Sagkeeng Anicinabe

Alternative Means Assessment for the Environmental Assessment of Canadian Nuclear Laboratories' Proposed WR-1 Reactor Decommissioning Project

October 13, 2020

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FINAL REPORT / October 13, 2020

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Executive Summary

THIS IS THE FINAL REPORT of the alternative means assessment completed by Sagkeeng Anicinabe First Nation (Sagkeeng) in relation to Canadian Nuclear Laboratories' (CNL or the Proponent) proposed WR-1 Reactor Decommissioning Project (the Project) at Whiteshell Laboratories, in Sagkeeng traditional territory. The report is being submitted to CNL and the Canadian Nuclear Safety Commission (CNSC), the regulator responsible for the environmental assessment (EA) of the Project. It describes Sagkeeng's approach and findings for the consideration of four technically and economically feasible alternative means to undertake the decommissioning of the WR-1 reactor facility.

As detailed in its draft 2017 Environmental Impact Statement, CNL conducted a wholly internalized comparative assessment of four technical and economically feasible alternative means for the decommissioning of the WR-1 Reactor, and proposed its preferred option of complete 'In Situ Decommissioning' (ISD), which would grout remaining radioactive materials in place in the ground at the existing WR-1 Reactor site immediately and permanently. Sagkeeng has, since early 2018, raised substantive concerns about the implications of CNL's proposal, including the exclusion of Indigenous perspectives in the development of criteria and weighting for the alternative means assessment undertaken by CNL. Sagkeeng has also repeatedly sought attempts to collaborate with the Proponent on a more inclusive approach to the assessment with limited success. As early as January 2018, Sagkeeng recommended CNL engage in a multi-party, multiple accounts evaluation to identify a preferred alternative means to decommission the WR-1 Reactor. The Proponent has declined to do so to date, but in mid-2020 agreed to fund Sagkeeng to conduct this parallel assessment that reflects Sagkeeng perspectives on preferred alternative means to decommission the WR-1 Reactor. Sagkeeng's preference remains to convene a multi-party table to conduct this most critical of assessments, as the choice of which alternative means to use to decommission the WR-1 Reactor has substantial implications for the future ability of Sagkeeng members to reconnect with this important portion of Sagkeeng territory.

Sagkeeng adopted the four alternative means deemed technically and economically feasible by CNL, for consideration in this alternative means assessment. Those alternative means are:

1. Deferred decommissioning with eventual complete dismantling and removal;
2. Complete dismantling and removal, effective immediately;
3. Complete in-situ decommissioning (ISD); and
4. Partial dismantling and removal with ISD of the remainder.

Sagkeeng notes that the full removal of the WR-1 Reactor (covered by Alternatives 1 and 2) is what the approved current decommissioning plan for the facility is, as a result of a prior EA completed in 2002.

This Sagkeeng Alternative Means Assessment is the culmination of work that began in late 2018. As a necessary first step, Sagkeeng Chief and Council worked with Firelight Research Inc. (Firelight) and CNL to better understand the four alternative means that were deemed technically and economically feasible in the proponent's initial alternative means assessment. Subsequently, Sagkeeng identified and integrated eight alternative means assessment tests in phases between late 2018 and September 2020. The alternative means assessment tests include a mixture of purely technical tests (undertaken independently by technical expert Mr. Tony Brown), as well as tests integrating criteria and weightings reflecting Sagkeeng's values and preferences relevant to the WR-1 decommissioning project. Sagkeeng chose a large number of tests so that many different aspects – technical, Sagkeeng values-based criteria, Treaty rights implications, among others – could be considered in its deliberations.

The Sagkeeng tests consistently reveal that the immediate full removal of the radioactive materials from Sagkeeng's traditional territory (Alternative 2) is the highly preferred alternative based on technical reconsideration, Sagkeeng guiding questions, values, Treaty rights, and likelihood of garnering Sagkeeng consent. Seven and a half of the eight tests (two of the tests were two part tests) prefer for full removal options, especially Alternative 2 because it would happen more quickly.

Full ISD (Alternative 3) is the least preferred alternative means from Sagkeeng's perspective in the vast majority of tests, in part given that the continued presence of Intermediate Level Waste radioactive materials at the WR-1 facility has a higher likelihood in resulting in significant adverse effects on current and future land use, Treaty rights, food security, and faith in country foods, amongst other Sagkeeng priority values. ISD would leave Intermediate Level radioactive waste under the ground, near the surface and near the Winnipeg River, in perpetuity. This would likely lead to multiple adverse effects on Sagkeeng members, via both potential biophysical changes if the ISD does not work properly and as it loses structural integrity over time, and fear and stigma caused and/or extended in longevity by the continued presence of these nuclear materials in the area. Both types of impacts can be avoided with full removal.

The findings and analysis presented in this Final Report clearly demonstrates that Sagkeeng opposes CNL's proposal to change from the currently permitted full removal plan to an ISD proposal which would leave these radioactive materials in the ground in Sagkeeng's Traditional Territory, and provides clear reasons behind that opposition, based on criteria that reflect Sagkeeng Pimatziwin – Sagkeeng values and way of life. These findings also highlight the need to address this issue of preferred alternative means to decommission WR-1 in a more collaborative way in this EA. Sagkeeng thus calls for Canada to stick to the existing full removal plan and to not adopt any alternative that does not get the consent of Sagkeeng.

Contents

Acronyms Used in this Report

Acronym	Definition
AECL	Atomic Energy Canada Limited
ALARA	As Low as Reasonably Achievable
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
CNL (or the Proponent)	Canadian Nuclear Laboratories
CNSC	Canadian Nuclear Safety Commission
CSR	Comprehensive Study Report (2002)
EA	Environmental assessment
EIS	Environmental Impact Statement
Firelight	Firelight Research Inc.
FPIC	Free, prior, and informed consent
ILW	Intermediate level radioactive waste
ISD	In-Situ Decommissioning
PCB	Polychlorinated Biphenyls
Sagkeeng	Sagkeeng Anicinabe First Nation
TRC	Truth and Reconciliation Commission
UNDRIP	*United Nations Declaration on the Rights of Indigenous Peoples*
Whiteshell Labs	Whiteshell Labratories

1. Introduction

THIS IS THE FINAL REPORT of an alternative means assessment completed by Sagkeeng Anicinabe First Nation (Sagkeeng) in relation to Canadian Nuclear Laboratories' (CNL or the Proponent) proposed WR-1 Reactor Decommissioning Project (the Project) at Whiteshell Laboratories, in Sagkeeng traditional territory, and asserted Aboriginal title territory. It is being submitted to CNL and the environmental assessment (EA) body, the Canadian Nuclear Safety Commission (CNSC), which is the regulator responsible for the EA for this proposed decommissioning project, as part of Sagkeeng's engagement in this EA process.

This final report walks through the application of eight different "tests" Sagkeeng developed for consideration of which alternative means to undertake the decommissioning of the Whiteshell WR-1 reactor facility is preferable from Sagkeeng's perspective.

About Sagkeeng and the WR-1 Reactor Decommissioning Process

Sagkeeng members have a strong connection to the lands and waters in the Whiteshell Laboratories area. That connection has been alienated in whole or in part for over 50 years (since approximately 1963) by the presence of radioactive materials and an associated industrial facility on (and under) Sagkeeng Traditional Territory. In 2002, Canada committed to take all these radioactive materials out of the ground and move them to another purpose-built facility.

In 2017, the site operator, Canadian Nuclear Laboratories, proposed to change that WR-1 Reactor decommissioning process to In-Situ Decommissioning, which would see the remaining radioactive waste from the Reactor entombed in a grout/concrete chamber, in its current position near the east bank of the Winnipeg River. Sagkeeng has since consistently raised substantial concerns about both this proposed switch and the environmental assessment process within which it is being considered.

1.1 Purpose of the Sagkeeng Alternative Means Assessment

In Section 2 of its draft Environmental Impact Statement (draft EIS) for the WR-1 Reactor Decommissioning Project (CNL 2017), CNL conducted a comparative assessment of what it considers to be four technically and

economically feasible alternative means for the decommissioning of the WR-1 Reactor[1]. These alternative means are identified in more detail in Appendix A, but at essence their distinctions are concerned with what happens to the radioactive material, and when. The alternatives assessed by CNL include:

- Alternative 1 (Deferred Decommissioning with complete dismantling and removal) would leave it in the ground for a while and then remove it completely from Sagkeeng territory;
- Alternative 2 (Immediate Decommissioning with complete dismantling and removal) would remove it immediately from Sagkeeng territory;
- Alternative 3 (Complete In Situ Decommissioning) would cement it in place at the existing WR-1 Reactor site immediately and permanently; and
- Alternative 4 (Partial dismantling and removal, partial In-Situ Decommissioning) would take most of it out and cement in the rest in place.

CNL's preferred alternative means, In Situ Decommissioning (Alternative 3), is the only alternative means that CNL has advanced to its actual decommissioning proposal in the draft EIS.

From 2018 to date, Sagkeeng raised substantive concerns about the absence of perspectives from other parties, including impacted Indigenous groups, in the development of criteria and weighting for the alternative means assessment conducted by CNL, and the total absence of Indigenous perspectives in the conduct of that alternative means assessment[2]. As a result, starting in early 2018, Sagkeeng sought a collaborative alternative means reassessment process with CNL for the WR-1 decommissioning project. CNL has chosen instead to let its own alternative means assessment stand with minimal consideration of inputs from Sagkeeng. However, CNL provided funding for Sagkeeng to complete its own parallel alternative means assessment. This report is the result of that effort.

Sagkeeng Chief and Council's push for an alternative means assessment that considers other perspectives than CNL's was in part due to the very sensitive nature of CNL's proposal. In 2002, following a rigorous EA process reported in a Comprehensive Study Report (CSR), Atomic Energy Canada Limited (AECL) received authorization from CNSC to decommission the WR-1 nuclear research reactor at the Whiteshell Laboratories (Whiteshell Labs), via complete dismantling and removal of the facility, with disposal of hazardous materials at a purpose-built engineered facility elsewhere.

Fifteen years later, CNL, working under the direction of AECL, submitted a proposal to implement an alternate decommissioning project, referred to as "In-Situ Decommissioning" (ISD). CNL's new ISD proposal is to cement radioactive wastes within the WR-1 facility. Sagkeeng has, since the start of this EA, raised concerns about Canada not living up to its prior commitment to remove all radioactive wastes from the WR-1 facility, and the implications for people and the environment of turning the WR-1 site into a permanent radioactive waste storage facility, despite it not having been built for that purpose.

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1 CNL in December 2018 provided Sagkeeng with a draft Revision 2 of Section 2 of its EIS. This document was the one used in the technical reassessment by Mr. Tony Brown, described in Sections 2.2 through 2.4 below.

2 Those critiques of the Proponent's alternatives means assessment are not the focus of this Sagkeeng Alternative Means Assessment Final Report. They are already on the public record, for example in [Sagkeeng First Nation 2018), and these concerns remain undiminished at the time of filing this Final Report.

In many EAs, alternative means assessment plays a relatively minor role, with the Proponent simply required to show that their preferred method of undertaking a project is technically and economically feasible. As a result of the ISD proposal being intended to replace an already approved "full removal" plan (under the 2002 CSR), the alternative means assessment for WR-1 is an absolutely critical aspect of the overall process. Unless and until the ISD alternative (CNL's Alternative 3) can be demonstrated to be preferable (including to the Proponent, to impacted Indigenous groups, and to Canada) relative to the already committed and permitted full removal options (CNL's Alternatives 1 and 2), CNSC should reject the proposal to change the decommissioning plan to ISD.

Consideration of alternative means to undertake a proposed project is a topic required under the *Canadian Environmental Assessment Act, 2012, (CEAA, 2012)*. Good practice of EA requires that when interested, impacted parties identify a desire to engage meaningfully in the alternatives assessment, the Proponent and the assessment body should engage and consult them meaningfully, and integrate their perspectives into the alternative means assessment. This has not yet been accomplished during this EA. Sagkeeng remains open to and hopeful that CNL and CNSC will work with Sagkeeng to integrate findings in this report meaningfully into a reconsideration of alternative means to decommission the WR-1 Reactor facility.

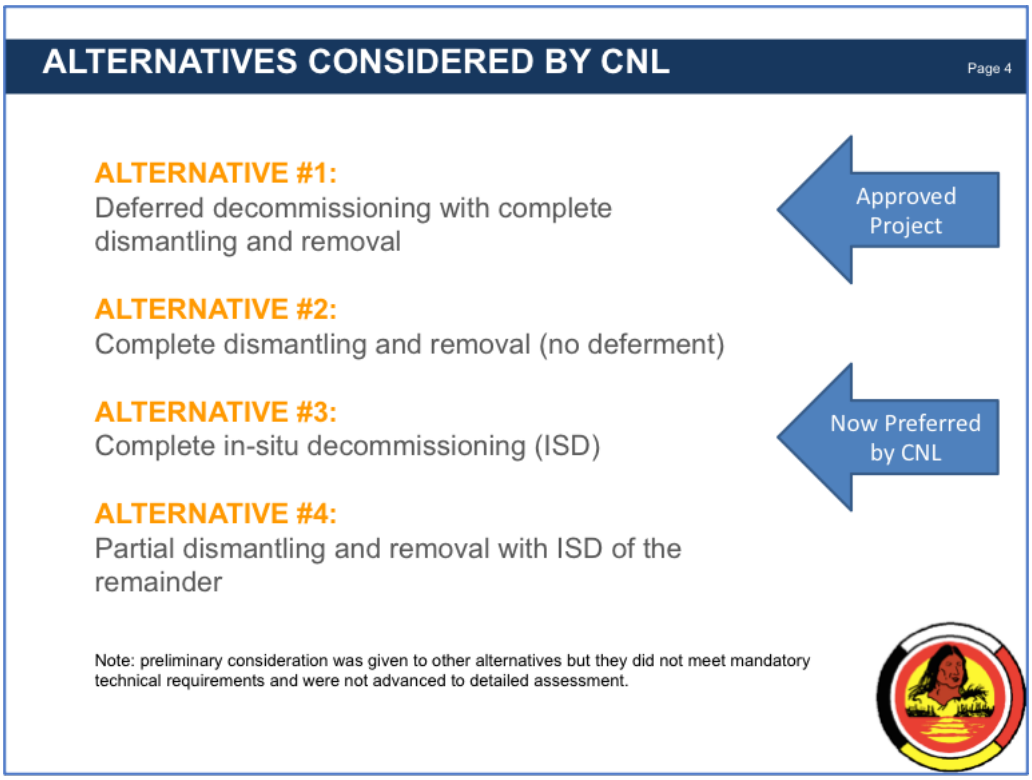
The results of this Sagkeeng Alternative Means Assessment must be read in combination with other past and forthcoming submissions by Sagkeeng and CNL in relation to the WR-1 Reactor Decommissioning Proposal:

1. The Sagkeeng Land Use and Occupancy Study specific to the WR-1 Facility (Olson et al 2019a);
2. Prior submissions of technical comments on the Alternatives Assessment by Sagkeeng (including but not limited to Sagkeeng First Nation 2018);
3. The forthcoming psycho-social effects study with Sagkeeng related to the decommissioning of WR-1 (Narratives Inc. 2020);
4. The forthcoming revised draft EIS, Section 2 (CNL expects to file this in the latter part of 2020); and
5. The forthcoming Rights Impact Assessment report which will be co-developed by Sagkeeng with CNSC staff.

