives a volume of approximately 348 m^3. If the peak mass loading rate for radon to the Winnipeg River were applied to this volume for a year without any decay (~79 Bq/m^3), the 200 Bq/m^3 guideline (Health Canada 2017) would not be exceeded. Since the half-life of radon is 3.8235 days (see Table 4-1 of the Groundwater Flow and Solute Transport Modelling Report [GWFSTMR; Golder 2021]), there will be substantial decay. U-238 has now been included in Table 3-16 in the ERA (EcoMetrix 2021). Therefore, the assessment in the latest ERA includes U-238 in the dose calculations as shown in the following tables: • Table 5-10: Estimated Radiation Dose for Harvester during Post-Closure – Maximum • Table 5-11: Estimated Radiation Dose for New On-site Farm during Post-Closure – Maximum • Table 5-12: Estimated Radiation Dose for New On-site Farm 3 Month Old during Post-Closure – Maximum • Table 5-13: Estimated Radiation Dose for Farm A Resident during Post-Closure – Maximum • Table 5-14: Estimated Radiation Dose for Farm A 3-Month Old during Post-Closure – Maximum • Table 7-6: Estimated Concentrations of Ecological Receptors during Post-Closure – Maximum • Table 7-7: Estimated Radiation Dose for Ecological Receptors during Post-Closure – Maximum **Change to ERA:** Changes were made to the 2021 ERA as described above. **References:** *CNL 2020. WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates. WLDP-26100-041-000. Revision 2. October 2020.* *CNL 2021. Whiteshell Reactor Disposal Facility - Source and Release versus Time. WLDP-26000-038-000. Revision 0. December 2021.* *CSA Group 2014. N288.1-14 Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities. (reaffirmed 2019). March 2014.* *EcoMetrix 2017. WR-1 at the Whiteshell Laboratories Site Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 1. September 2017.*

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						EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021. *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Health Canada 2017. Guide for Radon Measurements in Residential Dwellings (Homes). May 2017.* *NRCC (National Research Council of Canada) 2015. National Building Code of Canada 2015. NRCC 56190. Volume 2. January 2015.* *Paradise Developments 2021. Average House Size in Canada. June 2021.*
169.	CNSC	H. Mulye	ERA - Section 4.1.1 Receptor selection	4.1	**Comment**: In the selection of human receptors, Aboriginal receptors were not included in the assessment. While it is understood that the closest Aboriginal group is some distance away from the project site, Aboriginal groups may spend time in closer proximity to the site and consume higher amounts of local and country foods. How has this been considered in the 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.	**Incorporated:** Indigenous receptors have been included in the Human Health Risk Assessment (HHRA) in Section 4.0 of the Environmental Risk Assessment (ERA; EcoMetrix 2021), taking into account their cultural practices and higher reliance on traditional and country foods. **Change to ERA:** The text of Section 4.1.1 was revised as follows: *"Harvesters represent Indigenous or Traditional users of the area who may be exposed through harvesting of country foods (see Table 4-6 for exposure factors for the harvester). It is assumed that the harvesters spend part of their time on-site, part near Farm F, and part at an unexposed location. CNL (2018a) conducted an Indigenous Food Intake Survey completed by members of the Sagkeeng First Nation and Manitoba Métis Citizens to understand the types and quantities of local food consumed. The survey results have been incorporated into the Harvester's diet and are discussed in more detail in Sections 4.1.3 and 4.2.4."* **References:** *CNL 2018a. Aboriginal Food Intake Survey. Memo from Jesse Gordon to Brian Wilcox. WLDP-26000-021-000. September 2018.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*
170.	CNSC	N. Kwamena	ERA - Section 4.1.2 Selection of Chemical, Radiological and Other Stressors	4.2	**Comment**: As identified in comment #68 above, the proposed project includes construction of temporary structures, demolition, transportation and power generation. In addition to the indicator compounds identified in the assessment there is the potential for the increased levels of other fuel-combustion products such as polycyclic aromatic hydrocarbons, volatile organic compounds and metals. **Expectation to Address Comment:** Provide justification for not including other products of fuel combustion (i.e., polycyclic aromatic hydrocarbons, volatile organic compounds and metals) as COPCs for the HHRA.	**Resolved As:** Assessment of fuel combustion on air quality is assessed in the Environmental Impact Statement (EIS; Golder 2022) in Section 6.2.1. Non-road non-mobile fuel combustion products such as polycyclic aromatic hydrocarbons and metals were not considered as indicator compounds as their associated emission factors are significantly lower than the assessed indicator compounds (e.g., NOx). It is not expected that potential emissions from fuel combustion would result in significant emissions and predicted concentrations. **Change to ERA:** No changes have been made to the Environmental Risk Assessment (ERA; EcoMetrix 2021). **Change to EIS:** Section 6.2.1.3 (Valued Components) was updated as follows: *"The [volatile organic compounds (VOCs)], while a criteria air contaminant, are not considered indicator compounds for this Project. The VOCs are not expected to be emitted from the decommissioning activities with the exception of some VOC emissions from fuel combustion. There are no provincial or federal standards for total VOCs to compare predicted concentrations, therefore, were not retained for the air quality baseline assessment. Polycyclic aromatic hydrocarbons (PAHs) and metals are not considered as indicator compounds as their associated emission factors, where applicable, are considerably lower than the assessed indicator compounds (e.g., NOx). It is not expected that emissions from fuel combustion would result in substantial predicted concentrations. Non-road mobile fuel combustion products may include hydrocarbons; however, the associated emission factors may represent total hydrocarbons or non-methane hydrocarbons."* **References:** *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*

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171.	CNSC	H. Mulye	ERA - Section 4.1.2.2 Screening of non-radiological COPCs	4.3	**Comment**: It is unclear why a number of non-radiological hazardous substances were not considered in the assessment of exposures to workers. For example, asbestos, PM_{10}, $PM_{2.5}$, PCBs, VOCs, lead, diesel exhaust, and biological (mold spores). **Expectation to Address Comment:** Provide a rationale for exclusion of the above noted COPCs from the assessment of exposure of workers and the health risk posed.	**Resolved As:** There are two types of on-site workers: workers directly involved in the closure activities of the Whiteshell Reactor 1 (WR-1) reactor, and on-site workers not directly involved in the closure activities. On site workers performing in situ disposal activities will be Nuclear Energy Workers. Radiological doses and exposure to hazardous non-radiological materials to these workers will be monitored and managed as part of CNL's Work Planning for WL Decommissioning (CNL 2019a), Radiation Protection Program (CNL 2021a) and Occupational Safety and Health Program (CNL 2021b) in place under the Whiteshell Laboratories (WL) Decommissioning Licence (NRTEDL-W5-8.00/2024; CNSC 2019). As stated in the Environmental Risk Assessment (ERA; EcoMetrix 2021), Section 4.1.1, *"According to CSA N288.6-12, Nuclear Energy Workers who participate in a Radiation Protection Program do not require radiological assessment in the ERA because their radiation exposure is monitored and their doses are controlled."* On-site workers not involved in performing closure activities were identified as the "on-site receptor" for potential non-radiological exposures from environmental airborne emissions during project closure activities. For the on-site workers not involved closure activities, the potential non-radiological substances are listed and screened out in the ERA Section 4.1.2.2. Management of dust, lead, mould, asbestos, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs) and mercury is routinely addressed at CNL within approved procedures that outline the process for safely performing work on or near these materials. Site controls and construction safety procedures ensure that hazardous materials generated at the Project site do not migrate to the environment. It is thus very unlikely there will be exposure for workers not involved in decommissioning. Therefore, these controlled substances were not included in the non-radiological hazardous screening in Section 4.1.2.2. Conventional air quality including $PM_{2.5}$ and PM_{10} is addressed in the Environmental Impact Statement (EIS, Golder 2022) in Section 6.2. All potential air contaminates were below applicable criteria. **Change to ERA:** Section 4.1.2.2 was updated with rationale for excluding the non-radiological hazardous substances identified in the comment from the assessment: "*Other non-radiological COPCs* [Contaminants of Potential Concern] *have been identified as potentially remaining in the WR-1 system, such as asbestos and mould. Mould and asbestos are hazards that are routinely addressed at CNL within approved procedures that outline the process for safely performing work on or near these materials ([CNL 2017, 2019b]). Following these procedures ensures these materials are managed within the required regulations and limits and in accordance with standard practice.* *A construction Health and Safety Plan (HASP) will identify workplace hazards associated with the closure phase activities, specifically addressing all non-radiological COPCs. It will define workplace procedures to limit worker exposures, allowable airborne exposure concentrations, compliance monitoring programs, and waste disposal plans, in accordance with applicable workplace safety regulations. The regulations require collection and proper disposal of waste materials containing designated substances (asbestos, lead, PCBs, and mercury). Accordingly, there will be very little release of these materials to the environment. The HASP will ensure that workplace concentrations of hazardous substances during the closure phase are safe for workers.* *With the exception of HB-40, the identified hazardous substances are routinely addressed in construction projects. HB-40 consists mainly of hydrogenated terphenyl (74-87%), with smaller fractions of partially hydrogenated terphenyls and terphenyl. OSHA's [Occupational Safety and Health Administration] permissible exposure level (PEL) for hydrogenated terphenyl is 5 mg/m^3 as a time-weighted average (TWA). The PEL for terphenyl is 9 mg/m^3 as a ceiling value. Weeks (1974) calculated a permissible exposure level for HB-40 of 4.4 mg/m^3, for a 40 hour work week, based on a minimal effect concentration of 500 mg/m^3 in mice, with a 100-fold safety factor. Similarly, Farr et al. (1989), using rats, found an effect concentration for hydrogenated terphenyl of 500 mg/m^3, and a no-effect concentration of 100 mg/m^3. These studies support the OSHA PELs and their use for HB-40.*" **References:** *CNL 2017. Management Control Procedure. Controlling Asbestos Hazard. 900-510400-MCP-003. Revision 0. December 2017.* *CNL 2019a. Work Planning for WL Decommissioning. WLDP-00160-PRO-001. Revision 2. February 2019.* *CNL 2019b. Operating Procedure. Indoor Air Quality Evaluation. OSH-510425-OP-031. Revision 0. February 2019.* *CNL 2021a. Radiation Protection Program Description Document. 900-508740-PDD-001. Revision 2. July 2021.* *CNL 2021b. Occupational Safety and Health Program Description Document. 900-510400-PDD-001. Revision 3. October 2021.* *CNSC 2019. Nuclear Research and Test Establishment Decommissioning Licence: Whiteshell Laboratories. NRTEDL-W5-8.00/2024. December 2019.* *CSA Group 2012. N288.6-12. Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*

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						Farr, C.H., R.S. Nair, I.W. Daly, J.B. Terrill, and F.R. Johannsen. 1989. Subchronic inhalation and oral toxicity of hydrogenated terphenyls in rats. Fundam. Applied Toxicol. 13(3): 558-567. *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Weeks, J.L. 1974. A Toxicological Study of Organic Reactor Coolants. AECL-4756.*
172.	HC		ERA - Section 4.1.3 Selection of Exposure Pathways	4.6, 2nd paragraph	**Comment:** The reference or rationale to support bounding medicinal plant intakes by the assumed consumption of local berries is missing from this section of the EIS. **Expectation to Address Comment:** Provide a reference to support the assumption that ingestion of berries is appropriate to bound the exposure through consumption of medicinal plants.	**Incorporated:** Medicinal plants (weekay and cedar) are now assessed separately from berries in the Environmental Risk Assessment (ERA) as described in Section 4.1.3-4.2.6 of the ERA (EcoMetrix 2021). **Change to ERA:** The paragraph in question (Pg. 4.6 of Revision 1 of the ERA (EcoMetrix 2017)) was changed from: "It was noted from engagement with Indigenous communities that Sagkeeng First Nation members in the Whiteshell area harvest wild rice and medical plants. However, wild rice does not grow in close proximity to WR-1 [Whiteshell Reactor 1]. It was considered that any medicinal plant intakes would be bounded by the assumed consumption of local berries. Harvester will ingest country foods such as deer, hare and berries." To the following text in Section 4.1.3 (Pg. 4.6) of Revision 5 of the ERA (EcoMetrix 2021): *"It was noted from engagement with Indigenous communities that Sagkeeng First Nation members in the Whiteshell area harvest wild rice and medicinal plants. However, wild rice does not grow in close proximity to WR-1.* *CNL (2018) also conducted an Indigenous Food Intake Survey completed by members of the Sagkeeng First Nation to understand the types and quantities of local food consumed. CNL also partnered with the Manitoba Métis Federation (MMF) to conduct Harvester food intake surveys with Manitoba Métis Citizens that harvest in the area of the WL* [Whiteshell Laboratories] *site (Shared Value Solutions 2018). The information provided confirmed the VCs [Valued Components] selected for the EIS* [Environmental Impact Statement] *and was used to validate the assumptions made for wild game, fish and plant ingestion rates for subsistent receptors. The intake rates from the MMF survey were lower than the intake rates identified by the Sagkeeng First Nation. Therefore, the Harvester receptor in the model uses the intake rates from the Sagkeeng First Nation Indigenous food intake survey. The survey results have been incorporated into the Harvester's diet.* *The results indicate that survey participants consume animals such as wild game (e.g., moose, deer, rabbit and hare), waterfowl (e.g., duck and geese), fish, fruits and berries, and medicinal plants (e.g., weekay and cedar). Although a number of respondents indicated that they eat moose, moose are not commonly found around Pinawa and Lac du Bonnet, but are typically farther north. Additionally, during the closure phase, the focus is on terrestrial pathways, since only atmospheric releases are expected. Based on these considerations terrestrial animals including hare and deer, terrestrial plants including berries, and medicinal plants including cedar and weekay are included in the assessment for the harvester for the closure phase. Other intakes for the harvester (such as moose) are considered in the post-closure phase where aquatic pathways are more applicable."* There are also minor changes throughout Sections 4.1.3-4.2.6 of the ERA (EcoMetrix 2021) to reflect medicinal plants being assessed separately. **References:** *CNL 2018. Aboriginal Food Intake Survey. Memo from Jesse Gordon to Brian Wilcox. WLDP-26000-021-000 #50641749. September 2018.* *EcoMetrix 2017. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 1. September 2017.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Shared Value Solutions 2018. Whiteshell Reactor Decommissioning Community Feedback Report. November 2018.*
173.	HC		ERA - Figure 4.2	4.8	**Comment**: The irrigation pathway is missing from Figure 4.2 but is mentioned in the text. **Expectation to Address Comment:** Make the appropriate correction and update, where appropriate, other relevant sections of the EIS and ERA documentation,	**Incorporated:** Figure 4-2 in the Environmental Risk Assessment (ERA; EcoMetrix 2021) has been updated to include the irrigation pathway. **Change to ERA:** P23 and P24 have been added to Figure 4-2 (see revised figure below) to reflect the irrigation pathway, as they were modeled in the ERA.

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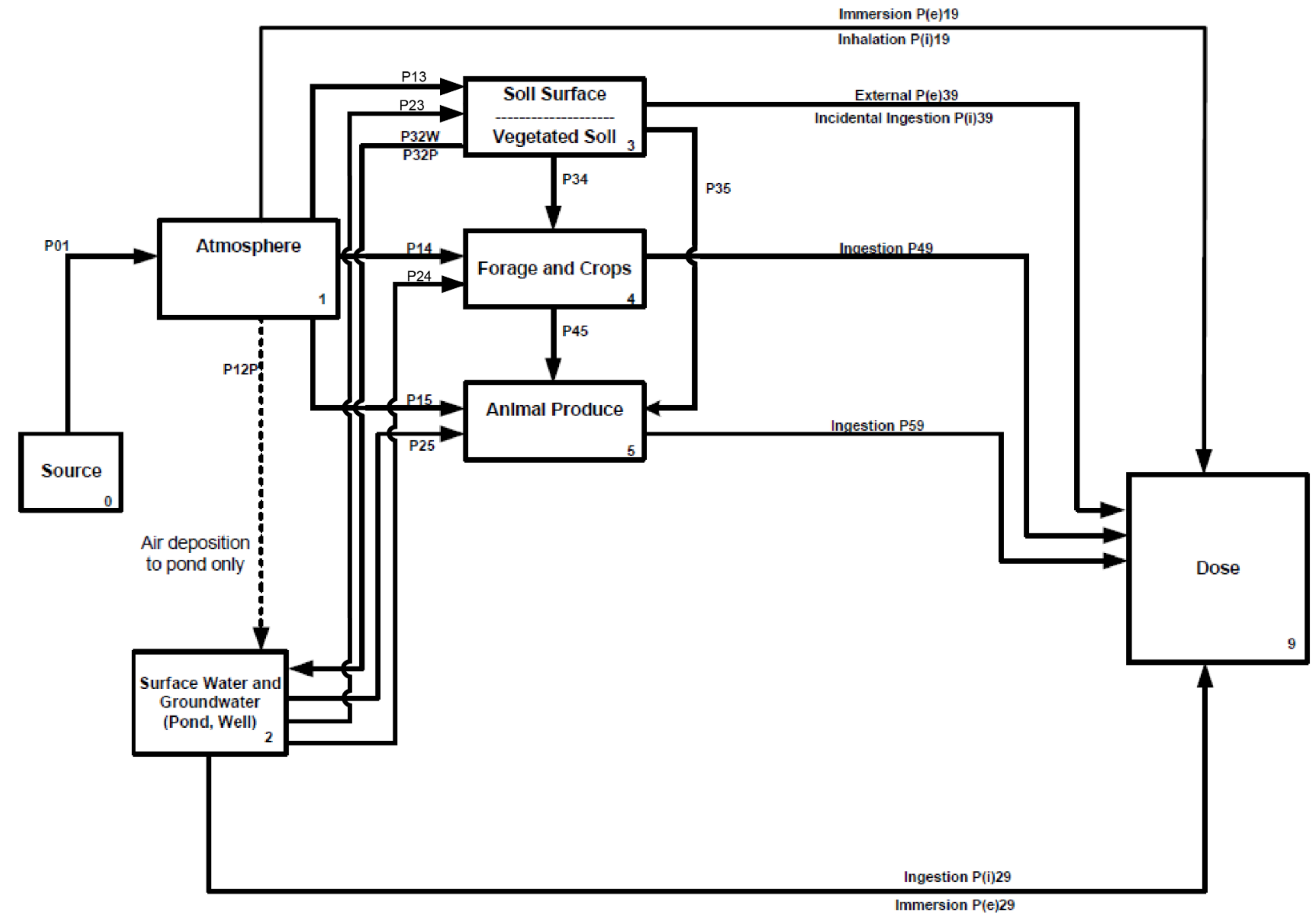
					including adding dose from this pathway to the relevant components of the assessment.	 **References:** *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*
174.	CNSC	H. Flynn	ERA - Section 4.2.2 Exposure Duration and Frequency	4.10 to 4.11	**Comment**: The harvester is not assumed to eat local fish, since the relevant exposure pathways are terrestrial. Is this reasonable to assume? Section 5.1.3 Selection of Exposure Pathways of the document states: "residents from Farm A are also assumed to fish in the Winnipeg River." and Table 5.3 shows fish consumption. Should harvester consumption be included in the earlier assessment?	**Resolved As:** Section 4 of the Environmental Risk Assessment (ERA; EcoMetrix 2021) is about Human Health during closure. During closure there are only atmospheric releases. Atmospheric deposition to large water bodies is not considered a significant pathway. A large water body is a lake or a river, as opposed to a small pond. Therefore aquatic pathways are not considered during closure. Section 5 is during post-closure which does include aquatic pathways. Farm A and the harvester receptors eat fish in this section. **Change to ERA:** No changes have been made to the ERA. **References:** *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*

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175.	CNSC	RPD	ERA - Section 4.2.4 Exposure Factors	4.15	**Comment**: Average intake rates were used to estimate doses to human receptors. For the purpose of the EIS, it would be more conservative, thereby beneficial, to use 95th percentile values. In addition, according to CSA N288.1-14: "Conservatism is introduced into the current model by selecting conservative values for food, water, soil, and air intake rates for the representative person, typically at the 95th percentile level. Conservative values are also chosen for occupancy factors (e.g., fraction of the total time spent by the representative person at the exposure location, fraction of the year spent swimming or bathing in contaminated water). All other model parameters, including those that determine environmental dispersion and partitioning of contaminants, should be selected to be realistic. This combination of conservative intakes and exposure factors, and realistic dispersion and partitioning parameters, provides sufficient conservatism to be protective; selection of all factors at conservative values is excessively restrictive. Use of 95th percentile intakes is in line with ICRP 101 guidance on representative persons." **Expectation to Address Comment:** Use 95th percentile values for intakes of air, water, soil and foodstuff.	**Resolved As:** The use of 95th percentile intakes was considered appropriately conservative for a Derived Release Limit (DRL) calculation. The same degree of conservatism is not appropriate for public dose assessment, where the central intake values are used to provide more realistic dose estimates. Central values are provided in N288.1 (CSA 2014) for this purpose. Public dose assessments have generally used these central values as per N288.6-12 (CSA 2012). The cited clause in N288.1-14 (CSA 2014) pertains specifically to DRL calculation, as indicated in the first sentence of the clause. As identified in the Introduction, the N288.1 model may be adapted for other purposes, such as public dose calculation. Public dose assessments have generally used the central intake values from the N288.1 Guideline, as per N288.6-12 (CSA 2012). **Change to ERA:** No changes have been made to the Environmental Risk Assessment (ERA; EcoMetrix 2021). **References:** *CSA 2012. N288.6-12: Environmental risk assessments at Class I nuclear facilities and uranium mines and mills.* *CSA 2014. N288.1-14: Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*
176.	CNSC	RPD	ERA - Section 4.2.4 Exposure Factors	4.16	**Comment:** Ingestion of local duck was not considered for the farm resident or harvester. In addition, beef liver was not considered for the farm resident. **Expectation to Address Comment:** Justify not including these food ingestion pathways described in CSA N288.1-14.	**Resolved As:** Section 4 of the Environmental Risk Assessment (ERA; EcoMetrix 2021) is about Human Health during closure. During closure there are only atmospheric releases. Atmospheric deposition to large water bodies is not considered a significant pathway (CANDU Owners Group Derived Release Limits (COG DRL) guidance [COG 2013]). A large water body is a lake or a river, as opposed to a small pond. Therefore aquatic pathways are not considered during closure. Duck is an aquatic animal and as such its consumption was considered a pathway during the post-closure phase, when the primary release pathway is through groundwater. Ingestion of local duck was considered for the Harvester receptor in Section 5 of the ERA, specifically identified in Section 5.1.3 and 5.2.2. Beef offal is included in this assessment (Table 4-4 and 4-5 in the ERA), as 50% of beef is assumed to be consumed from the farm. **Change to ERA:** No changes have been made to the ERA. **References:** *COG 2013. Derived Release Limits Guidance, COG-06-3090-R3-I, 2013-12.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*
177.	HC		ERA - Section 4.2.4.1 Dose Coefficients	4.17	**Comment:** The following sentence in the EIS states that: "Any radionuclides not already included in the IMPACT™ database were added with appropriate parameter values." **Expectation to Address Comment:** Provide information about or a reference for new radionuclides and parameters that were added to the IMPACT database.	**Incorporated:** The information and references regarding the new radionuclides and parameters that were added to the IMPACT™ database have been provided in Section 4.2.4.1 of the Environmental Risk Assessment (ERA; EcoMetrix 2021). **Change to ERA:** The specific parameters that were added are now noted in Section 4.2.4.1 of the ERA as follows:

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						"Any radionuclides not already included in the IMPACT™ database were added with appropriate parameter values (including Ac-225, Ac-227, Ag-108m, Bi-210, Ca-41, Gd-152, Ni-59, Pa-231, Pa-233, Pa-210, Pb-210, Po-210, Ra-223, Ra-224, Ra-225, Ra-228, Th-227, Th-230, Th-231). All dose coefficients used in the model are provided in Appendix B." **References:** *EcoMetrix 2015. IMPACT™ 5.5.1 – Tool Qualification Report, Report to CANDU Owners Group. August 2015.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*
178.	CNSC	H. Mulye	ERA - Section 5.1.1 Receptor selection	5.56	**Comment**: In the selection of human receptors for post-closure HHRA, Aboriginal receptors were not included in the assessment. Aboriginal groups may consume higher amounts of local and country foods and may spend time in closer proximity to the site. **Expectation to Address Comment:** Aboriginal receptors should be included in the post-closure HHRA, taking into account their cultural practices and their higher reliance (compared to the general Canadian population) on traditional and country foods.	**Incorporated:** The Harvester receptor group in Section 5.1.1 of the Environmental Risk Assessment (ERA; EcoMetrix 2021) is used to represent Traditional or Indigenous users of the area and is included in the assessment. **Change to ERA:** The paragraph on Harvesters in Section 5.1.1 of the ERA was changed to the following to provide clarity: *"Harvesters represent Traditional or Indigenous users of the area who may be exposed through harvesting of country foods. It is assumed that the harvesters spend part of their time on-site, part near Farm A, and part at an unexposed upstream location. CNL (2018a) conducted an Indigenous Food Intake Survey administered by members of the Sagkeeng First Nation to understand the types and quantities of local food consumed. CNL also partnered with the Manitoba Métis Federation (MMF) to conduct Harvester food intake surveys with Manitoba Métis Citizens that harvest in the area of the WL* [Whiteshell Laboratories] *site (Shared Value Solutions 2018). The information provided confirmed the VCs* [Valued Components] *selected for the EIS* [Environmental Impact Statement] *and was used to validate the assumptions made for wild game, fish and plant ingestion rates for subsistent receptors. The intake rates from the MMF survey were lower than the intake rates identified by the Sagkeeng First Nation. Therefore, the Harvester receptor in the model uses the intake rates from the Sagkeeng First Nation Indigenous food intake survey. The survey results have been incorporated into the Harvester's diet and are discussed in more detail in Section 5.1.3 and 4.2.4."* **Change to EIS:** Section 6.7.1.7.2.1 (Methods), sub-heading 'Receptor Selection and Characterization' of the EIS (Golder 2022) was revised to include the following text: *"Harvesters represent Indigenous and traditional users of the area who may be exposed through harvesting of country foods. The age groups evaluated for the Harvester included adult, 10-year-old child, and 1-year old infant, since Harvesters would likely bring back harvested food to feed their families. Harvesters are considered to:* ■ *spend part of their time on-site, part near Farm A and part at an unexposed location.* ■ *obtain moose and waterfowl from hunting;* ■ *obtain fish from the Winnipeg River; and* ■ *harvest plants including weekay.* *CNL conducted an Indigenous food intake survey (CNL 2018b) completed by members of the Sagkeeng First Nation to understand the types and quantities of local food consumed. CNL also partnered with the Manitoba Métis Federation (SVS 2019) to conduct Harvester food intake surveys with Red River Métis Citizens that harvest in the area of the WL site. The survey results have been incorporated into the Harvester's diet. Additional Traditional knowledge on harvested foods was shared by Sagkeeng First Nation in a Traditional Knowledge Study, by the Manitoba Métis Federation in a Traditional Knowledge, Land Use and Occupancy Study, by Broken Head Ojibway, Black River and Hollow Water First Nations through their Traditional Use Study and by Wabaseemoong First Nation through their Traditional Use Study. Human receptors during the post-closure- phase are shown on Figure 6.7.1-1. For radiological parameters an adult, 10-year-old child and 1-year-old infant were the age groups assessed for the Harvester. For non-radiological dose calculations an adult and toddler were assessed for the Harvester.* *For each receptor, the exposure factors (e.g., intake rates, occupancy and shielding factors, etc.) are generally those used in N288.1-14 (CSA 2014) or other federal guidelines. For example, water ingestion rates for receptors are from Guidelines for Canadian Drinking Water Quality (Health Canada 2010), and are given as 0.6, 0.8 and 1.5 L/day for Toddlers, Child and Adults respectively. Detailed information on other receptor behaviours such as food ingestion rates and occupancy factors are documented in the Environmental Risk Assessment Tables 5-7 and 5-8 (EcoMetrix 2021)."*

