Date: December 18, 2017

From: W. Turner

To: Candida Cianci, Environmental Assessment Specialist
Canadian Nuclear Safety Commission

By email: cnsc.ea-ee.ccsn@canada.ca

Subject line: Supplementary submission w.r.t. the Draft EIS report for the WR-1 ISD project

CEAA Reference number: 80124

Comments:

Dear Ms. Cianci:

I have come to the end of reviewing Revision 1 of the draft EIS for the "In Situ Decommissioning of the WR-1 Reactor at the Whiteshell Laboratories Site" (Registry Number 80124). I had hoped that the CNSC would have directed CNL to withdraw this document since it did not address both the CNSC's dispositions on the Project Description and CNSC Regulatory Policy P-290.

I have therefore taken the time to review this report. However, after spending sometime evaluating the report, I came to the conclusion that the report is even more flawed than suggested by the two issues I identified in my previous submission.

Attached are my comments. I expect to see all comments addressed by the proponent, before the CNSC takes the information from the final EIS and writes their EA report.

Below are some of the issues (in no particular order) that support the conclusion that reviewing this report is a waste of time. The list is by no means complete.

- The inappropriate use of the Environmental Risk Assessment methodology to an Environmental Assessment.
- Confusion as to when the Institutional Control (IC) period will end. Sometimes, the authors state that the IC period never ends and at other times, it ends after 300 years.
- No discussion of the acceptable level of residual radioactivity at the end of the IC period.
- Ignoring all international guidance with respect to the appropriateness of entombment for reactors
- Ignoring public comments. Essentially stating their concerns are "not significant"
- Focusing on short-term risks while ignoring any long-term consequences.
- Flawed "alternative means" assessment
- No acknowledgement of the US DOE lessons learned document as applied to "In-situ Decommissioning"
- Large numbers of inconsistencies and outright contradictions

If you wish to publish the above list on the Registry, please feel free.

Thank you for the opportunity to review CNL's draft EIS report for the WR-1 entombment project.

Regards

W. Turner (former Pinawa resident, and AECL retiree)

Comments on Revision 1 of the draft EIS for the "In Situ Decommissioning of the WR-1 Reactor at the Whiteshell Laboratories Site" (Registry Number 80124)

By W. Turner (Former Pinawa Resident, AECL Retiree)

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1.		General	CNL's use of the risk assessment process is not appropriate. Therefore, its conclusions are pointless. Further, it distracts from what should be the ultimate goal of the project, reduce the risk at the end of the Institutional Control period to meet free release criteria.	One definition of risk is "consequence" multiplied by "likelihood". Applying the formula to CNL's proposed entombment of the WR-1 reactor, the "consequence" is any unacceptable exposure to radiation and/or hazardous materials. This leads to the question, what would the likelihood of an exposure be at the end of the Institutional Control (IC) period? By definition, at the end of the IC period, there will no barriers to prevent intrusion (either active or passive) and intrusions will happen. Therefore, when that inevitable intrusion happens, there is no barrier to prevent an exposure and the risk is equal to the consequence. Therefore, there is nothing to prevent the intruder being exposed to whatever radioactivity remains. Thus, to protect that intruder, the residual activity at the end of the IC period cannot exceed the defined clearance levels. Hence, the ultimate goal for the project is to ensure the residual activity is at or below those clearance levels. Since we know the residual activity must meet clearance levels, there is no need to complete a risk assessment. The environmental assessment process boils down to answering two questions, • *"Will these clearance level criteria be met at the end of the IC period?"* and • *"If not, what mitigation measures are required to ensure conformance to these levels at end of the IC period?"* The advantage to this approach is that the evaluation criteria currently exist and do not need to be derived or estimated. They are defined in Schedule 2, of the *Nuclear Substances and Radiation Devices Regulations*, SOR/2000-207. Thus, no calculations are required to forecast the levels at the end of the IC period, and conformance with them means both human heath and the environment are protected. How easy is that? Please revise the report and discuss how the proposed undertaking will meet these defined clearance criteria at the end of the IC period.

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2.		General	Through its Regulatory Policy, P-290, the CNSC has defined the criteria for the residual radioactivity at the site at the end of the Institutional Control Period.	The following quotation is from the CNSC Regulatory Policy, P-290, *Managing Radioactive Waste* (July 2004) *d) The predicted impacts on the health and safety of persons and the environment from the management of radioactive waste are no greater than the impacts that are permissible in Canada at the time of the regulatory decision;* This quotation implies two questions. • *When is the regulatory decision being made? and* • *What will the impact be at that time?* The regulatory decision is the EA decision. If all goes according to CNL's plans, that decision will be made within the next few months. Therefore, the permissible impact at that time (i.e. within the next year or so) will be the same as that for all nuclear facilities currently licenced. Essentially, all public exposures must less than 1 mSv/year. This is currently accomplished through the implementation of institutional controls (such as barriers, shielding, procedures, processes, security, the list goes on). All are implemented as required by their licences, such that all licencees achieve this dose constraint. Essentially, it is the law. What would happen if those institutional controls were absent? Essentially, anyone or any animal would wander through the site with no constraints. This would mean that the individual would be exposed to radioactivity considerably higher the 1 mSv/year. However, if the radioactivity from all the activities on the site were below clearance levels, it would not matter. The individual could never receive a dose about the 1 mSv/year. (See also Comment 1 above). The authors need to demonstrate that the residual activity on the site of the WR-1 reactor will meet clearance criteria at the end of the Institutional Control period. See also, CNSC G-320, which states: *7.4 Assessment Time Frames* *There is no time limit associated with the statutory objective to "prevent unreasonable risk, to the environment and to the health and safety of persons.," (NSCA, 9(a)(i)), or with the principle that* ***the predicted impact on the health and safety of persons and the environment from the management of radioactive waste are no greater than the impacts that are permissible in Canada at the time of the regulatory decision*** *(as discussed in CNSC regulatory policy P-290, Managing Radioactive Waste).*

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3.		General	The authors are unclear with respect to the long-term implications to future land use of the "entombed" WR-1 site. As such, their assessment of the long-term adverse environmental impact of the proposed undertaking remains unproven.
			
			In order for one to conduct an evaluation of the environmental effects, one needs to a clearly defined end-state. Otherwise, one cannot know the potential environmental effects. Thus, the whole assessment becomes meaningless.
			
			To paraphrase the Cheshire Cat in Alice in Wonderland, "If you do not know where you going, it does not matter what road you take". (See also Comments 1 & 2 above)
				The following list contains examples of why one is confused by the lack of a clearly defined end-state.
				