1.2 Alternative Means Assessment Timeline

This Sagkeeng alternative means assessment was conducted in stages between late 2018 and September 2020. In the first stage of this assessment, Sagkeeng Chief and Council worked with Firelight Research Inc. (Firelight) and CNL to better understand the four alternative means that were deemed technically and economically feasible in CNL's original alternative means assessment, the results of which were included in CNL's draft EIS for the WR-1 Reactor Decommissioning Project. Those alternative means deemed economically and technically feasible by CNL were (and remain as of the date of this final report) the ones shown in Figure 1.

Figure 1: CNL's Four Technically and Economically Feasible Alternative Means



CNL in June 2020 provided Sagkeeng updated information about these four alternative means; they are presented verbatim in Appendix A.

Sagkeeng's understanding of the four alternative means came through information sharing, both between Firelight and Sagkeeng Chief and Council from November 2018 to January 2019, and between CNL and Chief and Council, at a two-day meeting in Winnipeg in February 2019. The results of the first three tests used by Sagkeeng in its independent alternatives assessment described below were also provided by a technical expert retained by Sagkeeng, Mr. Tony Brown, at those February 2019 meetings (Brown 2019).

From November 2018 to February 2019, Sagkeeng Chief and Council, along with other members and traditional knowledge-holders in Sagkeeng, also worked with Firelight to identify and apply principles, criteria and associated alternatives comparison tests that more deeply reflect Sagkeeng values, priorities, concerns, and laws and norms, to the four alternative means identified by CNL as economically and technically feasible. Sagkeeng also identified guiding questions that can help protect those values in relation to the decommissioning of WR-1 (Sagkeeng Test #5).

At the February 2019 meeting, Sagkeeng Chief and Council and Elders determined that additional time was necessary to conduct ceremonies, prior to continuing on with the consideration of alternative means. Two ceremonies were held – one on March 18, 2019 at Turtle Lodge in Sagkeeng, and one held at the Whiteshell Labs facility itself, on September 13, 2019. At the March 2019 meeting, a Sagkeeng Elder introduced a fifth alternative means for CNL's consideration – that of rotating stewardship. CNL subsequently deemed this alternative non-feasible and did not include this alternative in its draft EIS' alternative means assessment.

At a meeting between Sagkeeng and CNL on December 11, 2019, Sagkeeng asked about the resumption of the alternative means assessment process. CNL indicated at that time that it planned to complete the alternative means assessment for its EIS on its own. On February 18, 2020, Sagkeeng formally requested funding from CNL to support Sagkeeng completing the alternative means assessment Chief and Council had started in November 2018, and which "was never completed, and which Sagkeeng has never abandoned"[3]. On June 5, 2020, CNL committed to support this Sagkeeng alternatives assessment completion project.

Firelight worked with Sagkeeng Chief and Council from July through September 2020, to finalize the Sagkeeng alternative means assessment by conducting additional tests (see further discussion of tests below) and confirming the results of all eight Sagkeeng tests, including three verification sessions with Chief and Council (July 23, August 18, and October 13, 2020). At the final verification session on October 13, 2020, Sagkeeng Chief and Council approved the findings of this Final Report. Upon submission of this Final Report, Sagkeeng is seeking to engage with CNSC and CNL on the results of the Sagkeeng alternatives assessment, and a path forward toward integrating these results meaningfully into the EA process.

1.3 Sagkeeng Alternative Means Assessment Methods

Sagkeeng's WR-1 alternative means assessment approach was to triangulate results from a maximum variety of tests, based on a rationale that more information and more ways of looking at the comparative benefits and risks of multiple alternatives, results in stronger and more accurate assessment of preferable solutions.

It was important to Sagkeeng that technical perspectives on the preferability of alternative means, and perspectives from community representatives, informed the Sagkeeng alternatives means assessment. Purely technical assessment of the four alternative means deemed technically and economically feasible by CNL, by an independent third party (Mr. Tony Brown), was sought first (Tests 1-3). After that, assessment integrating Sagkeeng weighting and values (Tests 4-8) was conducted, with a mixture of direct scoring by Sagkeeng Chief and Council and Firelight's professional judgment based on their understanding of Sagkeeng priorities and the characteristics of each alternative means, followed by confirmation of the accuracy of this scoring by Sagkeeng Chief and Council.

The eight Sagkeeng alternative means assessment tests included in this final report are as follows, and each is identified in further detail in Section 2 of this final report:

Purely Technical Tests (conducted by Mr. Tony Brown (2019))

1. Revised Scoring with CNL Weighting
2. Revised Scoring and Revised Weighting
3. Revised Scoring, Revised Weighting, and Technical Uncertainties Included

3 Sagkeeng letter from Chief Derek Henderson to CNL dated February 18, 2020, pg. 10.

Tests with Sagkeeng Values and Preferences Integrated (Sagkeeng Chief and Council with support from Firelight)

4. Technical with Sagkeeng Preferred Weighting

    4.1. CNL Scoring with Sagkeeng Preferred Weighting

    4.2. Tony Brown Scoring with Sagkeeng Preferred Weighting

5. Sagkeeng Guiding Questions "pass/fail" test

6. Assessment using 13 Sagkeeng priority value based preferences as criteria

7. Assessment using Indigenous rights and interests factors:

    7.1. Aboriginal and Treaty rights

    7.2. CEAA 2012 Section 5(1)(c) factors

8. Sagkeeng perspectives on the overall ability of each alternative to receive the necessary consent from Sagkeeng

Mr. Brown's technical test results are entirely independent from Sagkeeng's and vice versa.

Tests 1 through 3 were performed solely by Mr. Brown.

Tests 4 through 8 were performed solely by Sagkeeng Chief and Council with the support of Firelight. Sagkeeng Chief and Council have a mandate to represent, support and protect Sagkeeng members. Sagkeeng's Consultation and Accommodation Protocol, which is a legally binding document made pursuant to the *Sagkeeng O'na-katch-to'o-na-wa Onakonigawin* (Conservation Law) designates Chief and Council as the decision maker when Sagkeeng is to be consulted by a project proponent.

The methods, criteria, weighting and scoring, as applicable, for each of the eight Sagkeeng tests are provided in Section 2.

Each of the eight tests stands on its own; Sagkeeng has not assigned a specific weight to each test. Section 2.10 summarizes the results of all eight tests and in combination with the Conclusions in Section 3 talks about the implications of the Sagkeeng tests overall, regarding preferred alternative means to decommission the WR-1 Reactor.

Overall, Firelight met with Sagkeeng Chief and Council on seven occasions to discuss and conduct the Sagkeeng alternative means assessment. All the findings herein attributed to Sagkeeng Chief and Council (Tests 4 through 8 and the conclusions of this final report) have been verified by Sagkeeng Chief and Council as of October 13, 2020.

1.4 Limitations

The following limitations apply to the Sagkeeng WR-1 alternative means assessment:

- The final EIS has not been submitted to date; Sagkeeng has had to work off information about alternatives provided by CNL that may be subject to later revision by the Proponent.
- Given timing, funding, and logistical issues related to Covid-19 barriers to travel and community engagement and verification, this assessment was conducted predominantly using desktop review with input from Sagkeeng Chief and Council in both in person and virtual meetings.
- It is limited to the four alternatives deemed economically and technically feasible by the Proponent.
- The tests on rights impacts (Test 7) is not a full-scope rights impact assessment, it is a preliminary one. Sagkeeng looks forward to conducting a more detailed rights impact assessment with CNSC during the technical review period prior to the finalization of the EA Report provided to the CNSC Commissioners.
- Given the sensitive nature of Aboriginal and Treaty rights (subject of Test 7), and of the concept of free, prior and informed consent by Indigenous peoples for developments in their territories (subject of Test 8), quantitative scores are not provided for those tests. Any discussion of the likelihood of an alternative means to garner Sagkeeng consent is also preliminary in nature and subject to future revision by Sagkeeng.
- With a large number of tests like this, with Sagkeeng considering the question of preferable alternative means from many different angles and perspectives, there is inevitably overlap between some of the tests and criteria. As Sagkeeng's overall approach is to look for patterns in the findings, and applying a large number of different tests, we are not concerned that this overlap has unduly influenced the findings. Patterns in the findings are highlighted in Section 2.10.

2. Sagkeeng Alternative Means Assessment Tests

2.1 Alternative Means Assessment Terminology

Certain terminology specific to alternative means assessments is used in this final report.

Alternative means are the different ways in which a physical work and associated activities can be technically and feasibly completed to meet an overall end goal, in this case the decommissioning of the retired WR-1 Reactor at the Whiteshell Labs facility.

Criteria are the factors used to compare the alternative means. For example, Sagkeeng Test #6 herein identifies 13 separate value-based criteria identified by Sagkeeng as priorities, which are compared against the alternative means. A **Criterion** is a single criteria.

Weighting is how much each criterion matters compared to other criteria, when it comes to making an overall decision on which alternative means is/are preferred. Sagkeeng Tests 1 through 4 herein used weighting that is clearly identified in the body text. Wherever weighting is used, the party which chose the weighting is identified. Not all tests use weighting of criteria; some (like Sagkeeng Tests 5, 6 and 7 herein) treat each criterion as having the same weight.

Scoring refers to the process of giving a numerical score to each criterion within a test, and to summing up the scores for each criterion in order to identify the preferability of different alternative means. Sagkeeng Tests 1 through 6 have numerical scores; 7 and 8 do not.

2.2 Sagkeeng Test #1: Revised Scoring and CNL Weighting

Sagkeeng first wanted to understand, from a purely technical perspective:

Was the CNL assessment process done right and if changes are required, is ISD still the preferred alternative?

Sagkeeng does not have this capacity internally, so the first three Sagkeeng tests were all conducted by Mr. Tony Brown, a technical consultant employed by Sagkeeng for the purposes of this EA.

Tony Brown, B.Sc., M.Sc., P.Eng. (Ontario, NWT & Nunavut) is a Civil Environmental Engineer with over 20 years of professional experience across a variety of disciplines, including Environmental Assessment and involvement in multi-party multiple accounts evaluations related to decommissioning projects. Examples of Mr. Brown's EA experience include:

- Project manager and lead author for the Giant Mine Environmental Assessment on behalf of the Canadian Federal Government.
- Project manager for the environmental assessment of a proposed uranium and rare earth mine in northern Ontario.
- Project manager and lead author for an EA of Low Level Storage Buildings for the Bruce Nuclear Reactor Site.
- Project coordinator and lead author of a Strategic Regulatory Evaluation for a Permanent Repository for Low and Intermediate Level Radioactive Waste.

Mr. Brown's technical review of the Proponent's alternative means assessment as put forward in Revision 2 of Section 2 of the EIS (provided to Sagkeeng by CNL in December 2018) identified a variety of concerns with the CNL methodology. To address the identified deficiencies, Mr. Brown modified the methodology used by CNL as described in Sagkeeng Tests 1 through 3 below.

In Sagkeeng Test #1, Mr. Brown noted the following concerns and applied the following changes to the scoring methodology utilized by the Proponent:

1. **Design Effectiveness** – CNL's assessment assigned scores based on the assumption that the retrofit of a 50-year-old facility designed for another purpose will be as effective as a new, purpose-built disposal facility. This assumption fails to account for the superior performance of a purpose-built facility using the most current technology.

2. **Mitigation** - CNL's alternatives assessment is based on potential impacts, prior to implementation of standard mitigative measures. This is inappropriate because it downgrades alternatives that pose theoretical risks, even when they can be effectively mitigated. Similar to EA processes, the alternative means assessment needs to be based on the assumption that appropriate mitigations have been put in place.

3. **Ranking Instead of Scoring** - CNL's assessment was based on the ranking of each alternative relative to other alternatives instead of assessing each alternative's performance against the criteria. For example, in some cases, CNL assigned low scores to alternatives that performed well if other alternatives were predicted to perform even better. This resulted in the exaggeration of minor differences between the alternatives and skewed the selection process.

Taking into consideration the flaws noted above, Mr. Brown performed an independent scoring of the alternative means by modifying the assessment methodology used by CNL.

As a first step, the qualitative assessment performed by CNL was converted to a quantitative scoring system to facilitate aggradation and comparison of alternative scores[4]. Subsequently, the alternatives were re-assessed by Mr. Brown to eliminate the flaws noted above, using his professional judgment. The results of the revised scoring are presented in Figure 2 on the right-hand side, with CNL's original score at left. Higher scores indicate higher preferability of the alternative means from a technical perspective.

Figure 2: Sagkeeng Test #1 Results – Revised Scoring with CNL Weighting (Brown 2019)

Indicates a higher score was assigned
Indicates a lower score should be assigned

	CNL Scoring					Independent Scoring (with rationale for any changes)							
		Alternative					Alternative							
Criteria	Weight	#1	#2	#3	#4	Weight	#1		#2		#3		#4	
Worker Safety														
Closure Phase	30%	1	2	3	2	30%	2.5	Risks Mitigated	2.5	Risks Mitigated	3		2.5	Risks Mitigated
Institutional Control Phase		3	3	3	2		3		3		3	Reversal Risks	2.5	99% of Rad Removed
Post-Inst. Control Phase		2	2	2	2		2		2		2		2	
Sum		6	7	8	6		7.5		7.5		8		7	
Weigted Sum		1.8	2.1	2.4	1.8		2.3		2.3		2.4		2.1	
Public Safety														
Closure Phase	30%	1	1	3	2	30%	2.5	Risks Mitigated	2.5	Risks Mitigated	3		2.5	Risks Mitigated
Institutional Control Phase		2	2	2	2		3	No Risks	3	No Risks	2.5	Minor Risks	3	99% of Rad Removed
Post-Inst. Control Phase		2	2	2	2		3	No Risks	3	No Risks	2.5	Minor Risks	3	99% of Rad Removed
Sum		5	5	7	6		8.5		8.5		8		8.5	
Weigted Sum		1.5	1.5	2.1	1.8		2.6		2.6		2.4		2.6	
Biophysical														
Closure Phase	30%	2	2	3	1	30%	2.5	Risks Mitigated	2.5	Risks Mitigated	3		2.5	Risks Mitigated
Institutional Control Phase		2	2	3	2		3	No Risks	3	No Risks	3	Minor Risks	3	99% of Rad Removed
Post-Inst. Control Phase		2	2	2	2		3	No Risks	3	No Risks	2		3	99% of Rad Removed
Sum		6	6	8	5		8.5		8.5		8		8.5	
Weigted Sum		1.8	1.8	2.4	1.5		2.6		2.6		2.4		2.6	
Social														
Closure Phase	10%	3	3	1	2	10%	3		3		1		2	
Institutional Control Phase		3	3	1	2		3		3		1		2	
Post-Inst. Control Phase		2	2	2	2		2		2		2		2	
Sum		8	8	4	6		8		8		4		6	
Weigted Sum		0.8	0.8	0.4	0.6		0.8		0.8		0.4		0.6	
Cumulative Weighted Sum	**100%**	**5.9**	**6.2**	**7.3**	**5.7**	**100%**	**8.2**		**8.2**		**7.6**		**7.8**	

Alternatives #1 and #2 are now preferred.
Alternative #3 has the lowest score.