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						References: *CNL 2018. Aboriginal Food Intake Survey. Memo from Jesse Gordon to Brian Wilcox. WLDP-26000-021-000 #50641749. September 2018.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Shared Value Solutions 2018. Whiteshell Reactor Decommissioning Community Feedback Report. November 2018.*
179.	CNSC	RPD	ERA - Section 5.1.3 Human Health Conceptual Model	5.63	**Comment**: Ingestion of terrestrial plants was not included as an exposure pathway for the harvester during post-closure. **Expectation to Address Comment:** Include this exposure pathway.	**Resolved As:** The post-closure of the Environmental Risk Assessment (ERA; EcoMetrix 2021) has only an aquatic release (groundwater flow to the Winnipeg River), therefore terrestrial pathways are not complete for the harvester in post-closure. Terrestrial pathways are complete for the farmer during post-closure because they irrigate their plants with water from the Winnipeg River. However, irrigation is not an appropriate pathway for the country food harvesting scenario as those plants are not likely to be irrigated. It was noted from engagement with Indigenous Nations that Sagkeeng First Nation members in the Whiteshell area harvest wild rice and medicinal plants. However, wild rice does not grow on the Winnipeg River downstream of Whiteshell Reactor Disposal Facility (WRDF). Weekay is a wetland plant and could grow along the shore of the Winnipeg River or in shallow areas. It is unlikely that weekay would be exposed to direct groundwater, but could potentially be exposed to river water. Therefore, ingestion of riparian plants (weekay) was considered to be a complete pathway for the harvester in the post-closure scenario. **Change to ERA:** No changes have been made to the Environmental Risk Assessment (ERA; EcoMetrix 2021). **References:** *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*
180.	CNSC	RPD	ERA - Section 5.2.6 Exposure Point Concentrations and Doses	5.76	**Comment**: Default intake rates were used to estimate doses to harvester receptors. How do these intake rates compare with what was learned from communities that harvest local food? **Expectation to Address Comment:** Discuss how the intake rates assumed are relevant to local communities.	**Incorporated:** Within the Environmental Risk Assessment (ERA; EcoMetrix 2021) and the Environmental Impact Statement (EIS; Golder 2022), harvested food intake rates were updated based on the information provided by the local communities to reflect relevant community food trends. Parameters that were not affected by the results of the survey continue to use the recommended parameter values defined by Canadian Standards Association (CSA) N288.6 (CSA Group 2012). The Harvester receptor represents Traditional or Indigenous users of the area who may be exposed through harvesting of country foods. It is assumed that the harvesters spend part of their time on-site, part near Farm A, and part at an unexposed upstream location. CNL conducted food intake studies administered by members of the Sagkeeng First Nation (CNL 2018) and Manitoba Métis Citizens (Shared Values Solutions 2018) to understand the types and quantities of local food consumed. The survey results have been incorporated into the Harvester's diet and are discussed in more detail in Sections 4.1.3, and 5.1.3 of the ERA (see below for additional text added to the ERA), and Sections 6.7.1.7.1.1 and 6.7.1.7.2.1 of the EIS (see below for additional text added to the EIS). **Change to ERA:** The following text was added to Section 4.1.3 (Selection of Exposure Pathways [Closure]) of the ERA: *"It was noted from engagement with Indigenous communities that Sagkeeng First Nation members in the Whiteshell area harvest wild rice and medicinal plants. However, wild rice does not grow in close proximity to WR-1 [Whiteshell Reactor 1].* *CNL (CNL 2018) also conducted an Indigenous Food Intake Survey completed by members of the Sagkeeng First Nation to understand the types and quantities of local food consumed. CNL also partnered with the Manitoba Métis Federation (MMF) to conduct Harvester food intake surveys with Manitoba Métis Citizens that harvest in the area of the WL [Whiteshell Laboratories] site (Shared Value Solutions 2018). The information provided confirmed the VCs [Valued Components] selected for the EIS [Environmental Impact Statement] and was used to validate the assumptions made for wild game, fish and plant ingestion rates for subsistent receptors. The intake rates from the MMF survey were lower than the intake rates identified by the*

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						Sagkeeng First Nation. Therefore, the Harvester receptor in the model uses the intake rates from the Sagkeeng First Nation Indigenous food intake survey. The survey results have been incorporated into the Harvester's diet. *The results indicate that survey participants consume animals such as wild game (e.g., moose, deer, rabbit and hare), waterfowl (e.g., duck and geese), fish, fruits and berries, and medicinal plants (e.g., weekay and cedar). Although a number of respondents indicated that they eat moose, moose are not commonly found around Pinawa and Lac du Bonnet, but are typically farther north. Additionally, during the closure phase, the focus is on terrestrial pathways, since only atmospheric releases are expected. Based on these considerations terrestrial animals including hare and deer, terrestrial plants including berries, and medicinal plants including cedar and weekay are included in the assessment for the harvester for the closure phase. Other intakes for the harvester (such as moose) are considered in the post-closure phase where aquatic pathways are more applicable."* *The following text was added to Section 5.1.3 (Selection of Exposure Pathways [Post-Closure]) of the ERA:* *"It was noted from engagement with Indigenous communities that Sagkeeng First Nation members in the Whiteshell area harvest wild rice and medicinal plants. However, wild rice does not grow on the Winnipeg River downstream of [Whiteshell Reactor Disposal Facility] WRDF. Nor are aquatic medicinal plants such as water lilies common on the river downstream of WRDF.* *CNL (CNL 2018)] conducted an Indigenous Food Intake Survey administered by members of the Sagkeeng First Nation to understand the types and quantities of local food consumed. CNL also partnered with the Manitoba Métis Federation (MMF) to conduct Harvester food intake surveys with Manitoba Métis Citizens that harvest in the area of the WL site (Shared Value Solutions 2018). The information provided confirmed the VCs [Valued Components] selected for the EIS and was used to validate the assumptions made for wild game, fish and plant ingestion rates for subsistent receptors. The intake rates from the MMF survey were lower than the intake rates identified by the Sagkeeng First Nation. Therefore, the Harvester receptor in the model uses the intake rates from the Sagkeeng First Nation Indigenous food intake survey.* *The results indicate that survey participants consume animals such as wild game (e.g., moose, deer, rabbit and hare), waterfowl (e.g., duck and geese), fish, fruits and berries, and medicinal plants (e.g., weekay and cedar). During the post-closure phase, the focus is on aquatic pathways, since groundwater releases to surface water will occur. Since the focus is on aquatic pathways, a moose has been included instead of a deer (which was assessed during the closure phase), since a portion of the moose's diet is from ingestion of aquatic plants. Weekay is a wetland plant and could grow along the shore of the Winnipeg River or in shallow areas. It is unlikely that weekay would be exposed to direct groundwater, but could potentially be exposed to river water.* *Based on these considerations, exposure via consumption of fish and waterfowl would be the important pathways for exposure of the harvester to contaminants released from WRDF to the river. Harvesters will ingest country foods such as weekay, fish and waterfowl, as well as moose that drink from the Winnipeg River. During post-closure, aquatic release (groundwater flow to the Winnipeg River) is the relevant pathway; therefore, terrestrial pathways are not complete for the Harvester in post-closure."* **Change to EIS:** The following text was added to Section 6.7.1.7.1.1 (Methods), subsection "Reception Selection and Characterization": *"Harvesters represent Indigenous or traditional users of the area who may be exposed through harvesting of country foods. The age groups evaluated for the Harvester included adult, 10-year-old child, and 1-year old infant, since Harvesters would likely bring back harvested food to feed their families. Harvesters are considered to:* • *spend part of their time on-site, part near Farm F and part at an unexposed location;* • *obtain deer and hare from hunting and trapping; and* • *harvest plants including berries, weekay, and cedar.* *CNL conducted an Indigenous food intake survey to understand the types and quantities of local food consumed. This survey was completed by members of the Sagkeeng First Nation. CNL also partnered with the Manitoba Métis Federation (SVS 2019) to conduct Harvester food intake surveys with Red River Métis Citizens that harvest in the area of the WL site. The survey results have been incorporated into the Harvester's diet. Additional Traditional knowledge on harvested foods was shared by Sagkeeng First Nation in a Traditional Knowledge Study, by the Manitoba Métis Federation in a Traditional Knowledge, Land Use and Occupancy Study, by Broken Head Ojibway, Black River and Hollow Water First Nations through their Traditional Use Study and by Wabaseemoong First Nation through their Traditional Use Study. The information collected through the surveys and the studies was used to validate the assumptions made for wild game, fish and plant ingestion rates for the subsistent Harvester receptors. The survey results have also been incorporated into the Harvester's diet. The intake rates from the Manitoba Métis Federation MMF survey were lower than the intake rates identified by the Sagkeeng First Nation. Therefore, the Harvester receptor in the model uses the intake rates from the Sagkeeng First Nation Indigenous food intake survey, and is considered to be a conservative reflection of potential health effects to a Harvester."* The following text was added to Section 6.7.1.7.1.1 (Methods), subsection "Exposure Pathways":

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						"CNL conducted an Indigenous food intake survey completed by members of the Sagkeeng First Nation to understand the types and quantities of local food consumed (CNL 2018). The results indicate that survey participants consume animals such as wild game (e.g., moose, deer, rabbit and hare), waterfowl (e.g., duck and geese), fish, fruits and berries and medicinal plants (e.g., weekay and cedar). During the closure period, the focus is on terrestrial pathways, since only atmospheric releases are expected. Based on these considerations terrestrial animals including hare and deer, terrestrial plants including berries and medicinal plants including cedar and weekay are included in the assessment for the harvester. Other considerations for the harvester are considered in the post closure period where aquatic pathways are more applicable. It was noted from engagement with Indigenous peoples that Sagkeeng First Nation members in the Whiteshell area harvest wild rice and medicinal plants; however, wild rice does not grow in close proximity to WR-1. CNL also partnered with the Manitoba Métis Federation to conduct Harvester food intake surveys with Red River Métis Citizens that harvest in the area of the WL site (SVS 2019). The information provided supported the VCs selected for the EIS and was used to validate the assumptions made for wild game, fish and plant ingestion rates for subsistent receptors. The intake rates from the Manitoba Métis Federation survey were lower than the intake rates identified by the Sagkeeng First Nation. Therefore, the Harvester receptor in the model uses the intake rates from the Sagkeeng First Nation Indigenous food intake survey. In addition, some diet components were not included in the model, such as moose. Diet components that exist in the Whiteshell area were considered for the ERA (EcoMetrix 2021), and it has been reported that moose populations are extremely low in the study area considered in the ERA (EcoMetrix 2021). Therefore, moose was excluded from the model in the closure phase, but was added to the post closure phase model. This was done because moose is a very important VC to Indigenous people and in the future, moose may become more abundant in the area." The following text was added to Section 6.7.1.7.2.1 (Methods), subsection "Receptor Selection and Characterization: Normal Evolution Scenario": *"CNL conducted an Indigenous food intake survey (CNL 2018) completed by members of the Sagkeeng First Nation to understand the types and quantities of local food consumed. CNL also partnered with the Manitoba Métis Federation (SVS 2019) to conduct Harvester food intake surveys with Red River Métis Citizens that harvest in the area of the WL site. The survey results have been incorporated into the Harvester's diet. Additional Traditional knowledge on harvested foods was shared by Sagkeeng First Nation in a Traditional Knowledge Study, by the Manitoba Métis Federation in a Traditional Knowledge, Land Use and Occupancy Study, by Broken Head Ojibway, Black River and Hollow Water First Nations through their Traditional Use Study and by Wabaseemoong First Nation through their Traditional Use Study. Human receptors during the post-closure - phase are shown on Figure 6.7.1-1. For radiological parameters, an adult, 10-year-old child and 1-year-old infant were the age groups assessed for the Harvester. For non-radiological dose calculations an adult and toddler were assessed for the Harvester."* The following text was added to Section 6.7.1.7.2.1 (Methods), subsection "Exposure Pathways: Normal Evolution Scenario": *"As described in Section 6.7.1.6.1.1, CNL conducted an Indigenous food intake survey completed by members of the Sagkeeng First Nation to understand the types and quantities of local food consumed (CNL 2018). The results indicate that survey participants consume animals such as wild game (e.g., moose, deer, rabbit and hare), waterfowl (e.g., duck and geese), fish, fruits and berries, and medicinal plants (e.g., weekay and cedar). During the post-closure phase, the focus is on aquatic pathways, since groundwater releases to surface water will occur. Since the focus is on aquatic pathways, moose has been included instead of deer (which was assessed during the closure phase), since a portion of the moose's diet is from ingestion of aquatic plants. Weekay is a wetland plant and could grow along the shore of the Winnipeg River or in shallow areas. It is unlikely that weekay would be exposed to direct groundwater, but could potentially be exposed to river water. Based on these considerations, exposure via consumption of food harvested from the site (e.g., plants, fish, waterfowl, and moose) would be the important pathways for exposure of the harvester to contaminants released from WRDF to the river.* *Harvesters will ingest country foods such as weekay, fish and waterfowl, as well as moose that drink from the Winnipeg River. During post-closure, aquatic release (groundwater flow to the Winnipeg River) is the relevant pathway; therefore, terrestrial pathways are not evaluated for the harvester in post-closure.* *CNL also partnered with the Manitoba Métis Federation to conduct Harvester food intake surveys with Red River Métis Citizens that harvest in the area of the WL site (SVS 2019). The information provided supported the VCs selected for the EIS and was used to validate the assumptions made for wild game, fish and plant ingestion rates for subsistent receptors. The intake rates from the Manitoba Métis Federation survey were lower than the intake rates identified by the Sagkeeng First Nation. Therefore, the Harvester receptor in the model uses the intake rates from the Sagkeeng First Nation Indigenous food intake survey."* **References:** *CNL 2018. Aboriginal Food Intake Survey. Memo from Jesse Gordon to Brian Wilcox. WLDP-26000-021-000. September 2018.* *CSA Group 2012. N288.6-12: Environmental Risk Assessment at Class 1 Nuclear Facilities and Uranium Mines and Mills.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*

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						Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022. *Shared Value Solutions 2018. Whiteshell Reactor Decommissioning Community Feedback Report. November 2018.* *SVS 2019. Whiteshell Reactor #1 Decommissioning: Manitoba Métis Traditional Knowledge, Land Use, and Occupancy Study. January 2019.*
181.	CNSC	H. Flynn	ERA - Table 6-3	6.5	**Comment**: Fish SAR species are not included in this table which identifies assessment endpoints, measurement endpoints and lines of evidence during closure. **Expectation to Address Comment:** Please clarify why fish are missing from this table? Is this an oversight or related to closure and post-closure effects?	**Resolved As:** This is related to the distinctive pathways between closure and post-closure phases of the project. During closure there are only atmospheric releases. Atmospheric deposition to large water bodies is not considered a significant pathway. A large water body is a lake or a river, as opposed to a small pond. Therefore aquatic pathways are not considered during closure. Fish species are included in the post-closure assessment, as indicated in Table 7-2 and 7-4 of the Environmental Risk Assessment (ERA; EcoMetrix 2021)., and are included in the ecological conceptual model for the post-closure assessment in Figure 7-2 of the ERA. **Change to ERA:** No changes have been made to the ERA. **References:** *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*
182.	CNSC	R. Goulet	ERA - Section 7.2.6 Radiological concentrations and dose Table 7-6	7.16 7.17	**Comment**: C-14 is the main dose contributor to both terrestrial and aquatic biota. Considering that C-14 is predominantly present in a gaseous form and to a lesser extent, dissolved in water, it is surprising that doses to both aquatic and terrestrial biota are similar. Appendix C provides an example of C-14 dose calculation to wild waterfowl but does not provide examples for other VCs and most transfer parameters are calculated so it is difficult to verify if the dose calculations are conservative. **Expectation to Address Comment:** Please provide C-14 dose calculation for all species and explain why aquatic biota receive similar dose than terrestrial biota, even if C-14 is predominantly present as a gas.	**Resolved As:** In the post-closure period of the Environmental Risk Assessment (ERA; EcoMetrix 2021), it is assumed that C-14 is released from groundwater to the river in a dissolved carbonate form. Transfer to the terrestrial environment is through use of river water for irrigation or livestock watering. Aquatic biota and terrestrial biota have similar stable carbon content. Therefore, when exposed to C-14 in river water, their C-14 uptake is expected to be similar. The assumption that C-14 is in a soluble form, rather than a gaseous form, is conservative, because it directs the full inventory of C-14 down an exposure pathway where it is more likely to interact with the environment and have an impact. Any gaseous releases of C-14 would be rapidly dispersed into the atmosphere and would by-pass the aquatic exposure pathways and be dispersed into the atmosphere. **Change to ERA:** No changes have been made to the ERA. **References:** *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP-26000-REPT-006. Revision 5. December 2021.*
					Radiological Characterization Summary and Radionuclide Inventory Estimates Report	
183.	CNSC	R. Goulet	Inv Summary - All - General	N/A	**Comment**: The inventory for the reactor core which supports the current version of the EIS is based on computer modelling performed in 1992 and there has been no radionuclide characterization of contaminants contained within closed systems of the primary transport system or the experiment loop to determine the relationship of fission products and actinide activity. **Expectation to Address Comment:** Provide within the EIS and supporting documentation any additionally available WR-1 radiological and non-radiological characterization data in order to adequately support the EIS assessment and its	**Incorporated:** Additional characterization work was performed and the Radiological Characterization Summary and Radionuclide Inventory Estimates Report (CNL 2020) was updated to incorporate the results of the 2017/18 reactor system characterization (Section 4.3, Section 6.3.4, Section 6.4.2, Section 6.5.3, and Section 6.6.2), non-radiological inventory estimates (Section 7 and Table 29) and tritium estimates (Section 6.8 and Table 26). The Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2021b) was revised to update the solubility of lead (Table 3-1 and Section 4.2.2.4), update the initial inventory of tritium (Table 4-2, Table 5-2), include U-238 in initial inventory (Table 4-1, Table 4-2, Table 4-7, and Table 5-3), include an additional sensitivity run to assess complete degradation of grout and foundation over 100 years (Section 5.1, Section 5.2, Table 5-3 and Table 5-4), and include an additional sensitivity run to assess the absence of the foundation (Section 5.1, Section 5.2, Table 5-3 and Table 5-4). These changes were carried forward into the Environmental Impact Statement (EIS; Golder 2022), Environmental Risk Assessment (ERA; EcoMetrix 2021b) and Decommissioning Safety Assessment Report (DSAR; Golder 2021a) with minor changes throughout the documents (too numerous to list, but not significant enough to change any of the discussion).

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					conclusions. If no changes are proposed, provide a justification.	CNL contracted Oak Ridge Associated Universities (ORAU), who are industry leaders in the development and execution of characterization of nuclear equipment and facilities, to review the Radiological Characterization and Radionuclide Inventory Estimate Report and develop a characterization plan for the remaining Whiteshell Reactor 1 (WR-1) system (ORAU 2017). The plan was developed to address the knowledge gaps identified in the first draft of the Radiological Characterization Summary and Radionuclide Inventory Estimate Report. The plan specified a random sampling of the various major systems using a Ranked Set Sampling approach. The plan was executed by CNL, and samples were collected and analyzed. The results of those samples were provided to ORAU and they produced a revised inventory estimate and updated the Radiological Characterization Summary and Radionuclide Inventory Estimate Report with those recent results. CNL further added to the report update with recent information on Lead inventory, Tritium Estimates and a Summary of the non-radiological hazardous materials estimate. The revised report was provided to the CNSC and is attached for reference to this information request response. The revised characterization report largely does not change the EIS. The results show that the original estimates used as the basis of the EIS were conservative for the reactor core inventory, the out of core systems, and non-radiological hazardous materials. The only item that was revised was the inventory of Tritium to reflect the most bounding estimate produced from the recent characterization work (CNL 2020). The increased inventory was updated in the models to ensure that the most conservative values are used wherever uncertainty is present, but the change is not significant enough to reflect a change to the results of the EIS or the conclusions drawn from them. **Change to Radiological Characterization Summary and Radionuclide Inventory Estimates Report:** The report was extensively updated including the addition of: - Details regarding non-radiological hazardous materials in Section 7 and non-radiological inventory estimates in Table 29. - Details about tritium in the thermal shield water in Section 6.8 and the tritium activity levels obtained in Table 26. - Results of the 2017/18 reactor system characterization plan in Section 4.3 (2017/2018 Fuel Channel Characterization), Section 6.3.4 (Primary Heat Transport System), Section 6.4.2 (Contaminated Process Drain), Section 6.5.3 (Helium and Heavy Water Systems), and Section 6.6.2 (Experimental Loops). - Inventory summaries in Tables 20 to 28 and Table 31. **Change to GWFSTMR:** The following changes were made to the document: - Update to solubility of lead in Table 3-1 and Section 4.2.2.4. - Update to initial inventory of tritium in Table 4-2 and Table 5-2. - Inclusion of U-238 in initial inventory in Table 4-1, Table 4-2, Table 4-7, and Table 5-3. - Inclusion of an additional sensitivity run to assess complete degradation of grout and foundation over 100 years (Scenario 14) in Section 5.1, Section 5.2, Table 5-3 and Table 5-4. - Inclusion of an additional sensitivity run to assess the absence of the foundation (Scenario 15) in Section 5.1, Section 5.2, Table 5-3 and Table 5-4. **References:** *CNL 2020. Technical Document WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates. WLDP-26100-041-000. Revision 2. October 2020.* *EcoMetrix 2021. WR-1 at the Whiteshell Laboratories Site - Environmental Risk Assessment. WLDP26000-REPT-006. Revision 5. December 2021.* *Golder 2021a. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2021b. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *ORAU 2017. Characterization Plan for the WR-1 Reactor, Canadian Nuclear Laboratories, Whiteshell Laboratories, DCN 5302-PL-01-0. WLDP-26400-REPT-001. Revision 1. September 2017.*

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184.	CNSC	H. Mulye	Inv Summary - 3.2 Non-Radiological	13 to 14	**Comment**: Characterization of non-radiological hazards was carried out in 2006 which identified a number of COPCs such as, but not limited to, friable asbestos, lead, PCBs, mercury, and mold. As such, a more recent inventory of non-radiological hazards is needed to better assess potential risks to workers and members of the public. This uncertainty is exacerbated by the lack of quantitative estimates of these hazardous substances (see Table B-3) as well as unknown locations of certain chemicals/materials (e.g., beryllium, hydrazine, chromium/cadmium) anecdotally expected to be present within the reactor. **Expectation to Address Comment:** Provide a more recent characterization of non-radiological hazards including, if possible, quantitative estimates, and a discussion of uncertainty in the assessment of risks posed by these hazards to workers and members of the public.	**Incorporated:** Additional characterization work was performed and the Radiological Characterization Summary and Radionuclide Inventory Estimate Report (CNL 2020) was updated to include a new section (Section 7) to the report with details on the non-radiological hazardous materials. Table 29 has also been added containing a summary of the non-radiological contaminants in Whiteshell Reactor 1 (WR-1). A memo regarding the Non-Radiological Inventory of WR-1 was also created in 2017 (CNL 2017) providing an order of magnitude estimate of the inventory of the non-radiological contaminants and the uncertainty of estimates. CNL contracted Oak Ridge Associated Universities (ORAU 2017), who are industry leaders in the development and execution of characterization of nuclear equipment and facilities, to review the Radiological Characterization and Radionuclide Inventory Estimate Report and develop a characterization plan for the remaining WR-1 system. CNL further added to the report update with recent information on lead inventory, tritium estimates and a summary of the non-radiological hazardous materials estimate. An estimate of the non-radiological inventory that is proposed to be encapsulated and disposed of in-situ with WR-1 was completed in March of 2017. These results, which are included in the memo on Non-Radiological Inventory of WR-1 (CNL 2017) and Table 29 of the Radiological Characterization Summary and Radionuclide Inventory Estimates Report (CNL 2020) are shown below: **Table 29: Summary of non-radiological contaminants in WR-1** Contaminant / Quantity (kg) / Uncertainty Factor Range: Potassium Hydroxide / 0.01 / 0.1-10 Boron / 0.0009 / 0.1-10 Lead / 40,800 / 1-3 Xylene / 1.9 / 0.1-10 Palladium / 15.5 / 0.1-10 Chromium / 148 / 1-10 Cadmium / 91.4 / 1-10 HB-40 (OS-84) / 87,700 / 0.5-2 Mercury / 0.74 / 1-10 The uncertainty in these results is loosely quantified in the table above. The uncertainty is seated in the methodology of the estimate, in that no physical samples were taken, no internal components were viewed, and no in-depth review of changes to the building over time were considered. The estimate relies entirely on documented use of materials during design and construction, and anecdotal evidence from operator experience. Of particular interest is the estimated inventory of lead. Lead estimates were limited to documented uses as part of the reactor design. It does not specifically include loose lead added as shielding over the lifetime of the reactor, nor does it specifically include lead as additives in other materials (ex., lead paint). An effort was made to include these by adding a multiplication factor to the lead estimated from the literature. A sensitivity analysis (Scenario 7) was conducted in Section 5.1 and Section 5.2 to determine the effects of the upper-bound source term estimate for the non-radiological solutes. The results from the sensitivity analysis showed that the timing of the peak mass loadings was essentially the same as the base case scenario. The scaling of the peak mass loading was proportional to the increase in mass specified in the source area (e.g., a ten-fold increase in mass resulted in a ten-fold increase in the peak mass loading. The exceptions to this were HB-40 and lead, which are controlled by solubility constraints and had simulated peak mass loadings that were similar to the base case. Lead and cadmium were the only contaminants to pass the screening and make it into the biosphere however the cadmium amounts are still not high enough to pose any risks and lead is solubility limited and would therefore not pose a risk even if the peak loading rate was increased. **Change to Radiological Characterization Summary and Radionuclide Inventory Estimates Report:** A new section (Section 7) has been added to the report with details on the non-radiological hazardous materials. Table 29 has also been added containing a summary of the non-radiological contaminants in WR-1.