				• The term "300 years" appears 27 times in the EIS, typically associated with the concept of "institutional control".
				• Except for 3 occurrences from the Table of Contents, the term "institutional control" occurs 279 times
				• The term "restricted land use" occurs twice buy only when comparing the size of the entombed facility
				• The term "restrictions on land use" occurs 8 times all in relation to institutional controls
				• The term "unrestricted land use" occurs 4 times all when comparing the size of the entombed facility with the land use of the rest of the site.
				• From Table 6.1.2-1: Valued Components Selected for the Effects Assessment
				
				"Land tenure considers the uses, allocations, and ownership of lands in proximity to the Project, including the WL site itself. The change in decommissioning for WR-1 Building will change the proportion of the WL site available for future land tenure by private or public entities. The use of ISD may also change the perceived suitability of land use surrounding the WL site". [see Page 6-8 of the EIS]
				
				• From the conclusions in Section 6.8.5.2.2 Secondary Pathways, of the assessment of Land and Resource Use
				  • *"The use of ISD as the decommissioning method for the WR-1 Building will change the proportion of the site that can be released for unrestricted use.*
				  • *Changes to access restrictions associated with the WL site end state as a result of the Project may result in changes to future land tenure and uses of portions of the site itself.*
				  • *Decommissioning and reclamation of the entire WL site, including the Project, may change the future land tenure and uses of the WL site".* [see Page 6-384 of EIS]
				
				Questions for the authors,
				
				• What is the eventual end-state for the Whiteshell site as a whole? From the EIS, it appears to be "unrestricted land use".
				• What is the eventual end-state for WR-1 itself?
				• Will the location of the WR-1 building ever be released for unrestricted land use? If so, when? (There appears to be at least two answers to this question, one is "never" and the other is post institutional control. However, the authors do not provide an explicit answer.)
				• When will the need for "institutional control" end?
				• When will the need for monitoring end
				• At the WR-1 end-state, what is the total residual radioactivity?

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				• At the WR-1 end-state, what is the residual radioactivity for each of the long-lived individual radionuclides? Without clear unequivocal answers to these questions, the conclusions of the EIS report are, at best, unproven.
4.		General	The authors have substituted an Ecological Risk Assessment for an Environmental Assessment. This suggests the authors do not understand the difference, or are deliberately trying to mislead.	The use of an Ecological Risk Assessment (ERA) is not appropriate for an evaluation of the risks from a future facility. An ERA is a management tool designed to help managers identify areas of risk that need to require immediate action to address. Thus, its focus is on current operations not issues that could result from future operations. It is not designed to assess the performance of the components of the entombed system over the thousands of years that the structure's Integrity must be maintained to ensure minimal risk. The process includes identification of valued components that are resident near those operations. As such, it cannot evaluate risks to VCs at any point in the distant future, since these VCs are unknown. An ERA starts with current conditions and evaluates the concentrations of Contaminants of Potential Ecological Concern (COPEC) at the point of exposure against benchmark values to determine the relative risk (calculated as the RQ value, which is the concentration in the environment divided by the benchmark value). Note that the source is not considered and neither is the performance of the facility that is the source. Further, it is not designed for assessing the future risks to those COPECs resulting from future operations, accountants and malfunctions, effects of the environment on an undertaking (global warming, extreme weather events, earthquakes, etc.) A Performance Assessment (PA), by definition, includes the source. It is designed to identify weaknesses and strengths of the various components that function as barriers to the release of the COPECs to the environment (including human health). By its very nature, a performance assessment must address the future. An Environmental Assessment (EA) is analogous to the PA in that it evaluates the potential for adverse environmental effects resulting from the activities associated with the proposed facility (that is, source). The EA is specifically a future oriented assessment tool, since there is no facility at the time it is conducted. Therefore, there are no associated physical activities interacting with the environment. Under the CEAA 2012, the EA must address the future operations, accidents and malfunctions, effects of the environment on an undertaking (global warming, extreme weather events, earthquakes, etc.) The results of the evaluation are inputs into the project design such that the need for appropriate mitigation measures are identified and addressed in the design. Once the project design is complete, a performance assessment can be done to confirm that the facility will meet its design constraints.

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				The authors must conduct an appropriate assessment of the potential impacts through the performance assessment process, and refrain from using the ERA tool inappropriately. Please revise and eliminate all references to the results of an ERA since those results are inappropriate. For examples as to what should be included in a Performance Assessment for an entombed facility, I refer the authors to a document they cite as a reference: *U.S. Department of Energy. 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,* I find it most disturbing that I feel compelled to provide the above explanation. The notion that the authors of this document (who represent reputable consulting companies) would require such an expiation is incredible. As any reliable environmental practitioner would know, the three tools, the ERA, the PA and the EA, are very different and have very different purposes. **It is not the role of the public to point out these disparities to the proponent and/or to (what are supposed to be) reputable consultants.**
5.		General	Assuming the authors wish to include a performance assessment, they must provide details, summary, methodology and criteria used to address this requirement. The draft EIS does not provide sufficient information about these elements.	To quote the US DOE ISD lessons learned document. *Key to ISD is the "performance assessment" conducted with the use of pathway modeling to demonstrate the long term safety to the environment and to the public health.* • Reference - U.S. Department of Energy. 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, Please address this key requirement. As discussed in Comment 4 above, the EIS is NOT an Envrionmental Risk Assessment (ERA).

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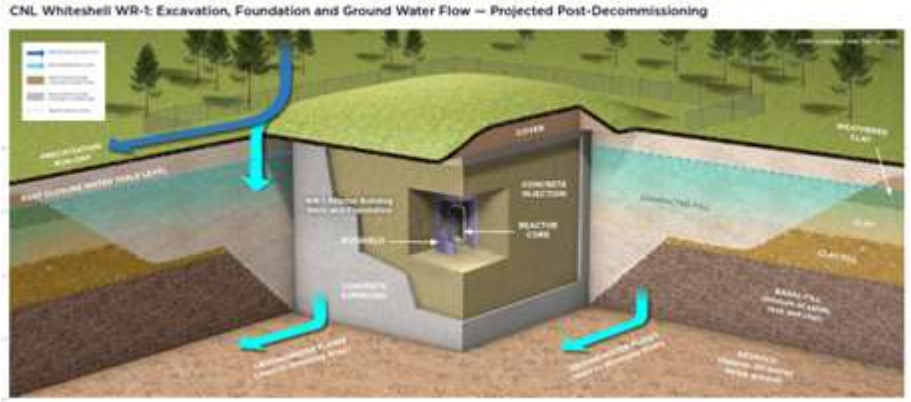
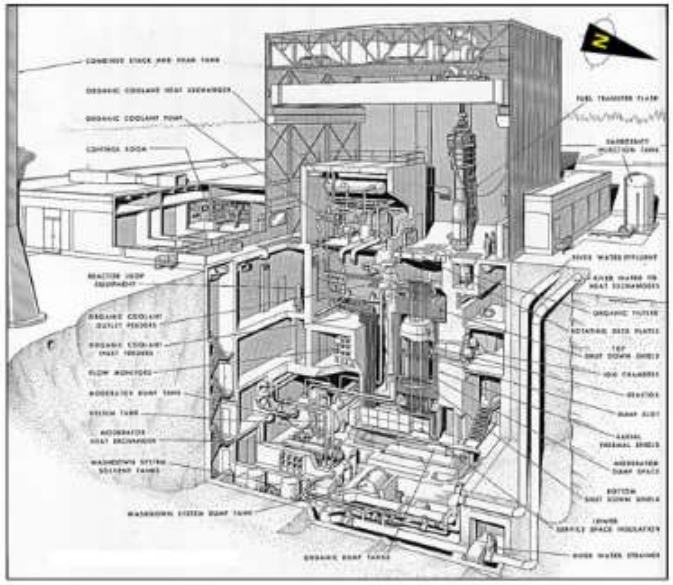
6.		General	The term "discipline" appears 82 times in the EIS report. All the instances are associated with environmental components terminology. This is an inappropriate and somewhat misleading use of this term.	According to an online dictionary (link - http://www.dictionary.com/browse/discipline), the noun "discipline" means: • *training to act in accordance with rules; drill (e.g. military discipline)* • *activity, exercise, or a regimen that develops or improves a skill; training (e.g. A daily stint at the typewriter is excellent discipline for a writer.)* • *punishment inflicted by way of correction and training.* • *the rigor or training effect of experience, adversity, etc. (e.g. the harsh discipline of poverty.)* • *behavior in accord with rules of conduct; behavior and order maintained by training and control (e.g. good discipline in an army.)* • *a set or system of rules and regulations.* None of these meanings apply to the descriptions and evaluations of the environmental components as given in this draft report. The authors need to ensure the terminology used to describe environmental components is correct. Please revise.

