Speaking Notes
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Review of CNL Waste Acceptance Criteria
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My name is Emily Ham, I am a Junior Environmental Scientist from Hutchinson Environmental Sciences. We were tasked by Northwatch to conduct a review of documents pertaining to Waste Acceptance Criteria at the proposed Near-Surface Disposal Facility at the Chalk River Laboratories site.

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- **The NSDF is designed to house solid, low-level radioactive waste for permanent disposal in an Engineered Containment Mound -** It is located within the Chalk River Laboratory site, approx. 300 km west-northwest of Ottawa. The NSDF project will dispose of waste in an **Engineered Containment Mound** including a multi-level base liner and cover system.
- **1,000,000 cubic metres of waste will be placed within 10 internal cells -** It will hold up to 1,000,000 cubic meters of low-level radioactive waste within 10 internal cells. The waste is proposed to be placed in each of the 10 cells, and each cell will be covered once it is full.
- **Includes a wastewater collection and treatment system** - A wastewater collection and treatment system in included in the NSDF design to collect and pump leachate from the ECM to a WWTP. Leachate will then be treated to remove radiological and chemical contaminants, and then discharged to the ground through an exfiltration gallery. In the vicinity of the NSDF, shallow groundwater flows towards the Ottawa River, and surface water also ultimately flows to the Ottawa River through Perch Lake and Perch Creek.
- **Designed to contain low-level radioactive waste from previous and future operations, contaminated soils, and building materials:** The NSDF is designed to contain low-level radioactive waste from previous and future operations at the Chalk River facility, and contaminated soils from environmental remediation and decommissioning of outdated infrastructure at the CRL site. Low-level radioactive waste is defined as waste containing short-lived radionuclides (which means having a half-life of <30 years), which require containment for 100s of years.

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We reviewed four core documents related to Waste Acceptance Criteria for the Near-Surface Disposal Facility, on behalf of Northwatch. We were specifically asked to identify key elements of the Waste Acceptance Criteria that might have uncertain impacts to environmental and human health, and to compare the NSDF Waste Acceptance Criteria to similar international facilities housing low-level radioactive waste. (Therefore, this review and its findings have been approached from an environmental perspective, identifying any potential shortcomings in the core licensing documents and any uncertainties in communication).

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Overall, we found that the CNL Waste Acceptance Criteria and CNSC amendment documents were well-informed and detailed. There appeared to be careful consideration of the design, mitigation actions, and also the regulatory principles for management of radioactive waste. However, in our review of key documents, we identified 3 potential overarching issues that may need further clarification from Canadian Nuclear Laboratories:

Point 1: Uncertainty in licensing documents

Point 2: Some information may not have been fully considered from an environmental perspective.

Point 3: Differences in design/waste accepted/approach from other international WAC from comparable facilities also accepting low-level radioactive waste were also identified.

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As mentioned, very little environmental context was given in the core licensing documents, although the licensing documents were well-informed and detailed with respect to waste acceptance and design context. Landfill gas monitoring plans were not well understood from the licensing documents, and groundwater monitoring protocols were not fully understood from a cursory review of licensing documents. This information was found to be difficult to locate without a detailed review of the Environmental Impact Statement, which is quite substantive and not practical to review in full, especially for concerned citizens who should not need to review this document to understand how their environmental and human health concerns are being addressed.

Further, some ambiguity was identified regarding what documents are actually included in the licensing. For example, the Post-Closure Safety Agreement was mentioned to be included in the licensing, but any other parts of the licensing are unclear and may need to be clarified by the proponent.

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We also identified some ambiguity surrounding the types and quantities of intermediate-level radioactive waste that will be accepted in the NSDF.

A majority of the waste to be accepted in the NSDF is legacy waste from previous activities at Chalk River Laboratories, and is mostly contaminated soils and building materials, but it is understood that some intermediate-level waste may be included in the NSDF if the legacy waste contains some longer-lived radionuclides that are not practical to separate from lower-level waste. However, the possible inclusion of other intermediate-level waste remains uncertain. Some questions arise – such as How much intermediate-level contamination is allowed? What percent of the accepted waste may be intermediate-level waste?

In the EIS, it states that 87% of the waste to be accepted in the ECM will be bulk materials, while packaged waste will make up approx. 13% of total waste volume; But in the CNSC documents, it was stated that ~90% of the waste in the ECM would be contaminated soils and building materials. Details on the proportion of wastes that will be accepted should be consistent between the core documents.

The acceptable extent of intermediate-level waste should be further defined to prevent unacceptable quantities/types from being deposited :

“The NSDF will not contain high-level radioactive wastes such as nuclear fuels nor intermediate waste such as irradiated reactor core components” – some of the regulatory documents state that some intermediate-level waste may be included if CRL legacy waste contains some longer-lived radionuclides that are not practical to be separated from lower-level waste.

The number and volume of long-lived radionuclides (half-life >30 years) is not well understood:

It is stated in the WAC that there are restrictions on the number of long-lived radionuclides, but the volume of allowable longer-lived radionuclides should be specified. In the Waste Acceptance Criteria, the disposal framework and acceptance criteria for low-level waste is well-outlined and thorough, but the types and quantities of intermediate-level radioactive waste that are acceptable in the NSDF should be further defined to prevent unacceptable quantities of intermediate-level waste from being deposited in the NSDF.