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						References: *CNL 2017. Memo, J. Miller to B. Barrios. Non-Radiological Inventory of WR-1. WLDP-26000-021-000. March 2017.* *CNL 2020. WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates. WLDP-26100-041-000. Revision 2. October 2020.* *ORAU 2017. Characterization Plan for the WR-1 Reactor. Whiteshell Laboratories. DCN 5302-PL-01-0. WLDP-26400-REPT-001. Revision 1. September 2017.*
185.	CNSC ECCC	RPD	Inv Summary - Section 7.2 Discussion	23	**Comment**: Section 7.2 of this TSD identifies additional activities and work that could be warranted to enhance the currently available radionuclide inventory information for the reactor core, WR-1 biological shield, heavy water and helium systems, and primary heat transport system and experimental loops. In this document, limitations of the current data are discussed. For example, specifically for fuel channels, Section 4.2 acknowledges that the calculated exposures rates for fuel channels based on the model do not agree well with the measured rates, "with the measured exposure rate being significantly lower in stainless steel fuel channels and significantly higher in Ozhennite and Zr-2.5 Nb". These variations call into question whether the modelling that was done in the early 1990s can be relied upon to determine a conservative reactor core inventory. CNSC staff is aware that CNL is undertaking additional source term characterization work and will be providing an update by March 2018. **Expectation to Address Comment:** Identify what work is being carried out to enhance the source term characterization information, and to specifically identify whether they are currently undertaking the enhancements identified in Section 7.2 of this TSD. If any of the enhancements identified in Section 7.2 are not being pursued, CNL should provide a justification. CNL is also requested to provide justification to support that the source term inventory information, with any enhancements taken into account, is sufficiently conservative for the purposes of modelling releases to the environment and doses to the public, workers and to non-human biota.	**Incorporated:** In Section 7.2 of Revision 0 of the Characterization Summary Technical Document (CNL 2016), additional characterization work on the Reactor Core, Biological Shield, Heavy Water and Helium Systems, and Primary Heat Transport System and Experimental Loops was identified as being potentially beneficial to build confidence in the Whiteshell Reactor 1 (WR-1) radionuclide inventory estimates. In 2017 and 2018, a comprehensive characterization campaign was performed to verify and/or improve upon the conservatism of these estimates including: • Review and validation of the original inventory modelling. • Scrape samples from fuel channels to confirm radionuclides of concern and upper inventory estimate. • Comprehensive and detailed characterization of reactor systems to confirm radionuclides of concern and upper inventory estimate. • Additional investigation of the tritium inventory. • Estimation and verification of the non-radiological hazardous material inventory. The activation of WR-1 components and the decay of the activation products were modelled using WIMS-CRNL, ONEDANT, ORIGEN-S, and MCNP codes. This modelling provided an estimate of the total activity of the WR-1 core and has provided the basis for the overall estimate of remaining activity in WR-1. This work was completed in 1992 and as such, there have been several revisions to the codes used. To validate the estimate, a review of the modelling was carried out in 2017 and documented in the Review of ORIGEN Based Modelling Work (CNL 2017). The review examined three aspects of the work: 1. The modelling assumptions and approach. 2. Changes in the modelling codes used since 1992 that may affect results. 3. Changes in information databases, such as nuclide cross-sections and half-lives, since 1992 that may affect results. The review found that the calculations have an order of magnitude accuracy. Instead of repeating the modelling using current up-to-date codes, as discussed in Section 7.2 of Revision 0 of the Characterization Summary Technical Document (CNL 2016), four scrape samples were obtained from four different fuel channels (one Zr-2.5%Nb fuel channel, one ozhennite fuel channel, and two stainless steel fuel channels) at the elevation of maximum neutron flux. When the results of the samples were compared to the model estimated inventories, a ratio for each material and nuclide was calculated and applied to the inventory calculation. This 'Modified Total' is lower than the inventory estimate calculated from the 1992 model (see the table below; this is Table 14 of Revision 2 of the Characterization Summary Technical Document [CNL 2020]), providing confidence in the original modelling results being conservative.

Nuclide	ORIGEN-S (Bq)	Modified by Scrape Samples (Bq)
^{14}C	3.02×10^{12}	8.11×10^{8}
^{55}Fe	1.03×10^{11}	3.33×10^{11}
^{60}Co	9.65×10^{12}	4.60×10^{12}
^{59}Ni	8.30×10^{12}	3.80×10^{12}
^{63}Ni	8.55×10^{14}	4.68×10^{14}

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						(table continued; see below)

^{94}Nb	2.95 x 10^{12}	8.56 x 10^{11}
Total	8.79 x 10^{14}	4.78 x 10^{14}

The additional characterization work for the Biological Shield, discussed in Section 7.2 of of Revision 0 of the Characterization Summary Technical Document (CNL 2016), was also not pursued. The current total activity estimate for the Biological Shield is based on a concrete core sample taken from less than 100 cm below the elevation of the maximum neutron flux and the assumption that all of the Biological Shield would be equally activated. This is a reasonable estimate and since the result accounts for a very small portion of the total WR-1 activity (< 0.00012%, see the table below; this is Table 31 of Revision 2 of the Characterization Summary Technical Document [CNL 2020]), additional characterization work is not warranted.

System	2016 Estimate (Bq)	2021 Estimate (Bq)	Bounding Value (Bq)
Biological Shield	4.1E+09	N/A	4.1E+09
Reactor Core	1.1E+15	4.77E+14	1.1E+15
Out of Core Systems	1.1E+12	8.45E+10	1.1E+12
Total ^{3}H Out of Core	1.27E+14	2.47E+15	2.47E+15
Total	1.18E+15	2.95E+15	3.53E+15

The additional characterization work discussed for the Heavy Water and Helium Systems was pursued. Nine (9) intrusive samples were collected from the Helium Gas System and 12 intrusive samples were collected from the Heavy Water System. The inventory of the Helium Gas System was found to be 4.5 x 10^{8} Bq with the Heavy Water System inventory found to be 1.3 x 10^{9} Bq.

The additional characterization work discussed for the Primary Heat Transport System and the Experimental Loops was also pursued. The Primary Heat Transport System was characterized with the co-located Auxiliary Organic and Gas Systems, and a total of 39 intrusive samples were collected. The total inventory was found to be 4.7 x 10^{10} Bq. Twenty-seven (27) intrusive samples were collected from the Experimental Loops and the inventory was found to be 1.7 x 10^{9} Bq. As the historical inventory of the Primary Heat Transport System and the Experimental Loops were combined, the new characterization inventories were also combined. The result of 4.9 x 10^{10} Bq is conservative of the 30-year post-shutdown theoretical inventory of 1.0 x 10^{12} Bq by a factor of greater than 20.

The following systems were also examined as part of the 2017-2018 characterization campaign:

- Process Drain
- Active Drainage System
- Fuel Transfer Systems
- Thermal Shield and Concrete Cooling Systems

As can be seen in the above Summary of Characterization Changes table (Table 31 of Revision 2 of the Characterization Summary Technical Document [CNL 2020]), only the tritium (^{3}H) estimate has been increased. The characterization of the Heavy Water System showed significantly less tritium remaining within the system when compared to the preliminary tritium estimate. To ensure the conservatism of the tritium inventory, additional tritium estimation methods were used to attain a ‘worst case’ scenario. The largest result was deemed the ‘worst case’ and was carried forward for environmental assessment modelling, even though such a case is arguably not possible. (The new tritium related work is discussed in Section 6.5.3 of Revision 2 of the Characterization Summary Technical Document [CNL 2020].) With the updated tritium estimate and based on the validation of the characterization campaign, the new radionuclide inventory is conservative.

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						New non-radiological hazardous material inventory work has also been performed. In 2017, an estimate of the non-radiological hazardous material inventory that is proposed to be encapsulated and disposed of in situ with WR-1 was completed based on: • A review of system descriptions in WR-1 Reactor Handbook. • A review of system specifications in Whiteshell Reactor No. 1: Design Manual Vol. 1-9. • Anecdotal evidence from reactor operations staff. Later, a more extensive examination was performed for lead and polychlorinated biphenyl (PCB) containing materials. This examination included a desktop review of documentation, analysis of paint samples, and a thorough walkthrough of the reactor building. The lead estimate was determined to be conservative and no new PCB sources above exemption quantities were identified within the In Situ Disposal (ISD) envelope (all previously identified PCB sources above exemption quantities will be removed prior to ISD). (This work is discussed in Section 7 of Revision 2 of the Characterization Summary Technical Document [CNL 2020].) The new non-radiological hazardous material inventory along with the new radiological inventory were used as inputs to the environmental assessment modelling, which still shows the project provides long-term safety of the workers, the public, and the environment. **Change to Radiological Characterization Summary and Radionuclide Inventory Estimates Report:** The Characterization Summary Technical Document (CNL 2020) was revised to incorporate the results of the 2017/2018 characterization campaign and other characterization activities; the most relevant sections to this Information Request are as follows: • Section 4.2 provides information on the review and validation of the original inventory modelling. • Section 4.3 provides information on the fuel channel scrape samples. • Section 6.3 provides information on the characterization of the Primary Heat Transport System. • Section 6.5 provides information on the characterization of the Heavy Water and Helium Systems. • Section 6.6 provides information on the characterization of the Experimental Loops. • Section 7 provides information on the estimation and verification of the non-radiological hazardous material inventory. **References:** *CNL 2016. WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates. WLDP-26100-041-000. Revision 0. August 2016.* *CNL 2017. Review of ORIGEN based modelling work. Memo from Vinicius Anghel to Jeffrey Miller. WLDP-26400-021-000. Revision 0. March 2017.* *CNL 2020. WR-1 Reactor Radiological Characterization Summary and Radionuclide Inventory Estimates. WLDP-26100-041-000. Revision 2. October 2020.*
					Decommissioning Safety Assessment Report	
186.	ECCC		DSAR - Sections 2.2.3 Environmental Protection and 2.2.4 Emergency Preparedness Appendix 5.1.2-1	38 to 39	**Comment:** The EIS and supporting documentation largely focuses on the mitigation measures (both passive and active) in the prevention of accidents and malfunctions and on the preservation of human health and safety. The EIS and supporting documentation are, however, lacking sufficient detail on possible environmental effects as a direct result of accidents or malfunction scenarios. No information could be located within the EIS detailing any environmental monitoring plans, contingency plans or environmental clean-up and restoration work that would be required during or immediately following postulated malfunction or accident scenarios. Of equal importance, there was no mention of specific environmental response plans or capacities, nor of the expected success rates of response and	**Resolved As:** Please note that the Decommissioning Safety Assessment Report (DSAR; Golder 2021) has been significantly revised following CNSC input. The requested information is located in Section 7.2 and 7.3 of the Environmental Impact Statement (EIS; Golder 2022). Section 2.2.3 Environmental Protection and Section 2.2.4 Emergency Protection in Revision 2 of the DSAR (Golder 2017) provided the legislative and organizational framework under which the environmental protection and emergency preparedness work is planned, controlled and executed. The references in these two sections described the high level program documents, and not specific mitigation or response plans. The DSAR has been significantly revised and these sections were removed from the current revision of the DSAR. The relevant CNL management system and Quality Assurance program descriptions are provided in Section 3.1.6 of the DSAR. The requested information about accidents and malfunctions and the resulting environmental mitigation measures, monitoring, contingency plans or clean-up work is provided in the following places: 1. Section 5.4.1.1 of the DSAR states: *"Further, an accidents and malfunctions report (ISR 2016) was prepared to identify credible events which could arise during the WR-1* [Whiteshell Reactor 1] *closure phase, causing potential harm to people or the environment. The "What-if" questions and scenarios developed during HAZOP were incorporated into the accidents and malfunctions report where appropriate. Potential effects from the accidents and malfunctions, as well as factors which may mitigate the effects are also identified. The report determined that the consequences of these accidents and malfunctions were anticipated to be significantly lower than those identified by the* [Comprehensive Study Report] *CSR (AECL*

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					restoration activities. The EIS does reference (in Section 2.2.3) the WL Environmental Protection Program, CNL's Environmental Protection Program Manual, Environmental Management System, the WL Environmental Monitoring Program, WL's Emergency Preparedness Program (in Section 2.2.4), and the CNL Emergency Plan – all of which may contain some of the missing information that is required in the EIS. In the absence of this information, it cannot be determined if CNL's emergency preparedness plans and associated response capacities are commensurate with the environmental risks that the proposed activities present. ECCC recommends that CNL provide details related to the expected success rates of response and restoration activities in order to inform a determination of significance of any residual effects. **Expectation to Address Comment:** It is recommended that CNL provide information that specifically details their planned mitigation measures that includes any monitoring, contingency, clean-up or restoration work in the surrounding environment that would be required during or immediately following the postulated malfunction or accident scenarios.	*2001), the effects would be localized to the decommissioning site, and are sufficiently mitigated by existing Management System Programs (see Section 3.1.6); specifically emergency response/management and environmental protection programs. These programs form the basis of the CNSC-issued site decommissioning licence. They are assumed to be sufficiently comprehensive to support this Project, and any residual hazards from the potential events are used as the basis for assessment in Section 7.0 (i.e., Table 7.1.1-1)."* 2. Section 3.1.6 of the DSAR states: "*CNL's Emergency Preparedness, Radiation Protection, Environmental Protection and Occupational Health and Safety Programs and associated procedures are in place to assist in the response to radiological and non-radiological incidents. Incident response and mitigation procedures and capabilities are maintained for all facilities, processes and activities with identified environmental aspects. Response and mitigative actions to anticipated environmental incidents are addressed in facility/operation/building emergency procedures. The WR-1 Building has an existing emergency procedure that will be modified as the facility changes – the WL Emergency Operations Centre Operating Procedure. This procedure conforms to the legislative and regulatory requirements as outlined by CNSC's REGDOC 2.10.1 Nuclear Emergency Preparedness and Response (CNSC 2016), and the Federal Nuclear Emergency Plan. In accordance with these requirements, this procedure, as part of WL's* [Whiteshell Laboratories'] *broader Emergency Management framework, serves to provide for the protection of life, property and the environment in the event of an abnormal condition or emergency situations affecting the WL site or surrounding area."* 3. Section 7 of the EIS contains a detailed evaluation of potential accidents and malfunctions, and includes the accident and incident scenarios identified in the DSAR in its analysis. Sections 7.2 and 7.3 of the EIS specifically provide details about various accident conditions, proposed mitigations and responses, as well as past performance of the WL site programs in preventing and mitigating these events. As covered in Section 7.3 of the EIS (Golder 2022), the nature of accidents and malfunctions related to closure-phase activities remains similar to the original assessment covered under the CNSC-accepted CSR (AECL 2001); although with the proposed In Situ Disposal approach, the closure phase risks are significantly reduced. A key reference in the CSR, and the current EIS is the Whiteshell Laboratories Site Emergency Response Plan (CNL 2018a) that forms part of the basis for the WL site licence issued by the CNSC as appropriate for decommissioning work at the WL site. This plan contains CNL's planned responses to various industrial, radiological and environmental accidents as well as bounding case source terms for both airborne and liquid emissions. It should be noted that the WR-1 building and project source term is low compared to other facilities at the WL site, and potential accidents involving WR-1 are not considered to be bounding within the scope of WL site. The WL Site Emergency Response Plan includes: - The process for activating the Emergency Plan, - Responsibilities of employees and Emergency Services Operations staff, - On-site and off-site responses, including radiological monitoring and sampling of airborne and liquid emissions and contamination, and estimation of doses, and - Implementation of recovery planning as outlined in the WL Emergency Operations Center Operating Procedure (CNL 2017). Recovery planning will vary dramatically depending on the type of accident but will include prioritization of safety (nuclear and public, regulatory compliance, employee safety, etc.), damage assessments, restoration of affected services, and ongoing monitoring as required. There are no specific responses, clean-up or restoration procedures developed at this time for every potential incident involving environmental effects during WR-1 decommissioning. Current monitoring of emissions from WR-1 (Building 100) are described in the WL Effluent Verification Monitoring Plan (CNL 2018b), which outlines that the potential for significant release from WR-1 is limited due to its low accessible source term. Existing building Emergency Procedures will be updated as required to address potential accidents and incidents during closure phase. All incidents will be managed in accordance with the methodology outlined in the Environmental Incident Reporting, Investigation and Mitigation procedure (CNL 2018c), which includes the assignment of responsibilities for internal CNL and external regulator reporting, investigations, evaluation, and mitigation of impacts of environmental incidents, as well as reporting on the effectiveness of containment and clean-up efforts. Environmental incidents shall be mitigated to the extent practical to minimize adverse environmental impacts. Mitigating actions shall be directed on a case-by-case basis by the CNL Facility Authority or Manager responsible for the incident, in consultation with CNL Environmental Protection Program staff. To help determine that CNL's emergency preparedness plans and associated response capacities are sufficient for the proposed activities, it should be pointed to the fact that CNL has been carrying out decommissioning activities in accordance with the approved procedures for Environmental Protection Program and WL's Emergency Preparedness Program for over 20 years with a proven track record for incident prevention and management. The activities proposed for WR-1 decommissioning are not significantly different from other decommissioning work being safely carried out on site. Past performance metrics provided for the accidents identified in sub-sections of Section 7.3 of the EIS (Golder 2022) demonstrate that CNL has been effective in preventing and managing accidents and incidents, including those affecting the environment. **Change to DSAR:** The DSAR (Golder 2021) has been significantly revised following CNSC input. The requested information is better found in Sections 3.1.6, and 5.4.1.1. Section 5.4.1 of the DSAR has been significantly updated to clarify the hazard assessment process and development of the features, events, processes

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						required for the assessment model, formulation of the normal evolution scenario, as well as disruptive events. The analysis of accidents and malfunctions during closure identified as part of the DSAR (ISR 2016) was consolidated in Section 7.3 of the EIS (Golder 2022). **Change to EIS:** The EIS Section 7.0 has been significantly revised to focus on potential accidents and malfunctions during closure. Accidents and malfunctions occurring during post-closure (former Sections 7.3.7 (WR-1 ISD Structural Failure) and 7.3.8.2 (Human Intrusion and Human Habitation)) were relocated to Section 6.7.1.7.2.1 and 6.7.1.7.2.2 that discuss various disruptive events that can affect the Normal Evolution Scenario of the WR-1 Disposal Facility. The discussion of applicability of CNL's WL Site Emergency Response Plan (CNL 2018a) has been added to the specific accident scenarios in Sections 7.3.1 through 7.3.7. **References:** *AECL 2001. Whiteshell Laboratories Decommissioning Project – Comprehensive Study Report. WLDP-03702-041-000. Revision 2. March 2001.* *CNL 2017. Whiteshell Emergency Operations Center Operating Procedure. WL-508730-PRO-559. 2017 October.* *CNL 2018a. Whiteshell Laboratories Site Emergency Response Plan. WL-508730-ERP-001. Revision 5. April 2018.* *CNL 2018b. WL Effluent Verification Monitoring Plan. WL-509200-PLA-001. Revision 0. December 2018.* *CNL 2018c. Environmental Incident Reporting, Investigation and Mitigation. 900-509200-STD-005. Revision 0. January 2018.* *CNSC 2016. REGDOC-2.10.1, Nuclear Emergency Preparedness and Response. Version 2. February 2016.* *Golder 2017. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 2. September 2017.* *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *ISR (International Safety Research Inc.) 2016. CNL WR-1 In-Situ Decommissioning Activities: Accidents and Malfunctions. ISR Report 3014-01-02. Version 1.0. 18 November 2016.*
187.	CNSC	E. Dagher	DSAR - Section 2.3.1.1 Section 2.3.1.7, Table 2.3.1-1	42 46	**Comment:** CNL states that they are using a defence-in-depth multi-barrier approach within their safety strategy, and describe the reactor core and bioshield components as a barrier. However, within Section 2.3.1 of the DSAR, there is no supporting information or reference made to supporting information as to the adequacy of this barrier to containment, although this information has been provided for other engineered barrier system components. For example, what is the expected hydraulic conductivity and degradation rate of this barrier, and if this is provided elsewhere, reference should be made within the DSAR. **Expectation to Address Comment:** Describe the adequacy of the reactor core and bioshield components to containment and if the supporting evidence has been provided in another supporting document, make reference to such information within the safety assessment report.	**Incorporated:** Please note that the Decommissioning Safety Assessment Report (DSAR; Golder 2021a) has been significantly revised following CNSC input. Section 2.3.1.1 of the 2017 DSAR (Golder 2017) is now in Section 4.1.1.1 of the current DSAR. Section 2.3.1.7 of the 2017 DSAR is now in Section 4.1.1.7 of the current DSAR (Golder 2021a). Text was added to Section 4.1.1.1 of the DSAR to clarify that the reactor core components (calandria and fuel channels), although sources of contamination, function as barriers providing contaminant isolation and containment. The reactor core is considered a barrier to contaminant release as the activation products within the components are only released as the component corrodes over time. The grout, bioshield and non-core reactor components as barriers were conservatively disregarded for the purposes of the safety assessment. The anticipated performance and the associated release of the contaminants from the reactor core components, including corrosion rates, are analysed in Section 6.1 of the DSAR, which includes sensitivity analysis performed for key properties of the reactor core. Further details on the reactor core modeling are described in Section 4.1.3 of the Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2021b). Hydraulic conductivity is not a property directly applicable to the reactor core. The reactor core will be the primary source of contamination as it corrodes and its corrosion rate is the key property of the reactor core to its function as a barrier, as it controls the rate at which contaminants become available for transport. The bioshield is a concrete structure and its hydraulic conductivity is modelled conservatively as matching that of the surrounding grout block, effectively removing it as a barrier in the model. **Change to DSAR:** Section 4.1.1.1 of the DSAR was revised as follows: *"The reactor core components (combined calandria and fuel channels), although sources of contamination, function as barriers providing contaminant isolation and containment. The majority of the remaining contamination in WR-1* [Whiteshell Reactor 1] *is located within the piping and tanks that make*

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						up the reactor systems (primarily in the calandria and fuel channels). The contamination is both on the internal surfaces (surficial contamination), as well as embedded in the material itself (activated components). In some cases, the components themselves are the contaminant (e.g., lead). The reactor core (combined calandria and fuel channels) is considered a barrier to contaminant release as the activation products within the components are only released as the component corrodes over time. These components are the initial barrier and must first breakdown through corrosion and dissolution for contamination to be released to any groundwater. No contamination within them will be released prior to their corrosion and dissolution. The effectiveness of the grout, bioshield and non-core reactor components as barriers was conservatively disregarded for the purposes of the Safety Assessment." Table 6-1 of the DSAR includes the defence-in-depth analysis to better understand uncertainty associated with the modelling of releases from the Whiteshell Reactor Disposal Facility (WRDF), and the uncertainty in rates of the reactor systems corrosion analyzed in Scenario 9. These scenarios are described in detail in Sections 5.1 and 5.2 of the GWFSTMR (Golder 2021b). The groundwater flow and solute transport model assumes: • The Reactor Core corrosion rate is higher (based on neutral pH groundwater) than will actually occur. • The Bioshield instantly corrodes and all concrete activation products are instantly released for groundwater transport. • The Bioshield provides no physical barrier to release of activation products released by either the Bioshield, or the Reactor Core components. In reality, it is anticipated that the reactor corrosion will be slower than modelled, as the groundwater pH will be higher (>11) due to the presence of concrete and grout. In addition, the Bioshield will not be instantly dissolved, and release of the concrete activation products will take time. Furthermore, the Bioshield remains physically in place and provides a physical barrier with a low hydraulic conductivity to slow the movement of any activation products released from either the Bioshield or Reactor Core components. Uncertainty in the corrosion rate of the Reactor Core was modelled in the Sensitivity Analysis Scenario 9 – Timescales Associated with Reactor Corrosion, in Section 5.1 of the GWFSTMR (Golder 2021b). Therefore, the approach to modelling bounds or conservatively encompasses any uncertainty in the effectiveness of the reactor core components as a barrier to release. **References:** *Golder 2017. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 2. September 2017.* *Golder 2021a. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2021b. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.*
188.	CNSC	E. Dagher	DSAR - Section 2.3.1.2, para 2 Section 2.3.1.7, Table 2.3.1-1 Barrier Performance	42 46	**Comment:** CNL states that the grout formulation will provide a hydraulic conductivity of 1E-9 m/s, however, there is no reference provided in the DSAR to support this claim. For modeling purposes, CNL has assumed a hydraulic conductivity of 5E-8 m/s and have applied a step function to increase the hydraulic conductivity in order to simulate degradation; however there are no references provided in the DSAR to support the claim that the grout and cover will perform accordingly. **Expectation to Address Comment:** Provide supporting evidence to justify the claims made. If the supporting evidence has been provided in another supporting document, CNL should make reference to such information within the safety assessment report.	**Incorporated:** Information regarding the hydraulic conductivity in the grout is now provided in Section 4.1.1.2 of the Decommissioning Safety Assessment Report (DSAR; Golder 2021a). For the initial properties of grout, the maximum hydraulic conductivity target of 1.0E-09 m/s, based on the Savannah River analogue, has been replaced by a hydraulic conductivity of 9.5E-10 m/s in the latest revision of the DSAR. CNL has specified that the bulk fill grout to be used in the decommissioning of Whiteshell Reactor 1 (WR-1) must have a hydraulic conductivity of less than 9.5E-10 m/s (CNL 2017). Based on the recent testing of the refined grout formulation specific to the WR-1 Project (Golder 2022), CNL confirmed that this grout recipe can achieve all required wet and cured properties, including the target hydraulic conductivity. For the assessment model, CNL has conservatively selected 5.0E-08 m/s as initial grout hydraulic conductivity. Degradation rates of grout and final hydraulic conductivity were determined based on literature review as part of the development of the solute transport model, as described in the Groundwater Flow and Solute Transport Modeling Report (GWFSTMR, Golder 2021b) in Section 4.1.4 and Table 4-4.

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						(continued below)

Table 4-4: Simulated Groundwater Flow through the WRDF Components in the Post-closure Period

Time Following Decommissioning (year)	Simulation	Model Parameters				Simulated Flow (m^3/d)		
		Grout and Cover K (m/s)	Foundation K (m/s)	Cover Recharge (mm/year)	Backfill Recharge (mm/year)	Grout	Foundation	Backfill
0	Base	5.0E-08	5.0E-10	0.80	2.0	0.0062	0.011	0.167
500	Step 1 (base x 2)	1.0E-07	1.0E-09	1.6	2.0	0.012	0.022	0.169
1,000	Step 2 (base x 4)	2.0E-07	2.0E-09	3.2	2.0	0.024	0.043	0.173
2,000	Step 3 (base x 10)	5.0E-07	5.0E-09	8.0	2.0	0.053	0.093	0.180
5,000	Step 4 (base x 10, foundation x 100)	5.0E-07	5.0E-08	8.0	2.0	0.12	0.24	0.186
10,000	Step 5 (base x 10, foundation x 1,000)	5.0E-07	5.0E-07	8.0	2.0	0.13	0.28	0.193

Note: This table shows stepwise changes in hydraulic conductivity and recharge applied in groundwater model. A linear interpolation is applied between steps in the solute transport model such that transitions in flow and recharge values are gradual.

This information was summarized in the DSAR in Section 4.1.1.2 that provides justification for selecting a hydraulic conductivity of 5.0E-08 m/s and applying a step function to increase the hydraulic conductivity in order to simulate degradation.

As indicated in the review comment, there is uncertainty in that the grout will perform as assumed in the modeling. To address this uncertainty in the rate of degradation and final hydraulic conductivity of the grout, CNL carried out sensitivity analyses as part of the groundwater flow and solute transport modeling. To confirm that the hydraulic conductivity of the grout does not control the overall safety of the containment system, Scenario 14 of the solute transport model, described in Section 5.1 of the GWFSTMR (Golder 2021b), assumes the grout rapidly degrades to match the condition of the surrounding geological layers. In the results of this scenario, there was no appreciable difference in peak loadings or the timing of peak loadings. Doses and risks from this scenario would not be appreciably different from the base case. This confirms that while the grout hydraulic conductivity does influence the overall solute transport model, it is not a controlling parameter and that its complete failure still allows the disposal system to provide protection of the public and the environment.

Change to DSAR:

Section 4.1.1.2 of the DSAR (Golder 2021a) was revised to include the results of grout formula design and testing completed in 2019.

The following text was also added to Section 4.1.1.2 of the DSAR:

"Initial performance requirements and a supporting test plan were prepared by Savannah River National Laboratory (SRNL 2018). CNL engaged a vendor to develop a grout formulation that meets or exceeds the requirements specified by Savannah River National Laboratory, using locally available materials. A similar grout design process (where an existing formula was adapted to use local materials) has already been successfully performed by CNL (Golder 2020, 2019a). The formulations have been tested to validate their performance against the required and assumed properties, to confirm they perform as well as or better than estimated in the solute transport model, prior to the installation of any grout into WR-1 (Golder 2019a)."