7.		General	The EIS contains no figure similar to first one in the cell on the right. This figure was copied from Poster 4 on CNL's website. (link - http://www.cnl.ca/site/media/Parent/WR-1_posters_July.pdf) I note that this figure suggests that the reactor core will not be filled with grout. The second figure (EIS Figure 1.1-2) depicts the reactor building, including all the internal structures.	  Comparing the first figure with the second suggests that the grout will not completely fill the structure. The authors need to provide details as to the grouting process, including the any rearrangement, removal or size reduction of the components such that the structure can and will be completely filled with no void spaces.

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8.	1-7	1.1 Project Context	*AECL's mandate is to manage its radioactive waste and decommissioning liabilities in a safe and environmentally responsible manner. AECL has asked CNL to perform the work, and in keeping with international best practices* ***(IAEA 2004, 2006)*** *[emphasis added]*	The two references cited in this sentence (and found in Section 13 of the EIS) are: • *IAEA. 2004.* Safety Assessment Methodologies for Near Surface Disposal Facilities, Results of a Co-ordinated Research Project*. Vienna: International Atomic Energy Agency. 2 vols.* • *IAEA 2006, Fundamental Safety Principles. Safety Fundamentals No. SF1. Vienna: International Atomic Energy Agency* The two much more relevant references (conveniently missing from the reference list in Section 13) are: • *IAEA, Decommissioning Strategies For Facilities Using Radioactive Material, Safety Report Series #50, IAEA, Vienna, 2007* • *IAEA, Decommissioning of Facilities, General Safety Requirements Part 6, IAEA, Vienna, 2014* To quote from IAEA 2007: *2.4. ENTOMBMENT* *Entombment is the strategy in which the radioactive contaminants are encased in a structurally long lasting material* ***until the radioactivity decays to a level that permits release of the facility from regulatory control.*** *The fact that radioactive material will remain on the site means that the facility will eventually become designated as a near surface waste disposal site and criteria for such a facility will need to be met. [Emphasis added].* And *Section 3.2.3 Entombment* *Entombment is not relevant for a facility that contains long lived isotopes because these materials are not suitable for long term surface disposal. Consequently, reprocessing facilities, fuel fabrication facilities, enrichment facilities or facilities that use or process thorium or uranium would not be appropriate for entombment. However, entombment could be a viable option for other nuclear facilities containing only short lived or limited concentrations of long-lived radionuclides, i.e. in order to comply with the site release criteria. [emphasis added].* To quote from IAEA 2014 *1.9. Strategies for decommissioning that have been adopted or are being considered by States include immediate dismantling and deferred dismantling. In principle, these two possible decommissioning strategies are applicable for all facilities.* *— Immediate dismantling: In this case, decommissioning actions begin shortly after the permanent shutdown. Equipment and structures, systems and components of a facility*

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				containing radioactive material are removed and/or decontaminated to a level that permits the facility to be released from regulatory control for unrestricted use, or released with restrictions on its future use. *— Deferred dismantling: In this case, after removal of the nuclear fuel from the facility (for nuclear installations), all or part of a facility containing radioactive material is either processed or placed in such a condition that it can be put in safe storage and the facility maintained until it is subsequently decontaminated and/or dismantled. Deferred dismantling may involve early dismantling of some parts of the facility and early processing of some radioactive material and its removal from the facility, as preparatory steps for the safe storage of the remaining parts of the facility.* *1.10. A combination of these two strategies may be considered practicable on the basis of safety requirements or environmental requirements, technical considerations and local conditions, such as the intended future use of the site, or financial considerations.* ***Entombment****, in which all or part of the facility is encased in a structurally long lived material,* ***is not considered a decommissioning strategy and is not an option in the case of planned permanent shutdown****. It may be considered a solution only under exceptional circumstances (e.g. following a severe accident). [emphasis added].* If AECL has requested that CNL *"… perform the work… in keeping with international best practices ...*", then, given the two additional references quoted above, CNL has failed. What is somewhat disturbing is that both these latter references were provided to CNL in the comments on the Project Description. (see comments on the Agency Registry, link - http://www.ceaa-acee.gc.ca/050/documents/p80124/114854E.pdf). The only reason why the authors deliberately omitted these two references is the fact they undermine the whole basis for this proposed undertaking. CNL must justify why their proposal for "in-situ decommissioning of the WR-1 reactor" can proceed counter to the IAEA guidance for "entombment".

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9.	1-11	1.2 Project Overview	*"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****…" [emphasis added]*	To quote from a US DOE document cited by the authors:, *"ISD projects are presumed to be* ***under indefinite institutional control*** *of the U.S. Government."* [emphasis added] Obviously, this statement about the 300-year IC period does not match that from the US DOE document quoted above. (See also Comment 3 above) (Reference - U.S. Department of Energy. 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, Page 1). Another quote from the same US DOE document: *In "entombment," facilities containing radioactive contaminants are permanently encased within in a structurally stable material, such as concrete, and* ***appropriately maintained and monitored until the radioactivity decays to a level permitting restricted release of the property****. [emphasis added]* Essentially, the US DOE recognizes that the decay of the radionuclides will never permit "… *release of the facility from regulatory control"*.. While the US DOE has their Legacy Management Office (whose mandate is to ensure institutional control in perpetuity), Canada has no such entity, thus cannot undertake that commitment. What is somewhat surprising is that the authors implicitly recognize this issue. For example, to quote from the EIS, Section 2.5.4.2 *Environmental*: *" … the presence of the WR-1 ISD structure will result in restricted land use of the WR-1 portion of the WL site. This area will require ongoing controls including Institutional Control, access restrictions, and performance monitoring; however, the amount of land associated with this area is very small relative to the size of the WL site that will have unrestricted land use.* When discussing their proposed institutional control timeframe, the authors need to be consistent and ensure that the readers understand that, with entombment, institutional control will be required in perpetuity. Please revise to remove the inconsistencies and explicitly state that institutional control period can never end.