The result, when Mr. Brown's revised scoring is applied without changing CNL's preferred weighting of the criteria, show that alternatives 1 and 2 (each involving the complete dismantling and full removal of radioactive wastes from WR-1 to an external facility) now are preferred[5] over alternatives 3 and 4 (full or partial ISD). In contrast, CNL's preferred Alternative 3 (full ISD) rates poorest among the four alternatives.

4 The "CNL Scoring" columns in Figure 2 below shows these converted CNL scores.

5 Higher scores are indications of preferability in all Sagkeeng tests that include numerical values.

2.3 Sagkeeng Test #2: Revised Weighting On Top of Revised Scoring

In Sagkeeng Test #2, the technical reassessment applied a revised weighting to the four criteria utilized in CNL's alternatives assessment, which were Worker Safety, Public Safety, Biophysical, and Social.

CNL's alternatives assessment was based on the following criteria weightings:

1. Worker Safety = 30%
2. Public Safety = 30%
3. Biophysical = 30%
4. Social = 10%

It should be noted that these relative proportions ("weights") were established unilaterally by CNL without consulting Sagkeeng or other interested parties on their appropriateness. Mr. Brown questioned the weighting distribution selected by CNL. Specifically, CNL's assessment places an excessive emphasis on worker safety, at the expense of the primary purpose of the remediation project which is to protect people and the environment from impacts associated with a hazardous site that was created by the Government of Canada. While Mr. Brown agreed that protection of worker safety should be a mandatory requirement of any project, he questioned the relatively high emphasis placed on Worker Safety since CNL has indicated that all alternatives can be implemented safely (i.e., they will comply with the requirements of appropriate occupational authorities, including the CNSC). In this regard, Mr. Brown noted the following unique attributes for worker risks:

1. they have a short duration;
2. they can be fully mitigated;
3. they are highly regulated; and
4. workers are fully informed, trained and compensated, as appropriate.

With these concerns re: weighting in mind, Mr. Brown conducted a revised assessment using a more appropriate weighting distribution that shifts the emphasis towards the protection of the public and the environment, while at the same time considering Worker Safety. The revised weighting reduces the influence of worker safety relative to the other criteria. Mr. Brown's professional opinion is that the revised weighting for Worker Safety, as shown in Table 1 below, more closely aligns the reassessment with a best practices approach of focusing on effects after mitigation (i.e., residual effects).

Mr. Brown's revised weighting shifts the emphasis from Worker Safety to the protection of the public (Public Safety) and the environment (Biophysical); Social weighting remains unchanged (Table 1).

Table 1: Differences Between CNL's and Mr. Brown's Weighting of Criteria

Criteria	CNL's Weighting	Mr. Brown's Weighting
Worker Safety	30%	**20%**
Public Safety	30%	**35%**
Biophysical	30%	**35%**
Social	10%	**10%**

Figure 3 shows the results of Sagkeeng Test #2 with this revised weighting basis, added on top of Mr. Brown's prior revisions to scoring of the alternatives.

Figure 3: Sagkeeng Test #2 Results - Revised Scoring & Revised Weighting (Brown 2019)

Indicates a higher weighting was assigned
Indicates a lower weighting was assigned

	Independent Scoring & CNL Weighting					Independent Scoring & Revised Weighting				
	Weight	Alternative				Weight	Alternative			
Criteria		#1	#2	#3	#4		#1	#2	#3	#4
Worker Safety										
Closure Phase		2.5	2.5	3	2.5		2.5	2.5	3	2.5
Institutional Control Phase	30%	3	3	3	2.5	20%	3	3	3	2.5
Post-Inst. Control Phase		2	2	2	2		2	2	2	2
Sum		7.5	7.5	8	7		7.5	7.5	8	7
Weigted Sum		2.3	2.3	2.4	2.1		1.5	1.5	1.6	1.4
Public Safety										
Closure Phase		2.5	2.5	3	2.5		2.5	2.5	3	2.5
Institutional Control Phase	30%	3	3	2.5	3	35%	3	3	2.5	3
Post-Inst. Control Phase		3	3	2.5	3		3	3	2.5	3
Sum		8.5	8.5	8	8.5		8.5	8.5	8	8.5
Weigted Sum		2.6	2.6	2.4	2.6		3.0	3.0	2.8	3.0
Biophysical										
Closure Phase		2.5	2.5	3	2.5		2.5	2.5	3	2.5
Institutional Control Phase	30%	3	3	3	3	35%	3	3	3	3
Post-Inst. Control Phase		3	3	2	3		3	3	2	3
Sum		8.5	8.5	8	8.5		8.5	8.5	8	8.5
Weigted Sum		2.6	2.6	2.4	2.6		3.0	3.0	2.8	3.0
Social										
Closure Phase		3	3	1	2		3	3	1	2
Institutional Control Phase	10%	3	3	1	2	10%	3	3	1	2
Post-Inst. Control Phase		2	2	2	2		2	2	2	2
Sum		8	8	4	6		8	8	4	6
Weigted Sum		0.8	0.8	0.4	0.6		0.8	0.8	0.4	0.6
Cumulative Weighted Sum	**100%**	**8.2**	**8.2**	**7.6**	**7.8**	**100%**	**8.3**	**8.3**	**7.6**	**8.0**

Emphasis shifted from Worker Safety to Public Safety and Biophysical. No change to Social at this time.

Alternatives #1 and #2 are still preferred. The performance of Alternative #3 decreases relative to other alternatives.

The results of revised weighting on top of revised scoring (Sagkeeng Test #2) show that alternatives 1 and 2 (full removal) are still preferred, while the performance of alternative 3 (full ISD) decreases relative to the other alternatives.

2.4 Sagkeeng Test #3: Revised Scoring, Revised Weighting and Technical Uncertainties Included

CNL elected to exclude technical considerations in the alternative means assessment on the grounds that alternatives 1 to 4 were all technically feasible (Brown 2019, slide 12). While agreeing that all four alternatives are technically feasible, Mr. Brown determined that the exclusion of technical uncertainties from the alternative means assessment overlooked important technical differences between the alternatives that warrant consideration. Test #3 as presented in Figure 4 below, thus includes two new weighted factors in the assessment, on top of revised scoring and revised weighting:

1. the reversibility of proposed alternatives, and
2. confidence in the predicted results for each alternative.

Evaluating the **reversibility** recognizes that the proposed alternatives are remedial solutions and these do not always perform as intended, and therefore contingency measures are sometimes necessary. However, "reversing" the original remediation can result in excessive risk, environmental impacts, and expense, and this must be assessed (Brown 2019, slide 12).

Evaluating the **confidence in predicted** results recognizes that the preferred alternative is required to perform as intended for an extended period of time (i.e., hundreds of years). While each alternative is technically feasible, there are varying degrees of confidence that the project objectives will continue to be met over the long-term.

Figure 4 applies a revised scoring on top of Sagkeeng Test #2 results (i.e., revised scoring and weighting) taking into consideration technical uncertainties and the extent to which these criteria could influence the performance of the various alternatives that CNL is considering. Sagkeeng Test #2 weightings have been revised to accommodate the consideration of technical uncertainties as a new criterion with a relative weighting of fifteen (15%) percent.

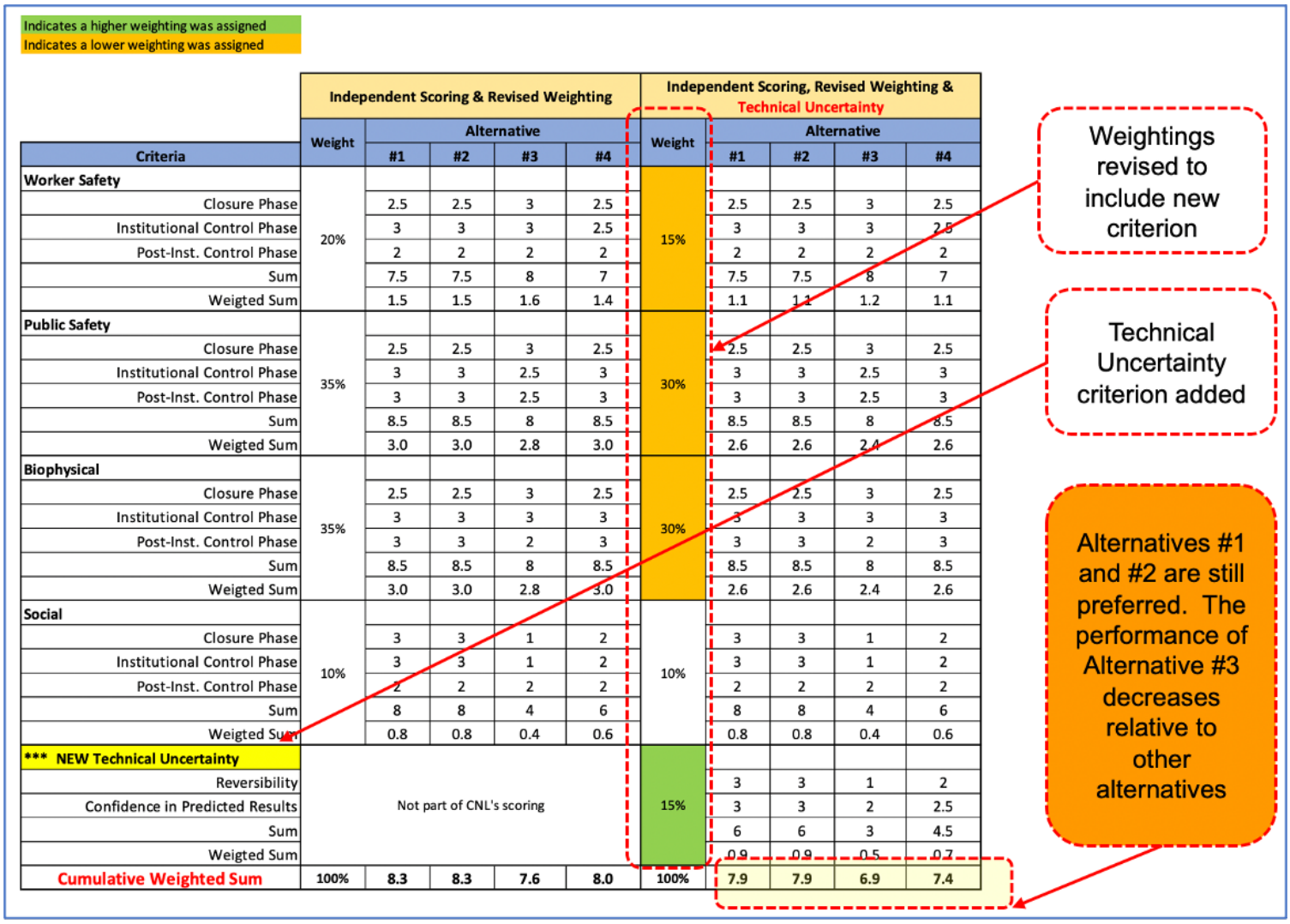
Factoring technical uncertainties into Sagkeeng Test#3, Alternatives 1 and 2 (full removal) become even more preferable, and the performance of alternative 3 (full ISD) decreases further relative to other alternatives.

Summary of Purely Technical Tests 1 to 3

In all three technical tests, CNL's preferred alternative #3 (full ISD) ranked the lowest of the four alternatives. This brings into question the appropriateness of CNL's preferred alternative for remediation of WR-1. The gap between the full removal options (1 and 2) and the ISD-related options (3 and 4) increased with each revision to recognize gaps in the Proponent's consideration of: a. scoring; b. weighting of criteria; and c. technical uncertainties.

Tests 4-8 below provide much-needed input centred on Sagkeeng values and preferences.

Figure 4: Sagkeeng Test #3 Results - Revised Scoring, Revised Weighting and Technical Uncertainties Added (Brown 2019)



Indicates a higher weighting was assigned
Indicates a lower weighting was assigned

	Independent Scoring & Revised Weighting					Independent Scoring, Revised Weighting & Technical Uncertainty				
	Weight	Alternative				Weight	Alternative			
Criteria		#1	#2	#3	#4		#1	#2	#3	#4
Worker Safety										
Closure Phase	20%	2.5	2.5	3	2.5	15%	2.5	2.5	3	2.5
Institutional Control Phase		3	3	3	2.5		3	3	3	2.5
Post-Inst. Control Phase		2	2	2	2		2	2	2	2
Sum		7.5	7.5	8	7		7.5	7.5	8	7
Weigted Sum		1.5	1.5	1.6	1.4		1.1	1.1	1.2	1.1
Public Safety										
Closure Phase	35%	2.5	2.5	3	2.5	30%	2.5	2.5	3	2.5
Institutional Control Phase		3	3	2.5	3		3	3	2.5	3
Post-Inst. Control Phase		3	3	2.5	3		3	3	2.5	3
Sum		8.5	8.5	8	8.5		8.5	8.5	8	8.5
Weigted Sum		3.0	3.0	2.8	3.0		2.6	2.6	2.4	2.6
Biophysical										
Closure Phase	35%	2.5	2.5	3	2.5	30%	2.5	2.5	3	2.5
Institutional Control Phase		3	3	3	3		3	3	3	3
Post-Inst. Control Phase		3	3	2	3		3	3	2	3
Sum		8.5	8.5	8	8.5		8.5	8.5	8	8.5
Weigted Sum		3.0	3.0	2.8	3.0		2.6	2.6	2.4	2.6
Social										
Closure Phase	10%	3	3	1	2	10%	3	3	1	2
Institutional Control Phase		3	3	1	2		3	3	1	2
Post-Inst. Control Phase		2	2	2	2		2	2	2	2
Sum		8	8	4	6		8	8	4	6
Weigted Sum		0.8	0.8	0.4	0.6		0.8	0.8	0.4	0.6
*** NEW Technical Uncertainty										
Reversibility							3	3	1	2
Confidence in Predicted Results		Not part of CNL's scoring				15%	3	3	2	2.5
Sum							6	6	3	4.5
Weigted Sum							0.9	0.9	0.5	0.7
Cumulative Weighted Sum	100%	8.3	8.3	7.6	8.0	100%	7.9	7.9	6.9	7.4

2.5 Sagkeeng Test #4: Sagkeeng Weighting Integrated onto Technical Scoring

Sagkeeng's next question was:

What happens to the technical assessment of preferred alternatives when Sagkeeng's preferred weighting for criteria is used?