"In the long-term (i.e., thousands of years), it is expected that the grout will degrade, and the hydraulic conductivity will increase as a result of this degradation. As noted in the literature, there are many factors that contribute to the degradation of grout over time, and the ability to model its performance is limited as a result of the uncertainty associated with these factors (Walton et al. 1990, Clifton et al. 1995). Contributing factors to degradation include sulphate and magnesium attack (leading to expansion and disruption of the cement), reinforcement corrosion through chloride attack, leaching, carbonation, alkali aggregate reaction, freeze/thaw and cracking. The extent to which degradation of concrete will occur as the result of these contributing factors is dependent on the environmental conditions surrounding the concrete, which are uncertain (Walton et al. 1990; Clifton et al. 1995). For the WRDF [Whiteshell Reactor Disposal Facility] *assessment, a step function was assumed (with linear transitions in between steps) to simulate the anticipated increase in hydraulic conductivity of the grout as degradation progresses. Due to the uncertainty associated with the degradation of the grout over time, this concept was explored in the context of a sensitivity analysis. The degradation is assumed to occur as a step function over the first 2000 years and the grout will reach its fully degraded hydraulic conductivity value of 5.0E-07 m/s by year 2000 (Table 4.1.1-3). The degraded grout hydraulic conductivity value was chosen to match that of the highest value of the surrounding geological units. For comparison, the geological conditions are anticipated to remain consistent until glaciation occurs (at least 60,000 years from present)."*

The following text was added to Section 6.2 of the DSAR:

"To confirm that the hydraulic conductivity of the grout does not control the overall safety of the containment system, Scenario 14 of the solute transport model, described in more detail below, assumes the grout rapidly degrades to match the condition of the surrounding geological layers. In the results of

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						this scenario, there was no appreciable difference in peak loadings or the timing of peak loadings. Doses and risks from this scenario would not be appreciably different from the base case. This confirms that while the grout hydraulic conductivity does influence the overall solute transport model, it is not a controlling parameter and that its complete failure still allows the disposal system to provide protection of the public and the environment." **References:** *CNL 2017. Whiteshell Reactor #1 Grout Fill Requirements. WLDP-26000-041-000. 35303521.November 2017.* *Golder 2020. Laboratory Testing Program on Fresh and Cured Properties of Bulk and Low pH Grout. CNL NPD Decommissioning. March 2020.* *Golder 2019a. CNL Whiteshell Reactor 1 - Phase 1000 Grout Formulation Testing Report. WLDP-26000-REPT-012. Revision 0. August 2019.* *Golder 2021a. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2021b. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022. CNL Whiteshell Reactor 1 - Phase 1000 Grout Formulation Testing Report. WLDP-26000-REPT-012. Revision 1. May 2022.* *SRNL 2018. Grout Formulation Test Plan for WR-1 Reactor Facility Decommissioning Project. SRNL-L3200-2017-00155. January 2018.* *Walton et al. 1990. Walton JC, Plansky LE, Smith RW 1990. Models for Estimation of Service Life of Concrete Barriers in Low-Level Radioactive Waste Disposal. Idaho National Engineering Laboratory, EG&G Idaho Inc. September 1990.* *Clifton et al. 1995. Clifton JR, Pommersheim JM, Snyder L. 1995. Long term performance of engineered concrete barriers. Building and Fire Research Laboratory. National Institute of Standards and Technology publication 5690. July 1995.*
189.	CNSC	E. Dagher/ R. Goulet/ J. Brown/ S. Nguyen	DSAR - Section 2.4.3, Figure 2.4.3-1 Time frame	58 to 62	**Comment:** Selection of a time frame should be supported using a multiple lines of evidence approach, which must encompass the time frame when the maximum impact is predicted to occur, as per P-290. When assessing multiple lines of evidence to support the time frame, consideration should be given to the source-term and the longevity of the source-term, the use of natural analogues, and the period with maximum exposure to critical receptors as per an acceptable Normal Evolution Scenario. It is not clear within Section 2.4.3 of the DSAR how CNL has used a multiple lines of evidence approach to support their selection of an assessment time frame. For example, considering the source-term inventory and longevity, based on CNSC's independent estimates of the reactor core and heat transport system decay rates (using CNL data), the radionuclide inventory will decay to background in 300,000 years (if daughter products do not contribute significantly to the long-term dose) yet the selected assessment timeframe is 60,000 years. Furthermore, a natural analogue may be used to support the proposed assessment time frame, however no information has been provided to support the acceptability of using the Prairie Flats uranium deposit as a natural analogue to define the time frame (see related comment on Natural Analogues). The use of a natural analogue, which has not been shown to be similar to the proposed facility and its site, alone, is not	**Incorporated:** CNL has significantly revised Section 5.3 of the Decommissioning Safety Assessment Report (DSAR; Golder 2021) to provide evidence to support CNL's rationale for the timeframe selection and explain CNL's estimated decay of the radionuclide inventory and how this estimate was used to support the proposed assessment timeframe. **Change to DSAR:** Section 5.3 of the DSAR has been revised to include the following text: *"The assessment timeframe is 10,000 years. The timeframe is established in compliance with the CNSC's REGDOC-2.11.1, Volume III (CNSC 2018a), which requires that, "the assessment of future impacts of radioactive waste on the health and safety of persons and the environment encompass the period of time when the maximum impact is predicted to occur." Per Section 7.4 of CNSC's REGDOC-2.11.1, Volume III (CNSC 2018a) there is no time limit associated with the statutory objective to "prevent unreasonable risk, to the environment and health and safety of persons…" (Nuclear Safety and Control Act, 9(a)(i)). Instead, the determination of the appropriate time period is part of the assessment process.* *The approach taken to determine the assessment timeframe accounted for the following elements:* *hazardous lifetime of the contaminants associated with the waste;* *duration of the operational period (before the facility reaches its end-state);* *design life of engineered barriers;* *duration of institutional control; and* *frequency (probability) of natural events and human-induced environmental changes (e.g., seismic occurrence, flood, drought, glaciation, climate change).* *The following sections provides rationale for the selection of the 10,000-year timeframe and how each of the criterion listed in the REGDOC-2.11.1 has been met and supports the proposed 10,000-year timeframe.* ***Hazardous Lifetime of the Contaminants*** *CNL has determined the hazard level of each contaminant in the WR-1* [Whiteshell Reactor 1] *by calculating an annual dose rate, or [Hazard Quotient] HQ for the expected exposure pathways. For radionuclides, the total dose rate is the sum of dose contributions from all radionuclides; and the maximum total*

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					sufficient to determine the assessment time frame. **Expectation to Address Comment:** Provide additional lines of evidence to support CNL's rationale for the selection of a 60,000 year timeframe and explain CNL's estimated decay of the radionuclide inventory and how this estimate was used to support the proposed assessment timeframe.	*dose rate occurs within the 10,000-year assessment period. For most non-radionuclides, the peak HQ also occurs during the 10,000-year assessment period.* *Some non-radionuclides, such as lead, reach their peak over millions of years; however, the peak HQ over millions of years is lower than the acceptable HQ and is a result of reaching maximum solubility of lead in groundwater. REGDOC-2.11.1 states "In some cases, only the magnitude of the maximum impact, independent of time, may be sufficient for the assessment (e.g., bounding assessments using calculations based on solubility constraints)". For the WR-1 safety assessment, as the peak HQs for these non-radionuclides are constrained by their solubility limit, it is appropriate to remove the time dependency from their assessment.* *Further, for all nuclides and non-nuclides, the peak release rate, independent of time, is used to assess the impacts on receptors. This approach removes the time dependency of the assessment during selection of an assessment timeframe, and permits the selection of a 10,000 year assessment timeframe.* ***Duration of the Operational Period*** *The effects of the construction and closure of the Project on the environment are assessed separately prior to evaluation of the 10,000-year post-closure assessment period. The timeframe for closure is 3 years and institutional control is assumed to last a minimum of 100 years. In addition to this, the WR-1 has had at least 30 years of storage with surveillance, during which time the long-term performance of the facility structures forming the engineered barrier has been studied. This provides similar experience as would be obtained during the operation of a waste disposal facility prior to closure. The relatively short period (i.e., 133 years) does not contribute significant additional time to the assessment timeframe of 10,000 years.* ***Design Life of Engineered Barriers*** *Criterion #3 is the consideration of the life of the engineered barriers and providing that the assessment timeframe considers the effects of changes or degradation of those barriers on the assessment outcomes. To meet Criterion #3, the assessment may employ one of three approaches:* *1) Assume barrier life cycle is complete within the assessment timeframe;* *2) Assume barrier properties are set to the most bounding conservative value in the barrier life cycle irrespective of time; or* *3) Assume barrier life cycle exceeds hazardous lifetime of materials.* *There are four main engineered barriers with the WRDF: the wasteform itself, the grout, the existing building walls and foundation, and the concrete cap and engineered cover. In the case of the cover, grout, and foundation, approach #1 was taken and the assumed lifetime of the cover, foundation, and grout fall within 10,000 years. The assumed barrier lifetime for the cover and grout is 2,000 years, and for the foundation it is 10,000 years. The assessment assumes that the foundation and grout degrade linearly over that period, increasing in hydraulic conductivity and ending with natural soil conditions.* *The release of contaminants from the wasteform is a slow process controlled by the dissolution of metal components. The rate of dissolution or degradation of the wasteform is dependent on the groundwater chemistry, the surface area of the wasteform and the corrosion resistance of the wasteform. For the wasteform, approach #2 was taken. The safety assessment does not examine the changes in groundwater chemistry over time, and instead uses the more conservative long-term chemistry (neutral pH) as the initial condition. The release rate from the wasteform is corrosion controlled. As a result, there is no change in the wasteform release rate over time, and the release rate from the wasteform is bounded.* ***Duration of Institutional Controls*** *The post-closure phase has two discrete periods: institutional control and post-institutional control, as described in Section 3.1.1 Project Schedule. The site is expected to remain under institutional control for a minimum of 100 years to provide a means to confirm the continued safe and effective function of the Project following site closure. During institutional control, long-term performance monitoring and maintenance activities will continue through to 2125[see note below] to demonstrate compliance with the safety case assumptions. In the assessment, it is assumed that human intrusion and disruptive events would*

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						be prevented during institutional control. Passive controls such as access restrictions (e.g., physical barriers/fencing, signage, and land title instruments/deed restrictions) will remain in place until the end of institutional control. A summary of the Project schedule is provided in Table 3.1.1-1. *This timeframe is consistent with that required for other near surface disposal projects (range of 100 to 300 years), including a similar project under CNSC jurisdiction. Examples include:* • *Centre De La Manche Disposal Facility (operated by the Agence Nationale pour la Gestion des Déchets Radioactifs [ANDRA; French National Radioactive Waste Agency] in France) (Chino et al. 1999);* • *L'Aube (operated by ANDRA in France) (Potier 1998);* • *Rokkasho Low-level Radioactive Waste Disposal Centre (operated by Japan Nuclear Fuel Ltd in Japan) (Bergström et al. 2011); and* • *Deep Geological Repository (proposed by Ontario Power Generation) (NWMO 2011).* *It is recognized that institutional control will continue until the CNSC agrees institutional controls are no longer needed. The assessment assumes a minimum of 100 years of institutional control. The assessment also assumes that institutional controls cannot be relied upon as a long-term barrier to the release of contaminants, and so are not employed as a safety barrier. Instead, institutional controls are looked at as a short-term barrier, and a mean to verify performance of the WRDF in the short-term and to provide additional confidence in the long-term safety assessment. Institutional controls are assumed to fail after 100 years; therefore, these fall within the proposed assessment timeframe of 10,000 years.* ***Frequency of Natural and Anthropogenic Changes*** *Another key consideration in the development of the assessment timeframe is the frequency of natural events and human-induced environmental changes (e.g., seismic occurrence, flood, drought, glaciation, climate change). 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. Climate change has been previously accounted for through specific scenarios, including the river level fall/discharge to shore case for drought conditions, and the erosion case to represent floods. Current understanding of the long-term effects of global warming indicated that the next ice age will not occur for 100,000 years as a result of anthropogenic climate change, at a time when the effects of an event will be insignificant compared to the peak dose rates expected during the 10,000-year assessment timeframe. By accounting for all of these scenarios early in the assessment timeframe, when the inventory is larger and has not decayed, the results of the later events are bounded."* Note: The dates for the Institutional Controls were updated in the EIS to be 2027 to 2127. The dates in the DSAR will be updated in the next revision to match. **References:** *Chino P, Durent F, Voinis S 1999. The Centre de la Manche Disposal Facility: Entering into the Institutional Control Period, ANDRA.* *CNSC 2018a. REGDOC-2.11.1 Vol. 3 Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. May 2018. ISBN 978-0-660-25806-5* *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Bergström U, Pers K, Almén Y. 2011. International Perspective on Repositories for Low Level Waste. SKB International AB Publication SKB R-11-16. ISSN 1402-3091. December 2011.* *Nuclear Safety and Control Act. S.C. 1997, c. 9. Current to July 1, 2019. Last amended on January 1, 2017.* *NWMO 2011. Post-closure Safety Assessment: Data. OPG's Deep Geologic Repository for Low and Intermediate Level Waste. Prepared by Quintessa Ltd. and Geofirma Engineering Ltd. March 2011.* *Potier JM 1998. Andra's Cenre de L'Aube: Design, Construction, Operation of a State-of-the-Art Surface Disposal Facility for Low and Intermediate Level Waste. IAEA-SM-357/27.*
190.	CNSC	J. Brown	DSAR - Section 2.4.3 Section 2.4.5.2.6 Natural Analogues	58 to 62 71 to 77	**Comment: Part 1**- It is not possible to fully evaluate CNL's use of natural analogues in the DSAR based on the information provided. Surficial uranium deposits are used as natural analogues (by CNL) in two ways: 1) as the **main tool to select the safety assessment**	**Incorporated:** Please note that the Decommissioning Safety Assessment Report (DSAR; Golder 2021) has been significantly revised following CNSC input. The following response contains references to updated sections where the information is now provided.

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					timeframe (Section 2.4.3); and 2) to **consider the potential effects of future glaciation** (Section 2.4.5.2.6). While proposing the Prairie Flats uranium deposit as a natural analogue to justify the selection of the safety assessment time frame (Section 2.4.3 Timeframes, p.59, DSAR), CNL present very limited information to support this argument in a figure (Figure 2.4.3-1) depicting activity vs. time in both the "grout block" and the Prairie flats U deposit. Characterization of the Prairie flats U deposit was not found in any of CNL's submissions. In Section 2.4.5.2.6.2 (DSAR p.75) further near surface uranium deposits are listed in support of their arguments about post-closure glaciation scenarios. The cited 2007 CCME report is a supporting document as a basis for assessment and remediation of contaminated sites, to support environmental guidelines. It does not characterize the deposit. Tixier and Beckie [1] and Rossel [2] indicate that organic-rich material and clay units created conditions favourable for uranium precipitation in the shallow subsurface. The limited characterization of the surficial deposits at the WR-1 site (see related comments on the EIS) suggest that organic materials are not present on the Whiteshell site (e.g., Figures 6.3.1-6, 6.3.1-7 in the EIS; Figures 3-2, 3-3, *Hydrogeological Study Report*). **Part 2** - The Maqarin natural analogue is a well-documented analogy for cementious radioactive waste engineered barriers (usually for low and intermediate level waste). Numerous studies have been done to evaluate cement evolution, and high pH leachate development and potential consequences (e.g., Khoury et al [3]). **Expectation to Address Comment: Part 1** - The use of natural analogues in both the time frame assessment and the glaciation scenario requires further characterization in CNL submissions including characterizing the analogue, clearly identifying how it is analogous to the WR-1 project using relevant scientific literature (are these analogues for the entire system or just one component), and integrating those components with the site characteristics – or by clearly defining the limitations of the analogue. Please also clarify whether this is the first use of post-glacial, surficial uranium deposits as a natural analogue. If so, this is another reason that the arguments require substantiation. **Part 2** - Consider using information about the Maqarin natural analogue to evaluate the impact of alkaline plume generation at the WR-1, from interaction of cementitious materials and groundwater. **References:** [1] Tixier K, Beckie R. 2001. Uranium	<u>Part 1: Timeframes:</u> The Timeframes section has been moved to Section 5.3 of the DSAR, which has been expanded to include a detailed description of each of the five elements (hazardous lifetime of the contaminants associated with the waste; duration of the operational period; design life of engineered barriers; duration of institutional controls; and frequency of natural events and human-induced environmental changes) taken into consideration when selecting the assessment timeframe for the project. This section was revised significantly to indicate the various timeframes associated with the project components and explain how the assessment timeframe of 10,000 years encompasses these and to justify this selection based on the analysis of hazards specific to Whiteshell Reactor 1 (WR-1). The timeframe selection no longer includes the use of Prairie Flats to support the use of 300 year timeframe, thus a detailed characterization of Prairie Flats was not required for the selection of the timeframe. <u>Part 2: Natural Analogues:</u> The Natural Analogue section has been moved to Section 5.4.3.2.6.2 of the DSAR. Additional text was added into Section 5.4.3.2.6.2 to: 1) Discuss the rationale of using natural analogues as a comparison to the proposed In Situ Disposal (ISD) of WR-1 over the geological timescale and following a glaciation scenario; 2) Discuss the Maqarin source rock and how it is a reasonable analogy to a manufactured cement, and how the studies conducted helped inform the selection of the modeling parameters (corrosion rates) for the WR-1 Project; and 3) Further define the Prairie Flat deposit and compare the composition and activity to the WR-1 reactor. **Change to DSAR:** Section 5.4.3.2.6.2 of the DSAR has been revised to: *"The IAEA and CNSC guidance recognize that due to the very long time periods involved for a disposal facility, there are uncertainties in the assessment. Ways to enhance confidence in the safety features and provide an understanding of the disposal system include testing and evaluation of barrier materials and the use of natural analogues. In Section 5.4.3.2.6.1 Comparison with Unconditional Clearance Levels, the specific radioactivity is compared to the CNSC Unconditional Clearance Level. In this section, the specific radioactivity is compared to natural analogues.* *Many naturally occurring ore bodies contain elevated concentrations of radionuclides. Unlike naturally occurring subsurface deposits, the WRDF* [Whiteshell Reactor Disposal Facility] *has been designed to provide multiples lines of defence to contain the radioactive waste over many centuries. However, it is feasible that during the next glaciation cycle the engineered cap and geological surround will undergo accelerated erosion leading to the loss of containment. It is assumed that the metals and the remaining radioactivity would be distributed as an undefined mass, mixed with the gravel and soil normally associated with glacial deposits. The existing ore bodies provide a point of comparison for evaluating the potential health risks to human and non-human biota of ISD material becoming dispersed within the surface environment.* *Three natural analogues were considered, as detailed below.* ***The Maqarin Site*** *Maqarin is located in north-east Jordan, near the border with Syria, in the river valley of the Yarmouk River. The valley is deeply incised allowing a good view of the stratigraphy. The Maqarin natural analogue is a well-documented analogy for cementitious radioactive waste engineered barriers. Numerous studies have been done to evaluate cement evolution, and high pH leachate development and potential consequences (e.g., Khoury et al 1992).* *The geological composition of the Maqarin site differs from the future location of the WRDF in that the Maqarin site contains large concentrations of organic matter, whereas the WRDF would be embedded in a soil/clay matrix containing limited quantities of organic matter (McPherson 1968). The groundwater at the Maqarin site was found to have a pH of 12.5. This is consistent with the expected porewater pH that was made for the selection of corrosion rates for the WRDF (though more conservative neutral pH corrosion rates were used in the solute transport modelling assessment). As such, the Maqarin site is considered an appropriate natural analogue to use as a comparison to the environmental conditions that will be experienced by the grout and concrete at the WRDF.* ***Natural Radioactivity in Soils and Rocks*** *The radioactivity released from the WRDF will not be unique in the sense that low levels of radioactivity are prevalent throughout the Earth's crust (CCME 2007a). Natural surface soils in Canada generally register uranium values in the range of 0.5 to 10 ppm. Soils with these levels of radioactivity are widely distributed throughout Canada. In addition, relatively high concentrations of metals (including uranium) occur naturally in Canadian soils, stream sediments, and water bodies as a result of naturally occurring bodies of ore.* *There are a number of near-surface uranium deposits located in Canada, including:* • *British Columbia – Prairie Flats, Sinking Pond, Stinkhole Prospect, North Wow Flat;*

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					depositional controls at the Prairie Flats surficial uranium deposit, Summerland, British Columbia. Environmental Geology. Volume 40, issue 10 page 1242-1251. [2] Rossel, K. 1999. A hydrogeological and geochemical study of the origin and nature of the prairie flats uranium deposit, Summerland, BC. University of British Columbia, MASc thesis. [3] Khoury HN, Salameh E, Clark ID, Fritz P, Bajjali, W. Milodowski AE, Cave MR, Alexander WR. 1992. A natural analogue of the high pH cement pore waters from the Maqarin area of northern Jordan. 1. Introduction to the site. Journal of Geochemical Exploration. Volume 46, Issue 1, pages 117-132.	• *Manitoba – Kasmere Lake;* • *New Brunswick – Oromocto Lake, Whooper Swamp;* • *Nova Scotia – TA Bog; and* • *Yukon – Partridge Lake (IAEA 1984).* *Generally, these near-surface uranium deposits were deposited after the last ice age (Jones 1990); therefore, they are relatively young. The naturally occurring radionuclides within the deposits have very long radioactive decay times, therefore, these deposits have not been in place long enough to generate radioactive daughter products (Tixier and Beckie 2001). In other words, there are relatively no short-lived radionuclides present, and the long-term potential hazard from the WRDF 140,000 years from now will be similar in terms of specific radioactivity to the surficial uranium deposits that naturally exist today. Surficial uranium deposits are formed at or within a few metres of the surface; therefore, these naturally occurring deposits can be used as analogues for qualitative estimation of the potential effects of the waste in the WRDF becoming exposed to the surface environment 140,000 years from now.* *In 2007, the CCME* [Canadian Council of Ministers of the Environment] *reviewed environmental levels of radionuclides in soil, groundwater and vegetation in several locations with subsurface uranium deposits, including Prairie Flats (CCME 2007a). The Prairie Flats deposit is located just south of the Town of Summerland (southwest of Kelowna and northwest of Penticton on Okanagan Lake) and is recognized as a large and complex deposit (IAEA 1984). It underlies a hay field in an area where year-round the water table is maintained at less than 1 metre below ground surface and the site is intersected by a series of drainage ditches and underground culverts. The annual precipitation rate in the region is approximately 400 millimetres (mm) to 700 mm, most falling in the winter months, leading to considerable spring runoff (IAEA 1984).* *Measured vertical hydraulic gradient indicates an upward discharge of groundwater into the shallow peat and clay unit. This deposit is estimated to be up to 10,000 years old, with ongoing deposition from upwards groundwater flow and it is estimated that 230 t of uranium are deposited in the top 3 m of soil within the peat and clay unit as triuranium octoxide (U_3O_8) (Tixier and Beckie 2001), with local uranium concentration in the surface layer exceeding 1,000 parts per million (ppm) (IAEA 1984). A typical natural deposit will contain several million tonnes of ore, which is larger than the quantity of radioactive waste within the WRDF (IAEA 1984). Since glacial retreat the Prairie Flats deposit is estimated to accumulate 23 kg/yr (Jones 1990).* *As stated above, unlike naturally occurring subsurface deposits, the WRDF has been designed to provide multiples lines of defence to contain the radioactive waste over many centuries. As compared to the Prairie Flats, there are other natural analogues that could be chosen that are more closely representative of the intact WRDF (i.e., massive uranium bearing rocks). However, the Prairie Flats deposit is more representative of the state of the WRDF after glacial retreat (i.e., relatively loose material distributed within the surface environment). Further, the environmental setting of the Prairie Flats deposit also provides an appropriate comparison for the Project (e.g., for downward gradient to groundwater flow).* *The greatest concentration of uranium in the Prairie Flats exceeds 1,000 ppm. A concentration of 500 ppm of uranium-238 corresponds to 0.5 g of uranium-238 per kg of soil, or an activity concentration of approximately 6 Becquerels per gram (Bq/g) (Levinson et al. 1984). In a surficial uranium deposit, uranium-238 exists with other isotopes of uranium and thorium as well as their progeny, with uranium-234, thorium-230 and radium-226 trending towards equilibrium with uranium-238 (IAEA 1984), depending on the age of the deposit. If we consider only the primary long-lived isotopes of the uranium-238 decay chain (uranium-238, thorium-230 and radium-226), this translates to a total specific radioactivity of about 23 Bq/g when the radionuclides within the uranium-238 decay chain are in secular equilibrium. For comparison, the concentration of radioactivity within the reactor vault following the end of the glaciation period (estimated to be approximately 140,000 years from present) was calculated to be about 11 Bq/g. In native deposits mobile progeny, including radium-226 and its daughter radionuclides, leach out at very low concentrations over the centuries and generally do not accumulate within deposits.* *The decrease in specific radioactivity within the WRDF as a function of time is depicted on Figure 5.4.3-2 (Golder 2021). Figure 5.4.3-2 shows that by the time the glacier retreat occurs the radioactivity content in the vicinity of WR-1 will have decayed to levels less than what is typical for surficial uranium deposits in Canada. The grout block activity intersects the Prairie Flats activity after approximately 60,000 years elapsed time. This includes the progeny of long-lived uranium and thorium isotopes.* *While the levels of environmental radioactivity attributed to releases from the WR-1 site are comparable to the levels of radioactivity occurring naturally, it is noted that many of the radionuclides present within the reactor vault are artificially produced and not naturally occurring. As described in Table 5.4.3-2, every specific radionuclide has a unique detriment (or hazard) attributable to it. Similarly, the 14 naturally occurring radionuclides within the uranium-238 decay chain each present a unique detriment (or hazard). Hence a simple comparison of the specific environmental radioactivity of various radionuclides is not appropriate. The standard method for directly comparing the environmental hazards from the artificial radionuclides within the WR-1 to the naturally occurring radionuclides present everywhere in the Earth's crust, is to consider the dose to members of the critical group.* *Radiological consequences to a hypothetical exposure group settling in the vicinity of the WL site area after the glacial retreat will be bound by the current levels of exposure to members of the public living in the vicinity of surficial uranium deposits. In 2007, the CCME concluded that environmental levels of*

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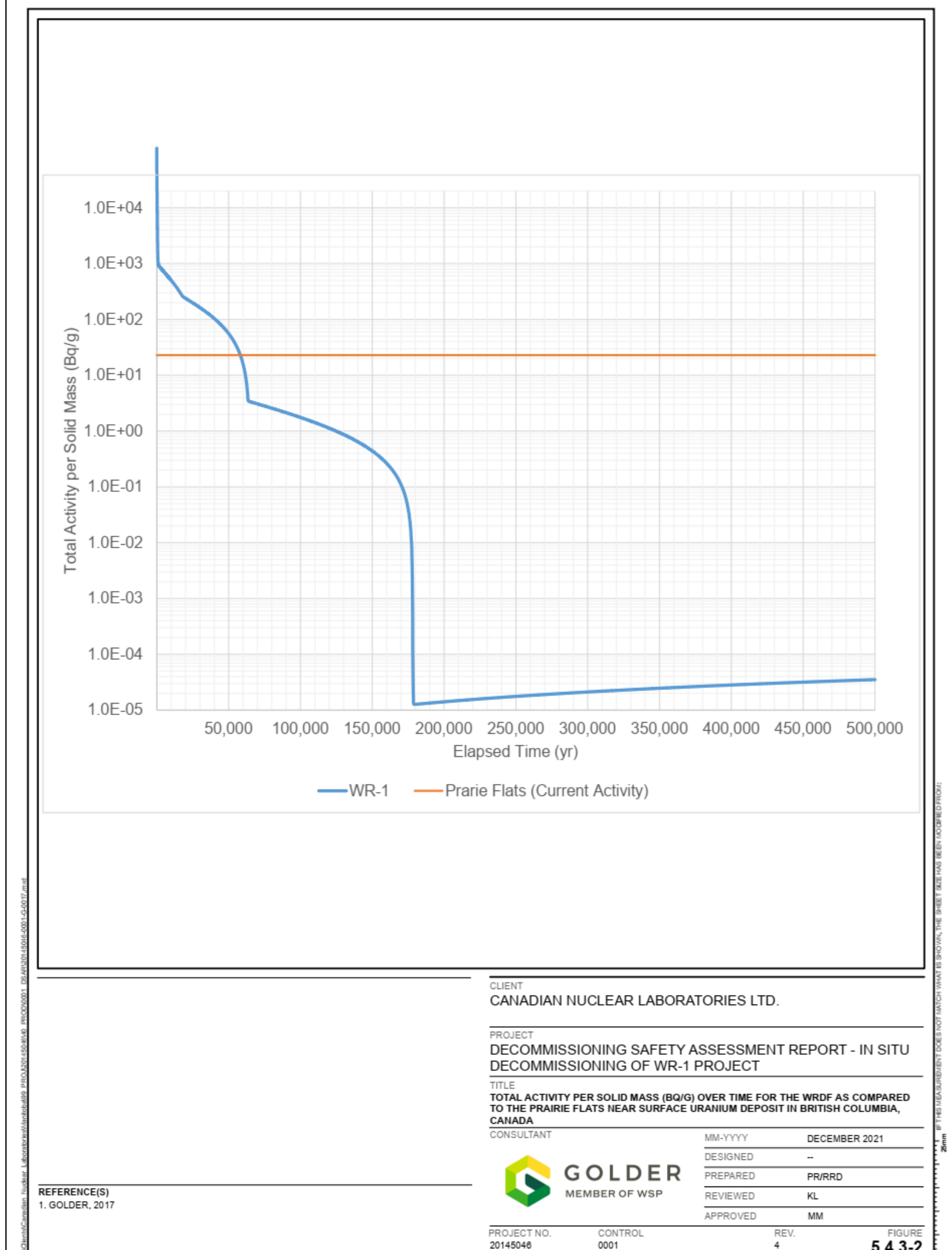
						radionuclides at several locations containing subsurface uranium deposits, including Prairie Flats, met regulatory guidelines for the protection of the health of human and non-human biota, and that "no adverse effects are expected." Experience has shown that a sound knowledge of the potential radiological effects associated with the presence of these natural deposits has generally resulted in no measurable effect on human health (CCME 2007b).