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10.	1-11	1.2 Project Overview	*See quote from Comment 9 above.*	To repeat the quote from the DOE document in Comment 9 above *In "entombment," facilities containing radioactive contaminants are permanently encased within in a structurally stable material, such as concrete, and* ***appropriately maintained and monitored until the radioactivity decays to a level permitting restricted release of the property****. [emphasis added]* Apparently, the US DOE recognizes that release of the property will always be restricted. As such, institutional controls perpetually will be required to ensure those restrictions will be maintained. It is my understanding that in Canada, at the end of the IC period, the site should be eligible for a licence to abandon, in other words, "unrestricted use" (see Comments 1 & 2 above). Otherwise, the institutional controls must be maintained to ensure use of the site is restricted. As discussed in Comment 9 above, US practice for the DOE sites suggests that institutional control is maintained in perpetuity by the Legacy Management Office. The authors should know that the proposed institutional control period of 300 years would not meet either US practice or IAEA guidance. Further, given the half-life of radionuclides that will be entombed the level of radioactive decay will not meet the both Canadian and international (IAEA) unrestricted use criteria (see Comments 1 & 2 above). In Section 2.5.4.2 *Environmental*, the authors admit this. To quote: *" … **the presence of the WR-1 ISD structure will result in restricted land use of the WR-1 portion of the WL site**. This area will require ongoing controls including Institutional Control, access restrictions, and performance monitoring; however, the amount of land associated with this area is very small relative to the size of the WL site that will have unrestricted land use.* Please revise the institutional control period to be consistent with the restricted use of the WR-1 location. Essentially this period must address the time required for the level of radioactivity to decay to the CNSC clearance criteria (see Comments 1 & 2 above).

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11.	1-11	1.2 Project Overview	*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) 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 Generations's* [sic] *Deep Geological Repository project).*	These statements are inconsistent with several other of the authors' assertions (such as that quoted in Comment 10 above), in which the authors state that the WR-1 site will never be released without land use restrictions. Please revise the institutional control period to be consistent with the unrestricted use of the WR-1 location. Essentially this period must address the time required for the level of radioactivity to decay to the CNSC clearance criteria (see Comments 1 & 2 above).
12.	1-13	1.4.1 Corporate History	Last Paragraph, last sentence *CNL works to deliver safety execution and innovation in all work activities, and provide the highest performance in meeting the commitments expected of them by their regulators, customers, stakeholders, First Nation and Métis peoples, and the public.*	What is the evidence that CNL actually does work "… *to deliver* …"? In the EIS Table 6.9.10-1: *Summary of Predicted Residual Adverse Effects for Socio-economic Valued Components* the proponent concludes that the concerns of the local residents are "Not Significant". All the mitigation measures identified in this table are short-term and do not address the legacy left at the site by a near surface radioactive waste disposal site. By concluding that the residual adverse affects for the socio-economic components are "Not Significant", CNL has not provided "*… the highest performance in meeting the commitments expected of them by … First Nation and Metis peoples and the public*." Please delete or revise this sentence.
13.	1-13	1.4.2 Management Structure	*CNL is led by an Executive Team and a Board of Directors. The President and Chief Executive Officer, along with seven Vice Presidents are responsible for different aspects of the business.*	When the consortium set up the executive structure for CNL in September 2015, there were seven VPs. In January 2016, there were 9 VPs. As of October 2017, there are 10 VPs If the authors cannot get an accurate number for their VPs, one wonders whether they can describe much more complex issues. Certainly simple errors such as these suggest that CNL has failed *"… to provide the highest performance … expected of them …*" (See also Comment 12 above.)

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14.	1-17	1.6.1 Federal Review Process	Second Paragraph, second bullet • ***Waste generator registration*** *will be maintained through the Manitoba Conservation and Water Stewardship and in compliance with the Dangerous Goods Handling and Transportation Act.* *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.*	The title of this section is "*Federal Review Process*". Yet this bullet refers to "Waste generator registration", a provincial requirement. Further, whether or not the "Project is located on Federal lands and is regulated by the CNSC …" does not mean "… that provincial permits, licences or other authorizations are not required." Nor does it exclude other federal regulators from having jurisdiction. The authors should know: • the distinction between federal and provincial legislation and • how this federal site addresses the requirements of the various "Authorities Having Jurisdiction". Please revise to ensure all applicable legislation is identified appropriately, and not just focus on the CNSC as the only regulator having jurisdiction. This lack of knowledge about the applicable legislation cannot be justified. Further, it raises significant questions about the competence of the proponent and their consultants. If this lack of knowledge represents their "… *highest performance in meeting the commitments expected of them by their regulators …*", then just performing normally would be unacceptable. (See also Comment 12 above.)
15.	1-17	1.6.2 Relevant Standards, Codes and Guidelines	The list of "Relevant Standards, Codes and Guidelines" includes no international guidelines or standards.	This list is incomplete since it contains no references to international guidelines or standards. It does not even include the US DOE document on lessons learned from the various ISD projects undertaken on behalf of the US DOE. This is somewhat strange since the authors continually assert that *In Situ Decommissioning* is a proven technology, and US DOE document is an assessment of the implementation of that technology at the only sites at which it has been used. In other words, this DOE document is the one that could provide that proof. See U.S. Department of Energy. 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, Please revise and include all "relevant standards, codes and guidelines", especially the international ones, since they are the only ones that address "entombment" or "in situ decommissioning".

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16.	1-18	1.6.2 Relevant Standards, Codes and Guidelines Ninth Bullet	• *CNSC Guidance Document G-320: Assessing the Long-term Stability of Radioactive Waste Management (CNSC 2006);*	The following is quoted from the CNSC G-320 guidance document: *7.4 Assessment Time Frames* *There is no time limit associated with the statutory objective to "prevent unreasonable risk, to the environment and to the health and safety of persons.," (NSCA, 9(a)(i)), or with the principle that the predicted impact on the health and safety of persons and the environment from the management of radioactive waste are no greater than the impacts that are permissible in Canada at the time of the regulatory decision (as discussed in CNSC regulatory policy P-290, Managing Radioactive Waste).* *Assessments of the future impact that may arise from the radioactive waste are expected to include the period of time during which the maximum impact is predicted to occur. In some cases, only the magnitude of the maximum impact, independent of time, may be sufficient for the assessment (e.g., in bounding assessments using calculations based on solubility constraints).* I cannot find any discussion of the potential impacts *"… to the environment and to the health and safety of persons …"* either during or after the institutional control period. Please include the appropriate assessment of the risk beyond the 100-year monitoring and the 300-year institutional control periods. Please include a discussion of the models used to predict these risks. See Section 7.3.1 of G-320. The following is quoted from that section of the guide. *Site characteristics must be sufficiently defined to produce an accurately descriptive model. For long term waste management facilities, site characterization activities will take place over many years, and should be carried out under a formal site characterization plan that includes quality assurance/quality control (QA/QC) protocols to verify the data. The evaluation and characterization plan also should include:* *1. Subsurface characterization (geology, hydrogeology, geochemistry, seismicity, etc.);* *2. Surface characterization (ecology, hydrology, geomorphology, climate, etc.);* *3. Monitoring systems;* *4. Current and foreseeable land use;* *5. Data integration, analysis, and incorporation into the site descriptive model; and* *6. Program and management quality assurance plans.* *The resulting information should be sufficient to develop site-specific models that will reliably simulate the response of the site to the perturbation caused by the licensed*