In Sagkeeng Test #4, Sagkeeng's Chief and Council identified their own preferred weighting for the criteria applied in CNL's Alternatives Assessment, as per Table 2 below. Sagkeeng's preferred weighting addresses CNL's over-emphasis on Worker Safety and increases the weight of Social considerations to equal Public Safety and Biophysical considerations. Sagkeeng and CNL weighting are compared in Table 2 below.

Table 2: Differences Between CNL's, Mr. Brown's, and Sagkeeng's Weighting of Criteria

Criteria	CNL Weighting	Mr. Brown's Weighting from Test 2	Sagkeeng Weighting
Worker Safety	30%	20%	**10%**
Public Safety	30%	35%	**30%**
Biophysical	30%	35%	**30%**
Social	10%	10%	**30%**

Sagkeeng agreed with Mr. Brown's estimation that worker safety issues are extremely well regulated and minimal in relation to the nuclear decommissioning sector. However, Sagkeeng also places a much greater emphasis on the social criterion[6]. Social considerations such as community health and well-being, mental health, and food security are in pre-existing conditions of high constraint/vulnerability among Canadian Indigenous groups, including Sagkeeng. It is therefore a much higher priority criterion when considering the preferability of different alternative means to decommission the WR-1 Reactor to an indigenous Nation. The above-noted social considerations depend in large part on feeling safe and secure on the land throughout Sagkeeng territory, and feeling confident that lands and preferred country foods are healthy. In light of these considerations and due to the nature of the Project and activities at Whiteshell Labs property, and the long-term implications of the project decision, the increased weight of Social considerations is justified. Social considerations are critical to Sagkeeng's decision-making and whether to give or withhold consent for projects in its Traditional Territory.

Table 3 shows the results when Sagkeeng's preferred criterion weighting is applied to two separate scenarios:

- Test 4.1 - Sagkeeng's preferred weighting with CNL's scoring; and
- Test 4.2 - Sagkeeng's preferred weighting with Mr. Brown's scoring.

6 It is worth noting that several Sagkeeng representatives actually pushed for higher weighting for social considerations like fear and stigma and long-term infringement of Sagkeeng rights, and lack of ability to practice culture in the area. In order to remain conservative, the weighting eventually chosen for social considerations in Sagkeeng Test #4 is lower than these Council members' stated desires.

The first row in Table 3 represents Mr. Brown's conversion of CNL's preferred scoring and weighting to quantitative data, and is here for comparative purposes only; it is not a Sagkeeng test.

Table 3: Sagkeeng Test #4.1 and 4.2 Results – Sagkeeng Weighting Preference Added[7]

	Alternative 1 – Deferred Decommissioning w/ Complete Dismantle	Alternative 2 – Immediate Complete Dismantle	Alternative 3 – Complete ISD	Alternative 4 – Partial Dismantle and Removal/ Partial ISD
CNL Scoring (converted by Mr. Brown to quantitative)	5.9	6.2	7.3	5.7
4.1 CNL Scoring with Sagkeeng weighting	6.3	6.4	6.5	5.7
4.2 Mr. Brown's scoring with Sagkeeng weighting	8.4	8.4	6.9	7.7

2.6 Sagkeeng Test #5: Sagkeeng Guiding Questions

Another key issue Sagkeeng tackled in its alternative means assessment was:

What guiding questions should Sagkeeng use to focus its assessment of alternatives, and how do the different alternatives rate against these questions?

For Sagkeeng Test #5, Sagkeeng representatives developed a set of 18 guiding questions identifying overarching key aspirational considerations applied by Sagkeeng leadership in their reassessment of alternatives to the Project. Chief and Council weighed in on the type of questions that needed to be asked. Sagkeeng representatives then graded the four alternative means on a "pass/fail/unknown" basis against the guiding questions.

The Sagkeeng Guiding Questions emphasize the following topics and Sagkeeng-specific considerations:

- **Technical Feasibility**: Sagkeeng focuses on whether technical performance is proven for each phase of the Project, and confidence that physical human intervention will not be required long-term at the WR-1 site.

7 The preferred alternative in Table 3 is shown with green cells, with secondary alternatives ("runners up") in yellow, and the weakest performing alternative represented by red cells. Throughout the remainder of this report, green, yellow and red highlights have this same meaning.

- **Economic Feasibility**: Sagkeeng focuses on longer term costs (e.g., construction, future remediation or mitigations, monitoring costs) and whether there is confidence that those funds will be available in the future.
- **Worker Safety**: Sagkeeng focuses on whether the alternative can be conducted in a safe manner for workers and worker risks, now and if future intervention is required.
- **Public Safety**: Sagkeeng focuses on the acceptability of risks associated with the alternative, based on perspectives from local public and Indigenous groups.
- **Environmental Effects**: Sagkeeng focuses on whether radiation risks are As Low As Reasonably Achievable (ALARA), and the ability to identify effects over time.
- **Social and Culture**: Sagkeeng focuses on whether the alternative lives up to Canada's commitments to Indigenous nations and people (e.g., UNDRIP, Truth and Reconciliation Comission Calls to Action), fear and stigma reduction, and increased access for Sagkeeng members to the Traditional Territory.

Out of recognition that the alternatives have different short-term versus long-term effects, different questions were posed for each of three timelines:

1. During the Active **Closure Phase**, when the initial decommissioning process is occurring;
2. During the subsequent **Institutional Control Phase**, after decommissioning and during the period of active controls; and
3. During the subsequent **Post-Institutional Control Phase**, after all active controls are removed (and in perpetuity thereafter).

Table 4 identifies Sagkeeng Guiding Questions for evaluating alternative means of carrying out the Project, as well as Chief and Council's ratings of whether each Alternative "passes", "fails", or is "unknown" in how it deals with the aspirational question.

Table 4: Sagkeeng Test #5: Sagkeeng Guiding Questions

Sagkeeng Guiding Question	Alternative 1 – Deferred Full Removal	Alternative 2 – Immediate Full Removal	Alternative 3 – In Situ Decommission	Alternative 4 – Part Removal/ Part ISD
1. Is there a high degree of confidence that the proposed technology will perform as intended at the site throughout the Closure phase, as demonstrated through other similar projects?	Pass	Pass	Pass	Pass

Table 4: Sagkeeng Test #5: Sagkeeng Guiding Questions Con't

Sagkeeng Guiding Question	Alternative 1 – Deferred Full Removal	Alternative 2 – Immediate Full Removal	Alternative 3 – In Situ Decommission	Alternative 4 – Part Removal/ Part ISD
2. Is there a high degree of confidence that the proposed technology will perform as intended at the site throughout the Institutional Control phase, as demonstrated through other similar projects.	Pass	Pass	Unknown (there is a limited track record for ISD's ability to contain radioactive materials long-term)	Pass
3. Is there a high degree of confidence the alternative will not require physical human intervention/support at the site beyond the Institutional Control period?	Pass	Pass	Fail (given uncertainty about long-term ability of grout to keep water out and radioactive materials in, and the need for invasive measures in case of failure)	Pass
4. Is there a high degree of confidence that the proposed technology will perform as intended at the site throughout the Post-Institutional Control phase?	Pass	Pass	Fail (short track record as noted above)	Unknown
5. Does Canada have enough money to implement this alternative?	Pass (according to CNL)	Pass (according to CNL)	Pass (according to CNL)	Pass (according to CNL)
6. Is there a high degree of confidence the site will not require additional management activities during Institutional Control that will require additional expenditures? If not, is there a high degree of confidence that the funds will be available?	Pass (removal of all ILW radioactive materials means there is no meaningful risk left to be managed)	Pass (removal of all ILW radioactive materials means there is no meaningful risk left to be managed)	Unknown	Pass (amounts of radioactive materials left in reactor will be 99% smaller than in Alternative 3; risks objectively smaller)
7. Is there a high degree of confidence the site will not require additional management activities during Post-Institutional Control that will require additional expenditures? If not, is there a high degree of confidence that the funds will be available?	Pass	Pass	Fail (not only are risks of failure objectively higher, the longer the time frame, the less confidence we can have that funds will be available for clean-up)	Pass

Table 4: Sagkeeng Test #5: Sagkeeng Guiding Questions Con't

Sagkeeng Guiding Question	Alternative 1 – Deferred Full Removal	Alternative 2 – Immediate Full Removal	Alternative 3 – In Situ Decommission	Alternative 4 – Part Removal/ Part ISD
8. Does the alternative result in worker risks that can be effectively mitigated to the satisfaction of applicable regulatory authorities that are responsible for occupational safety? In other words, can the alternative be conducted in a manner safe for workers? [including radiological, industrial and transportation hazards]	Pass (according to CNL)	Pass (according to CNL)	Pass (according to CNL)	Pass (according to CNL)
9. If there is a need for a future intervention, does this alternative pose the least on site worker, public and environmental risks of the four alternatives?	Fail (any on site future intervention in the interval prior to full removal is a risk)	Pass (risks removed right away from the site)	Fail (radioactive risks remain on site in perpetuity)	Fail (smaller amount of radioactive risks remain on site long term)
10. Is there a high degree of confidence the level of risks the alternative will pose to the public and aboriginal peoples in the area during Institutional Control will be acceptable to those parties?	Pass (all radioactive materials removed from the WR-1 facility during Closure Phase)	Pass (all radioactive materials removed from the WR-1 facility during Closure Phase)	Fail (bulk of radioactive materials will remain in the ground in what will now be a permanent radioactive waste disposal facility)	Fail (Sagkeeng representatives indicate that even 1% of the radioactive waste remaining onsite would continue current pattern of fear and stigma)
11. Is there a high degree of confidence the level of risks the alternative will pose in the area during Post-Institutional Control will be acceptable to the public and aboriginal peoples?	Pass (same reasons as #10 above)	Pass (same reasons as #10 above)	Fail (same reasons as #10 above)	Fail (same reasons as #10 above)
12. During the immediate Closure Phase, will the level of environmental risks at the site be ALARA in comparison with the other alternatives?	Fail (some small amount of risk during removal of materials and transport to another facility)	Fail (some small amount of risk during removal of materials and transport to another facility)	Pass (least risk short term due to no activity moving the radioactive materials; this risk is passed on to future generations)	Fail (although nominally less risk than Alternatives #1 and #2)

Table 4: Sagkeeng Test #5: Sagkeeng Guiding Questions Con't

Sagkeeng Guiding Question	Alternative 1 – Deferred Full Removal	Alternative 2 – Immediate Full Removal	Alternative 3 – In Situ Decommission	Alternative 4 – Part Removal/ Part ISD
13. Is there a high degree of confidence the level of environmental risks at the site of the alternative will be ALARA in comparison with other alternatives, and identifiable during the Institutional Control period?	Pass (no radioactive materials left at WR-1 facility means no meaningful risks)	Pass (no radioactive materials left at WR-1 facility means no meaningful risks)	Unknown (the comprehensiveness and integrity of the grout – i.e., lack of entry and exit points for water to move the radioactive materials out of the facility - is unknown)	Unknown (same as #3, but higher confidence due to smaller grouted area and less remaining radioactive materials to leach out)
14. Is there a high degree of confidence the level of environmental risks at the site of the alternative will be ALARA in comparison with other alternatives, and identifiable during the Post-Institutional Control period?	Pass (same as #13 above)	Pass (same as #13 above)	Fail (radioactive risks will not be fully diminished by the time Post-Institutional Control phase starts; integrity of grouted chamber will reduce over time)	Unknown
15. Does the alternative live up to Canada's prior commitment to remove all radioactive materials from the WR-1 Reactor, as per the CSR of 2002?	Pass	Pass	Fail	Fail
16. Is the alternative likely to reduce psycho-social stigma with the project area during Closure, Institutional Control or Post-Institutional Control?	Pass (fear and stigma has the potential to reduce over time with removal of all materials)	Pass (fastest potential option for reducing fear and stigma due to immediate removal of the stigma causing agent)	Fail (Sagkeeng Chief and Council indicate this is the highest fear and stigma alternative for members)	Fail (as per #10 above, concerns likely to remain even with only 1% of radioactive materials entombed underground)
17. Is the alternative likely to increase Sagkeeng access to land and resources during Closure, Institutional Control or Post-Institutional Control?	Pass (Appendix A shows removal of any visible and physical barriers)	Pass (Appendix A shows removal of any visible and physical barriers)	Fail (permanent radioactive waste disposal facility, surrounded by fencing and unnatural cap)	Fail (permanent fencing required)

Table 4: Sagkeeng Test #5: Sagkeeng Guiding Questions Con't

Sagkeeng Guiding Question	Alternative 1 – Deferred Full Removal	Alternative 2 – Immediate Full Removal	Alternative 3 – In Situ Decommission	Alternative 4 – Part Removal/ Part ISD
18. Can the alternative be completed within the next generation (20 to 25 years)?	Fail	Pass	Pass (although Sagkeeng notes this is a conservative estimate, given that in fact this facility will require perpetual care to monitor the remaining radioactive risk)	Pass (although Sagkeeng notes this is a conservative estimate, given that in fact this facility will require perpetual care to monitor the remaining radioactive risk)

Table 5 summarizes the total results of Sagkeeng Guiding Questions for each alternative.

Table 5: Summary Results of Sagkeeng Test #5 – Sagkeeng Guiding Questions

Alternative	Pass	Fail	Unknown
1 – Deferred Full Removal	15	3	0
2 – Immediate Full Removal	17	1	0
3 – ISD	5	10	3
4 – Partial ISD, Partial Removal	8	7	3

Based on these results, **Alternatives 2 (immediate full removal) is most preferable** against Sagkeeng's Guiding Questions, and **Alternative 3 (ISD) is least preferable**. Alternative 3 rates poorly (absolutely and compared to the other alternatives) in relation to the following:

- The amount of risk left in situ on Sagkeeng Traditional Territory;
- The length of time that active controls will need to be in place on Sagkeeng Traditional Territory;
- Fear and stigma associated with the area, now and into the far future, by Sagkeeng members;
- Confidence that the technology used (concreting/grouting radioactive materials in place underground near the Winnipeg River) will be effective, especially long-term, and that malfunctions will be avoided;
- Confidence that should a malfunction occur, that the cleanup will be easy, safe and effective, and that monies will be available long-term to conduct that cleanup process; and
- Living up to Canada's prior commitments and permitted plan to remove all radioactive materials from the WR-1 facility.