Figure 5.4.3-2: Total Activity per Solid Mass (Bq/g) over time for the WRDF as compared to the Prairie Flats Near Surface Uranium Deposit in British Columbia, Canada



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References:

CCME 2007a. Canadian Environmental Quality Guidelines Summary Table.

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						CCME 2007b. Canadian Soil Quality Guidelines for Uranium: Environmental and Human Health. *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *IAEA 1984. Surficial Uranium Deposits: Report of the Working Group on Uranium Geology Organized by the International Atomic Energy Agency.* *Jones 1990. Uranium and Thorium Occurrences in British Columbia. Ministry of Energy and Mines and Petroleum Resources.* *Khoury et al. 1992. A natural analogue of the high pH cement pore waters from the Maqarin area of northern Jordan.* *Levinson et al. 1984. Uranium series disequilibrium in young surficial uranium deposits in southern British Columbia.* *McPherson 1968. Pleistocene stratigraphy of the Winnipeg River in the Pine Falls – Seven Sisters Falls area, Manitoba.* *Tixier and Beckie 2001. Uranium depositional controls at the Prairie Flats surficial uranium deposit, Summerland, British Columbia.*
191.	CNSC	Q. Zheng	DSAR - Table 2.4.5-2	66	**Comment:** For the "Human Habitation Bounding Scenario", the solute transport modeling results are not presented in the modeling report. It is not clear where the groundwater supply well is located, and what the breakthrough curve in this location looks like. The DSAR indicates that the following two bounding scenarios are included in the bounding scenario evaluation: localized failure of ISD structure and substantial failure of ISD structure. It is not clear what the difference is between the two failure scenarios in terms of the consequences and how they are represented in the modeling. Are these two scenarios simulated in the groundwater flow and solute transport modeling? **Expectation to Address Comment:** For each bounding scenario presented in the DSAR, the corresponding solute transport modeling results should be presented in the *Groundwater Flow and Solute Transport Modeling Report*. CNL should confirm if the localized failure of ISD structure and substantial failure of ISD structure are all simulated in the groundwater flow and solute transport modeling.	**Resolved As:** Please note that the Decommissioning Safety Assessment Report (DSAR; Golder 2021a) has been significantly revised following CNSC input. The following response contains references to updated sections where the information is now provided. The contents of Section 2.4.5 of the DSAR is now found in Section 5.4.3 of the current DSAR revision. Table 5.4.3-1 Normal Evolution Scenario and Disruptive Events Considered in the Decommissioning Safety Assessment, in the DSAR, presents the Normal Evolution Scenario, all the Disruptive Events and Bounding Scenarios evaluated in the DSAR, and provides references to the appropriate modeling scenarios outlined in the Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2021b). There are three bounding scenarios that are introduced in Section 5.4.3 and effects analysis is presented in Section 8.6.1 of the DSAR: 1. Human Intrusion Bounding Scenario (Section 8.6.1 of the DSAR): "*For this Bounding Scenario, it was assumed that immediately following the 100 years of institutional control, an exploration borehole was drilled through the concrete cap and engineered cover, grout, concrete structure, and ISD* [In Situ Disposal] *waste from ground surface to bedrock. The material encountered was brought to surface, handled by the driller, and dumped on the ground. Once the driller had left, trespassers would spend time at the drill location. The driller and trespasser would be exposed to the waste material through incidental soil ingestion, dermal contact with soil and groundshine. For the trespasser, there may be inhalation of dust from resuspension of dried waste material, which is not the case for the driller since the material would be considered wet when it was initially brought to surface. This is an unlikely scenario but is considered as a conservative assessment for the disruptive events.*" Since this Bounding Scenario evaluates exposure and effects above the ground surface, there was no specific groundwater flow scenario applicable. However, the concentrations of contaminants used in evaluating the radiological and non-radiological exposure effects were taken from the overall groundwater flow model. 2. Whiteshell Reactor Disposal Facility (WRDF) Barrier Failure Bounding Scenario (Section 8.6.2 of the DSAR): "*For this bounding scenario, an open fracture was modelled in the foundation of the WR-1* [Whiteshell Reactor 1] *Building that will remain in place as a component of the WRDF. The foundation floor and walls for the WR-1 Building were specified as a 1 m thick continuous barrier with a uniform hydraulic conductivity (grout failure was included in the Normal Evolution Scenario). To examine potential effect of a failure in this barrier, a 2 m-wide zone of enhanced hydraulic conductivity was simulated. Exposure pathway characterization are the same as was modelled in the Normal Evolution Scenario, except that groundwater loadings to the surface water are based on an open fracture.*" This bounding scenario is analysed in Scenario 3 in Section 5 (Sensitivity Analysis) of the GWFSTMR (Golder 2021b). The WRDF Barrier Failure scenario was intended to represent a 2 m wide failure of the building foundation, creating a hypothetical preferential pathway for groundwater from the ISD and local groundwater pathway to the river. 3. Well in Plume Bounding Scenario (Section 5.4.3.3.3 of the DSAR). This bounding scenario models a groundwater supply well to be located halfway between the WRDF and the Winnipeg River at the end of the 100 year Institutional Control period. This scenario is outlined in Scenario 16 in Section 5.1 of the GWFSTMR (Golder 2021b). The result of this Scenario 16 is presented in Section 5.2 (Sensitivity Analysis Results) of the GWFSTMR and the effects are summarized in Section 8.6.3 of the DSAR (Golder 2021a). Plots of solute mass loadings to the Winnipeg River for each scenario, including Scenario 16, are provided in Appendix B of the GWFSTMR.

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						Change to DSAR: The DSAR has been significantly revised to better align with the GWFSTMR. Specifically, the Well in Plume Bounding Scenario is found in Section 8.6.3 and now includes a summary of the transport modeling results in Table 8.6.3-1, 8.6.3-2, and 8.6.3-3. Section 8.6.2 of the DSAR provides the modeling results for the WRDF Barrier Failure Scenario, with detail provided in Section 5.4.3.2.4 and 5.4.3.3.2 of the DSAR. Furthermore, the relationship between disruptive events and bounding scenarios has been clarified. Eight Disruptive Events were postulated and described. Those eight Disruptive Events were then grouped and covered by three overall bounding scenarios. Only the bounding scenarios were modelled to produce a dose result. **References:** *Golder 2021a. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2021b. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.*
192.	CNSC	E. Dagher	DSAR - Section 2.4.5 Normal Evolution Scenario	63 to 79	**Comment:** As defined in G-320: “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.” CNSC staff do not consider the proposed Normal Evolution Scenario (NES) to be in alignment with G-320 for the following reasons: Selection of critical receptors: with respect to the habits of the critical receptors, it is assumed that the on-site farmer will be exposed to contaminated surface water from the Winnipeg River, which will act as their source of water for drinking, bathing, and agricultural use. Currently the Unplanned Human Habitation scenario, whereby a human receptor is exposed to the radioactivity through drinking groundwater from a well within the plume, is considered as an independent bounding scenario. However, based on reasonable receptor lifestyles, it is likely that an on-site resident would drink groundwater from a well over the course of the 60,000 year time frame and this exposure pathway should therefore form part of the NES. Performance of the engineered barrier system: sufficient uncertainty exists within the key model parameters (i.e., hydraulic conductivity and degradation rates) of barrier performance (i.e. grout, foundation). In the absence of scientific evidence, a level of conservatism in the performance of the EBS that is commensurate with the level uncertainty, should be applied to the NES and justified (see related comments on the *Groundwater Flow and Solute Transport Modelling Report*). For instance, given the unavailability of the current specifications of the grout type(s) to be used in the decommissioning of	**Resolved As:** Please note that the Decommissioning Safety Assessment Report (DSAR; Golder 2021a) has been significantly revised following CNSC input. The following response contains references to updated sections where the information is now provided. The response is divided in three parts, as per the Expectation to Address Comment: i) The on-site farmer drinking groundwater was not considered normal evolution because the Winnipeg River is nearby and the local hydrogeological conditions prevent well capacity that would meet all water needs of a residential family. Even if the river could move in 60,000 years and no longer be adjacent to the site, a resident could not depend on groundwater alone as a water source. The highly unlikely nature of this scenario meant that it was not considered part of the normal evolution but was considered to be a disruptive event (DSAR Section 5.4.3.2.5) and a bounding scenario (DSAR Section 5.4.3.3.3). Section 5.4.3.2.5 of the DSAR (Golder 2021a) was revised as follows: *“It is not possible to predict the behaviour of people in the future with any certainty. In estimating doses to individuals in the future, the assumption is made that at some time in the distant future government failure will lead to government controls (e.g., zoning designation, land use restrictions, or orders) being ineffective, and people will be present locally and make some use of local resources (i.e., unplanned future land use). To confirm the long-term safety of future generations, the assumption was made that a human receptor (On-site Farm) has a well in the groundwater plume from WRDF* [Whiteshell Reactor Disposal Facility] *and uses it for drinking water.* *A well in the groundwater plume was considered not feasible until after institutional control ends (i.e., 100 years after closure). To occur, the Well in Plume Disruptive Event requires failure of government controls, such as land use restrictions; loss of knowledge of the WRDF by local residents, and that the surface land could be attractive to settlement, all of which are unlikely within the 100 year institutional control period.* *The Well in Plume Disruptive Event is the same as the Normal Evolution Scenario, except that the On-site Farm has a well located in the overburden half-way between the WRDF and the Winnipeg River and is used for drinking water. Water for other purposes, including bathing and irrigation of garden crops is taken from the Winnipeg River near the site because water yield rates from the hypothetical well were estimated to be very low. Calculations of well capacity were completed based on the methods in Driscoll (Driscoll FG. 1995) for an overburden well (0.051 m radius) located in the basal till unit (i.e., the overburden unit with the greatest capacity for water production). For a well situated in this unit pumping at its maximum capacity it is reasonable to assume that the flow to that well would be governed by the average aquifer properties due to its radius of influence. Under these conditions the estimated well capacity is 0.02 cubic metres per day (m^3/d). Therefore, the well cannot be used for purposes other than drinking because the well capacity is too low.* *This conclusion is supported by observations during routine groundwater sampling campaigns at boreholes on the WL* [Whiteshell Laboratories] *site. In both 2018 and 2019, groundwater sampling of the basal sand unit boreholes downgradient of WR-1 were incomplete due to an inability to obtain sufficient water for sampling (CNL 2019, 2020). This reinforces the conclusion that drinking water wells are unlikely downgradient of the WRDF due to a very low potential well capacity to support the needs of any potential future human receptor. This disruptive event was carried forward as a bounding scenario (see Section 5.4.3.3.3 Well in Plume Bounding Scenario).”*

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					WR-1, and uncertainty in the current integrity and degradation rates of the building foundation, it may be more appropriate to assume complete degradation of these barriers over the reference timeframe. Performance of the natural barrier system: in Section 2.4.5 of the DSAR, CNL states that: "the expected longevity and integrity of the subsurface geological surround, including the WR-1 ISD structure, is encompassed by the Normal Evolution Scenario", however it is not clear how this may be the case without adequate characterization of the site geology and it's anticipated evolution in the reference time frame (see related comments on the EIS). CNL should provide supporting evidence to demonstrate that the site geology and its anticipated evolution in the reference time frame is being considered in the Normal Evolution Scenario, and has been adequately documented in supporting documentation. **Expectation to Address Comment:** CNL should reassess their proposed Normal Evolution Scenario and take into consideration the following: i) an on-site human resident drinking groundwater from a well capturing the plume; ii) 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 iii) adequate characterization of the current geology and its evolution within the reference timeframe.	ii) Further investigations of key model parameters have been carried out in order to better define the modelling. Hydraulic conductivity of the existing foundation was measured during the WR-1 Building Condition Assessment (Section 4.2.7 in Golder 2022b) and the grout formula was finalized and tested in Phase 1000 Grout Formulation Testing Report (Section 5.2 in Golder 2022c). This information was used to validate the assumptions used in the Groundwater Flow and Solute Transport Modelling Report (Golder 2021b, Sections 4.1.4 and Sections 4.1.5). Where uncertainties remained regarding the performance of the barriers, best estimates have been used as part of the Normal Evolutions scenario, and Sensitivity Analyses were performed to understand the impact of the barrier degradation uncertainty (Golder 2021b, Section 5.1). Sensitivity Analyses were performed to examine the impact of a change in corrosion rates. Any reduction in corrosion rate produced a comparable reduction in peak dose rate. The lifetime of barrier materials (cap, foundation, grout) was examined through sensitivity analyses in the Groundwater Solute Transport modelling (Golder 2021b). The base case assumed that the concrete barriers complete their first degradation step (hydraulic conductivity is doubled) within 500 years. The sensitivity cases assumed that time is reduced to 250 years, and show no significant changes to peak releases. Both time frames were considered conservative based on the available literature and other analogues as provided in the Technical Memorandum on barrier performance (Golder 2020). Other sensitivity analyses examined the effects of sudden failures (such as a crack in the foundation wall) or changes in the geosphere, and show there is very little effect on the overall impact. WRDF performance in mitigating releases until after the peak dose rate has occurred (~1000 years) was considered sufficiently evaluated, and accounts for variability in what are already considered conservative assumptions of geosphere performance, barrier degradation and component corrosion. The results of sensitivity cases on individual barriers are discussed in Section 6 of the DSAR, and conservatism within the models to address uncertainty is discussed in Section 5.7.1 iii) The text on reference timeframes within former Section 2.4.5 of the DSAR is currently in Section 5.4.3 of the DSAR. The DSAR does not provide details on the current or future geology of site, but rather confirms that the geological properties and their future evolutions are part of Normal Evolution scenario (Section 5.4.3.1). As indicated in Section 2.1.3 of the DSAR, a detailed description of the regional and local geology and hydrogeology of the WL site is provided in the WR-1 Hydrogeological Study Report (Dillon 2018), the Geosynthesis for WR-1 Environmental Impact Statement (CNL 2022), as well as Section 6.3.1.5 (Description of the Environment) of the Environmental Impact Statement (Golder 2022a). The natural evolution of the site geology and hydrogeology during the project timeframe is provided in Section 5.2 of the Geosynthesis. **Change to DSAR:** No changes to this section of the DSAR were required specifically as part of this response; however, the DSAR has been significantly revised since last submission. **References:** *CNL 2019. 2018 Progress Report on the Environmental Assessment Follow-Up Program for Whiteshell Laboratories. WL-509246-ACMR-2018. Revision 1. June 2019.* *CNL 2020. 2019 Progress Report on the Environmental Assessment Follow-Up Program for Whiteshell Laboratories. WL-509246-ACMR-2019. Revision 0. June 2020.* *CNL 2022. Geosynthesis for WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. January 2022.* *Dillon 2018. WR-1 Hydrogeological Study Report, WLDP-26000-REPT-004. Revision 1. November 2018.* *Driscoll FG. 1995. Groundwater and Wells. 2nd ed. US Filter / Johnson Screens.* *Golder 2020. CNL WR-1 Information Request No 48. Technical Memorandum. GAL-132-1656897. March 2020.* *Golder 2021a. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2021b. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow And Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022a. Environmental Impact Statement for the In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Golder 2022b. Building Condition Assessment In-Situ Decommissioning of Whiteshell Reactor 1 (WR-1). WLDP-26000-REPT-011. Revision 1. May 2022.* *Golder 2022c. CNL Whiteshell Reactor 1 – Phase 1000 Grout Formulation Testing Report. WLDP-26000-REPT-12. Revision 1. May 2022.*

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193.	CNSC	E. Dagher	DSAR - Section 2.4.5, Table 2.4.5-2 Section 2.4.5.3 Disruptive Event Scenarios and Bounding Scenarios	63 to 65 77 to 79	**Comment:** In Table 2.3.5-2 and Section 2.4.5.3, CNL is using the terminology of Bounding Scenarios to describe Disruptive Event Scenarios. As per G-320, bounding assessments are used to provide limiting or "worst-case" predictions, whereas Disruptive Event Scenarios, including human intrusion are used to test the robustness of the system in the occurrence of an improbable or unlikely event. **Expectation to Address Comment:** Use the appropriate terminology and distinguish between Disruptive Event Scenarios and Bounding Scenarios.	**Incorporated:** The Decommissioning Safety Assessment Report (DSAR; Golder 2021) was updated and the terminology of 'Bounding Scenarios' and 'Disruptive Events' was clarified and made consistent throughout the document. Disruptive Events are variations of the Normal Evolution Scenario, designed to test the robustness of the system and address uncertainties that have arisen during the definition of scenarios and conceptual models. Each Disruptive Event is described with specific scenario assumptions. Bounding Scenarios are Disruptive Events that have been identified as having the consequences greater than the other Disruptive Events considered. **Change to DSAR:** The entire DSAR has been revised to provide consistency. The appropriate terminology has been used and Disruptive Event Scenarios and Bounding Scenarios have been distinguished from one another in Section 5.4.3, as described above. Disruptive Events are described in Section 5.4.3.2. Disruptive Events have been expanded to include 'Seismicity' and 'Liquefaction'. Bounding Scenarios are described in Section 5.4.3.3, and indicate which disruptive events are bounded by them. **References:** *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.*
194.	CNSC	E. Dagher/ G. Su	DSAR - Section 2.4.5, Table 2.4.5-2 Scenario Development	63 to 79	**Comment:** Section 2.4.5 does not provide a clear description of each scenario outlined in Table 2.4.5-2, including a description of the release characteristics and the transport and exposure pathways through the engineered and natural barrier systems to the defined receptors. **Expectation to Address Comment:** Provide a table and/or a diagram clearly describing the underlying assumptions of each scenario evaluated in the DSAR.	**Incorporated:** Please note that the Decommissioning Safety Assessment Report (DSAR; Golder 2021) has been significantly revised following CNSC input. The following response contains references to updated sections where the information is now provided. Each of the assessment scenarios is now described in Section 5.4.3 of the DSAR. The section has been revised to provide detailed description and underlying assumptions for the Normal Evolution Scenario (Section 5.4.3.1), each of the Disruptive Events (Section 5.4.3.2), and Bounding Scenarios (Section 5.4.3.3), which are Disruptive Events that produce the "worst case" scenarios with greatest consequences. Table 2.4.5-2 has been renumbered as Table 5.4.3-1 and has been revised to include all modelled scenarios, a description of the scenario, key scenario assumptions and the effect on the final model result. **Change to DSAR:** Table 5.4.3-1 in the DSAR has been revised as per text above.

<table>
<tr><th>No.</th><th>Department/ Agency</th><th>SME</th><th>Section Table or Figure</th><th>Pg. #</th><th>Information Request or Summary of Comment</th><th>Response by CNL</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>
Table 5.4.3-1: Normal Evolution Scenario and Disruptive Events Considered in the Decommissioning Safety Assessment
<table>
<tr><th colspan="3">Scenario</th><th colspan="2">Description</th><th>Key Scenario Assumptions</th><th>Solute Transport Model Result</th></tr>
<tr><td colspan="3">Normal Evolution Scenario</td><td colspan="2">The expected long-term evolution of the Project and the site following closure. The scenario includes the consideration of probable features, events and processes, such as forest fires, and flooding.</td><td>■ Based on the timeframe for the assessment the Normal Evolution Scenario includes extreme conditions such as climate shifts
■ Groundwater flow and solute transport conditions are representative of base case conditions
■ An On-site Farm was not considered reasonable for the Normal Evolution Scenario. The WR-1 site will be under institutional control for the first 100 years of post-closure, which will physically restrict residential use of the site, including any farming activities. After institutional control, the WRDF site will be designated for commercial or industrial land use.</td><td>Base Case Simulation with model output provided as mass loading rates to the Winnipeg River.</td></tr>
<tr><td rowspan="8">Disruptive Events</td><td rowspan="3">Bounding Scenarios</td><td></td><td>WRDF Barrier Failure</td><td>Open fracture in the foundation of the WRDF; unconfined failure of waste isolation mechanism.</td><td>■ A significant void occurs resulting in non-conformance of the WRDF due to the failure of the concrete building foundation, grouting fabrication and/or installation is inappropriate, or the long-term performance deteriorates rapidly due to unforeseen or underestimated physical, chemical, and/or biological processes.
■ Presence of void represented in the groundwater flow model as a 2 m-wide zone of enhanced hydraulic conductivity (10,000 times higher than the hydraulic conductivity of the foundation as specified in the model) across the full width of the WRDF.
■ Results in incomplete encapsulation of the contaminated waste.
■ Human and ecological receptors exposure pathways would be consistent with the Normal Evolution Scenario.</td><td>Scenario 3 (WRDF Barrier Failure) – with model output provided as mass loading rates to the Winnipeg River.</td></tr>
<tr><td></td><td>Well in Plume</td><td>A well in the groundwater plume half-way between the WRDF and the Winnipeg River is used for drinking water by the on-site farm.</td><td>■ A farm is established on-site (On-site Farm), with the farmhouse being located directly over the WRDF.
■ Groundwater flow and solute transport conditions are representative of base case conditions.
■ Same as the Normal Evolution Scenario, except that the On-site Farm has a well in the groundwater plume from WRDF and is used for drinking water.</td><td>Scenario 16 – Half Pathway Length, with model output provided as groundwater concentrations.</td></tr>
<tr><td></td><td>Human Intrusion</td><td>Human intrusion into the WRDF by an exploration borehole.</td><td>■ Considers the drilling of an exploration well into the WRDF and into the ISD waste.
■ Groundwater flow and solute transport conditions are representative of base case conditions.
■ Contaminated waste would be brought to the surface during drilling and becomes mixed with clean material during excavation. Conservatively this waste would be assumed to be left on surface, as well as transported for testing.
■ Current drilling exploration best practices and standards are not followed during the intrusion.</td><td>Base Case Simulation with model output provided as dissolved and solids (total) concentrations within WR-1.</td></tr>
<tr><td rowspan="5">Non-bounding Scenarios</td><td></td><td>Localized Failure of the WRDF</td><td>Perforation of the WRDF barrier; localized failure of waste isolation mechanism.</td><td>■ Considers a localized failure in the grout encasement.
■ Small excess voids or a relatively moderate void occurs resulting in non-conformance of the WRDF.
■ To capture worst-case, it is assumed that incomplete encapsulation within the ISD results in a localized failure of the WRDF.
■ Human and ecological receptors exposure pathways are consistent with the Normal Evolution Scenario.</td><td>No equivalent solute transport modelling simulation was completed because it is bounded by the WRDF Barrier Failure Bounding Scenario.</td></tr>
<tr><td></td><td>Unsealed Borehole</td><td>Insufficiently sealed or substantially degraded site investigation or monitoring borehole.</td><td>■ Considers a deep borehole on the WL site not being properly sealed prior to abandonment, or the degradation over time of a currently sufficiently sealed well.</td><td>No equivalent solute transport modelling simulation was completed because it is bounded by the Human Intrusion Bounding Scenario.</td></tr>
<tr><td></td><td>Glaciation</td><td>Substantial perforation or excision of the WRDF and removal of the concrete cap and engineered cover.</td><td>■ As the current climate trend will likely delay the glacial period until 100,000 years after present, the scenario of human inhabitants returning to the area after the glacial retreat would be projected to occur 140,000 years from present.
■ The worst-case scenario is assumed to include the glacial advance having completely removed the concrete cap and engineered cover and excised the WRDF (i.e., glacial erosion), and glacial retreat having dispersed the ISD material within the surface environment.
■ Assumed that receptors consistent with the population present today would become established (i.e., consistent habits and exposure pathways).</td><td>Base Case Simulation with model output provided as total mass in WR-1 at 140,000 years.</td></tr>
<tr><td></td><td>Seismicity</td><td>Seismic event which would damage the WRDF.</td><td>■ This scenario considers the probability of a seismic event which could damage the WRDF. The results of the seismic analysis for WR 1 (1 in 10,000-year event, PGA = 0.10) indicate that there will be no cracking or displacement of any portion of the facility.</td><td>Not applicable.</td></tr>
<tr><td></td><td>Liquefaction</td><td>Liquefaction during a seismic event.</td><td>■ Given the aseismic conditions of Eastern Manitoba and the soil properties of the WL site, liquefaction is not anticipated to be an issue for the Project.</td><td>Not applicable.</td></tr>
</table>
Sections 5.4.3.1, 5.4.3.2, and 5.4.3.3 were created to provide descriptions for scenarios and events in Table 5.4.3-1.
References:
Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.
</td></tr>
<tr><td>195.</td><td>CNSC</td><td>E. Dagher/ G. Su</td><td>DSAR - Section 6.1.3, Table 6.1.3-1 FEPs</td><td>187 to 222</td><td>Comment: It does not appear that effects of permafrost have been considered as a features, events and processes (FEP). Other periglacial effects such as frost penetration and action need further assessment based on the further characterized physical property of the overburden soils.
Expectation to Address Comment: Clarify whether the effects of permafrost have been included or excluded as an FEP and justify why. In the event that it has been included, describe how permafrost and its evolution were considered within the assessment of scenarios. Re-assess the effect of frost penetration and action on the project based on the further characterized overburden soils.</td><td>
Resolved As:
Please note that the Decommissioning Safety Assessment Report (DSAR; Golder 2021) has been significantly revised following CNSC input. The following response contains references to updated sections where the information is now provided.
Features, Events and Processes (FEPs) are listed in Appendix C, Attachment A of the DSAR.
Long-term frost penetration and permafrost are addressed in FEP #1 3 4 “Periglacial effects”. FEP #1 3 4. states that “Frost penetration in soils may result in ice lens formation and heaving. Climate change would result in warmer and wetter, not cold enough for permafrost conditions to develop. Permafrost would only develop at the onset of a glaciation period, which is not expected within the 10,000-year assessment time period.” The Periglacial effects were thus excluded from the assessment.
Frost penetration and freeze-thaw cycles are also addressed through FEP #2 2 10, which states that frost penetration is not included in the analysis because it is negated by the depth of Whiteshell Reactor Disposal Facility (WRDF), which protects it from frost penetration, and thus from freeze-thaw cycles.
Change to DSAR:
Appendix C, Attachment A of the DSAR for FEP #1 3 4 was revised as follows:
“Frost penetration in soils may result in ice lens formation and heaving. Climate change would result in warmer and wetter, not cold enough for permafrost conditions to develop. Permafrost would only develop at the onset of a glaciation period, which is not expected within the 10,000-year assessment time period.”
Appendix C, Attachment A of the DSAR for FEP #2 2 10 was revised as follows:
</td></tr>
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						"The depth of the WRDF (near surface but sufficiently deep to protect from frost penetration) excludes the potential for impacts from changes in host rock and substrate condition. This FEP is not relevant to the WRDF long-term performance and safety." **References:** *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.*
196.	CNSC	E. Dagher/ G. Su	DSAR - Section 6.1.3, Table 6.1.3-1 FEP# 2 1 12	206	**Comment:** It is understood that gas will be generated during the life time of the project. However, it is not clear whether "gas sources and effects (in wastes and EBS)" has been taken into account within the Normal Evolution Scenario or other scenarios, although it has been included as an FEP in Table 6.1.3-1. **Expectation to Address Comment:** CNL should describe whether/how it has considered the effects of gas generation and migration on the facility safety within the Normal Evolution Scenario and a description of any models that have been used in the safety assessment.	**Resolved As:** Please note that the Decommissioning Safety Assessment Report (DSAR; Golder 2021) has been significantly revised following CNSC input. The following response contains references to updated sections where the information is now provided. The effects of generation of gasses were considered via two main features: generation of hydrogen gas during closure phase and off-gassing of waste materials in the post-closure phase. The two features are described as follows: 1. Within the DSAR, off-gassing of tritium, generation of hydrogen and general airborne particulates are included in the assessment of the Normal Evolution Scenario in Section 7.1 (Radiological Assessment for Workers Under Normal Conditions), specifically in Table 7.1.1-1 – Item 2, and in the Features, Events and Processes (FEP) evaluation in Appendix C, Attachment A of the DSAR, where gas generation is listed as FEP #2 1 12 and is included in the assessment. No specific modeling of hydrogen generation has been performed in the safety assessment for Whiteshell Reactor 1 (WR-1). It is considered as a well-understood construction phenomenon that will be mitigated using material isolation, grout formulation with lower pH, or adequate ventilation when interactions with aluminum are anticipated, as well as controlled under existing CNL Fire Protection procedures (Environmental Impact Statement (EIS; Golder 2022)), Table 7.4-1 and Section 7.3.6 Fires and Explosions in the EIS. The consideration of hydrogen gas generation during grouting is explicitly documented in the project Design Requirements document (CNL 2020). 2. During closure scenario, any off-gassing of waste material will be controlled by providing adequate ventilation and monitoring. During the Post-Closure Phase, off-gassing (volatilization) of waste materials resulting in volatile radionuclides migrating through the barriers to where they can be taken up by the receptors has been considered in the Normal Evolution Scenario (Section 8.2.1 of the DSAR). There is no direct release to air; however, for volatile radionuclides (tritium, carbon-14, iodine-129), receptors will be exposed via the air pathway (inhalation and immersion) through volatilization from irrigated soil. **Change to DSAR:** Section 8.2.1 was revised to include: *"There is no direct release to air; however, for volatile radionuclides (tritium, carbon-14, iodine-129), receptors will be exposed via the air pathway (inhalation and immersion) through volatilization from irrigated soil. All tritium mass was conservatively assumed to migrate via the groundwater flow pathway without loss to volatilization."* Table of Features, Events and Processes has been moved to Attachment A of Appendix C of the DSAR. It is too large to reproduce here. **References:** *CNL 2020. Design Requirements for WR-1 Disposal Facility. WLDP-26000-DR-001. Revision 0. March 2020.* *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement for the In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
197.	CNSC	G. Su	DSAR - Section 6.1.3, Table 6.1.3-1 FEP# 1 2 3	193	**Comment:** Seismicity is excluded from FEP as CNL claims that the project site is within a region recognized as aseismic. As per comment #148 above, it is inappropriate to claim the site is aseismic based on a short period of measurements of seismicity in the region. The seismic hazard of the site should be	**Incorporated:** Seismicity has now been included in the Features, Events and Processes (FEP) FEP #1 2 3 in Appendix C, Attachment A of the Decommissioning Safety Assessment Report (DSAR; Golder 2021). It was also considered as a Disruptive Event in Section 5.4.3.2.7 in the DSAR, and included in Table 5.4.3-1. A seismic hazard assessment was prepared by CNL Engineering (CNL 2018) and the results were incorporated into the groundwater model and the Post-Closure Safety Assessment as required. The overall effect of seismicity on the post-closure safety was not deemed to be significant enough to include it