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				activities. Geoscientific modelling and initial assessment modelling can identify information gaps and later be used to guide on-going site characterization activities. From the US DOE Lessons Learned document *Key to ISD is the "performance assessment" conducted with the use of pathway modeling to demonstrate the long term safety to the environment and to the public health* (Reference - U.S. Department of Energy. 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, Page 1) The authors appear to have forgotten both Canadian and US DOE basics for an assessment of the long-term safety of their proposed entombed facility.
17.	1-21	Figure 1.7-1	ENVIRONMENT IMPACT STATEMENT DOCUMENT STRUCTURE	This figure does not include any document that describes a "Long-Term Performance Assessment" Please revise to include all documentation required for determining the long-term consequences for this undertaking. (See also Comment 16 above.)
18.	2-1	2.2 CNL's Integrated Waste Strategy (Last Sentence)	*The proposed WR-1 Project ensures CNL focuses their environmental efforts on* ***limiting nuclear legacy obligations for future generations****.[emphasis added]*	If a generation is 20 years, then an institutional control period of 300 years is equal to 15 future generations. The authors have to explain how IC results in "limiting nuclear obligations for future generations". The 300-year IC period is such an obligation and that responsibility will be transferred to at least 15 future generations. However, even that is a significant underestimate of future obligations. As the authors state several times in their document, the site of the reactor can never be freely released. (See Comment 10 above.) Since this assertion is obviously false, please delete, or acknowledge that the *"… nuclear obligations for future generations ..."* may change, but can never be limited.
19.	2-1	2.3 Purpose of the Project	*AECL's objective is to address risks and hazards in order to reduce risks and costs for Canada in a safe manner,* ***consistent with international best practices*** *(IAEA 2004, 2006).*	See Comment 8 above. These are the identical references given in Section 1.1 of the EIS. Essentially, the authors have ignored the IAEA guidance that specifically questions "entombment" as an acceptable process for decommissioning nuclear facilities Please address the two IAEA references on entombment given in Comment 8 above.
20.	2-2	2.3 Purpose of the Project	*1) Apply international best practices to safely decommission the WR-1 Building while ensuring protection to the environment*	See Comments 8 and 19 above. International best practice would suggest entombment is not acceptable.

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21.	2-2	2.3 Purpose of the Project	*3) **Significantly reduce risk to workers** during the decommissioning phase by avoiding and minimizing industrial hazards.*	I can find no evidence (except assertions) that the risk to workers is significantly reduced. For example, I cannot find any information about the risk to workers from the entombment process itself. This is somewhat surprising since the US DOE document (*DOE EM Project Experience & Lessons Learned for In Situ Decommissioning*) has extensive discussions on the risk to workers from the entombment process. Since the authors have failed to provide any details as to the activities associated with the entombment process, this omission is explainable. However, failing to provide details about these activities is not excusable. As discussed in the DOE document, those activities must include processes to ensure the required characterization of the physical, chemical, structural, and radiological contamination in all areas filled by the grout. Please provide a quantitative assessment of the various risks to workers from all activities (including characterization) for all four of the alternatives discussed. (**Note**, if the decommissioning of the reactor is deferred, then the activity in the facility will have decayed such that the risk to the workers conducting the characterization will be reduced.)
22.	2-2	2.3 Purpose of the Project	*c) Demonstrating the long-term safety of the Project through a consideration of the site characteristics and engineered design features, **including implementation of a long-term monitoring and surveillance program for the site.***	This sentence contradicts the quotation given in Comment 11 above in which it states: *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) only required for the first 100 years.** [emphasis added]* The authors need to explain why "long-term monitoring" is only required for 100 years. See also Comment 10 above.
23.	2-2	2.4 Project Design Principles	*The following principles and requirements are essential elements in the design of the preferred means of decommissioning the WR-1 Building.*	I cannot find any description, specification and/or performance requirements for the grout. From the EIS, the authors suggest that the potential long-term environmental, and health and safety of the entombed facility is based on the performance thus the integrity of the grout. This oversight raises a major issue. How does one assess the long-term safety if the information about the information about a critical aspect of that safety (that is the grout) is missing? The authors have failed to provide sufficient information about their "favoured" alternative such that a reviewer can confirm the assertions made about the long-term safety of the entombed facility. Please discuss the performance requirements of the grout.

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24.	2-3	Defence in Depth	*Of these seven* [defence in depth] *principles, the most effective is to eliminate the hazard, and wherever possible this will be the preferred method of hazard control for the Project. When a hazard cannot be eliminated, then the remaining principles are implemented to varying degrees to provide an acceptable level of defence-in-depth.*	I note that the authors in their discussion of "Defence in Depth" state that *"… the most effective …* [principle] *… is to eliminate the hazar*d". Further, the authors state that "*When a hazard cannot be eliminated, then the remaining principles are implemented …*" With respect to eliminating the hazard when calculating the residual risk see Comment 1 above. If the authors truly apply these seven principles, then it seems strange to me that they chose the only "alternative means" that does not remove the hazard. How do they apply the remaining principles? This again is somewhat strange. The focus of the discussions presented and the assessment provided focuses on "worker safety", a very short-term issue. For a disposal project, the authors must apply these principles to the long-term situation, and not focus on "worker safety". Given the 300-year institutional control and the potential risk that remains after that period, to put it bluntly, all those workers will be gone. The authors must address all seven principles in the long-term when assessing the four decommissioning alternatives. Specifically they must justify why the "most effective" principle was not chosen as the governing criterion when the evaluating the alternatives.
25.	2-5	2.4.2 Design Principles from External Sources	First Paragraph *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.*	The only two IAEA references cited in this section (and given in Section 13) are: • *IAEA. 2006. Fundamental Safety Principles. Safety Fundamentals No. SF-1. Vienna: International Atomic Energy Agency. ISBN 92-0-110706-4.* • *IAEA (International Atomic Energy Agency). 2014. Near Surface Disposal Facilities for Radioactive Waste.Specific Safety Guide SSG-29. Vienna: International Atomic Energy Agency. ISBN 978-92-0-114313-6.* The missing ones include: • *IAEA, Decommissioning Strategies For Facilities Using Radioactive Material, Safety Report Series #50, IAEA, Vienna, 2007* • *IAEA, Decommissioning of Facilities, General Safety Requirements Part 6, IAEA, Vienna, 2014* These latter two essentially state that entombment is not an appropriate end-state for the decommissioning of nuclear facilities. (See also Comment 8 above) The authors must address the latter two IAEA references and provide a justification as to why they do not apply to their proposal.