Overall, these communication uncertainties should be clarified by CNL to make it easier for citizens and reviewers to determine if environmental and human health concerns have been adequately addressed.

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The second issue identified based on the review of core documents was a possible lack of sufficient consideration of NSDF impacts from an environmental perspective.

Landfill gas capture methods were uncertain – More clarification should be given in this licensing document to describe the landfill gas capture and monitoring for radionuclides. The EIS mentioned that a landfill gas venting system will be included, and methane gas production will be mitigated, although it remains unclear in the Commission Member Document how this will be accomplished – for document completeness, a summary of the landfill gas management approach should be provided or a reference provided to the EIS.

Groundwater monitoring – the extent of groundwater monitoring did not appear to be sufficient for the extent of the site based on information gathered from the core licensing documents. Groundwater monitoring appears to only be conducted at 9 wells on the wetland-NSDF boundary, but GW monitoring across the rest of the site and in potential stratified groundwater regimes was not well described, nor was the frequency of groundwater monitoring to assess impacts.

Criteria for assessing surface water quality may not be sufficient or appropriate for surface water discharges. Guidelines for maximum acceptance concentrations of radionuclides in groundwater are derived from Health Canada’s Drinking Water Quality Guidelines, which are not appropriate and less stringent for surface water discharges. The reason why Drinking Water Quality Guidelines were proposed is not well understood – Therefore, more appropriately, PWQO should be used for assessment, which are intended to protect ecological receivers in Ontario.

Multiple occurrences of the phrase “The waste acceptance criteria for the NSDF will limit the level of contamination, limiting the magnitude of surface water and groundwater quality changes”, however, no

rationale is given for how this will protect surface water quality of what mitigation strategies will be implemented if a leak is detected.

The Environmental Impact Statement provides environmental context for the NSDF in great detail, and filled in several information gaps from core licensing documents, such as landfill gas monitoring considerations, in which gas monitoring probes will be installed around the perimeter of the landfill, and also provided more information on exceedance levels for wastewater and special radionuclides, which will inform mitigation strategies and response frameworks. However, because the EIS is so substantive, it was not reviewed in its entirety, and only sections pertaining to WAC were reviewed. It is possible some of these environmental issues in the core documents are addressed in the EIS, although the key information is difficult to find without detailed review.

Potential risks from the facility and frameworks for detecting project-related effects are provided in the licensing documents, However, an overarching recommendation of the NSDF licensing is that key environmental impact monitoring and mitigation strategies be summarized and made readily available in the core licensing documents, for ease of review and to increase public confidence in the project.

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Potential environmental impacts and framework for detecting project-related effects were not well understood from the core documents –

Potential pathways from the facility itself to the environment, and potential impacts and/or mitigation measures were not well described – many potential receivers in the area, wastewater plant discharged to ground via an exfiltration gallery – therefore any contaminants of concern in wastewater effluent can enter groundwater and enter receivers such as Perch Lake and Perch creek, and ultimately reach the Ottawa River.

Therefore, a summary or reference to guidelines and mitigation strategies should be readily available in CNSC licensing documents for ease of review and public confidence in the project.

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The fate of metals and radionuclides separated from leachate during water treatment process was not described in background documents – collection and disposal of these residuals should be clarified.

“Several radionuclides and non-radiological constituents may be present in the wastewater at concentrations exceeding discharge targets” – Plans for treating leachate if wastewater treatment system is not operational should be provided:

As previously mentioned, treated effluent will be discharged to groundwater through an exfiltration gallery, providing a longer migration time to the Ottawa River instead of directly discharging to Perch Lake.

Not well described what will be done if leachate collection and treatment system is overcapacity

Also, an increase in leachate production during precipitation events may need further clarification in the licensing documents, to ensure that increased leachate volumes have been accounted for in the NSDF design.

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The NSDF Waste Acceptance Criteria was compared to Waste Acceptance Criteria from 4 international facilities with a similar shallow landfill-like design. These four facilities were:

the Lillyhall Landfill in Cumbria, UK;

The National Nuclear Security Site in Nevada, USA;

The Vaalputs facility in South Africa,

The Paducah gaseous diffusion plant in Kentucky, USA

Environmental context was found to be lacking in all WAC documents for the international facilities.

Considerations for particle and radionuclide resuspension (which were provided in Nevada WAC) do not appear to be accounted for in the NSDF. This may be a particular concern for contaminated soil placement. Clarification should be provided for how particulate matter will be safely contained within the NSDF.

Groundwater velocity was given in the Nevada landfill document. This information was missing from the NSDF documents and should be included to evaluate whether an appropriate groundwater monitoring program will be conducted.

Leak detection protocols (included in Paducah, Kentucky WAC) were not encountered in NSDF WAC, and more clarification should be given in the WAC document regarding CNL's policies for detecting and responding to leaks in packaging before it is sealed in its respective cell.

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In terms of the type of waste accepted in these facilities, it appears that none of the international facilities that we investigated have made provisions for intermediate-level waste, and it is possible that the NSDF facility has a more robust construction to allow the inclusion of legacy waste where intermediate-level radioactive waste cannot be feasibly separated.