Alternative 4 rates poorly also, in large part because Sagkeeng Chief and Council have indicated that even with the bulk of radioactive waste removed from the WR-1 Reactor, fear and stigma would still be associated with that remaining small amount of radioactive material underground in Sagkeeng Traditional Territory.

2.7 Sagkeeng Test #6: Sagkeeng Values Based Preferences

While the previous Sagkeeng tests are primarily focused on technical issues (e.g., assessment methodology and best practices, long-term performance of alternatives, etc.), the Sagkeeng Values-Based Preferences Test #6 assesses each alternative against values that Sagkeeng consider to be central to decision-making on preferred futures. The key question at the heart of this test is:

Which alternative or alternatives are preferable to Sagkeeng, when considering what matters most to Sagkeeng members?

Sagkeeng Chief and Council selected the following 13 preferences which comprise the Sagkeeng values-Based Preferences Test:

- **Preference 1:** Protect and Heal the Water
- **Preference 2:** Protect and Promote Sagkeeng Culture/Spirit
- **Preference 3:** Territorial Integrity
- **Preference 4:** Food Security and Faith in Traditional Foods
- **Preference 5:** Reduced Mental Stress, Fear, Stigma
- **Preference 6:** Reduced Long-term Risks in Sagkeeng Territory
- **Preference 7:** Address the Hazard Sooner and Reduced Future Management Requirements
- **Preference 8:** Flexibility to Adapt to Contingencies
- **Preference 9:** Impact Equity
- **Preference 10:** Higher Affected Public/Sagkeeng Acceptability
- **Preference 11:** Protection and Promotion of Treaty Rights
- **Preference 12:** Adherence to Ancestral Laws and Norms
- **Preference 13:** Sagkeeng Territory Free of Radioactive Waste[8]

The following sub-sections provide brief descriptions and scoring results for each Sagkeeng preference statement. The alternatives were assessed against each preference and given a score on a range from 1 to 3 by Sagkeeng Chief and Council. A score of 3 represents a very good alternative when assessed against the preference statement under investigation, while a score of 1 represents a poor alternative. Each alternative is rated based on its own merits, not ranked against the other alternatives. In other words, multiple alternatives can get the same score on any given preference.

8 Given the holistic nature of Sagkeeng values, overlap between some of these preference statements is unavoidable. Sagkeeng does not feel that overlap between categories has altered the outcome of which Alternative or Alternatives are preferable in the results.

2.7.1 **Preference 1:** Protect and Heal the Water

Sagkeeng members and everything in the world relies on available clean water in order to survive. Clean water is a right and a responsibility that Sagkeeng takes very seriously. To Sagkeeng, water is life and without it Sagkeeng Anicinabe cannot survive; the protection and healing of water merits its own criterion.

> *You know, our community does a lot of spiritual work; we do a lot of things for the water. We have water ceremonies, which we do twice a year. And it's to pray for the health of the water. We do that with the students here, we invite the youth. So, we do that in the spring and in the fall, we do water ceremonies, and we make offerings to the water beings and the water spirits—little people—you know, they live along the waters as well, and so we have those stories that have been shared to our families coming through our—to us. So, we make those water offerings of copper, they like copper, they like shiny stuff and so we make those things.* (Sagkeeng member in Olson et al. 2019a)

Sagkeeng Anicinabe have a deep relationship with the Winnipeg River in particular and relate to it as home, as livelihood, and the foundation of Sagkeeng subsistence.

> *I love it. It's my home. It's my livelihood. Everything is here that I need. This [Winnipeg] River is my livelihood. Everything's there I need to eat.* (Sagkeeng member in Olson et al. 2019a)

Olson et al. (2019a; 2019b) highlight the importance of water and use of the Winnipeg River by Sagkeeng members, including in the vicinity of Whiteshell Laboratories, for fishing, harvesting wild rice, navigation, learning skills and Sagkeeng knowledge, connection to territory, and other practices critical to Sagkeeng culture and subsistence. Unfortunately, some Sagkeeng members are avoiding fishing downstream from Whiteshell Labs and are concerned about the safety of water and fish for consumption.

Sagkeeng prefers alternatives that provide greater real and perceived long-term protection of the water. Based on the close proximity of Whiteshell Labs and the WR-1 Reactor to the Winnipeg River, there is widespread concern among Sagkeeng that Whiteshell Labs has already, or will in the future, impact the river through the contamination of water. **Sagkeeng prefers alternatives that can demonstrate that in the near to long-term, that waters, especially in Winnipeg River, will be protected and will be perceived to be safe by Sagkeeng members.**

The results of the alternatives assessment for Preference 1 Protect and Heal the Water are provided in Table 6.

Table 6: Preference 1 – Protect and Heal the Water

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
1. Sagkeeng prefers alternatives that provide greater real and perceived long-term protection of the water.	2.5	3 (most preferred alternative)	1.5 (least preferred alternative)	2

When assessed through the lens of Sagkeeng's preference to Protect and Heal Water, **Alternative 2 is most preferable**, and **Alternative 3 is least preferable**.

Overall, full removal options (Alternatives 1 and 2) score higher than full or partial ISD, in part as a result of perceived risks associated with groundwater flowing through the site towards the Winnipeg River, concerns regarding the integrity of cement and grout exposed to the erosive forces of water over long time scales (hundreds to thousands of years), and the possibility for seepage of radioactive materials into groundwater and the Winnipeg River. Sagkeeng members have expressed concerns regarding the durability, longevity, and permeability of the ISD containment approach for WR-1 (as reported in Olson et al. 2019a). Sagkeeng Anicinabe's home reserve is downstream of the Whiteshell property and any contamination resulting from the Project would be devastating to Sagkeeng rights and way of life. As there are no examples from which to draw confidence regarding the long-term integrity of the ISD approach, Sagkeeng prefers full dismantling and removal options to protect and heal the water.

2.7.2 **Preference 2:** Protect and Promote Sagkeeng Culture/Spirit

Sagkeeng Anicinabe have strong cultural connections to the lands and waters in the vicinity of Whiteshell Labs. The area has seen alienation of cultural activities for over 50 years due to the presence and operation of Whiteshell Labs, and Sagkeeng members have expressed a desire to use the area again for ceremonial activities that it was previously used for. The lands and resources at the Whiteshell Labs property are important to Anicinabe Pimatiziwin[9], including for the practice of ceremonies and connection to important ceremonial lands, sense of place and identity, use of campsites (including ones connected to hunting and fishing activities), transmission of knowledge between generations, and use of trails and water routes, and many of these values have been used for multiple generations (Olson et al. 2019a).

In the quotes below, Sagkeeng members who participated in a traditional use and occupancy study specific to Whiteshell Labs and WR-1 Decommissioning comment on the historic use and sanctity of the property as a gathering and ceremonial place used by Sagkeeng and other Indigenous groups:

> *So this, this [Project Footprint] was a very sacred ground where, where this place is, a very sacred ground to Anicinabe people, Ontario, the east, the west and us here, of course, in the middle. So they meet there, in a, in a certain time that would be in September ... I remember lots of, hundreds of tepees and stuff like that around that area, in that area where we're looking at. And they weren't mixed to, you know, the Ontario people are one, one spot. Sagkeeng was one spot and Fairford was one spot. They had, they had this big bonfire and that's where they'd meet when, when the ceremonies was over. But in the meantime everybody was, basically almost, almost quiet like, you know, while the thing was going on, while the ceremonies was going on. So that was a, a very sacred place this place here, you know.* (Sagkeeng member in Olson et al. 2019a)

> *... that piece of land was an actual traditional ceremonial site, right where that thing [nuclear reactor] is situated. They had an upper level of, you know, up in the rock area where they were doing their traditional ceremonies and then to have this thing come right there, nobody was consulted, nobody—surely you would try to find out, you know, is this going to be a safe place to put it, how is it going to affect the people? And they would have found out that those—you know, they [Sagkeeng members] were using that land...* (Sagkeeng member in Olson et al. 2019a)

9 Anicinabe Pimatiziwin is broadly defined as "Anicinabe Living", which encompasses Sagkeeng culture, identity, and way of life.

In light of the importance of the Whiteshell Labs area and WR-1 decommissioning to Anicinabe Pimatiziwin, **Sagkeeng prefers alternatives that are respectful of the spiritual balance of people with the earth, and allow at least the potential for greater access to territory for cultural purposes in the future.**

The results of the alternatives assessment for Preference 2 Promote Sagkeeng Culture/Spirit are provided in Table 7.

Table 7: Preference 2 – Promote Sagkeeng Culture/Spirit

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
2. Sagkeeng prefers alternatives respectful of the spiritual balance of people with the earth, and allow at least the potential for greater access to territory for cultural purposes in the future.	2.0	3 (most preferred alternative)	1 (least preferred alternative)	1.5

When assessed through the lens of Sagkeeng's preference to Promote Sagkeeng Culture/Spirit, **Alternative 2 is most preferable**, and **Alternative 3 is least preferable**.

Full removal of WR-1 radioactive materials would improve the prospect of future confidence in the health and safety of the Whiteshell Labs area as a venue for cultural and spiritual practices. Full removal will also lead to expedited removal of some physical and visual[10] barriers to access, such as fencing, and Alternative 2 would achieve this more quickly for Sagkeeng. Alternatives 3 and 4 on the other hand would see the area fenced off and inaccessible to Sagkeeng members in perpetuity, and in combination with the sustained perceived risk of ISD, is unlikely to result in the promotion of Sagkeeng culture/spirit. These findings are consistent with recent studies which found that the psychosocial effects of ISD would continue to impact sense of place and prevent revitalization of Sagkeeng culture and spirituality at Whiteshell into the future (Olson et al. 2019a).

2.7.3 **Preference 3:** Territorial Integrity

This preference assesses each alternative in relation to their implications for **territorial integrity** and potential to increase Sagkeeng access to territory over time. Territorial integrity requires that the land be allowed to heal as quickly as possible, and that barriers to access be removed from as much of Sagkeeng territory as possible. As noted for the preceding value test (Culture/Spirit), barriers to access include tangible barriers (e.g., fences, developments, private property designations) as well as psycho-social barriers such as health and safety concerns, loss of connection and sense of place in an area because of observed or perceived impacts, among other barriers. The restoration and healing of land is critical to overcoming barriers to access. **Sagkeeng members prefer alternatives that reduce hazards and result in a net benefit toward restoration of territorial integrity.**

10 Sagkeeng members are likely to be less willing to access and harvest from areas anywhere near a fenced-off location, due to risk perception as well as public safety concerns.

The results of the alternatives assessment for Preference 3 Territorial Integrity are provided in Table 8.

Table 8: Preference 3 – Territorial Integrity

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
3. Sagkeeng prefers alternatives that result in restoration of territorial integrity at Whiteshell.	2.0	3 (most preferred alternative)	1 (least preferred alternative)	1.5

When assessed through the lens of Sagkeeng's preference of ensuring Territorial Integrity, **Alternative 2 is most preferable**, and **Alternative 3 is least preferable**.

The rationale for this result is similar to the previous preference statement 2. Full or partial ISD would maintain physical and psychosocial barriers to Sagkeeng members' access and use of Whiteshell properties in perpetuity. Sagkeeng prefers full removal of all radioactive materials from Whiteshell and Sagkeeng territory. Alternative 2 scored higher than Alternative 1 because it would accomplish this, and restore Territorial Integrity on a faster timeline.

2.7.4 **Preference 4:** Food Security and Faith in Traditional Foods

This preference assesses each alternative for effects on Sagkeeng food security and members' faith in the quality and health of traditional food sources. **Sagkeeng prefers alternatives that will:**

- **increase trust in traditional foods and water sources over time;**
- **increase the amount of potential territory to access country foods in; and**
- **reduce risk of wildlife contamination and health risks.**

These considerations are relevant to all Sagkeeng country foods, which include a variety of terrestrial and aquatic plant and animal species used for food and medicine. Recent Sagkeeng studies show that Sagkeeng members have always harvested a wide variety of country foods from the Whiteshell Labs area including fish such as sturgeon, suckers, catfish; large game such as moose and white-tailed deer; berries and many other food and medicinal plants such as wild rice, blueberries, plums, low-bush cranberries, saskatoon berries, gooseberries, and chokecherries (Olson et al. 2019a). Country foods and food security is critical to Sagkeeng subsistence and physical health and well-being, as well as cultural well-being as many ceremonies, sharing protocols, and traditional knowledge are rooted in food harvesting, preparation, and sharing.

Table 9 provides the results of the Sagkeeng alternatives assessment for Preference 4 Food security and Faith in Traditional Foods:

Table 9: Preference 4 – Food Security and Faith in Traditional Foods

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
4. Sagkeeng prefers alternatives that will increase trust in traditional foods and water sources over time, increase the amount of territory to access country foods in, and reduce risk of wildlife contamination and health risks.	2.0	3 (most preferred alternative)	1 (least preferred alternative)	2

When assessed against Sagkeeng's preference for Food Security and Faith in Traditional Foods, **Alternative 2 is most preferable**, and **Alternative 3 is least preferable**.

ISD ranked the lowest due to sustained access issues (physical and psychosocial), which would continue to alienate Sagkeeng harvesting and therefore not increase the amount of territory available for country foods, and the presence of radioactive materials at the site in perpetuity would not wholly eliminate risks for wildlife (contamination and health), and not increase trust in traditional foods or water sources. Sagkeeng members would likely experience the adverse effects of ISD in the immediate vicinity of Whiteshell Labs and downstream along the Winnipeg River, including as far as Fort Alexander, as the following quote from a Sagkeeng member alludes:

> *About the—about the [Winnipeg] river ... whatever goes over there comes down to us here in the Reserve here, you know, and kills off our—our fishing and hunting as well too, right? Cause they don't know ... when I went there for a tour, anyway, you know, you had to wear special clothing and stuff like that. And so you can only imagine the danger of—of this thing here—that [the nuclear site], being there.* (Sagkeeng member in Olson et al. 2019a)

Conversely, full removal of radioactive materials is more likely to increase trust and improve access, and thus increase future use of the Whiteshell area for harvesting purposes. Sagkeeng prefers Alternative 2 because it would improve Food Security and Faith in Traditional Foods on a faster timeline.

2.7.5 **Preference 5:** Reduced Mental Stress, Fear, and Stigma

Sagkeeng members desire a future where they feel safe and secure in all parts of the territory and wish the same for future generations. Sagkeeng members past and present have borne the psychosocial impacts of living downstream from a nuclear reactor and waste storage at Whiteshell Labs since the 1960s. In past Sagkeeng studies related to Whiteshell, many Sagkeeng members have expressed concerns that they are fearful of exposure to radioactivity directly or through the consumption of country foods (Olson et al. 2019a).

> *I'm glad it's [Whiteshell Laboratories] shut down. That's where a lot of that poison came out of, from here. All the way up this river. And, then, we end up eating the fish here. I'm glad they shut this down. Like, I don't know how far that they were putting their waste in that plant, like, you know, under the ground, under the rock, I don't know how far down they had it.* (Sagkeeng member in Olson et al. 2019a)

Living downstream from Whiteshell at Fort Alexander hangs over Sagkeeng members and affects critical aspects of their way of life.