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					determined/assessed with consideration of the timeframe that is defined for the project. **Expectation to Address Comment:** Seismicity should be included as the FEP and its effect on the facility safety should be assessed under a normal evolution scenario.	within the Normal Evolution Scenario. Instead, the potential effects of an unanticipated (beyond design-basis) seismic event are appropriately bounded through the disruptive events and bounding scenarios that examine the effects of significant structural failure of the Whiteshell Reactor Disposal Facility (WRDF) barriers. **Change to DSAR:** Table 5.4.3-1 now includes seismicity as a Disruptive Event. The Key Scenario Assumption for Seismicity is stated in Table 5.4.3-1 as the following: *"This scenario considers the probability of a seismic event which could damage the WRDF. The results of the seismic analysis for WR-1* [Whiteshell Reactor 1] *(1 in 10,000-year event, PGA = 0.10) indicate that there will be no cracking or displacement of any portion of the facility."* Section 5.4.3.2.7 was added that states: "*In 1995, the NBCC [National Building Code of Canada] placed the WL [Whiteshell Laboratories] site (and all of Manitoba) within a Seismic Zone 0, a zone that has a probability of exceedance of 0.0021. The PGA [peak ground acceleration] data from NBCC was considered for the years 2005, 2010, and 2015. The trend since 2005 is that for every probability of exceedance, the seismic hazard at the WL site has decreased. For the 1 in 10,000-year probability of exceedance, the PGA is approximately 0.10. Comparatively, the 0.10 PGA represents an earthquake of about Moment Magnitude 4.5. This is considered a relatively small earthquake for which one would not expect structural damage for NBCC designed buildings and components. There could be some non-structural damage such as fine cracking of non-ductile non-structural elements (e.g., plaster or drywall). Structures that could experience damage due to this size of earthquake are those located on soils that are susceptible to amplification and/or have quite low natural frequencies (comparatively high mass and/or low stiffness). These structures may have characteristics that make them susceptive to earthquakes (i.e., tall structures with no bracing or shear walls, strongly asymmetric geometry, torsionally sensitive [centre of mass is far from the centre of stiffness], or constructed from brittle materials [e.g., unreinforced masonry]). Conventionally designed structures using ductile materials (structural steel or reinforced concrete) following good engineering practices that incorporate bracing/shear walls, symmetric geometry, and low horizontal eccentricity are not likely to be damaged by this level of earthquake. The results of the seismic analysis for WR-1 [Whiteshell Reactor 1] (1 in 10,000-year event, PGA = 0.10) indicate that there will be no cracking or displacement of any portion of the facility."* **References:** *CNL 2018. Whiteshell Seismic Hazard. WLDP-26000-021-000-0009. June 2018.* *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.*
198.	CNSC	E. Dagher	DSAR - Section 8.0 para 1, Table 8.0-1	299	**Comment:** There is a large disconnect between the text in Section 8.0 "Maintenance, Monitoring, and Design Implications", which references Table 8.0-1 as summarizing the results of the analysis completed as part of the DSAR, and the information actually provided in Table 8.0-1, which summarizes a HAZOP and Accidents & Malfunctions Analysis. **Expectation to Address Comment:** Ensure the information on "Accidents & Malfunctions", as well as the information on "Maintenance, Monitoring, and Design Implications", are appropriately captured in the right sections of the DSAR. To clarify what appears to be the intent of Section 8, and meet requirements of G-320, Section 8 should discuss and make reference to the monitoring programs that will be used in both the closure phase and the post-closure phase during active and passive institutional controls. Refer to Guidance on Monitoring programs in IAEA SSG-31.	**Resolved As:** Please note that the Decommissioning Safety Assessment Report (DSAR; Golder 2021) has been significantly revised following CNSC input. The following response contains references to updated sections where the information is now provided. Monitoring and Surveillance, formerly found in Section 8.0 of the DSAR is now found in Section 11.0. The concordance table (Table 1) in Appendix A has been revised to clearly identify where and how the requirements of REGDOC-2.11.1 (CNSC 2018, formerly G-320) and SSR-5 (IAEA 2011) are met in the DSAR. It identifies SSG-31 (IAEA 2014) as a source for guidance on the monitoring programs. Section 5.4 (Assessment Scenario Development) of the DSAR outlines the systematic process completed to develop scenarios for detailed assessment including accidents and malfunctions. Additional detail on the accidents and malfunctions considered for the Whiteshell Reactor 1 (WR-1) Project is provided in an Accidents and Malfunctions Report (ISR 2016). Information on maintenance, monitoring and design implications is provided in Section 10.0 (Institutional Control), Section 11.0 (Monitoring and Surveillance) and Section 12.0 (Limits, Controls and Conditions) of the DSAR. **Change to DSAR:** The following text was added to Section 11.0 of the DSAR (Golder 2021): "*CNL has revised the EAFP [Environmental Assessment Follow-up Program] for the WL [Whiteshell Laboratories] site to incorporate the proposed monitoring and reporting specific to the Project. For further information see work package #10 in Table 3 of the EAFP (CNL 2018e).*"

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						References: *CNL 2018e. Environmental Assessment Follow-Up Program for Whiteshell Laboratories. WL-509246-STD-001. Revision 0. December 2018.* *CNSC 2018. REGDOC-2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. May 2018. ISBN 978-0-660-25806-5* *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *IAEA 2011. Disposal of Radioactive Waste. SSR-5. April 2011.* *IAEA 2014. Monitoring and Surveillance of Radioactive Waste Disposal Facilities. SSG-31. May 2014.* *ISR (International Safety Research Inc.) 2016. CNL WR-1 In-Situ Decommissioning Activities Accidents and Malfunctions. 3014-01-02. November 2016.*
199.	CNSC	E. Dagher	DSAR - General and Appendix 2.1-1 Concordance Table	General	**Comment:** CNL has provided a concordance table in Appendix 2.1-1, which identifies sections of the DSAR which align with G-320 and IAEA SSR-5. However, a more detailed review of these sections has identified that in many cases the required information is either not included, incomplete, or not adequately referenced. Additionally, the level of conservatism applied for key model parameters of barrier performance (engineered and natural), and in the development of the Normal Evolution Scenario and Bounding Scenarios, should be included and justified commensurate with the level of uncertainty that exists within the safety strategy (see related comments). As a result of CNSC staff's assessment, 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 G-320. In alignment with guidance provided in CNSC G-320 (Section 5.0) and IAEA SSR-5 (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 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 to this comment table below) in which the Preliminary	**Resolved As:** Please note that the Decommissioning Safety Assessment Report (DSAR; Golder 2021) has been significantly revised following CNSC input. The concordance table that that was in Appendix 2.1-1 is now in Appendix A of the DSAR. The DSAR was developed in accordance with the guidance of REGDOC 2.11.1, Vol. III (CNSC 2018, formerly G-320) and IAEA SSR-5 (IAEA 2011). Appendix A of the DSAR includes a revised concordance table to indicate how each clause of REGDOC 2.11.1 and SSR-5 have been met by CNL in the DSAR or the supporting documents. The DSAR includes a re-organized Section 5.0 that focuses on the assessment approach, including: • How the approach addresses the principles of radioactive waste management identified in CNSC's REGDOC-2.11.1, Vol. III (CNSC 2018) to demonstrate the safety of the Whiteshell Reactor Disposal Facility (WRDF) during the closure and post-closure phases – Section 5.0. • Scientific and engineering principles used in the design of the Whiteshell Reactor Disposal Facility (WRDF) – Section 5.1; • The revised safety assessment and the assessment scenario development process – Section 5.4.3; • How the design process was iterated and founded on technical studies performed specifically for this Project to support the design and assessment with scientific evidence – Section 5.6.2; • Section 5.7.1 of the DSAR specifically provides a discussion on the conservatism used in all key model parameters, including assumptions and conservatism used for any areas of uncertainty in the Normal Evolution Scenario, as well as the additional levels of conservatism applied in the Bounding Scenarios to explore the limits of potential conditions. • Section 5.9 of the DSAR provides a list of Technical Supporting studies that were performed by CNL to complement the safety assessment and help reduce uncertainty. In addition to the DSAR, CNL has also prepared a Safety Case document (CNL 2020) to demonstrate to the CNSC that in situ disposal of Whiteshell Reactor 1 (WR-1) is safe during the physical decommissioning phase and during the long term post-closure phase. The Safety Case was developed based on the guidance of REGDOC 2.11.1, Vol. III (CNSC 2018), IAEA SSG-23 (IAEA 2012), REGDOC 2.9.1 (CNSC 2020), IAEA GSR-4 (IAEA 2016), IAEA SSG-29 (IAEA 2014a), IAEA SSG-31 (IAEA 2014b) and IAEA-TECDOC-1814 (IAEA 2017). SSG-23 states that the Safety Case is the collection of scientific, technical, administrative and managerial arguments and evidence in support of the safety of a disposal facility, covering the suitability of the site and the design, construction and operation of the facility, the assessment of radiation risks and assurance with the context of WR-1 Building in situ disposal activities. The Safety Case applies to both the closure and post-closure phases of the project in support of the application for approval to dispose of the WR-1 Building in situ. As required in SSG-23, the Safety Case document will be updated as needed during the WR-1 Building in situ disposal activities. **Change to DSAR:** The DSAR was significantly revised since the last submission. Section 5 of the DSAR specifically updated as described above. Table 2.1-1 is now located in Appendix A of the DSAR, and was updated to reflect the revision from G-320 to REGDOC 2.11.1, Vol III. The 'Decommissioning Safety Assessment Report Section' column was significantly expanded to include not just a reference to a section, but a summary of how and what content in that section addresses the legislated requirements. **References:** *CNL 2020. Safety Case for the In Situ Disposal of WR-1. WLDP-26000-SAR-002. Revision 1. June 2020.* *CNSC 2018. REGDOC-2.11.1, Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management. May 2018. ISBN 978-0-660-25806-5*

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					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:** Submit a safety case, which meets CNSC staff's expectations, in alignment with 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.	*CNSC 2020. REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.2. September 2020. ISBN 978-0-660-06255-6.* *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *IAEA 2011. Disposal of Radioactive Waste. SSR-5. April 2011.* *IAEA 2012. The Safety Case and Safety Assessment for the Disposal of Radioactive Waste. SSG-23. September 2012.* *IAEA 2014a. Near Surface Disposal Facilities for Radioactive Waste. SSG-29. March 2014.* *IAEA 2014b. Monitoring and Surveillance of Radioactive Waste Disposal Facilities. SSG-31. May 2014.* *IAEA 2016. Safety Assessment for Facilities and Activities. GSR-4. February 2016.* *IAEA 2017. Contents and Sample Arguments of a Safety Case for Near Surface Disposal of Radioactive Waste. IAEA-TECDOC-1814. June 2017.*
200.	ECCC		DSAR - Appendix 5.1.2-1 CNL WR-1 In Situ Decommissioning Activities Hazard Identification and CNL WR-1 In Situ Decommissioning Activities Accidents and Malfunctions, Section 2.2.3	38	**Comment:** The Appendix indicates: "A governing document index is provided (CW-509200-GDI-101 Revision 1) so that individuals involved with the Environmental Protection Program have a comprehensive list of documentation used within the program. Refer to Section 4.3.4.10.1.7 Post-closure Monitoring for a brief description of the environmental assessment follow-up." ECCC was not able to locate the above-mentioned section. It is important to fully understand CNL's environmental monitoring and follow-up capacities in order to assess whether they are commensurate with the credible environmental risks and remediation expectations. **Expectation to Address Comment:** Provide Section 4.3.4.10.1.7 Post-closure Monitoring for review of follow-up activities and capacities.	**Resolved As:** Please note that the Decommissioning Safety Assessment Report (DSAR; Golder 2021) has been significantly revised following CNSC input. Appendix 5.1.2-1 is now found in Appendix B of the DSAR. Section 4.3.4.10.1.7 is now found in Section 6.7 (Post-Closure Monitoring) of the DSAR. Additional details regarding follow-up monitoring of the Whiteshell Reactor Disposal Facility (WRDF) are provided in Section 10.0 (Institutional Control), and Section 11.0 (Monitoring and Surveillance) of the DSAR. Section 6.7 (Post-closure Monitoring) outlines how post-closure environmental monitoring is the final barrier used as part of the defence in depth process of applying multiple layers of protection against normal and abnormal events. Section 10.0 (Institutional Control) describes the institutional control period for the Project including the period of active management, surveillance and monitoring to demonstrate the site conditions evolve as predicted and the WRDF performs as expected. Section 11.0 (Monitoring and Surveillance) outlines at a high level the monitoring planned for the Project including the development of an Environmental Assessment Follow-up Program (EAFP) for the Project and that program will be prepared to be consistent with relevant CSA N288 Standards, where applicable. Section 2.2.3 Environmental Protection in Revision 2 (Golder 2017) of the DSAR provided a high-level legislative and organizational framework under which the environmental protection and emergency preparedness work is planned, controlled and executed. The references in this section described the program documents, and not specific mitigation or response plans. **Change to DSAR:** The following text was added to Section 11.0 of the DSAR: "*CNL has revised the EAFP for the WL [Whiteshell Laboratories] site to incorporate the proposed monitoring and reporting specific to the Project. For further information see work package #10 in Table 3 of the EAFP (CNL 2018e).*" **References:** *CNL 2018e. Environmental Assessment Follow-Up Program for Whiteshell Laboratories, WL-509246-STD-001. Revision 0. December 2018.* *Golder 2017. In Situ Decommissioning Of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 2. September 2017.* *Golder 2021. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.*
					Groundwater Flow and Solute Transport Modelling Report	
201.	CNSC	Q. Zheng	GWFSTMR - WR-1 Groundwater Flow and Solute Transport	N/A	**Comment:** With respect to model calibration and solute transport simulation: The calibrated recharge rate of 0.8 mm/yr over the whole modeling domain represents 0.14% of the annual average precipitation	**Resolved As:** **Regarding the infiltration rate on pg. 86 (Formerly page 90):** The net infiltration of approximately 100 mm/year in the 2017 version of the Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2017) was reported inaccurately. The 100 mm/year value represents the total precipitation minus evapotranspiration, and does not include a runoff component (which is significant). Average annual precipitation for the Whiteshell

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			Modeling Report WR-1 Hydrogeological Study Report		of 562 mm/yr. It seems very small. Confusingly, it states on p.90 that the estimated net infiltration rate for the WL area is approximately 100 mm/yr. The model does not consider water collected by sumps in other buildings other than WR-1; The ratios of K_h:K_v are very large for some stratigraphic units, particularly for basal sand (340); Considering the non-uniqueness of groundwater flow model calibration, it should be demonstrated if a different combination of parameters (e.g., larger recharger rate, larger hydraulic conductivity, smaller ratio of K_h:K_v, incorporation of sumps in other buildings other than WR-1 within the modeling domain, etc.) is possible. If it is possible, it would indicate a more conservative case in predicting the impact of the contaminants. It is understood from the hydrogeology report that the shallow bedrock is highly fractured, and thus fractures would form the preferential pathways for groundwater flow. Would an equivalent porous media model be conservative in predicting the impact of solute transport in fractured media? **Expectation to Address Comment:** Justify the very small values of recharge rate and ratio of K_h:K_v. Demonstrate if a different combination of parameters (e.g., larger recharger rate, larger hydraulic conductivity, smaller ratio of K_h:K_v, incorporation of sumps in other buildings other than WR-1 within the modeling domain, etc.) is possible. Evaluate the conservativeness of conceptualizing the fractured media as equivalent porous media in the modeling.	Laboratories (WL) area is 562 mm/yr, based on the 1964-1988 period of record (Thorne and Hawkins 2004). Based on studies of hydrological processes within the WL site, evapotranspiration and runoff are the dominant components of the site water balance, and account for most (98% to 99%) of the overall water budget (Thorne and Hawkins 2004), indicating that only a small fraction of the overall precipitation is available as infiltration, approximately 5-11 mm/year. This was corrected in the revised description of Scenario 2 in Section 5.1, as well as in Section 3.4 (Model Calibration) of the revised 2021 GWFSTMR (Golder 2021). **Regarding the sumps:** A comparison was made between sump elevation, hydrostratigraphic units, and the groundwater elevation at all sump locations. The flow rates of the sumps operating in other buildings are small in comparison to the Whiteshell Reactor 1 (WR-1) building. The sumps in other buildings are shallow compared to the sump in WR-1, hence they do not interact with the principal pathway (bedrock layer found below the WR-1 building structure). The sumps from other buildings collect water that percolates down from the surface around their individual building perimeters, similar to the weeping tiles in typical house designs. These sumps do not collect or influence the groundwater flow at depth in any way as there are tens of meters of low permeability clay layers between the building weeping tiles and the bedrock that is below the WR-1 building. **Regarding the K_h-K_v ratio and model calibration:** The low anisotropy ratio was necessary to achieve an acceptable calibration with respect to both groundwater elevations and flows into the WR-1 building sump. Groundwater elevations from multi-level monitoring wells show very strong vertical gradients at the site (see Table 2-2 in the GWFSTMR), which could only be reproduced in the model through the selected anisotropy ratios. Alternative model configurations with lower anisotropy ratios and higher recharge failed to reproduce the strong vertical gradients observed in groundwater monitoring wells. The low recharge value was necessary to avoid mounding of groundwater above ground surface. The measured flow rates into the WR-1 building sump were used to bound the selection of hydraulic conductivity. Alternative configurations of the model were evaluated during the model calibration process and it was found that further increases in hydraulic conductivity resulted in unrealistic simulated groundwater flow rates into the sump. It is noted that the horizontal hydraulic conductivities specified in the model are larger than the geometric mean measured values for the clay and clay till units, and equivalent to the geometric mean value for the basal unit. It should be noted that the basal unit is at times referred to as "basal sand", though this unit is in fact a till composed primarily of silt, with sand and clay. This is clarified in the Geosynthesis report (CNL 2022) and carried through the various documents. The large anisotropy ratios determined through model calibration are consistent with geological descriptions of the laminated nature of the surficial deposits. For example, Cherry et al. (1970) describe the clay unit as follows: *"The lower unit is composed of massive to laminated clay and silty clay."*. Its lacustrine origin has been well established by McPherson (1968) who mapped the Agassiz deposits in outcrops along the Winnipeg River between Seven Sisters Falls and Lake Winnipeg. Varve-like laminations, which occur in the Winnipeg River outcrops are indicative of lacustrine deposition and are well exhibited in Shelby tube samples. The end goal of the calibration is to identify the preferred groundwater path and transport time. The uncertainty in that estimate is examined through Sensitivity Case #1, preferential pathway. The results show that for the short lived mobile nuclides like H-3 there is a corresponding increase in total release rate due to the shorter transport time. The impacts of such a pathway would be identified and mitigated through the institutional control and environmental monitoring program. For longer lived nuclides released from the slow degradation of the reactor components, the model is relatively insensitive to the change, because the wasteform degradation is the driving parameter behind contaminant release. This sensitivity discussion is provided in Section 5.2 of the GWFSTMR (Golder 2021). Sensitivity case #1 further reinforces the appropriateness of using an equivalent porous media concept in the modelling, as these faster pathways do not significantly affect the assessment outcomes. **Change to GWFSTMR:** Section 5.1 Scenario 2 description was revised to: "*In the base case post-closure groundwater flow model a specified rate of infiltration was applied to the cover based on assumptions regarding the cover characteristics. The infiltration rate ranged from 0.8 mm/yr for the initial simulation to 8 mm/yr for the final simulation stages (the rate increased to account for degradation of the cover material over time). In order to address the uncertainty associated with these assumptions the groundwater flow model was reconfigured to specify a constant head boundary throughout the cover in order to maintain a water table depth of half a metre below-ground surface for all stages of post-closure. Results of the simulation indicate that prior to degradation of the foundation and grout the constant head boundary resulted in an equivalent infiltration rate through the grout of approximately 135 mm/yr. This value is larger than the estimated 5 mm/yr to 11 mm/yr net infiltration rate estimate for the WL area (Thorne and Hawkins 2004; refer to discussion on infiltration rates in Section 3.4). As such, the infiltration rate through the cover was conservatively maintained at 135 mm/yr for the Scenario 2 solute transport model, and this rate was applied to all stages of degradation of the grout and foundation.*"

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						References: *Cherry et al. 1970. Hydrogeologic Regime of the Environmental Control Area and Vicinity, Whiteshell Nuclear Research Establishment, Manitoba, Preliminary Progress Report. November 1970.* *CNL 2022. Geosynthesis for WR-1 Environmental Impact Statement. WLDP-26400-041-000. Revision 3. January 2022.* *Golder 2017. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 0. September 2017.* *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *McPherson 1968. Pleistocene Stratigraphy of the Winnipeg River in the Pine Falls – Seven Sisters Falls Area, Manitoba (Canada). April 1968.* *Thorne and Hawkins 2004. Hydrological Processes and Water Balance for the Dead Creek Watershed of Southeastern Manitoba. March 2004.*
202.	CNSC	R. Goulet	GWFSTMR - Section 4.1.3 Table 4.3	65 66	**Comment:** Release rates of radionuclides are very low. These low release rates are based on low corrosion rates obtained from supporting documentation for Ontario Power Generation's (OPG) application for the Deep Geological Repository (DGR) for Disposal of Low and Intermediate Level Waste. Theoretically, corrosion is mainly affected by salinity, pH, groundwater level variation and resistivity (Decker et al 2008). The groundwater model supporting documentation for the Whiteshell EIS indicates that the water table will likely vary around the reactor core. Corrosion of the reactor core and its components will be affected by variations in water levels. Combined with the alkalinity of the water in contact with the grout, it is possible that the corrosion rates used for the DGR project may not be conservative or apply to this project. **Expectation to Address Comment:** Justify the use of the OPG corrosion rates for their project.	**Resolved As:** The selected corrosion rates from the Ontario Power Generation (OPG) Deep Geological Repository (DGR) project are deemed justified because: - The corrosion rates were for aerobic humid conditions, which will be similar to the conditions expected in the Whiteshell Reactor Disposal Facility (WRDF). - The WRDF environment is expected to be alkaline because of the grout, leading to a significant inhibition of corrosion of the metals used in Whiteshell Reactor 1 (WR-1). The WR-1 Decommissioning Project reviewed both OPG data and additional international research results to confirm that the corrosion rates used in our models were reasonable. International references reviewed were: 1. E.A.C. Neeft, Carbon-14 Source Term CAST, Final overview of CAST (D7.23) Version 2, 06/08/2018. 2. S.W. Swanton, G.M.N. Baston and N.R. Smart, Rates of steel corrosion and carbon-14 release from irradiated steels – state of the art review (D2.1), AMEC, 07/01/2015. 3. Jean–Marie Gras, State of the art of 14C in Zircaloy and Zr alloys - 14C release from zirconium alloy hulls (D 3), 04/08/2014. 4. N.R. Smart and A.R. Hoch, A survey of steel and Zircaloy corrosion data for use in the SMOGG gas generation model, Serco Report SA/ENV-0841, Issue 3, 2010. 5. S. Feliu, M. Morcillo and S. Feliu Jr., The prediction of atmospheric corrosion from meteorological and pollution parameters - I. Annual corrosion, Corrosion Science 34(3), 403, 1993. These references all discussed the difficulty in developing corrosion data because of the very low rate of corrosion of carbon steel, stainless steel, and Zircaloy alloys when surrounded by grout (alkaline environments). These observations support the Whiteshell Laboratories Closure Project's selection of OPG data as the upper limit for the expected corrosion of WR-1 components in the WRDF. A Waste Form Synthesis Report (Arcadis 2021) was also produced, which further investigated and compared the selected corrosion rates from OPG DGR, and concluded that the corrosion rates used in WR-1 are generally consistent with the long term measurements. **Change to GWFSTMR:** Paragraph 1 of Section 4.1.3 of the Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2021) was revised to include: *"The corrosion rate for aluminum was assumed in the model to be effectively instantaneous (i.e., fully corroded within one year) due to the expectation of an alkaline environment in the WRDF due to the grout. The corrosion rate for ozhennite was conservatively based on the rate of Zr-alloy (ozhennite is shown to be less susceptible to corrosion than Zr-alloy [Boulton and Wright 1969]). It should be noted that the aluminum and ozhennite components constitute less than 1% of the overall mass inventory for the reactor. These corrosion rates were compared to international research into long term corrosion measurements in waste disposal applications in a Wasteform Synthesis Report (CNL 2020b) and it was concluded that the corrosion rates used in WR-1 assessment are generally consistent with the long term measurements. It was assumed that corrosion would occur on both sides of the reactor components."*