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26.	2-7	Paragraph at the top of the page	*The existence of this discussion paper demonstrates that the regulatory process for radioactive waste management and disposal is evolving.* ***It is likely that the regulations for radioactive waste disposal will change, or at least become more formalized, in the near future.*** *CNL will continue to meet and adapt to any new regulations as they develop. [emphasis added]*	The discussion paper to which this statement refers is: *CNSC. 2016b. Radioactive Waste Management and Decommissioning. Discussion Paper DIS-16-03. Ottawa ON: Canadian Nuclear Safety Commission. Version 1.0* With respect to the highlighted sentence, "It is likely that the regulations for radioactive waste disposal will change, or at least become more formalized, in the near future", begs the question. If the current status of WR-1 is essentially safe and *"… the regulations for radioactive waste disposal will change … in the near future*", why not wait until those regulations are in place? What is the rush? In other words, the authors must justify why the short-term objective of "reducing liabilities" is a higher priority than postponing the process until the CNSC regulations are in place "… *in the near future*." Recall, this project has a timeline of at least 300 years. Waiting a five years (i.e. 2% of this timeframe) has no long-term impact to the project. The authors must justify why they cannot encompass a short delay of 5 to 10 years in their project plan.
27.	2-7	2.5.1 Evaluation Approach	Second Paragraph *The purpose of this section is to present the alternative means of decommissioning the WR-1 Building. The consideration of alternatives is presented for each category in three steps:* • *identification of technical and economically feasible alternative means;* • *identification of effects on valued components (VCs); and* • *application of the defined criteria and the completion of a comparative evaluation to identify the preferred or most favourable option.*	Question: How does one identify the "… *effects on valued components*" when those components that are identified in this section do not match those in Section 6.0 of the EIS? Those VCs listed in Table 2.5.1-2 do not match those identified in Section 6.1 The authors cannot change VCs chosen to evaluate the alternatives, from those chosen to assess their preferred option. Please ensure that the evaluation criteria are consistently applied.

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28.	2-9	Table 2.5.1-2: Criteria for Evaluating Alternatives Means of Carrying Out the Project	Two criteria "Technical Feasibility" and "Economic Feasibility"	Both these criteria, "Technical Feasibility" and "Economic Feasibility", are part of the definition of "Alternative Means". To quote from the CEAA document, *Operational Policy Statement: Addressing the "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012*:: *"'Alternative means' are **the various technical and economically feasible** ways under consideration by the proponent that would allow a designated project to be carried out".* Obviously, any alternative means that are not technically or economically feasible would be eliminated from consideration. Further, these two criteria are not environmental factors. This document is an "***Environmental*** *Impact Statement*" [emphasis added], **NOT** a feasibility study. The authors must revise their evaluation methodology and remove these two criteria. See also Comment 12 above.)
29.	2-9	2.5.1 Evaluation Approach	Last Paragraph ***The alternatives are evaluated using a reason narrative approach*** *and described according to the above criteria (where applicable) …*	A "reason narrative approach" is not an acceptable evaluation approach if one can actually derive quantitative (or semi-quantitative) values. In this case, a quantitative can be done (although it requires more work.) Although any derived value will be subject to errors, as long as the assumptions used to calculate that value are provided, and the calculations are similar, the resulting estimates can be directly compared. A narrative approach is entirely subjective and subject to bias. This, it is **not** appropriate. Even if one does not wish to provide an estimated risk value, it is critical that all stakeholders are involved in determining the criteria against which to evaluate the alternatives. This is a disposal project. Thus, the long-term future of the First Nations, the local and regional communities is the major concern. This evaluation cannot be controlled by the short-term considerations of the proponent. The authors need to provide information as to who was involved in this evaluation approach, and ensure all stakeholders are included in determining the evaluation criteria and their comparative weightings, and conducting the evaluation of alternatives. See also Comment 12 above. This approach does not represent a reasonable attempt by CNL to "*… provide the highest performance in meeting the commitments expected of them by their … stakeholders, First Nation and Métis peoples, and the public.*"

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30.	2-9 to 2-11	Safety	"Worker Safety" and "Public Safety"	The criteria under "worker safety" include the following: • *Radiological Hazards during Decommissioning* • *Non-radiological Hazards during Decommissioning* • *General Worker Safety during Decommissioning* • *Waste Handling* I note that all these criteria are short term, and would all be covered in corporate procedures and processes. In other words, the project would not be required to do anything special. The criteria under "public safety" include the following: • *Transport of Hazardous Waste* • *Risk to Public at WL site during Post-closure* I note that only one of these six criteria (the last one) addresses the long-term safety of the public. This latter criterion will require the project to address the uniqueness of the proposed undertaking and its timeframe which exceeds 300 years. The authors need to evaluate their proposed undertaking and ensure that the long-term safety is given much higher priority or weighting than any short-term issues. See also Comment 12 above. This approach does not represent a reasonable attempt by CNL to "*… provide the highest performance in meeting the commitments expected of them by their … stakeholders, First Nation and Métis peoples, and the public.*"
31.	3-23	3.4.3 Regulatory Requirements	First Paragraph *The Project shall comply, as necessary, with federal and provincial regulations, guidelines, acts, standards, and codes (see Section 1.6.1 Relevant Standards, Codes and Guidelines and CNL's Program Requirements Document [CNL 2017a]);*	Section 1.6.1 is entitled "*Federal Review Process*", not "*Relevant Standards*". That latter section is numbered 1.6.2. A bit of surprise since this document is numbered *Revision 1*. As such, it had to have been subject to a review and comment process. Consistency within the document would be nice, but as this reviewer has found, it is unlikely.