> *...it denies us our full potential. And by limiting and having—having this type of dangerous material within your—within your backyard, it's—it, you know, it does something to your psyche.* (Sagkeeng member in Olson et al. 2019a)

Perceived risks associated with nuclear operations and radioactive materials storage, particularly for water, is both a barrier to current use of the Winnipeg River for some members, and a persistent source of mental stress, fear, and stigma, as the following quote expresses:

> *Yeah, he [husband] caught – I believe it was four pickerel or something, but I don't believe he got any sturgeon. And because of what my dad had said [about contamination], we threw them back. ...we didn't keep them because we were still at that stage being told by my dad, although we were living in Winnipeg, we were told that the fish is not going to be good, like you were taking a chance eating that fish. ... We had already heard stories of deformed fish and things like that.* (Sagkeeng member in Olson et al. 2019a)

According to Sagkeeng members this fear is rooted in their observations and lived experiences on the land and from living downstream of Whiteshell Labs. Several Sagkeeng members have reported catching unhealthy fish with tissue damage, or knew of other members who had, which they commonly associate with the nuclear facility at Whiteshell (Olson et al. 2019a). This fear and stigma is particularly impactful as fish from the Winnipeg River generally, and certain species specifically, are culturally critical and fundamental to way of life.

> *... the thing that really bothers me about that nuclear plant is ... there was deformation of fish ... Not only that but our sturgeon is very sacred to us okay? In respect to the Sturgeon Clan and all these things. I remember one elder was talking about that as well, but those things are deteriorating at a very, very – and I would say that a lot of that is a result of that nuclear plant, that's what I think.* (Sagkeeng member in Olson et al. 2019a)

In light of these conditions, **Sagkeeng's preference is for alternatives that will reduce mental stress, fear, and stigma, now and into the future, at and around the Whiteshell facility and at the wider Sagkeeng territory scale.**

The results of the Sagkeeng alternatives assessment for Preference 5 Reduced Mental Stress, Fear, and Stigma are provided in Table 10:

Table 10: Preference 5 – Reduced Mental Stress, Fear, and Stigma

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
5. Sagkeeng prefers alternatives that will reduce mental stress, fear, and stigma, now and into the future, at and around the Whiteshell facility.	2.0	3 (most preferred alternative)	1 (least preferred alternative)	2

When assessed through the lens of Sagkeeng's preference for Reduced Mental Stress, Fear, and Stigma, **Alternative 2 are most preferable**, and **Alternative 3 is least preferable**.

Mental stress, fear, and stigma associated with Whiteshell has already had a significant effect on Sagkeeng people. ISD alternatives (3 and, to a lesser but measurable degree, 4) would maintain the perception of risk and sustain mental stress, fear, and stigma in perpetuity for current and future generations of Sagkeeng Anicinabe. This has a high likelihood of continuing to negatively impact mental health, use of important areas in the territory, and willingness to harvest traditional foods. Full removal is preferred by Sagkeeng and Alternative 2 would achieve this much more quickly and expedite the healing process.

2.7.6 **Preference 6:** Reduced Long-term Risks in Sagkeeng Territory

This Sagkeeng preference is primarily focused on radioactive contamination risks now and into the future. Sagkeeng experiences the radioactive liability that Canada has left in place at Whiteshell Labs, which has the potential to expose Sagkeeng Anicinabe lands and people to radioactive risks into the long distant future. Preference 6 is a multi-faceted criterion that includes biophysical and human environmental receptors and risks to these receptors. **Sagkeeng prefers alternatives that reduce long-term risks in Sagkeeng territory and result in:**

- **reduced long-term human population health risks;**
- **reduced long-term risks on the Winnipeg River waters and fish; and**
- **lowest amount of in situ risks at the Whiteshell Labs site.**

The results of the Sagkeeng alternatives assessment for Preference 6 Reduced Long-term Risks in Sagkeeng Territory are provided in Table 11.

Table 11: Preference 6 – Reduced Long-term Risks in Sagkeeng Territory

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
6. Sagkeeng prefers reduced long-term risks in Sagkeeng territory including: reduced long-term human population health risks, reduced long-term risks on the Winnipeg River waters and fish, low amount of risks at the Whiteshell Labs site.	2.5	3 (most preferred alternative)	2 (least preferred alternative)	2.5

When assessed through the lens of Sagkeeng's preference for Reduced Long-term Risks in Sagkeeng Territory, **Alternative 2 is most preferable**, and **Alternative 3 is least preferable**.

Full removal of radioactive materials from the site, whether done immediately or deferred but completed within a reasonable timeline, would eliminate the hazard and thus reduce long-term risks in Sagkeeng Territory. For

this reason, Alternatives 2 is preferred, with the uncertainty associated with the period of deferral associated with Alternative 1. ISD would maintain heightened radiological risks in Sagkeeng Territory over hundreds of years and is therefore scored lower. Full ISD (Alternative 3) scored lowest as it maintains the greater volume of materials at the site and thus the greatest risk. *Please note that Sagkeeng scored this (and other aspects of this test) conservatively; in particular, due to assertions made by CNL about the limited biophysical impacts associated with any of the four alternative means, the lowest score for any alternative means in relation to this primarily biophysical impact test was a 2.0 for ISD.*

2.7.7 **Preference 7:** Address the Hazard Sooner and Reduced Future Management Requirements

Sagkeeng members logically prefer for alternatives that would reduce the on-site risks sooner. In addition, the long-term nature of the Project carries with it uncertainties around future funding, managerial capacity, and managerial requirements. Long-term management cannot be guaranteed in the same way that short-term management can be; government fiscal priorities and capacities change over time in ways that get less predictable the more time goes by. Sagkeeng's confidence that risk will be managed responsibly, or that effective monitoring will be in place to detect a failure mode, for example, decreases over time with every year that goes by. Sagkeeng is concerned that money and people committed to managing both predictable and unpredictable conditions at the Whiteshell site may not be available in the future. Many questions simply cannot be answered today – who will be funding the project in the future, how much can they afford, is it a priority, how much active management will be required, who will manage the project, how will they be held accountable? As such, **Sagkeeng prefers alternatives that address the hazard at WR-1 sooner, require less future management, and leave less risk on Sagkeeng lands for future generations.** The sooner no management is required at all, and the sooner the site returns to relatively natural conditions, the better.

The results of the Sagkeeng alternatives assessment for Preference 7 Reduced Future Management Requirements are provided in the following table:

Table 12: Preference 7 – Address the Hazard Sooner and Reduce Future Management Requirements

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
7. Sagkeeng prefers alternatives that address the hazard at WR-1 sooner and require less future management.	2	3 (most preferred alternative)	1.5 (least preferred alternative)	2.5

When assessed through the lens of Sagkeeng's preference for Addressing the Hazard Sooner and Reduced Future Management Requirements, **Alternative 2 is most preferable**, and **Alternative 3 is least preferable**.

Full and immediate removal of radioactive materials (Alternative 2) eliminates the risk, requires the lowest future management, and restores the site to a reasonable facsimile of natural conditions most quickly. While immediate ISD (Alternatives 3 and 4) may reduce the hazard sooner than Alternative 1, it would require more

future management and monitoring over a long timescale. Alternative 3 maintains more radioactive materials at the site, and would conceivably require more management and monitoring, as well as greater response effort in the future should actions need to be taken to address incidents or concerns (for more on this see Preference 8 below).

2.7.8 **Preference 8:** Flexibility to Adapt to Contingencies

This Sagkeeng statement test considers the potential for unpredictable risks to emerge in the future, even risks which may not seem possible now. Readiness to manage contingencies is critical to effective incident response and especially important for nuclear projects. If the selected alternative lacks flexibility, it will be more difficult to respond to future hazards or incidents quickly, effectively, and safely.

Sagkeeng members have expressed concern that environmental factors could contribute to future compromise of ISD or another alternative.[11] Sagkeeng identified factors include higher than expected Winnipeg River erosion, and changing precipitation and groundwater flow rates, especially given the unpredictability of climate change (Olson et al. 2019a).

> *But how long would this capping last though? Because things deteriorate. Like concrete deteriorates too. It deteriorates by heat and rain and cold. It cracks, you know? I don't know if that's going to be a safe way to do it ... I don't think a cap is going to be a good thing. I think it's going to deteriorate by rain, cold and heat and wind. That's my point, dismantle it.* (Sagkeeng member in Olson et al. 2019a)

Sagkeeng prefers alternatives that either include the flexibility to alter management plans at the site in the future (even possibly future reversal and removal of radioactive materials) or remove the risks entirely from the site altogether.

The results of the Sagkeeng alternatives assessment for Preference 8 Flexibility to Adapt to Contingencies are provided in Table 13.

Table 13: Preference 8 – Flexibility to Adapt to Contingencies

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
8. Sagkeeng prefers alternatives that either include the flexibility to alter management plans at the site in the future or remove the risks entirely from the site.	2.5	3 (most preferred alternative)	1 (least preferred alternative)	2

When assessed through the lens of Sagkeeng's preference for Flexibility to Adapt to Contingencies, **Alternative 2 is most preferable**, and **Alternative 3 is least preferable**.

11 Sagkeeng notes as well that ISD does not have a long track record and therefore there is substantial uncertainty about how it will perform long-term.

Sagkeeng prefers Alternative 2 as it would result in full removal of the risk and does not require the flexibility to adapt to contingencies in the future. Alternative 1 would similarly remove the risk, but would take a longer period of time before this is accomplished, so it is graded slightly lower. Full or partial ISD (Alternatives 3 and 4), on the other hand, would require a remediation and contingency plan for responding to future incidents or hazards; these alternatives are not preferred by Sagkeeng in part because Sagkeeng is concerned for a potential future scenario where a reversal of ISD and removal of radioactive materials would be required. CNL has referred to a contingency plan of cutting out the concrete block in smaller pieces if there was evidence of failure; Sagkeeng has not been provided any evidence about the environmental and human safety, speed and efficacy of such an approach.

Given there are no other examples of safe containment of radioactive materials over a long time scale (hundreds to thousands of years), it is not possible for the Proponent to provide certainty that failure is not a possibility in the future, or that future interventions could be done easily and safely if necessary.

2.7.9 **Preference 9:** Impact Equity

> *… they wouldn't put that [nuclear material] in their populations. You know, why would it be acceptable in my population?* (Sagkeeng member in Olson et al. 2019)

This Sagkeeng preference test aspires for impact equity for Sagkeeng and it posits two important assertions:

(1) it asserts that not all the weight of impacts should be placed on one party, especially a sensitive and vulnerable group like Sagkeeng members and territory; and

(2) the parties who are most adversely impacted must see reciprocal benefits.

Sagkeeng has seen little if any benefit or accommodation from the Whiteshell facility or Canada since the facility's establishment in Sagkeeng territory over 50 years ago. Whiteshell Labs is part of a colonial legacy of actions being undertaken in Sagkeeng Territory without Sagkeeng consent and in some cases even knowledge. Sagkeeng never asked for the radioactive materials in question to be brought in for Whiteshell's nuclear operations; these have and continue to create great harm and concern among Sagkeeng members and pose an ongoing risk.

Sagkeeng prefers alternatives that do not put a disproportionate burden of impacts on Sagkeeng members, now and in the future. Cumulative effects must also be considered in this decision, including impacts from Whiteshell and other government approved developments.

The results of the Sagkeeng alternatives assessment for Preference 9 Impact Equity are provided in Table 14.

Table 14: Preference 9 – Impact Equity

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
9. Sagkeeng prefers alternatives that do not put a disproportionate burden of impacts on Sagkeeng members, now and in the future.	2.5	3 (most preferred alternative)	1 (least preferred alternative)	2

When assessed against Sagkeeng's preference for Impact Equity, **Alternative 2 is most preferable**, and **Alternative 3 is least preferable**.

Full removal of radioactive materials (Alternatives 1 and 2) for storage in a dedicated nuclear waste management facility outside of Sagkeeng Territory (as originally committed by Canada in 2002) is preferred by Sagkeeng for impact equity. Alternative 2 scores highest because if achieves impact equity more quickly than Alternative 1. Full or partial ISD (Alternatives 3 and 4) sustain impacts in Sagkeeng territory; Alternative 3 is least preferred because it stores a greater quantity of hazardous materials on Sagkeeng Traditional Territory and carries a potentially greater impact.

2.7.10 **Preference 10:** Higher Affected Public / Sagkeeng Acceptability

This preference statement assesses the social acceptability of each alternative, because for Sagkeeng, decisions on preferred alternatives are social as much as technical decisions; alternatives must be acceptable and preferable, as well as manageable. The importance of social acceptability and Sagkeeng consent for a preferred alternative cannot be underestimated. It is both a reflection of the concerns people have and a reflection of their agency (or the denial of their agency by decision-makers) to make decisions about things that are going to impact their lives.

The Project context also underscores the importance of Sagkeeng consent and acceptability. Sagkeeng consent was not sought or given when the original WR-1 Reactor was built and the materials that are now the subject of this assessment were brought into Sagkeeng territory. Neither was Sagkeeng consent requested or acceptability considered in the Proponent's decision to move forward with ISD as their preferred option.

Sagkeeng prefers alternatives that are acceptable to Sagkeeng Anicinabe members and land users.

The results of the Sagkeeng alternatives assessment for Preference 10 Higher Affected Public / Sagkeeng Acceptability are provided in Table 15.

Table 15: Preference 10 – Higher Affected Public/Sagkeeng Acceptability

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
10. Sagkeeng prefers alternatives that are acceptable to its members	2	3 (most preferred alternative)	1 (least preferred alternative)	1.5

When assessed through the lens of Sagkeeng's preference for Higher Affected Public / Sagkeeng Acceptability, **Alternative 2 is most preferable**, and **Alternative 3 is least preferable**.

Full and immediate removal (Alternative 2) is the preferred and acceptable decommissioning alternative for Sagkeeng. Deferred full removal (Alternative 1) ranks second for Sagkeeng and could be acceptable under certain conditions. According to Sagkeeng representatives, ISD alternatives are not acceptable, due to the retention of real, and perceived radioactive risks at and around the WR-1 facilities.

In addition, Alternative 2 represents a pathway that provides more agency for Sagkeeng as a community. Agency occurs where an Indigenous group:

- Feels listened to rather than lied to or ignored;
- Feels involved in decision-making of important issues that have the potential to impact on their well-being and quality of life;
- Has the opportunity to impose its traditional stewardship values in an area in a meaningful way; and
- Feels that the land it relies upon is being protected in a way that, when damaged, it will be allowed to heal in the future.