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						References: *Arcadis 2021. NPD and WR-1 In Situ Decommissioning Projects Waste Form Synthesis Report. 64-508760-REPT-017. Revision 1. July 2021.* *Boulton J, Wright MG 1969. Ozhennite 0.5 – Its Potential and Development. Symposium on Applications-Related Phenomena in Zirconium and its Alloys. American Society for Testing and Materials, ASTM special technical publication 458. pp 325 - 337.* *CNL 2020. Waste Form Synthesis Report. Arcadis - NPD and WR-1 In Situ Decommissioning Projects. 64-508760-REPT-017. Revision 0. April 2020.* *Feliu et al. 1993. The prediction of atmospheric corrosion from meteorological and pollution parameters.* *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - WR-1 Groundwater Flow and Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Gras 2014. State of the art of 14C in Zircaloy corrosion data for use in the SMOGG gas generation model.* *Neeft 2018. Carbon-14 Source Term CAST Final overview of CAST (D7.23) Version 2.* *Smart and Hoch 2010. A survey of steel and Zircaloy corrosion data for use in the SMOGG gas generation model.* *Swanton et al. 2015. Rates of steel corrosion and carbon-14 release from irradiated steels – state of the art review (D2.1).*
203.	CNSC	R. Goulet	GWFSTMR - Section 4.1.3 Table 4.3	65 66	**Comment:** CNL assumes that the radionuclides are evenly distributed within the calandria and heat transport system structures. This assumption does not appear particularly conservative. Further, the OPG DGR documentation reports a mean corrosion rate of 1E-7 m/yr. The OPG DGR also reports a maximum value of 1E-5 m/yr, 100 times higher than the current value used in the post-closure modeling for this ISD project. In the DGR project, to address barrier-related matters, OPG evaluated an instant release scenario. **Expectation to Address Comment:** In the event that using the corrosion rates from the OPG DGR is adequately justified, CNL should provide a sensitivity analysis of the corrosion rates in Section 5 of the report and determine how these corrosion rates will affect the breakthrough curves for groundwater and the Winnipeg River. CNL should also evaluate an instant release scenario in order to conservatively address the assumptions regarding corrosion rates and radionuclide distribution.	**Resolved As:** CNL deems that using the corrosion rates from Ontario Power Generation (OPG) Deep Geological Repository (DGR) has been adequately justified. This evaluation has been documented in Section 4.1.3 of the Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2021). CNL deems that the selected corrosion rates for the reactor components are justified because the recommended values from literature (NWMO 2011) are appropriate for neutral pH (other than for passivated steel), but the higher end of the range should be selected if conditions reach pH 5-6, which will not be present in the Whiteshell Reactor Disposal Facility (WRDF). CNL completed a sensitivity analysis of the corrosion rates. As detailed in Scenario 9 in Section 5.1 of the GWFSTMR, a model sensitivity analysis was completed where the corrosion rates were doubled for all reactor materials. The species contained in the reactor components are released congruently with the corrosion of the reactor; hence the release rate of species from the reactor components is effectively doubled, notwithstanding the impact of decay. Results of this simulation are provided in Section 5.2 of the GWFSTMR (Golder 2021). The results provided in Table 5-3 indicate that species with long half-lives, and non-sorbing properties (such as C-14) exhibited a 100% increase in the peak mass loading rates (fractions of a gram per year leaving the WRDF) with negligible change in the time the peak mass loading is observed. For species with some degree of sorption in the upper bedrock pathway (such as Nb-94, Ni-59, or Tc-99) the peak mass loading increased up to 60%, depending on the amount of sorption and the half-life of the particular species. Species such as Cs-137 and Sr-90 showed no change from doubling of the corrosion rate. The shorter half-lives of these radionuclides resulted in their total decay prior to release. As detailed in Section 4.1.3 of the GWFSTMR (Golder 2021) the model assumes an instant release of all radioactive species outside the Whiteshell Reactor 1 (WR-1) core, with the exception of lead. Species in the grout are also instantly dissolved with infinite solubility, except HB-40, which has a solubility limit of 0.8 mg/L and lead, which has a solubility limit of 0.1 mg/L. The model sensitivity to corrosion rate is the primary driver for the additional scrutiny CNL has put into selection of corrosion rates, and conservatism applied to that selection to provide confidence that corrosion rates are not underestimated within the model. The WR-1 Decommissioning Project reviewed both OPG data and additional international research results to confirm that the corrosion rates used in our models were reasonable. International references reviewed were: 1. E.A.C. Neeft, Carbon-14 Source Term CAST, Final overview of CAST (D7.23) Version 2, 06/08/2018. 2. S.W. Swanton, G.M.N. Baston and N.R. Smart, Rates of steel corrosion and carbon-14 release from irradiated steels – state of the art review (D2.1), AMEC, 07/01/2015. 3. Jean–Marie Gras, State of the art of 14C in Zircaloy and Zr alloys - 14C release from zirconium alloy hulls (D 3), 04/08/2014. 4. N.R. Smart and A.R. Hoch, A survey of steel and Zircaloy corrosion data for use in the SMOGG gas generation model, Serco Report SA/ENV-0841, Issue 3, 2010.

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						5. S. Feliu, M. Morcillo and S. Feliu Jr., The prediction of atmospheric corrosion from meteorological and pollution parameters - I. Annual corrosion, Corrosion Science 34(3), 403, 1993. These references all discussed the difficulty in developing corrosion data because of the very low rate of corrosion of carbon steel, stainless steel, and Zircaloy alloys when surrounded by grout (alkaline environments). These observations support CNL's selection of OPG data as the upper limit for the expected corrosion of WR-1 components in the WRDF. A Waste Form Synthesis Report (Arcadis 2021) was also produced, which further investigated and compared the selected corrosion rates from OPG DGR, and concluded that the corrosion rates used in WR-1 are generally consistent with the long term measurements. An instant release scenario for the reactor core or fuel channels would be an extreme assumption and there is no realistic mechanism to cause this release. CNL has, therefore, chosen not to evaluate the instant release scenario. None of the predicted changes in release rates of radioactive and non-radioactive species caused by doubling the corrosion rate of the reactor components had any impact on the environmental risk assessment for the WRDF. The WRDF continued to protect the public and the environment. **Change to GWFSTMR:** No changes were required to the GWFSTMR as a result of this comment. **Change to EIS:** No changes to the Environmental Impact Statement (EIS; Golder 2022) were required as a result of this comment. **References:** *Arcadis 2021. NPD and WR-1 In Situ Decommissioning Projects Waste Form Synthesis Report. 64-508760-REPT-017. Revision 1. July 2021.* *Feliu et al. 1993. The prediction of atmospheric corrosion from meteorological and pollution parameters.* *Gras 2014. State of the art of 14C in Zircaloy corrosion data for use in the SMOGG gas generation model.* *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow And Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Neeft 2018. Carbon-14 Source Term CAST Final overview of CAST (D7.23) Version 2.* *NWMO 2011. Post-closure Safety Assessment: Data. OPG's Deep Geologic Repository for Low and Intermediate Level Waste. Prepared by Quintessa Ltd. and Geofirma Engineering Ltd. March 2011.* *Smart and Hoch 2010. A survey of steel and Zircaloy corrosion data for use in the SMOGG gas generation model.* *Swanton et al. 2015. Rates of steel corrosion and carbon-14 release from irradiated steels – state of the art review (D2.1).*
204.	CNSC	E. Dagher	GWFSTMR - Section 4.1.4	67	Comment: In Section 4.1.4, CNL states that current specifications of the grout type(s) to be used in the decommissioning of WR-1 are not available. CNL also states that based on the grout specifications of the Savannah River analogue the grout formulation will provide a hydraulic conductivity of 1E-9 m/s, and CNL have assumed a hydraulic conductivity of 5E-8 m/s within the safety assessment to take into account voids which will not be penetrated by the grout. Due to the absence of evidence, the data presented does not support the claim that the grout (and cover) will perform as indicated. A level of conservatism for this model parameter should be included and justified commensurate with the level of uncertainty that exists. **Expectation to Address Comment:** A level of	**Incorporated:** To help provide background for this response, it should be noted that the grout is designed to prevent structural subsidence only. The grout is not intended to act as a barrier to contaminant release. It is modelled as a porous medium in which all contaminants are assumed to be evenly distributed and are available at a constant concentration at the exterior foundation wall for migration through the foundation wall at a rate dependent on the hydraulic conductivity of the wall. The property of grout important to the modelling is the hydraulic conductivity, which determines how quickly water can move through the grout to the foundation wall, which affects the rate of contaminant migration through the foundation wall. To help confirm that an appropriate level of conservatism is used in the modelling, CNL has since carried out a design and testing program for the grout mix to be used in the Whiteshell Reactor 1 (WR-1) building infilling (Golder 2022a). The testing program indicated an average hydraulic conductivity value of about 1.3E-11 m/s, which is significantly lower than the initial base case design conductivity used in the modelling of 5.0E-8 m/s. Thus, the hydraulic conductivity value used for the grout in the base case was deemed sufficiently conservative. CNL has also since completed designs for the reinforced concrete cap and soil cover (AECOM 2020). The designs specify a 0.85 to 1.0 m thick concrete cap and a 2.75 to 3.25 m engineered soil cover. The engineered soil cover was designed to provide the initial hydraulic recharge rate of 0.8 mm/year without relying on the reinforced concrete cap. CNL has also carried out a Building Condition Assessment to determine the condition and hydraulic conductivity

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					conservatism for this model parameter should be included and justified commensurate with the level of uncertainty that exists. Provide supporting evidence and make reference to appropriate documentation within the safety assessment report, to support the claim that the grout will perform as stated.	properties of the existing concrete foundation (Golder 2022b). Based on the Building Condition Assessment results (Section 4.2.7 of Golder 2022b), the hydraulic conductivity of intact concrete ranged from 1.16E-11 to 9.75E-11 m/s, which is in line with the literature review carried out (Golder 2020). Therefore the base case recharge rate of 2.5E-11 m/s (0.8 mm/year recharge) used in the modelling (Section 4.1.6 of the Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2021) was deemed sufficiently conservative. To address uncertainty surrounding long-term grout, soil cover and foundation performance, an additional Scenario 14 was evaluated and included in Section 5.1 of the GWFSTMR (Golder 2021). Scenario 14 modelled instant degradation (within approximately 100 years) of the grout and foundation by increasing the hydraulic conductivity of the grout and foundation walls to that of the surrounding soil. An additional literature review was also completed to justify selection of parameters (Golder 2020). This is a bounding condition because it models the flow of water as freely through the grout and the foundation wall as through the surrounding soil. This removes any uncertainty regarding the current or future condition of the grout by entirely removing the grout, cover, and foundation walls as barriers in the modelling. Revision to the GWFSTMR (Golder 2021), Section 5.1: The following text was added: *"Scenario 14 – Barrier Degradation Timeline* *The grout performance specification for hydraulic conductivity (9.5E-10 [CNL 2017b]) is approximately 50 times lower than the base case model value (i.e., a hydraulic conductivity of 5.0 E-08 m/s). However, the site-specific long-term performance of the grout (i.e., the rate of increase in hydraulic conductivity with material degradation) is uncertain. A simulation was completed to evaluate the potential changes to mass loading rates resulting from a rapid degradation of the grout. This change was achieved by increasing the hydraulic conductivity of the grout to 5.0E-07 m/s after 100 years (matching the highest value of the surrounding geological units). Because groundwater flow exiting the grout must pass through the foundation to be released to the environment, the hydraulic conductivity of the concrete foundation material was also increased to 5.0E-07 m/s after 100 years such that it would not limit the groundwater flow through the grout. The rate of recharge through the cover was also increased to 8 mm/year, which is equivalent to the recharge at the end of the base case simulation. This scenario is representative of a case in which the grout, the effect of grouting on the foundation, and the performance of the foundation as an effective barrier is limited to the first 100 years following decommissioning."* Section 5.2: The following text was added: *"The more rapid degradation of the grout and associated degradation of the foundation resulted in significant (two orders of magnitude) increases to the rate of flow through the grout, foundation and backfill for the period up to 5,000 years following decommissioning, after which flows in this Scenario were identical to the Base Case simulation.* *Radionuclides associated with the reactor (such as C-14) were not sensitive to the increase in groundwater flows resulting from the more rapid degradation of the grout and foundation. Release of these radionuclides is governed by corrosion of the reactor components, hence limiting the effect of the degradation of the other barriers. For species contained only in the biological shield, such as Cl-36, the increased flow through the grout and foundation resulted in a maximum increase in peak mass loading value by a factor of less than two. The results for Sr-90 and Cs-137 presented no change from the base case (i.e., zero mass loading).* *Overall, as in Scenario 4, the mass loading rate for solutes was not significantly affected by increases in the degradation rate of the building foundation, the grout, or the concrete cap."* This additional scenario further reinforces the conclusion that: *"Peak mass loading rates and earlier arrival to peaks was found to be less sensitive to: the degradation rate of the engineering components (within the ranges assessed); a local failure of the foundation; increase in the hydraulic conductivity of the backfill; an increase in the rate of degradation of the grout and foundation; and removal of the foundation."* – Section 6.0 of the GWFSTMR. One of the key assumptions of the solute transport modelling that was evaluated in the initial set of Sensitivity Analyses (Scenario 4, see Section 5.1 of the GWFSTMR) was that the source mass was distributed evenly throughout the grout and that solute transport occurred through the foundation, which was conceptualized as a 1 m thick concrete material. This assumption is conservative, as the grout itself is anticipated to provide some additional separation between the source mass (most of which is confined within the metal components of the reactor vessel) and the downstream environment. As shown in the sensitivity study (Section 5.2 of the GWFSTMR), in Scenario 4 where the grout was considered as a barrier, the resulting solute mass loadings to the downstream environment generally decreased. Inclusion of the grout as a barrier to solute migration generally resulted in considerably lower peak mass loadings and significant increases to the time of peak mass loadings. For solutes with relatively short half-lives (e.g., tritium), the mass loadings were reduced by more than an order of magnitude. These changes reflect the additional time required for solute mass to migrate through the grout prior to reaching the foundation. Exceptions to this can occur for solutes where the advective mass loading was the predominant component of the total mass released from the source area (e.g., for C-14, Scenario 4 resulted in a minor increase to peak mass loadings at the bedrock pathway outflow). Solutes such as Cl-36 were affected by the inclusion of the grout with regard to the timing of the peak mass loading value; Cl-36 experienced a delay of

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						over a factor of 2 and an 81% reduction in the estimated peak mass loading under Scenario 4. Species such as Sr-90 and Cs-137, which had no mass flux at the bedrock outflow in the Base Case scenario also had no mass flux following the addition of the grout to the pathway. In general the grout adds an additional effective barrier. Therefore, the additional model scenario (Scenario 14) demonstrates that the grout is expected to perform as described in Section 4.1.4 of the GWFSTMR. **Change to GWFSTMR:** The GWFSTMR was updated to include Scenario 14. A description of the scenario is provided in Section 5.1 and the results are provided in Section 5.2 (text copied above). **Change to EIS:** No changes to the Environmental Impact Statement (EIS; Golder 2022c) were required as a result of this comment. **References:** *AECOM 2020. Concrete Cap and Engineered Cover for the WR-1 Disposal Facility, WLDP-26000-235-000 #51799185. March 2020.* *CNL 2017b. Whiteshell Reactor 1 Grout Fill Requirements. WLDP-26000-041-000. November 2017.* *Golder 2020. CNL WR-1 Information Request No. 48. GAL-132-1656897. March 2020.* *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow And Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022a. CNL Whiteshell Reactor 1 – Phase 1000 Grout Formulation Testing Report. WLDP-26000-REPT-012. Revision 1. May 2022.* *Golder 2022b. Building Condition Assessment In-situ Decommissioning of Whiteshell Reactor 1 (WR-1). WLDP-26000-REPT-011. Revision 1. May 2022.* *Golder 2022c. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
205.	CNSC	E. Dagher	GWFSTMR - Section 4.1.4	67	Comment: CNL have applied a step function to reduce the hydraulic conductivity over time in order to emulate degradation in-line with information provided by Walton et al. (1990). Walton et al. (1990) states that “the empirical concrete degradation models included in this report are out of necessity applied outside their range of validity when evaluating long-term performance of concrete”. In light of this, it is not clear whether the data presented to support the claim that the grout and cover will perform as indicated is conservative enough provided the level uncertainty, even when considering the sensitivity analysis that was conducted (Scenario 8). **Expectation to Address Comment:** Provide supporting evidence and make reference to such information within the safety assessment report, to support the claim that the grout will perform as stated.	**Incorporated:** The grout is designed to prevent structural subsidence only. The grout is not intended to act as a barrier to contaminant release. It is modelled as a porous medium in which all contaminants are assumed to be evenly distributed and are available at a constant concentration at the exterior foundation wall for migration through the foundation wall at a rate dependent on the hydraulic conductivity of the wall. The property of grout important to the modelling is the hydraulic conductivity, which determines how quickly water can move through the grout to the foundation wall, which affects the rate of contaminant migration through the foundation wall. As per the quoted Walton et al. (Walton et al. 1990) study, it is difficult to model long-term performance of concrete materials. To mitigate this challenge, the Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2021a) was revised to provide additional analysis of the impacts of the uncertainty surrounding long term grout and foundation degradation by modifying their hydraulic conductivity properties. This revision was done by providing an additional model scenario (Scenario 14), as detailed in Section 5.1 in the GWFSTMR. Scenario 14 was also described in Section 6.2 of the Decommissioning Safety Assessment Report (Golder 2021b). For Scenario 14, the grout and foundation are instantly (after 100 years) degraded to the highest hydraulic conductivity level matching those of the surrounding geological units. This scenario represents the condition where the grout and foundation performance is significantly degraded as compared to the expected performance, effectively removing them from the model. Text added to the GWFSTMR (Section 5.1) detailing the scenario is provided below: *“Scenario 14 – Barrier Degradation Timeline* *The grout performance specification for hydraulic conductivity (9.5E-10 [CNL 2017b]) is approximately 50 times lower than the base case model value (i.e., a hydraulic conductivity of 5.0 E-08 m/s). However, the site-specific long-term performance of the grout (i.e., the rate of increase in hydraulic conductivity with material degradation) is uncertain. A simulation was completed to evaluate the potential changes to mass loading rates resulting from a rapid degradation of the grout. This change was achieved by increasing the hydraulic conductivity of the grout to 5.0E-07 m/s after 100 years (matching the highest value of the surrounding geological units). Because groundwater flow exiting the grout must pass through the foundation to be released to the environment, the hydraulic conductivity of the concrete foundation material was also increased to 5.0E-07 m/s after 100 years such that it would not limit the groundwater flow through the grout. The rate of recharge through the cover was also increased to 8 mm/year, which is equivalent to the recharge at*

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						the end of the base case simulation. This scenario is representative of a case in which the grout, the effect of grouting on the foundation, and the performance of the foundation as an effective barrier is limited to the first 100 years following decommissioning." Section 5.2: The following text was added: *"The more rapid degradation of the grout and associated degradation of the foundation resulted in significant (two orders of magnitude) increases to the rate of flow through the grout, foundation and backfill for the period up to 5,000 years following decommissioning, after which flows in this Scenario were identical to the Base Case simulation.* *Radionuclides associated with the reactor (such as C-14) were not sensitive to the increase in groundwater flows resulting from the more rapid degradation of the grout and foundation. Release of these radionuclides is governed by corrosion of the reactor components, hence limiting the effect of the degradation of the other barriers. For species contained only in the biological shield, such as Cl-36, the increased flow through the grout and foundation resulted in a maximum increase in peak mass loading value by a factor of less than two. The results for Sr-90 and Cs-137 presented no change from the base case (i.e., zero mass loading).* *Overall, as in Scenario 4, the mass loading rate for solutes was not significantly affected by increases in the degradation rate of the building foundation, the grout, or the concrete cap."* These additional studies further reinforce the initial conclusions that: *"Peak mass loading rates and earlier arrival to peaks was found to be less sensitive to: the degradation rate of the engineering components (within the ranges assessed); a local failure of the foundation; increase in the hydraulic conductivity of the backfill; an increase in the rate of degradation of the grout and foundation; and removal of the foundation."* – Section 6.0 of the GWFSTMR. As such, grout and foundation performance are not considered to be primary factors in the solute mass loadings to downstream receptors. The information request is therefore addressed by demonstrating that the impacts of a rapid and complete failure of the grout has no significant effect on the assessment outcomes, and therefore the level of conservatism and uncertainty in their expected performance are acceptable. **Change to GWFSTMR:** The GWFSTMR was updated to include Scenario 14. A description of the scenario is provided in Section 5.1 and the results are provided in Section 5.2 (text copied above). **Change to EIS:** No changes to the Environmental Impact Statement (EIS; Golder 2022) were required as a result of this comment. **References:** *CNL 2017b. Whiteshell Reactor 1 Grout Fill Requirements. WLDP-26000-041-000. November 2017.* *Golder 2021a In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow And Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2021b. In Situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report. WLDP-26000-SAR-001. Revision 4. December 2021.* *Golder 2022. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.* *Walton JC, Plansky LE, Smith RW 1990. Models for Estimation of Service Life of Concrete Barriers in Low-Level Radioactive Waste Disposal. Idaho National Engineering Laboratory, EG&G Idaho Inc. September 1990.*
206.	CNSC	E. Dagher	GWFSTMR - Section 4.1.5	67	Comment: In Section 4.1.5, CNL states that: "In the absence of data this material was assumed to have a hydraulic conductivity of 5E-10 m/s, which is 100 times higher than the values for ordinary concrete". However, there is no information provided which describes the current state of the building foundation and its effect on the hydraulic conductivity. CNL also states that: "any perforations in the foundation will	**Incorporated:** To help understand the current state and hydraulic properties of the building foundation, a building condition assessment was completed by CNL using an industry consultant, which included an evaluation of the current condition of the foundation (Golder 2022a). Concrete cores were extracted from exterior foundation walls and floors and sent for various analyses. Hydraulic conductivity values obtained from samples of the foundation were found to range from 1.2E-11 m/s to 9.8E-11 m/s. Comparatively, the value applied in the modelling was 5E-10 m/s (see Section 4.1.5 of Golder 2021), which is approximately 5 times greater than the highest measured value. The base model therefore is conservative. Relevant conclusions from Section 6.0 of the Building Condition Assessment Report (Golder 2022a) are as follows:

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					be filled and sealed"; however since no technical evidence has been provided on the state of the existing building foundation, in order to account for the current level of uncertainty, the assessment should be appropriately conservative and ignore the effect of any improvements to the foundation, until they have been adequately characterized. **Expectation to Address Comment:** Apply a sufficient level of conservatism in their model parameters that is commensurate with the level of uncertainty that exists, and adequately justify their selection.	*"The concrete of the foundation walls and floor slab have the properties (composition, strength, permeability, passivation, etc.) to continue to provide a durable building structure in the long term. The intact concrete has low permeability and is in generally good condition. It should be confirmed that the measured concrete hydraulic permeability values are consistent with the assumptions that were made when the long term integrity and performance of the decommissioned facility were modelled.* *The observed cracking of the structure components is minor, and consists of mostly narrow cracks which do not have signs of efflorescence, rust staining, etc. Thus, it is likely that the detected narrow cracks do not need to undergo any repairs prior to the overall grouting works. Consideration could be given to prior specialty grouting of the few medium cracks and cold joints. We recommend that crack repairs be undertaken using a combination of Sikadur 35, Hi-Mod LV, a high-viscosity and high strength epoxy grout sealer and Sikadur 31, Hi-Mod Gel, a high strength epoxy paste adhesive. These products are suitable for this purpose when applied in strict accordance with the manufacturer's recommendations. It is recommended that all medium cracks wider than 0.3 mm should be sealed.* *It should be noted, that there was no evidence of ground water ingress through cold joints which may indicate the effectiveness of the water stops utilized during original construction.* *Based on the results of surface deterioration mapping and delamination surveys, as well as testing of the recovered cores for compressive strength, chloride ion content, pH value, density, absorption, and voids in hardened concrete, hydraulic conductivity, and petrographic examination, we believe that the existing concrete is compatible with the proposed decommissioning works, subject to confirmation that the results obtained are compatible with the assumptions made during the previous modelling of the long term performance of the decommissioned facility."* In order to model the uncertainty and apply a sufficient level of conservatism, the Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2021) was revised to provide additional analysis of the impacts of the uncertainty surrounding the condition of the foundation. An additional model scenario (Scenario 15) was completed, as detailed in Section 5.1 in the GWFSTMR. This scenario assumes a further conservative approach that the foundation hydraulic conductivity is increased to match the hydraulic conductivity of the surrounding soil, effectively removing the foundation barrier from the model. This was deemed to be a very conservative approach as the peak mass loadings did not increase significantly after increasing the hydraulic conductivity 1,000 times from the base case, and over 5,000 times from the wall hydraulic conductivity measured in the Building Condition Assessment (Golder 2022a). This models the flow of water as freely through the foundation wall as through the surrounding soil. This removes any uncertainty regarding the current or future condition of the foundation wall or effectiveness of sealing of existing penetrations by removing the wall as a barrier entirely in the modelling. Text added to the GWFSTMR (Section 5.1) detailing the scenario is provided below: *"Scenario 15 – Removal of Foundation* *The base case groundwater flow model used a value of 5.0E-10 m/s to represent the hydraulic conductivity of the foundation. This value is approximately 5 times higher than the highest measured value obtained as a part of testing of the foundation materials that was completed during a recent building condition assessment (Golder 2019b). Further, this value is at least one order of magnitude higher than literature values for concrete (as discussed in Section 4.1.5). However, to address remaining uncertainties related to the building condition, a simulation was completed to assess the effect of a fully compromised building foundation. This simulation represents the condition where the building foundation is effectively removed at the beginning of the closure period. This is considered to be unrealistic, though has been included to provide a basis for the level of protection provided by the foundation and to support the evaluation of defence-in-depth principles as a part of the WRDF [Whiteshell Reactor Disposal Facility] safety assessment.* *In the groundwater flow model this change was achieved by increasing the hydraulic conductivity of the foundation to 5.0E-07 m/s (matching the highest value of the surrounding geological units) for the duration of the post-closure simulation."* Text added to Section 5.2 of the GWFSTMR (Golder 2021) detailing the Scenario 15 results is provided below: *"The compromised foundation scenario resulted in an increase to the flows through the grout, the foundation and the backfill relative to the base case. The increase in flows through the foundation were up to 14 times greater than the base case simulation at time zero, and gradually decreased to the base case value for the long term (greater than 10,000 years).* *Similar to Scenarios 4 and 14, radionuclides associated with the reactor (such as C-14) were not sensitive to the condition of the foundation. Release of these radionuclides is governed by corrosion of the reactor components, hence limiting the effect of the increased flow. For species contained only in the biological shield, such as Cl-36, the times to reach peak mass loading rates were reduced since the solutes found in the biological shield were immediately available for release at the time of saturation. The results for Sr-90 and Cs-137 presented no change from the base case (i.e., zero mass loading).* *Overall, as in Scenarios 4 and 14, the mass loading rate for solutes was not significantly affected by increase in the rate of degradation of the foundation."*