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32.	3-23	3.4.4 Guiding Standards	*In addition to considering Canadian and international safety guidance (e.g., CNSC G-320, IAEA SSR-5, IAEA SSG-23), in developing the Project, CNL considered three international standards that outline the three main* • *stages for the decommissioning process. International Atomic Energy Agency, Decommissioning Nuclear Facilities: Decontamination, Disassembly and Waste Management, Technical Report No. 230, 1982.* • *International Atomic Energy Agency, Factors Relevant to the Decommissioning of Land-Based Nuclear Reactor Plants, Safety Series No. 52, 1980.* • *International Atomic Energy Agency, 1986 Safety in Decommissioning Research Reactors, Safety Series No. 74, STI/PUB/713.*	Several observations with respect to this paragraph • None of the references in the first sentence (G-320, SSR-5 or SSG-23) are cited in Section 13 of the EIS. • All three IAEA standards in the bulleted list are dated in the 1980's over 30 years ago. It is extremely unlikely that references this old are current. • None of these latter three IAEA references are cited in Section 13 of the EIS. Obviously, the proponents did not consider the two IAEA references cited in Comment 8 above. Thus, it is entirely unclear as to which "international" standards the authors used as guidance. Please revise this list to include the actual standards used by the authors. See also Comment 12 above. This approach does not represent a reasonable attempt by CNL to "… *provide the highest performance in meeting the commitments expected of them by their regulators, customers, stakeholders, First Nation and Métis peoples, and the public.*"
33.	3-31	3.5.1.1.1 Deactivation of the Building	*The first stage of decommissioning the WR-1 Building will be to transition to a 'cold and dark' state, in which all building services, including HVAC, electrical supply, water supply and drains, and data services are disconnected, and the building is completely deactivated. Temporary services will be installed to support safe occupancy of the building, and to permit physical decommissioning work to be carried out, including lighting, emergency signals, ventilation, sump water collection, and electrical power for tooling.*	None of these activities are unique to the chosen option. Therefore, the potential impacts to workers, the public and the environment are essentially the same for all options. The one activity critical to the In-situ Disposal option that is ignored is the characterization of the radiological and non-radiological hazards that will be left in place (or entombed). As discussed in the US DOE Lessons Learned document, this activity is essential since this information forms the basis for any long-term safety or performance assessment. Please identify and address all the crucial activities associated with the characterization of the radiological and non-radiological hazards that will be left in place. For a guide to determining those activities and the requirements for that characterization, I suggest the US DOE Lessons Learned document. (See - U.S. Department of Energy. 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) I note that the report "*In Situ Decommissioning Of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report*" (WLDP-26000-SAR-001. Revision 2) does not address the DOE guidance. This is somewhat strange since the focus of the DOE report is specifically ISD projects. As far as I can determine, there is no other similar report.

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34.	3-36	3.5.4.1.1 Reactor Core and Bioshield Components	*The overwhelming majority (~97%) of the remaining contamination in WR-1 is located within the piping and tanks that make 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). … These system components are the initial barrier, and must first breakdown through corrosion and dissolution in order for contamination to be released to any groundwater. Prior to their corrosion and dissolution, no contamination within them will be released.* ***Breakdown of the reactor system components is expected to occur gradually over thousands of years.***	As the authors point out, all of these system components will breakdown. However, they provide no information as to the implications of the releases of the radionuclides or hazardous substances that will result from this failure. Therefore, there is no evidence that their proposed entombment will not present a significant adverse risk to both humans in the future. (See also Comments 1 & 2 above) Please ensure the draft EIS includes an assessment of the breakdown of these components. That said, if the institutional controls were maintained in perpetuity, then one would expect that required physical processes and corrective action activities would be in place to address this breakdown throughout the complete IC period. In which case, in the EIS, the authors need to identify those processes and activities that will be maintained in perpetuity.
35.	6-221	6.5.4.2.4 Benthic Macroinvertebrates	First Paragraph *Benthic invertebrate studies were undertaken on the Winnipeg River in the vicinity of the WL site by AECL (1973).*	I note the reference to this study is 1973, more than 40 years ago. This 44-year old study and the three other studies cited are not an appropriate evaluation of benthic invertebrates near the WL site. These studies do not describe the current benthic environment adjacent to the WL site. As such, an evaluation of any potential impacts resulting from this project is impossible. The effects from any operations at the site since 1973 will confound the results of any assessment. This is especially true since the reactor operated from 1965 to 1985. Please provide the results of more recent studies conducted adjacent to the Whiteshell site. As a minimum, the timeframe for these studies cannot be greater than 4 years. If those reports are not available, then CNL must conduct the appropriate surveys before proceeding with this undertaking.

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36.	6-279	6.7 Human and Ecological Health	*This section of the Environmental Impact Statement (EIS) for the Canadian Nuclear Laboratories (CNL) In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site (the Project) summarizes* ***the results of the Environmental Risk Assessment*** *(ERA) completed for the Project (EcoMetrix 2017)*	As this section provides a summary of an *Environmental Risk Assessment*, the results discussed in this section are completely irrelevant to an Environmental Assessment (EA), or a performance assessment (PA). See Comment 4 above. All that an ERA can provide is the answer to the question, *"Is there currently a risk that needs to be managed?"* It cannot answer the question, *What interventions are required to ensure the risk is managed such that it poses no undue harm to the environment and/or persons?"* Neither can it answer the question: *If these management interventions are put in place, will that risk be reduced such that there is no undue harm*?" Please delete this section and provide a proper assessment. This section is irrelevant to an EA. It is incumbent on the authors to evaluate this proposal using the proper tool, and in this case, that is an Environmental Assessment. (See Comment 4 above)
37.	6-319	Table 6.7.2-2: Valued Components for the Ecological Health Risk Assessment	This table identified VCs that would be impacted by the current activities associated the proposed entombment.	Since there can be no information about the species on the site at the end of the IC period, let alone 100 years from now, the species identified in this table as requiring protection is meaningless. Any assessment of species currently residing near the Whiteshell site that suggests they will still reside in the area more than about 50 years from now is pure speculation. As long as the institutional controls are maintained, all species present will be protected. Essentially no assessment is required. However, without the ICs, then the species present could be at risk. Thus, to ensure they are protected at the end of the IC period, the residual activity and hazardous substances must meet clearance levels. Please delete this misleading and distracting assessment. See also Comment 1 above

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38.	6-322	Table 6.7.2-3: Assessment Endpoints and Measurement Indicators for the Ecological Health Risk Assessment	This table states that the "Assessment Endpoint" for 9 categories of VCs is "Protection of ecological health"	The authors provide no definition of "Protection of ecological health". Without a definition, one can never determine whether the "endpoint" has been achieved. Until the authors define "Protection of ecological health", then this EIS assessment endpoint is meaningless. Please delete. See also Comments 1 & 37 above.
39.	6-322	Table 6.7.2-3: Assessment Endpoints and Measurement Indicators for the Ecological Health Risk Assessment	The items given in the column "Measurement Indicator" all start with "Changes to …. quality"	Again, this list is meaningless. For example, any releases of gases from combustion, of particulates from cutting, grout preparation, transport, etc. will change the air quality. What changes are to be measured? Please include more details as to what is to be measured. Otherwise please delete.

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40.	6-300, 6-301, 6-309,	Figure 6.7.1-3: Conceptual Model for Human Receptors during the Closure Phase for Farm F Figure 6.7.1-4: Conceptual Model for Human Receptors during the Closure Phase Harvester Figure 6.7.1-6: Conceptual Model for Human Receptors during the Post-closure Phase for Farm A and On-site Farm Figure 6.7.1-7: Conceptual Model for Human Receptors during the Post-closure Phase for Harvester	These four figures depict a source and the various pathways to the dose received by the "human receptor"	While these figures are interesting, they are not appropriate. However, what they do show is that by removing the source, there is no pathway to the receptor. Therefore, there is no need to do these pathways analysis. Thus, he best alterative is to remove the source (the reactor) and not entombment it in place. See Comments 1, 2 & 4 above. See also Comment 36 above. Please provide the results of an environmental assessment, **not** a risk assessment.