Alternatives 3, and to a lesser degree, 4, would reduce Sagkeeng agency rather than improve it. ISD has been rejected by Sagkeeng consistently as the preferred alternative but is still being proposed by CNL. Sagkeeng members will likely feel lied to by Canada if the 2002 commitment for full removal is rescinded. And ISD would see a future where community members would be unlikely to see the land heal or to reconnect in a meaningful way with the area.

Sagkeeng also notes that Article 29(2) of the *United Nations Declaration of the Rights of Indigenous Peoples*, to which Canada is a signatory, requires that "states shall take effective measures to ensure that no storage or disposal of hazardous materials shall take place in the lands or territories of indigenous peoples without their free, prior and informed consent." As a result, acceptability by Sagkeeng of any plan to decommission the site, through and informed consent decision, should be a mandatory requirement of approval.

2.7.11 **Preference 11:** Protection and Promotion of Treaty Rights[12]

This preference statement assesses each alternative in relation to the protection and promotion of Sagkeeng Treaty rights, which are recognized and affirmed by section 35 of the *Constitution Act, 1982*. Sagkeeng Treaty rights include, but are not limited to, the right to hunt, trap, fish, gather, occupy, and transport across the Sagkeeng traditional territory. While Sagkeeng rights have been infringed upon by multiple impact causing agents over time, they will never be extinguished. Sagkeeng members rely on these promised rights for their well-being and way of life.

Substantial uncertainty and anxiety about the safety of WR-1, now and into the future, and current effects on water has impacted Treaty rights such as the right to fish (Olson et al. 2019a).

Sagkeeng prefers alternatives that have the least potential for adverse impacts or infringements on Treaty rights in as much of Sagkeeng territory as possible, and prefers also for alternatives that could have the most beneficial effects on members' ability to meaningfully practice their rights into the future.

12 For further details on potential impacts of different alternatives on Sagkeeng rights, see Sagkeeng Test#7 below.

The results of the Sagkeeng alternatives assessment for Preference 11 Protection and Promotion of Treaty Rights are provided in Table 16.

Table 16: Preference 11 – Protection and Promotion of Treaty Rights

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
11. Sagkeeng prefers alternatives that have the least potential for infringements on Treaty rights and prefers alternatives that have beneficial effects on members' ability to meaningfully practices those rights in the future.	2.5	3 (most preferred alternative)	1 (least preferred alternative)	2

When assessed through the lens of Sagkeeng's preference for Protection and Promotion of Treaty Rights, **Alternative 2 is most preferable**, and **Alternative 3 is least preferable**.

Full removal of radioactive materials (Alternatives 1 and 2) are preferred as they would be most likely to eventually result in restoration of Sagkeeng confidence that the lands and resources near and downstream of Whiteshell are healed and safe for the practice of Treaty rights. Alternative 2 is most preferable because conditions supportive of the practice of Treaty rights would be restored more quickly. Conversely, ISD would maintain current low levels of confidence in the safety of the lands and resources in the Whiteshell area (Olson et al. 2019a), or reduce confidence further and in perpetuity, further eroding Sagkeeng members' ability to practice their aboriginal and Treaty Rights.

2.7.12 **Preference 12:** Adherence to Ancestral Laws and Norms

This preference test considers each alternative in relation to its adherence to Sagkeeng Anicinabe ancestral laws and norms. Sagkeeng ancestral laws and norms continue to guide Sagkeeng members in governance of traditional lands and people, and in Sagkeeng's relationship to non-Indigenous peoples and governments.

Anicinabe laws and norms include but are not limited to:

1. Allowing and encouraging the land to heal when it is damaged.
2. Water flows naturally and will "find a way".
3. Protect the land for future generations.
4. Respect for ancestors and ability to maintain and pass on history and Sagkeeng connection to land.

Sagkeeng prefers alternatives that adhere to or are otherwise are not likely to conflict with these ancestral laws.

The results of the Sagkeeng alternatives assessment for Preference 12 Adherence to Ancestral Laws and Norms are provided in Table 17.

Table 17: Preference 12 – Adherence to Ancestral Laws and Norms

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
12. Sagkeeng prefers alternatives that adhere to or are not likely to conflict with ancestral laws.	2.5	3 (most preferred alternative)	1 (least preferred alternative)	2

When assessed against Sagkeeng's preference for Adherence to Ancestral Laws and Norms, A**lternative 2 is most preferable**, and **Alternative 3 is least preferable**.

Full removal of radioactive materials (Alternatives 1 and 2) from Sagkeeng Territory are preferred because they remove the risk entirely and over time allow the land to heal back to a more normal (closer to pre-industrial) condition. Alternative 1 would accomplish this on a longer time frame than Alternative 2, so receives a slightly lower score. ISD (Alternatives 3 and 4) is less preferred against Anicinabe laws and norms because it introduces concrete and grouting to encase the risk and maintain it in perpetuity. The introduction of a concrete vault changes how groundwater moves and interferes with natural conditions. Sagkeeng are concerned that with ISD, water's capacity to "find a way" would over time intrude upon the concrete vault of radioactive materials, and eventually (in hundreds or thousands of years) result in erosion and leaching out of radioactive materials into the groundwater and Winnipeg River.

2.7.13 **Preference 13:** Sagkeeng Territory Free of Radioactive Waste

> *I think they should pull out all those reactors and dump them somewhere else…* (Sagkeeng member in Olson et al. 2019a)

This Sagkeeng preference statement regards the degree to which each alternative contributes to Sagkeeng's desire to see as much radioactive waste as possible removed from Sagkeeng Anicinabe traditional territory. Sagkeeng members have lived downstream from Whiteshell Laboratories for decades and desire a future where the stigma and psychosocial effects of this no longer affect their daily lives, use of lands and resources, and overall well-being.

Sagkeeng prefers alternatives that do not result in a permanent nuclear waste disposal facility in Sagkeeng territory.

The results of the Sagkeeng alternatives assessment for Preference 13 Sagkeeng Territory Free of Radioactive Waste are provided in the following table:

Table 18: Preference 13 – Sagkeeng Territory Free of Radioactive Waste

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
13. Sagkeeng prefers alternatives that do not create a permanent nuclear waste disposal facility in Sagkeeng territory.	2.5	3 (most preferred alternative)	1 (least preferred alternative)	1.5

When assessed through the lens of Sagkeeng's preference for Adherence to Ancestral Laws and Norms, **Alternative 2 is most preferable**, and **Alternative 3 is least preferable**.

Full removal of radioactive materials (Alternatives 1 and 2) is preferred because it removes the risk entirely and does not create permanent nuclear waste facility in Sagkeeng Territory. Alternative 2 is most preferable because it would achieve this immediately. ISD (Alternatives 3 an 4) would ensure nuclear waste remains in Sagkeeng Territory in perpetuity, and this is not preferred by Sagkeeng. Alternative 3 scores the lowest because it maintains a greater volume of radioactive materials.

2.7.14 Summary of Sagkeeng Test #6 – Values-based Preference Statements

Sagkeeng representatives identified and applied 13 Sagkeeng priority values-based preference statements against the four technically and economically feasible alternative means of decommissioning the WR-1 Reactor at Whiteshell Labs. Table 19 summarizes and totals the results, where 3 is a high (preferred for) score, and 1 is a low (non-preferred) score.

Table 19: Summary of Sagkeeng Test #6: Values-based Preference Statements

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
1. Sagkeeng prefers alternatives that provide greater real and perceived long-term protection of the water.	2.5	3 (most preferred alternative)	1.5 (least preferred alternative)	2
2. Sagkeeng prefers alternatives respectful of the spiritual balance of people with the earth, and allow at least the potential for greater access to territory for cultural purposes in the future.	2.0	3 (most preferred alternative)	1 (least preferred alternative)	1.5
3. Sagkeeng prefers alternatives that result in restoration of territorial integrity at Whiteshell.	2.0	3 (most preferred alternative)	1 (least preferred alternative)	1.5

Table 19: Summary of Sagkeeng Test #6: Values-based Preference Statements Con't

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
4. Sagkeeng prefers alternatives that will increase trust in traditional foods and water sources over time, increase the amount of territory to access country foods in, and reduce risk of wildlife contamination and health risks.	2.0	3 (most preferred alternative)	1 (least preferred alternative)	2
5. Sagkeeng prefers alternatives that will reduce mental stress, fear, and stigma, now and into the future, at and around the Whiteshell facility.	2.0	3 (most preferred alternative)	1 (least preferred alternative)	2
6. Sagkeeng prefers reduced long-term risks in Sagkeeng territory including: reduced long-term human population health risks, reduced long-term risks on the Winnipeg River waters and fish, low amount of risks at the Whiteshell Labs site, and a permanently safe decommissioning solution for the facility.	2.5	3 (most preferred alternative)	2 (least preferred alternative)	2.5
7. Sagkeeng prefers alternatives that address the hazard at WR-1 sooner and require less future management.	2	3 (most preferred alternative)	1.5 (least preferred alternative)	2.5
8. Sagkeeng prefers alternatives that either include the flexibility to alter management plans at the site in the future or remove the risks entirely from the site.	2.5	3 (most preferred alternative)	1 (least preferred alternative)	2
9. Sagkeeng prefers alternatives that do not put a disproportionate burden of impacts on Sagkeeng members, now and in the future.	2.5	3 (most preferred alternative)	1 (least preferred alternative)	2
10. Sagkeeng prefers alternatives that are acceptable to its members	2	3 (most preferred alternative)	1 (least preferred alternative)	1.5
11. Sagkeeng prefers alternatives that have the least potential for infringements on Treaty rights and prefers alternatives that have beneficial effects on members' ability to meaningfully practices those rights in the future.	2.5	3 (most preferred alternative)	1 (least preferred alternative)	2

Table 19: Summary of Sagkeeng Test #6: Values-based Preference Statements Con't

Sagkeeng Values-based Preference Statement	1 – Deferred Full Removal	2 – Immediate Full Removal	3 - ISD	4 – Partial ISD, partial removal
12. Sagkeeng prefers alternatives that adhere to or are not likely to conflict with ancestral laws.	2.5	3 (most preferred alternative)	1 (least preferred alternative)	2
13. Sagkeeng prefers alternatives that do not create a permanent nuclear waste disposal facility in Sagkeeng territory.	2.5	3 (most preferred alternative)	1 (least preferred alternative)	1.5
TOTAL SCORE	**29.5**	**39**	**15**	**25**
PREFERENCE RANKING	**2nd**	**1st**	**4th**	**3rd**

The results are remarkably consistent across a large number of Sagkeeng's values-based preference statements. In every instance, Alternative #2 (Immediate Full Removal) is the highest ranked alternative. In every instance, Alternative #3 (ISD) is the lowest ranked alternative. There is also a clear distinction between the second-ranked option - Alternative #1 (Deferred Full Removal) – and the third ranked option – Alternative 4 (Partial ISD, Partial Removal).

From a Sagkeeng values-based perspective, full removal of all radioactive materials from the WR-1 Reactor immediately through Alternative 2 is the least risk and highest reward alternative. There is a slight reduction in the overall score for Alternative 1 (Deferred Full Removal) due to the lag time in getting radioactive materials out of Sagkeeng territory impacting negatively on short term Sagkeeng preferences. Lower scores for Alternative 4 (Partial Removal, Partial ISD) are primarily due to Sagkeeng concerns about leaving any radioactive waste in Sagkeeng territory, especially longer-lasting Intermediate Level Waste such as that found in the WR-1 Reactor. ISD options (Alternatives 3 and 4) overall rate poorly because they maintain the fear and stigma for Sagkeeng members associated with the WR-1 facility, and will result in continued lack of access to preferred areas in the vicinity of Whiteshell and WR-1 into the far future due to fencing, visual, and risk perception barriers. Sagkeeng prefers removal of unnatural risks from Sagkeeng territory; ISD is the opposite and permanently maintains real and perceived risk in the territory, and is the alternative most likely to maintains fear and stigma among Sagkeeng members about the site over the long-term. As a Sagkeeng Council member put it: "There is no future for us at the site without full removal of all those nuclear materials from the Reactor. At least there is a chance of reconnecting with the land there if those materials are removed".

2.8 Sagkeeng Test #7: Sagkeeng Treaty Rights and *CEAA 2012* Section 5(1)(c) Factors

Note: Sagkeeng Test #7 results are provided here in a preliminary, non-prejudicial fashion, as they will be updated through the Rights Impact Assessment process between Sagkeeng and the staff of the Canadian Nuclear Safety Commission.

Sagkeeng Test #7 undertakes an assessment based on each alternative's potential beneficial or adverse implications in relation to Sagkeeng Treaty rights and *CEAA 2012* section 5(1)(c) factors. The test is largely derived from the question:

Which alternatives will have the least potential for adverse impact on the ability of Sagkeeng members to meaningfully practice their Treaty rights, and the most potential for beneficial impacts on Sagkeeng rights?

Important expressions of Sagkeeng Treaty rights include but are not limited to:

- Hunting
- Fishing
- Trapping
- Gathering
- Use and navigation of water
- Traveling and staying on the land

Sagkeeng Test #7 includes consideration of underlying conditions critical to this practice, some of which are reflected in *CEAA 2012* 5(1)(c). *CEAA 2012* section 5(1)(c) factors represent conditions and values critical to Indigenous peoples that are recognized by Canada as important to consider in federal impact assessment processes in relation to the effects of proposed projects on Indigenous peoples. These 5(1)(c) factors include:

- Health and socio-economic conditions
- Physical and cultural heritage
- Current use of lands and resources for traditional purposes
- Structures or sites of historical, archaeological, paleontological, or architectural significance

The meaningful expression of Sagkeeng Treaty rights, as well as the *CEAA 2012* factors, are contingent upon access to - and ability and willingness to use - the land. In order to do so, Sagkeeng members must have confidence that the land and water is healthy in Sagkeeng Anicinabe Traditional Territory. Specifically in relation to *CEAA 2012* factors, Sagkeeng mental and physical health and well-being is strongly related to the ability to harvest county foods from preferred harvesting areas, and the enjoyment of connection, peace, and serenity

on the land. Sagkeeng physical and cultural heritage is contained in real places such as areas of ancestral and current use that are intertwined with Sagkeeng stories and knowledge. Sagkeeng's current use of lands and resources for traditional purposes reflects a widely distributed pattern of use, occupancy, and expression of Treaty rights across the territory, and especially the Winnipeg River, a core cultural waterway (see Olson et al. 2019a, 2019b). Structures and sites of historical and archaeological importance are numerous and widespread; many persist and many others have been impacted by development such as Whiteshell Laboratories, dams and other water control structures, and settler interventions in the natural flows of Winnipeg River and Lake.

In the context of the proposed Project's alternative means, alternatives with higher uncertainty and anxiety about the long-term safety of the selected alternative would be detrimental to Sagkeeng Treaty rights and the factors outlined in *CEAA 2012* section 5(1)(c). Additional contamination of the Winnipeg River, or the perception of additional long-term contamination risk, could be devastating to how Sagkeeng's culture and way of life are practiced in the Project-affected area.