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						The findings within the Building Condition Assessment (Golder 2022a) and Scenario 15 above further reinforce the initial conclusions that: *"Peak mass loading rates and earlier arrival to peaks was found to be less sensitive to: the degradation rate of the engineering components (within the ranges assessed); a local failure of the foundation; increase in the hydraulic conductivity of the backfill; an increase in the rate of degradation of the grout and foundation; and removal of the foundation."* – Section 6.0 of the GWFSTMR. **Change to GWFSTMR:** The GWFSTMR (Golder 2021) was updated to include Scenario 15. A description of the scenario is provided in Section 5.1 and the results are provided in Section 5.2 (text copied above). **Change to EIS:** The following text was added to Section 6.3.2.7.1.2 of the Environmental Impact Statement (EIS; Golder 2022b): *"The hydraulic conductivity applied to the building foundation (i.e., the primary barrier) in the model at the beginning of the simulation was specified to be $5x10^{-10}$ m/s. This value is approximately 5 times higher than the highest measured value obtained as a part of testing of the foundation materials that was completed during a recent building condition assessment (Golder 2022a)."* **References:** *Golder 2019b. Building Condition Assessment In-situ Decommissioning of Whiteshell Reactor 1 (WR-1). WLDP-26000-REPT-011. Revision 0. March 2019.* *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow And Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.* *Golder 2022a. Building Condition Assessment In-situ Decommissioning of Whiteshell Reactor 1 (WR-1). WLDP-26000-REPT-011. Revision 1. May 2022.* *Golder 2022b. Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site. WLDP-26000-ENA-001. Revision 4. December 2022.*
207.	CNSC	Q. Zheng	GWFSTMR - Section 5.1 Table 5-4	90, 97 109	**Comment:** Sensitivity run (Scenario 1, p.90) was conducted to simulate the impact of a preferential pathway on solute transport. In Scenario 11 (p.97), the hydraulic conductivity in the upper 5 m of the bedrock unit was increased to double the base case value to represent an upper "weathered zone". It is not clear what the difference between Scenario 1 and Scenario 11 is. The note under Table 5-4 (p.109) states that Scenario 1 had identical flows to the base case. However, it also states on P.90 that the flow rate through the preferential pathway (Scenario 1) was set to be 10 times greater than the flow rate specified in the bedrock pathway. The two statements seem contradictory with each other. **Expectation to Address Comment:** Explain how the preferential pathway is represented in Goldsim (for example, is it located in bedrock? What is its geometry?) Clarify the difference between Scenario 1 and Scenario 11. Clarify the flow rate for the Preferential Pathway (Scenario 1).	**Resolved As:** Scenario 1 (preferential pathway) in Section 5.1 of the Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2021) conceptually represents a direct pathway between Whiteshell Reactor 1 (WR-1) and the Winnipeg River. For example, this could be an unsealed or improperly sealed pipeline, a "utility" channel, or an unknown geological feature. Because the geometry and orientation of such a feature is unknown, this was implemented in the solute transport model by increasing the pathway flow between WR-1 and the Winnipeg River by a factor of 10. Scenario 11 (increased hydraulic conductivity of the upper bedrock) represents an alternative hydrostratigraphic conceptualization where a "weathered zone" is assumed in the upper 5 m of bedrock. This was implemented in the groundwater flow model by defining an independent zone of hydraulic conductivity to represent "weathered bedrock". Results of the groundwater flow simulations (i.e., flows through the grout, foundation, backfill, and bedrock pathways) were then used as input to the solute transport model. Results of the sensitivity analysis, provided in Section 5.2 of the GWFSTMR (Golder 2021), indicate that increasing the hydraulic conductivity of the bedrock had a minor to negligible influence on flows through the grout and backfill, though the higher hydraulic conductivity of the rock resulted in higher groundwater velocities and earlier peak arrival times. **Change to GWFSTMR**: No changes were required to the GWFSTMR as a result of this comment. **References:** *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow And Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.*
208.	CNSC	Q. Zheng	GWFSTMR - Section 5.1	91	**Comment:** It is assumed in the Goldsim model that the source area is uniformly distributed within the grout block, and the release of contaminant is diffusion dominated. Since the grout	**Resolved As:** The release mechanisms are described in Section 4.2.2.2 of the Groundwater Flow and Solute Transport Modelling Report (GWFSTMR; Golder 2021). Section 5.1 of the GWFSTMR provides a description of various Sensitivity Analyses performed for various model parameters. As indicated in Section 4.2.2.2 and Figure 4-4 of the GWFSTMR (Golder 2021), the model pathway for release of contamination is through both diffusion and advection.

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					degradation/failure lead to increase in flow rates through the grout, is the release of contaminant still assumed to be diffusion dominated after grout degradation/failure? Is advective flow also considered as a mechanism for the release of contaminants from the source area? **Expectation to Address Comment:** Clarify if advective flow is considered as a mechanism for the release of contaminant from the source area for the base case and the bounding scenarios.	In Base Case (Section 4.2.2.2) and Sensitivity Analysis Scenarios (Section 5.1), both advective and diffusive components of mass flux were implemented in the solute transport model. The advective component is defined from flow rates through the source area (grout) and surrounding materials (foundation, backfill, and bedrock) as determined through the groundwater flow modelling. Diffusive mass flux is determined within the solute transport model based on the calculated concentration gradients and diffusive lengths specified between the source area and the surrounding environment. The transport model is diffusion-dominated within the grout due to the slow advective movement of groundwater within the grout while it is intact. Outside of the grout, and after the grout degradation/failure, transport becomes advection-dominated due to increased flow through the grout. In both cases, both advection and diffusion play a role. Regardless of the transport model, the peak mass loading were less sensitive to the condition of the grout or increased degradation of the grout and foundation, as indicated in the sensitivity analysis summary in Section 6.0 of the GWFSTMR (Golder 2021). **Change to GWFSTMR:** No changes were required to the GWFSTMR as a result of this comment. **References:** *Golder 2021. In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site – WR-1 Groundwater Flow And Solute Transport Modelling. WLDP-26000-REPT-005. Revision 4. December 2021.*

Attachment for IR 86:

Table 11.1-1: Environmental Assessment Follow-up and Monitoring Programs Proposed for the Project

EIS Section	Valued Component	Project Phase, Potential Effect and Conceptual Monitoring Program	Monitoring Program Objective	Suggested Duration	Implementing Program
Section 6.2 Atmospheric Environment	Air Quality	**Potential Source(s) of Effects:** ■ Closure activities will result in fugitive dust emissions. **Proposed Monitoring:** ■ Application of aggregate to unpaved roads – a record will be kept of the date of each application of aggregate to unpaved roads. ■ Dust Control on Roads – a record will be maintained of dust control treatment for roads. ■ Site inspection – during periods of high dust susceptibility, regular inspections will be carried out to monitor the efficacy of dust mitigation and any potential concerns with regards to fugitive dust, and if required implementation of mitigation will be recommended. Environmental conditions will be recorded. ■ Confirmatory monitoring of total suspended particulates (PM_{10}) and radioactivity will be conducted during demolition and other dust generating activities. **Trigger for Further Action:** ■ Investigation if parameters above predictions, applicable guidelines, thresholds or limits, or if actual number of vehicles/kilometres travelled exceeds the prediction on which emission estimates were based. ■ If high levels of dust are identified (qualitative), adjust dust suppression measures accordingly.	■ Verify that the following mitigation is being incorporated as planned and are effective. ■ Verify predictions are within air quality criteria. ■ Demonstrate compliance with regulatory requirements.	■ Throughout the closure phase.	■ Project air quality monitoring will be integrated into CNL's WL Effluent Verification and WL Environmental Monitoring Programs.

Table 11.1-1: Environmental Assessment Follow-up and Monitoring Programs Proposed for the Project

EIS Section	Valued Component	Project Phase, Potential Effect and Conceptual Monitoring Program	Monitoring Program Objective	Suggested Duration	Implementing Program
	Greenhouse Gases	**Potential Source(s) of Effects:** ■ Closure activities will result in increased greenhouse gas (GHG) emissions. **Proposed Monitoring:** ■ Fuel Usage – a record will be kept of the fuel usage related to the Project. **Trigger for Further Action:** ■ Investigation if parameters above applicable guidelines, thresholds or limits, or if actual number of vehicles/km travelled exceeds the prediction on which emission estimates were based.	■ Verify that GHG emission rates used in the assessment are reasonable, but conservative. Monitoring results will be used for GHG reporting requirements.	■ Annual estimations and GHG reporting, as required during the closure phase.	■ Monitoring of GHG emissions is already completed as part of CNL's WL Effluent Verification and WL Environmental Monitoring Programs. No new monitoring is required for Project-specific GHG emissions.
Section 6.3 Geological and Hydrogeological Environment	Geology	■ Monitoring and follow-up programs are not identified as there are no predicted residual effects to geology; rather, monitoring will be implemented for other disciplines (i.e., air quality and groundwater) to verify effects predictions for soil quality. For example, environmental monitoring will be completed throughout the institutional control period to confirm that the WRDF barriers are functioning as intended. This monitoring will be integrated into the overall CNL WL Groundwater Monitoring Program to verify that changes to soil quality as a result of groundwater are negligible. In addition, CNL's *Management and Monitoring of Emissions* will include monitoring objectives air quality to verify that air emissions during closure have a negligible effect on soil quality.			
	Hydrogeology	**Potential Source(s) of Effects:** ■ Changes to groundwater quality from the release of solutes into the groundwater as the grout and reactor components gradually deteriorate during post-closure phases. **Proposed Monitoring:** ■ Water elevation measurements to determine groundwater flow direction and gradients. ■ Sampling to confirm groundwater quality to detect potential releases of constituents from the WRDF. ■ Initial sampling frequency will likely be twice per year (spring and fall). **Trigger for Further Action:** ■ If groundwater parameters above applicable guidelines or upgradient groundwater, conduct soil and/or sediment sampling and analysis for contaminants of concern. ■ If significant unexpected changes to groundwater flow, employ geophysical methods to confirm integrity of the concrete cap and engineered barrier.	■ Verify effects predictions on groundwater from the Project. ■ Verify the effectiveness of mitigation. ■ Demonstrate compliance with regulatory requirements.	■ Groundwater monitoring will continue through closure and post-closure. Semi-annual water level measurement and water quality measurements will be completed; however, the frequency of recurrence of water sampling will be reviewed based on performance data. The number and location of wells, and parameters measured, may change based on an annual review of the data.	■ Project groundwater monitoring will be integrated into the overall CNL WL Groundwater Monitoring Program and will be compliant with *CSA N288.7-15: Groundwater Protection Programs at Class 1 Nuclear Facilities and Uranium Mines and Mills* (CSA Group 2015).
Section 6.4 Surface Water Environment	Hydrology	■ Monitoring and follow-up programs are not identified as there are no predicted residual effects to hydrology.			

Table 11.1-1: Environmental Assessment Follow-up and Monitoring Programs Proposed for the Project

EIS Section	Valued Component	Project Phase, Potential Effect and Conceptual Monitoring Program	Monitoring Program Objective	Suggested Duration	Implementing Program
	Surface Water Quality	<u>**Potential Source(s) of Effects:**</u> ■ Changes to surface water quality from the release of solutes into the groundwater as the grout and reactor components gradually deteriorate over time during the post-closure phases. <u>**Proposed Monitoring:**</u> ■ Monitor the quality of water in the Winnipeg River to evaluate whether the quality of the water is affected by the WRDF. ■ Monitor the quality of water in on-site ditches to verify the hydrogeological model. <u>**Trigger for Further Action:**</u> ■ Investigation (e.g., sediment analyses) if parameters above predictions, applicable guidelines, or indication of poor maintenance.	■ Verify effects predictions related to surface water quality. ■ Demonstrate compliance with regulatory requirements.	■ Surface water and ditch system water will be sampled on a semi-annual basis at one upstream and two downstream locations. Frequency of recurrence will be assessed based on performance data. ■ Water quality monitoring will continue through closure phase and post-closure phase (i.e., during institutional control).	■ Surface water monitoring in the receiving environment is already completed through CNL's WL Environmental Monitoring Program, which is compliant with *CSA N288.4-10: Environmental Monitoring Programs at Class 1 Nuclear Facilities and Uranium Mines and Mills* (CSA Group 2010). No new surface water quality monitoring is proposed for the Project.
Section 6.5 Aquatic Environment	Fish and Fish Habitat	■ Monitoring and follow-up programs for the Project specific to fish and fish habitat are not identified as there are no predicted residual effects to fish and fish habitat; rather, monitoring will be implemented for other disciplines (i.e., air quality, groundwater quality, and surface water quality) to verify effects predictions for fish and fish habitat. For example, environmental monitoring will be completed throughout the institutional control period to confirm that the WRDF barriers are functioning as intended. This monitoring will be integrated into the overall CNL WL Groundwater Monitoring Program to verify that changes to surface water quality, and subsequently fish and fish habitat, as a result of groundwater are negligible. In addition, CNL's *Management and Monitoring of Emissions* will include monitoring objectives air quality to verify that air emissions during closure have a negligible effect on surface water quality, and subsequently fish and fish habitat. ■ Although not required for the Project specifically, current Environmental Assessment Follow-up Program for the WL site includes water monitoring and collecting fish flesh at one location upstream and two locations downstream of the WL site. This monitoring will also verify the accuracy of environmental effects and determine the effectiveness of mitigation that has or is to be implemented. CNL will continue to carry out the existing Environmental Assessment Follow-up Program for the WL site as it is a requirement of CNL's current licence (NRTEDL-W5-8.00/2024) with the CNSC.			

Table 11.1-1: Environmental Assessment Follow-up and Monitoring Programs Proposed for the Project

EIS Section	Valued Component	Project Phase, Potential Effect and Conceptual Monitoring Program	Monitoring Program Objective	Suggested Duration	Implementing Program
Section 6.6 Terrestrial Environment	Vegetation	■ Monitoring and follow-up programs are not identified as there are no predicted residual effects to vegetation. ■ Although not required for the Project specifically, current Environmental Assessment Follow-up Program for the WL site includes collection of vegetation within the vicinity of the WL site and garden crop samples upstream and downstream from the site. This monitoring will also verify the accuracy of environmental effects and determine the effectiveness of mitigation that has or is to be implemented. CNL will continue to carry out the existing Environmental Assessment Follow-up Program for the WL site as it is a requirement of CNL's current licence (NRTEDL-W5-8.00/2024) with the CNSC.			
	Barn swallow	**Potential Source(s) of Effects:** ■ Closure and Post-Closure: If barn swallow are confirmed to be using the WR-1 Building as habitat through pre-disturbance surveys, there will be incremental contribution of the Project and all future decommissioning activities to the loss of potential nesting habitat in the RSA. There is predicted to be negligible effects on barn swallow, if determined to be nesting in the WR-1 Building, through the implementation of habitat compensation. **Proposed Monitoring:** ■ Barn swallow nest structures were installed in 2018 at the WL site proactively in consideration of potential loss of barn swallow nesting habitat from future decommissioning activities. ■ Effectiveness monitoring of compensatory barn swallow nest structures will be conducted to determine if the compensatory nest habitat is being used. ■ This compensation model and follow-up monitoring would be consistent with what has been designed by the Ontario Ministry of Natural Resources and Forestry. Barn swallows are designated as "Threatened" on the Ontario *Endangered Species Act*'s Species at Risk in Ontario list. An equivalent protocol has not been developed for Manitoba (barn swallow are not currently designated on the provincial *Endangered Species and Ecosystems Act*). Barn swallow are designated as "Threatened" under the federal *Species at Risk Act*. **Trigger for Further Action:** ■ If effectiveness monitoring shows that the barn swallow nest structure is not being used, it would be relocated to other suitable habitat on the site.	■ Offset the incremental contribution of the Project and all future decommissioning activity to the loss of potential nesting habitat in the RSA using compensatory nesting habitat. ■ Determine number of individuals using compensatory nesting habitat on an annual basis.	■ Annually for three years following installation.	■ Monitoring for barn swallow will be integrated into CNL's existing Environmental Protection Program. ■ A Biodiversity Plan will be developed and included in the Environmental Assessment Follow-up Program for the WL site.

Table 11.1-1: Environmental Assessment Follow-up and Monitoring Programs Proposed for the Project

EIS Section	Valued Component	Project Phase, Potential Effect and Conceptual Monitoring Program	Monitoring Program Objective	Suggested Duration	Implementing Program
Section 6.6 Terrestrial Environment	Bats	**Potential Source(s) of Effects:** ■ Closure and Post-Closure: If bats are confirmed to be using the WR-1 Building as habitat through pre-disturbance surveys, incremental contribution of the Project and all future decommissioning activity to the loss of potential anthropogenic maternity roosting habitat in the RSA. There is predicted to be negligible effects on bats, if determined to be roosting in the WR-1 Building, through the implementation of habitat compensation. **Proposed Monitoring:** ■ In consultation with CNL biologists on other CNL sites to be decommissioned in the future, and in consideration of future losses of anthropogenic structures that may provide roosting habitat at the WL site, offsetting in the form of bat boxes may be required if bats are confirmed to be using the WR-1 Building as habitat. ■ Criteria for appropriate siting, if required, may include: accessibility of box locations for installation and future monitoring of utilization/effectiveness, avoidance of areas with radiological contamination in surface water features and appropriate distance to anthropogenic disturbances to avoid sensory effects (i.e., noise). Immature forested areas adjacent to larger waterbodies (i.e., Winnipeg River) and wetlands are high priority locations, because these forest types do not currently provide high quality tree roosting habitat and would be most benefited by installation of bat roost boxes to expand the spatial coverage of potential roosting habitat within the RSA. Final site selection would be at the discretion of CNL biologists. ■ Effectiveness monitoring may be conducted to determine if boxes are being used for three years post-installation. **Trigger for Further Action:** ■ If effectiveness monitoring shows that the bat boxes are not being used by the target species, they would be relocated to other suitable habitat on the site.	■ Offset the incremental contribution of the Project and all future decommissioning activity to the loss of potential anthropogenic maternity roosting habitat across the RSA. ■ Install bat boxes and determine number of individuals and species using bat boxes on an annual basis.	■ Bat boxes should remain in place throughout the Closure Phase at minimum. Monitoring should take place annually for three years post-installation.	■ Monitoring for bats will be integrated into CNL's existing Environmental Protection Program. ■ A Biodiversity Plan will be developed and included in the Environmental Assessment Follow-up Program for the WL site.

Table 11.1-1: Environmental Assessment Follow-up and Monitoring Programs Proposed for the Project

EIS Section	Valued Component	Project Phase, Potential Effect and Conceptual Monitoring Program	Monitoring Program Objective	Suggested Duration	Implementing Program
Section 6.6 Terrestrial Environment	Snapping turtle	**Potential Source(s) of Effects:** ■ Closure: Minor increase in mortality risk on snapping turtle as a result of vehicle collisions, and negligible residual effect, if mitigation is implemented. ■ CNL will implement a follow-up monitoring program to address the uncertainty regarding the effectiveness of proposed mitigation for protecting snapping turtle populations. **Proposed Monitoring:** ■ Implementation of routine annual wildlife road surveys using protocols for road surveys available from other Canadian jurisdictions for similar species (e.g., Survey Protocol for Blanding's Turtle in Ontario [MNRF 2015]), to be conducted when snapping turtles are likely to cross (i.e., terrestrial life history period from May 1 to September 30). ■ Any road mortality or injury of snapping turtle (or other reptile species) will be reported and data will be compiled in a database that can be used to inform adaptive management for the site. **Trigger for Further Action:** ■ If, after mitigation and operational measures are shown to be ineffective and any mortality or injury of snapping turtle occurs, further mitigation will be considered in an adaptive management framework. This mitigation may take the form of: surveys of high-risk road crossing locations to determine if they are being used by turtles for crossing, potential upgrade of existing crossing culverts to enhance snapping turtle passage, consideration of the potential need to re-design or lengthen the existing amphibian and reptile fencing at the three most likely turtle crossings on Ara Mooradian Way, or consideration of the need to add fencing on any other roads where injuries or mortality of snapping turtle is recorded. ■ Based on results of routine wildlife road mortality surveys, evaluate implementation of traffic calming measures during the season when snapping turtles are expected to cross the road (i.e., terrestrial life history period from May 1 to September 30). These may include options such as further reduction of posted speed limit, installation of speed bumps, or other measures.	■ Track turtle observations during routine wildlife road surveys and use information for adaptive management.	■ Ongoing reporting and monitoring should take place annually over the active decommissioning period (until the start of institutional control).	■ Monitoring for snapping turtle will be integrated into CNL's existing Environmental Protection Program. ■ A Biodiversity Plan will be developed and included in the Environmental Assessment Follow-up Program for the WL site ■ Continuation of WL staff reporting of incidental wildlife observations.

Table 11.1-1: Environmental Assessment Follow-up and Monitoring Programs Proposed for the Project

EIS Section	Valued Component	Project Phase, Potential Effect and Conceptual Monitoring Program	Monitoring Program Objective	Suggested Duration	Implementing Program
Section 6.7 Human and Ecological Health	Human health and Ecological health	**Potential Source(s) of Effects:** ■ Closure activities will result in the release of airborne effluent from the WR-1 Building which could affect human and ecological health. ■ Release of solutes into the groundwater as the grout and reactor components gradually deteriorate over time during the post-closure phase may cause changes in groundwater quality, which could migrate towards the Winnipeg River and affect receptors along the Winnipeg River. **Proposed Monitoring:** ■ Monitoring for air quality as noted above (i.e., for dust, gross alpha, beta and gamma radiation monitoring of the filters). ■ Verification monitoring for tritium in air (post venting through WR-1 stack). ■ Passive tritium in air network monitoring (semi-annual change out) will be included as part of the Environmental Assessment Follow-up Program for the Project. Monitoring locations (approximately 4 of them) will be selected to be within the main upriver and downriver windrose sectors, at the site boundary and on-site mainly to monitor airborne tritium plumes potentially originating from the WRDF. ■ Estimate combustible gases (e.g., based on project-related traffic and equipment), as per atmospheric environment above. ■ Monitor contaminants of concern (e.g., lead, asbestos, tritium) in air displaced from grouting the below-grade structure, as per the atmospheric environment above. ■ Groundwater monitoring surrounding the WRDF, as noted above. **Trigger for Further Action:** ■ Investigation if parameters are above applicable guidelines identified.	■ Verify effects predictions related to air quality, groundwater quality and surface water quality to confirm no health effects are anticipated as a result of exposure to COPCs from the Project.	■ Dust monitoring would be carried out during the closure phase. ■ Monitoring of tritium in air will be initiated when the stack monitoring system is discontinued. This monitoring would be on-going during post-closure. The need for and duration of monitoring will be assessed based on annual review of monitoring data. ■ Groundwater and surface water quality monitoring would be on-going during closure and post-closure. The need for and duration of monitoring will be assessed based on an annual review of monitoring data. ■ WL currently conducts industrial hygiene assessments of lead, asbestos and mould within facilities as part of the decommissioning planning process.	■ Air quality monitoring for the Project will be captured through the implementation of CNL's WL Effluent Verification and WL Environmental Monitoring Programs. ■ Groundwater monitoring for the Project will be integrated into the overall CNL WL Groundwater Monitoring Program. ■ Surface water monitoring in the receiving environment is already completed through CNL's WL Environmental Monitoring Program. No new surface water quality monitoring is proposed for the Project.
Section 6.8 Land and Resource Use	■ Monitoring and follow-up programs are not specifically identified for land and resource use; rather, monitoring for environmental pathways noted above (i.e., air quality, groundwater quality, and surface water quality) will be implemented to verify effects predictions for land and resource use. ■ CNL is aware First Nations and the Manitoba Métis Federation have continuing concerns about the potential effects of the Project and more broadly the WL site and the potential effect on traditional land and resource use, and more specifically on water, wildlife, fish and plants upon which such use is based, and cultural and archaeological sites. As such, CNL is committed to involving First Nations and the Red River Métis in monitoring and will engage with them over the long-term to address on-going concerns. Beginning in 2019 the Manitoba Métis Federation had an Environmental Monitor observing CNL's environmental monitoring program. CNL has initiated discussions to also have First Nations and Métis Environmental Monitors who will report back to their communities. CNL will provide communication support to committee members, to help disseminate monitoring results. ■ CNL will continue to engage with local communities, municipalities and Indigenous peoples during the closure and post-closure phases.				

Table 11.1-1: Environmental Assessment Follow-up and Monitoring Programs Proposed for the Project

EIS Section	Valued Component	Project Phase, Potential Effect and Conceptual Monitoring Program	Monitoring Program Objective	Suggested Duration	Implementing Program
Section 6.9 Socio-economics	Government Finances Community Infrastructure and Services Community Well-being	There are no monitoring and follow-up programs specific to socio-economics; rather, concerns with respect to the Project are addressed through social commitments made by CNL. ■ CNL will proactively seek, engage and support meaningful discussion on issues and opportunities related to the Project. ■ CNL will work with each Indigenous Nation to ensure that relationships endure, grow and adapt to future activities. CNL is currently working on establishing an Indigenous Advisory Committee and relationship agreements with each engaged Indigenous Nation, which include liaison positions and create mechanisms to develop and implement initiatives that will help address each Nation's unique interests and concerns related to the Project and the Whiteshell Laboratories Closure overall. ■ CNL is committed to sharing information and working collaboratively with the Whiteshell Laboratories Community Regeneration Partnership[1] (the Partnership), First Nations and the Red River Métis to help develop a feasible socio-economic plan and development of robust communication plan to convey and confirm the Project's safety. ■ Specifically for Sagkeeng First Nation, CNL has committed to co-developing a community-led environmental monitoring program (CEMP) through the Technical Working Group. Public information activities required as part of CNL's Public Information Program (2021) will be part of the Environmental Assessment Follow-up Program for the Project and will be summarized as part of the annual Environmental Assessment Follow-up Program progress report			

CNL = Canadian Nuclear Laboratories; ISD = in situ decommissioning; CNSC = Canadian Nuclear Safety Commission; GHG = greenhouse gas; $PMR_{10}R$ = particles nominally smaller than 10 micrometres (µm) in diameter; NPRI = National Pollutant Release Inventory; WRDF = Whiteshell Reactor Disposal Facility; RSA = Regional Study Area; LSA = Local Study Area; COPC = contaminant of potential concern; LGD = Local Government District; the Partnership = Whiteshell Laboratories Community Regeneration Partnership; RM = Rural Municipality; EIS = Environmental Impact Statement; CEAA 2012 = *Canadian Environmental Assessment Act, 2012.*

[1] The mandate of the Whiteshell Laboratories Community Regeneration Partnership is to develop a Socio-economic Plan for the region by the WL decommissioning activities, to subsequently implement the plan and to review, update and report on the plan annually (Skinner 2016).