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41.	6-333, 6-339	Figure 6.7.2-1: Ecological Conceptual Model for Closure Phase Figure 6.7.2-3: Ecological Conceptual Model for Post-closure Phase	These two figures depict a source and the various pathways to the dose received by specific valued component	In Figure 6.7.2-1, these components are the red fox and the loggerhead shrike. In Figure 6.7.2-3, these components are the mink, the trumpeter swan, the horned grebe, the walleye, the mallard, the barn swallow, and the little brown bat. There are two problems with these figures. The first issue is that identified in Comment 40 above. These are pathways analyses and not relevant to an Environmental Assessment. The second issue speaks directly to why the ERA tool cannot be applied. The species chosen as valued components are those that are present near the undertaking today. Since one cannot predict the species that will be present at the end of the institutional control period (either the 300-year one, or the never-ending one, or even 50 years from now), then this analysis tool cannot be used. There are no relevant end-point species for which a risk assessment can be conducted. See also Comments 36 & 40 above Please provide the results of an environmental assessment, not a risk assessment.
42.	6-376	6.8.5 Project Interactions and Mitigation	*"This section describes the process by which interactions between Project components and activities and land and resource use VCs were identified and evaluated. Potential effect pathways are identified and mitigation developed to eliminate and/or reduce effects is presented.* ***A pathways analysis is then used*** *…*" [emphasis added]	I regret to say the obvious, but to apply a "pathways analysis" to the "… *interactions between Project components and activities and land and resource use VCs…"* suggests the authors have no idea as to the limits of the ERA methodology. There can be no pathway with respect to land and resource use, since this use is a direct interaction. Either one uses the land and the resources directly, or one does not. Please delete this section, as it is completely meaningless.
43.	8-1	8.0 SUMMARY OF CUMULATIVE EFFECTS	The complete section	If the proponent designed the facility such that at the end of the IC period the residual activity met clearance levels, then, except for short-term activities, this section is not required. Without some effects, there can never be any cumulative ones (see Comment 1 above.) Please address the end-state requirement to meet clearance requirements, and delete all irreverent information.

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44.	10-10	10.5.1 Comparison with Unconditional Clearance Levels	*Following cessation of pumping from the sumps in the WR-1 Building, and the encapsulation of WR-1 within a grout block, groundwater elevations will recover to a new equilibrium elevation and the remaining components of the reactor will be situated below the water table (Golder 2017b).* ***It is anticipated that the WR-1 ISD structure will eventually deteriorate over time allowing the release of the solutes contained in the biological shield, PHT, and reactor components to the interior of the grouted structure, and eventually to the geological pathway.***	Section 4.3.3 of the reference, CNL, *Decommissioning Safety Assessment Report for the WR-1 In Situ Decommissioning of Whiteshell Reactor 1 Project. WLDP-26000-SAR-001* explicitly states: *As the safety assessment provides a safety envelope for the Project, an appropriate degree of conservatism was integrated into the solute transport modelling, including:* • *Conservatively the assumption was made that no credit should be taken for encapsulation of waste in the grout.* As such, the relevance of an assessment of that incorporates any deterioration of the ISD structure over time is not clear. If no credit can be made for encapsulation, then the radioactive content at the time of entombment must such that at the end of the IC period, clearance levels in accordance with CNSC P-290. (See Comment 1 & 2 above.) Please ensure that all assumptions are consistently applied, such that one can demonstrate that clearance levels will be met at the end of the IC period.
45.	10-11	10.5.2 Comparison with Natural Analogues	*Many naturally occurring ore bodies contain elevated concentrations of radionuclides. These 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.*	While natural analogues appear to be an appropriate comparison for the purposes of a long-term evaluation, the particular nuclides included in the "near-surface deposits" are not equivalent to any anthropogenic nuclides. This is especially true since the natural deposits are typically dispersed, whereas the anthropogenic ones are considerably more concentrated. Essentially the natural deposits do not require protection (i.e. no institutional controls), whereas the anthropogenic ones do. This section is deliberately misleading. Please delete.
46.	10-12	Section 10.5.2, last sentence last paragraph	*Experience has shown that a sound knowledge of the potential radiological impacts associated with the presence of these natural deposits has generally resulted in no measurable impact on human health (CCME 2007).*	Cannot find the reference CCME 2007. See Comment 45 above, please delete, as this whole section is not relevant.

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47.	11-2	11.0 SUMMARY OF MONITORING AND FOLLOW-UP PROGRAMS, Paragraph 5, Second bullet	***Post-closure Phase****: The post-closure phase has two discrete periods: Institutional Control and Post-institutional Control. The Institutional Control period Includes implementation of both active and passive control throughout 2024 to 2324 (i.e., 300 years). During active Institutional Control, long-term performance monitoring and maintenance activities will continue through to 2124 to demonstrate compliance with the safety case assumptions. The passive Institutional Control period includes passive controls such as access restrictions (e.g., physical barriers/fencing, signage, and land title instruments/deed restrictions) and will continue through 2024 to 2324. Post-institutional Control occurs after year 2324 and continues indefinitely.*	Please delete. This is entirely misleading Any restriction on the use of the land in perpetuity (as stated elsewhere in the document – for example, see Comment 3 above), means permanent Institutional Control is required, thus there cannot be a "Post-Institutional Control period."

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48.		The EIS	**General Comment** • The EIS would not pass for a quality high school report	As the reader of my comments above will discern, I have found reviewing the EIS very frustrating. I sometimes wonder whether a document like this would even pass for a quality high school report (although the pictures are pretty). As a former teacher, I can confidently state that this report would not be acceptable. There are just too many discrepancies and distractions Further; most of the information in the report is irrelevant. It reminds me of the information a student would include in their report if they wanted to demonstrate their considerable knowledge about lots of stuff, but very little with respect to the topic at hand. As stated in Comment 1 above, the proponent only needed to demonstrate is that the facility would meet clearance criteria at the end of the Institutional Control period. This assessment would be a relatively easy task if the proponent's preferred option was simpler, and not involve the complexities of trying to prove the entombed structure would no present an undue risk to the health and safety of persons and to the environment in perpetuity. However, the proponent chose an alternative that requires too many assumptions, resulting in too many inconsistencies and several outright contradictions. As several of the comments above demonstrate, the authors have not provided sufficient evidence to support their assertions. Although one can speculate about the reason, I suggest it was because they did not understand the complexities of the alternative chosen. However, having made the choice, they can do nothing but defend that alternative. Too bad it was the most complex of the options available. I cannot address the fundamental issue of this lack of understanding. Therefore, providing further comments is unlikely to be of any benefit. The proponent must cease their attempt to muddle through the complexities of their chosen option and look to a simpler option that will achieve the ultimate goal to ensure unrestricted land use criteria are met for the footprint of the WR-1 reactor.