Sagkeeng's preferred future use of the Traditional Territory includes use of the lands currently contained within the Whiteshell Laboratories property boundaries. Sagkeeng's assessment of alternatives thus includes important considerations with regards to the question of what would be required to restore confidence and future use of Whiteshell. As the quote below describes, before Whiteshell Laboratories was constructed and Sagkeeng members lost access to the area, those lands supported many rights-based practices including the gathering of berries and medicines, hunting white-tailed deer, and use of hunting and fishing camps, among other practices (Olson et al. 2019a).

> *But, that's way before this thing [Whiteshell Laboratories] was built here. I guess there was a lot of fish there at one time. The rocks and, right up through here. And, then, you go to the dam. I guess, they were setting nets there and, then, they had, that's where they were getting their medicines or place they would camp and, move on. And, they did their hunting there too.* (Sagkeeng member in Olson et al. 2019)

While this exercise was originally conducted by Sagkeeng Chief and Council using quantitative data similar to Sagkeeng Tests #5 and #6, due to the sensitive nature of Treaty rights, Sagkeeng has not included any quantitative results of this assessment; the comparative ranking of alternatives is instead provided.

Tables 20 and 21 below show the results of Sagkeeng's assessment of alternatives for Sagkeeng Treaty rights and CEAA 2012 Section 5(1)(c) factors. Table 22 provides an overall summary of these two Sagkeeng tests in combination.

Table 20: Results of Sagkeeng Test #7.1 – Treaty Rights Implications

Criteria	Alternative 1 – Deferred Full Removal	Alternative 2 – Immediate Full Removal	Alternative 3 – Complete ISD	Alternative 4 – Partial Removal/ Partial ISD
Treaty Rights				
Hunting	Second ranked alternative	Most preferred alternative	Least preferred alternative	Third ranked alternative
Fishing	Second ranked alternative	Most preferred alternative	Least preferred alternative	Third ranked alternative
Collecting Berries	Second ranked alternative	Most preferred alternative	Least preferred alternative	Third ranked alternative
Collecting Medicines	Second ranked alternative	Most preferred alternative	Least preferred alternative	Third ranked alternative
Using and Navigating Water	Second ranked alternative	Most preferred alternative	Least preferred alternative	Third ranked alternative
Incidental Rights (e.g., travelling and staying on the land)	Second ranked alternative	Most preferred alternative	Least preferred alternative	Third ranked alternative

Table 21: Results of Sagkeeng Test #7.2 – *CEAA 2012* Section 5(1)(c) Implications

Criteria	Alternative 1 – Deferred Full Removal	Alternative 2 – Immediate Full Removal	Alternative 3 – Complete ISD	Alternative 4 – Partial Removal/ Partial ISD
***CEAA 2012* Section 5(1)(c) Factors**				
Health and socio-economic conditions	Second ranked alternative	Most preferred alternative	Least preferred alternative	Third ranked alternative
Physical and cultural heritage	Second ranked alternative	Most preferred alternative	Least preferred alternative	Third ranked alternative
Current use of lands and resources for traditional purposes	Second ranked alternative	Most preferred alternative	Least preferred alternative	Second ranked alternative
Structures or sites of historical, archaeological, paleontological, or architectural significance	Second ranked alternative	Most preferred alternative	Least preferred alternative	Second ranked alternative

Table 22: Summary Results of Sagkeeng Test #7

Criteria	Alternative 1 – Deferred Decommissioning w/ Complete Dismantle	Alternative 2 – Immediate Complete Dismantling	Alternative 3 – Complete In-Situ Decommissioning	Alternative 4 – Partial Dismantling and Removal/ Partial ISD
Preference Ranking	**2nd**	**1st**	**4th**	**3rd**
Key Differences	Lower score than Alternative 2 due to deferral of full removal and thus slower potential for improvement in conditions for Treaty rights.	Full removal of all nuclear materials would see both the least real and perceived risks at the site, thus most improved conditions for practice of Sagkeeng Treaty rights.	Minimal to no removal of perceived risk through keeping the waste on site, thus low likelihood of restored Sagkeeng confidence and Treaty rights practice.	Despite 99% of radioactive materials removed, perception of risk could still alienate Treaty rights.

When considered against Sagkeeng Treaty rights and *CEAA 2012* Section 5(1)(c) factors, **Alternative 2 is most preferable**, and **Alternative 3 is least preferable**.

Sagkeeng have consistently indicated that early and full removal of nuclear materials from Sagkeeng territory is preferred in part because it brings higher potential for the meaningful recovery of Treaty rights and use of lands and resources in and around Whiteshell Laboratories; this result is only achieved by Alternative 2. Alternative 1 scores second highest because it would achieve this eventually, but not as quickly as Alternative 2. ISD (Alternatives 3 and, to a lesser degree, 4) maintain nuclear materials at the WR-1 Reactor site in perpetuity and do not restore the necessary conditions for increased expression of Treaty rights. Sagkeeng members cannot and will not harvest on top of a permanent nuclear waste disposal facility. Alternative 4 scores higher as it lowers the volume of radioactive materials, however for Sagkeeng this is not likely to have a significant positive effect on the recovery of Treaty rights in and around the Whiteshell area due to sustained perceived risk.

These results are consistent with recent studies related to the proposed WR-1 decommissioning, in which Sagkeeng members noted that ISD would result in reduced confidence in water quality in the Winnipeg River, which is inextricably linked to the future practice of Treaty rights such as fishing, harvesting wild rice, hunting, and collecting drinking water (e.g., Olson et al. 2019a). Existing Sagkeeng use and occupancy data shows that numerous values and Treaty rights-based practices – including fishing sites for several species, fish spawning, berry and medicinal plant gathering locations, hunting and trapping values, sacred and ceremonial places, and campsites, among others – are already impacted or at risk in the immediate vicinity of Whiteshell, and Sagkeeng members have expressed that a decision to move forward with ISD would sustain this impact and risk in perpetuity (Olson et al. 2019a). Sagkeeng members prefer Alternatives 1 and - especially – 2, because they would remove the hazard and improve the improve the prospects of future access to the site for the practice of Treaty rights and reconnection to the land (Olson et al. 2019a).

2.9 Sagkeeng Test #8: Likelihood of Sagkeeng Consent (Preliminary Analysis)

Sagkeeng expects to be meaningfully engaged in all decisions affecting Sagkeeng Territory and for final decisions to be supported by Sagkeeng consent. The overarching question posed here for each alternative means was:

What is the likelihood that Sagkeeng will give its consent to the alternative?

Sagkeeng Test #8 assesses each alternative relative to the likelihood that it would receive consent from Sagkeeng Anicinabe and members. Sagkeeng is a self-determining Nation. Determining consent and acceptability is a community-based process that is informed by Sagkeeng's responsibilities to the lands and waters, and governed by Sagkeeng traditional laws and protocols, including accountability to Sagkeeng people of past, present, and future generations. Sagkeeng expects all decisions affecting Sagkeeng Anicinabe lands, waters, and people to follow the best practice of obtaining free, prior, and informed consent (FPIC).

Indigenous consent is not a minor issue; it is a central issue; when it comes to selecting a preferred alternative means to decommission the WR-1 Reactor. FPIC is a core principle of the *United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)*[13], which Canada endorsed in 2016 in a commitment to a renewed, nation-to-nation relationship with Indigenous peoples[14]. Articles 29 and 32 of *UNDRIP* are especially relevant to this decision. Article 29(2) requires consent for the storage or disposal of hazardous materials on Indigenous lands or territories declaring:

> *States shall take effective measures to ensure that no storage or disposal of hazardous materials shall take place in the lands or territories of indigenous peoples without their free, prior and informed consent.*

Article 32 requires states to consult and cooperate with Indigenous peoples in order to obtain consent before approving projects affecting Indigenous lands or territories:

> *States shall consult and cooperate in good faith with the Indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploration of mineral, water or other resources.*

Table 23 displays preliminary Sagkeeng Test #8 results focused on the likelihood that each technically and economically feasible alternative may achieve Sagkeeng consent. These results below are based on feedback from Sagkeeng Chief and Council, and Sagkeeng's comments on the public record to date in relation to the WR-1 Decommissioning impact assessment process.

13 United Nations Declaration on the Rights of Indigenous People: https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf

14 Indigenous and Northern Affairs Canada webpage regarding Canada's endorsement of UNDRIP: https://www.aadnc-aandc.gc.ca/eng/1309374407406/1309374458958

Table 23: Summary Results of Sagkeeng Test #8 – Likelihood of Sagkeeng Consent

Criteria	Alternative 1 – Deferred Decommissioning w/ Complete Dismantle	Alternative 2 – Immediate Complete Dismantling	Alternative 3 – Complete In-Situ Decommissioning	Alternative 4 – Partial Dismantling and Removal/ Partial ISD
Sagkeeng Consent Likely?	**Uncertain**	**Yes**	**No**	**No**
Why?	Deferred complete removal addresses Sagkeeng's main concern, which is removal of all radioactive materials from our lands; by doing so it upholds Canada's 2002 commitment; it will reduce fear and stigma, and the land and waters will heal.	The rationale is the same as Alternative 1, however the benefits are achieved more quickly by immediate removal.	ISD leaves risk in the ground in perpetuity for future generations; the land and waters cannot heal; the land will not become more accessible to Sagkeeng members and they will not be able to use the land; fear and stigma related to Whiteshell will continue into the future.	While partial dismantle and removal will heavily reduce the risk for future generations, partial ISD leaves some risk in the ground at the WR-1 site and access is still impacted well into the future, and perceived risk remains high.

It is important to note that the results of this test are preliminary and do not imply blanket consent for any alternative. Any proposal would need to show evidence that it is planned and undertaken in such a way that will not harm Sagkeeng lands, waters, rights, and people. **Any final Sagkeeng consent decisions will need to be through proper Sagkeeng Anicinabe protocols.**

As shown in Table 23 above, Alternative 2 resulting in the full and immediate dismantling and removal of radioactive materials from the WR-1 Reactor is most likely to receive Sagkeeng consent, while alternatives 3 and 4 (full and partial ISD) are not likely to receive consent. Sagkeeng members have made it clear that their preference is full removal of radioactive materials from WR-1 from their Traditional Territory, as this addresses critical concerns related to contamination and confidence in the health of the lands and waters. Alternatives 2 and - over a longer time horizon, 1, would reduce the risk for future generations, provide opportunity for the lands to heal over time, and improve the prospect of Sagkeeng future use of the Project lands. Alternative 1 gets a question mark for its ability to garner Sagkeeng consent due to the increased amount of time Treaty rights would be subject to infringement because radioactive materials would be removed further in the future. Alternative 4 is estimated to be likely to fail the Sagkeeng consent test due to concerns about continued fear and stigma around the site, even with bulk of (but not all of) the Intermediate Level Waste radioactive materials removed.

2.10 Summary Results for all Sagkeeng Alternative Means Tests

Table 24 displays Sagkeeng's preferred and least preferred alternative for each Sagkeeng Test.

Table 24: Sagkeeng's Preferred and Least Preferred Alternatives

Sagkeeng Test	Most Preferred	Least Preferred
1. Technical revised scoring	**1 and 2**	**3**
2. Technical revised scoring and revised weighting	**1 and 2**	**3**
3. Technical with revised scoring, revised weighting, and uncertainty integrated	**1 and 2**	**3**
4. Technical with Sagkeeng weighting	**4.1 - 3** **4.2 - 1 and 2**	**4.1 - 4** **4.2 - 3**
5. Sagkeeng guiding questions	**2**	**3**
6. Sagkeeng values-based preferences	**2**	**3**
7. Treaty rights	**7.1 – 2** **7.2 - 2**	**7.1 – 3** **7.2 - 3**
8. Likelihood of Sagkeeng consent	**2**	**3 and 4**

Alternatives 1 and 2 resulting in full removal of radioactive materials from the WR-1 Reactor are the preferred alternative in seven and a half out of eight Sagkeeng Tests. Immediate full removal (Alternative 2) is the preferred alternative based on Sagkeeng guiding questions, values, Treaty rights, and likelihood of garnering Sagkeeng consent. Alternative 1 (deferred full removal) does not score as well on Sagkeeng values and rights driven tests (Sagkeeng Tests #5 through #8), as it does on purely technical tests, primarily due to Sagkeeng desire to expedite the removal of radioactive waste from its Traditional Territory.

Alternatives resulting in in-situ decommissioning and permanent storage of all or a portion of radioactive materials at the current WR-1 site at Whiteshell Laboratories are least preferred in all eight Sagkeeng tests. Full ISD (Alternative 3) is the least preferred alternative in seven (and a half) out of eight Sagkeeng tests. Alternative 4 (partial ISD) generally scores considerably higher among Sagkeeng Tests than Alternative 3 (full ISD), however Alternative 4 received a failing or low grade for several Sagkeeng Tests. While Alternative 4 minimizes the volume of radioactive materials stored at Whiteshell, the fear and stigma caused by the presence of radioactive materials at the site would remain in perpetuity and thus continue to result in significant adverse effects on current and future use, Treaty rights, food security and faith in country foods, among other Sagkeeng values.

3. Conclusions and Required Next Steps

3.1 Discussion

This Final Report provides Sagkeeng's assessment, using eight different tests, of the preferability of four technically and economically feasible alternative means to decommission Canadian Nuclear Laboratories' WR-1 Reactor at the Whiteshell Laboratories, in Sagkeeng's Traditional Territory.

Sagkeeng was prompted to conduct this alternative means assessment because of gaps in CNL's existing alternative means assessment, which was the subject of Section 2 of the draft EIS (CNL 2017). Among the gaps in CNL's alternative means assessment, which are subject to prior and more extensive Sagkeeng comments on the public record for this EA, are:

- It ignores effects on Sagkeeng overall, including no consideration of whether *CEAA 2012* Section 5(1)(c) factors would be differentially affected by different alternatives.
- It ignores consideration of a "Plan B"; what degree of flexibility there is for each alternative means if an unforeseen failure mode occurs.
- It ignores effects on Sagkeeng Aboriginal and Treaty rights.
- It ignores psycho-social impacts (fear, stigma) in the alternatives assessment, even though they are central to the preferability of different alternative means.
- It provided no Sagkeeng seat at the table; no voice for Indigenous values in the assessment.
- It lacks appropriate weighting endorsed by any party other than CNL itself. For example, from a Sagkeeng perspective, worker safety should not be as high a priority as social considerations.
- It concludes with a finding that an alternative (ISD) is preferable even though it does not meet the nuclear industry standard of having radioactive emissions "As Low as Reasonably Achievable", instead choosing to leave radioactive materials in the shallow ground near a river in a facility not designed for radioactive waste disposal.
- It lacks full and proper recognition that future control will decline, making radioactivity in the ground more difficult to manage if issues emerge.

Sagkeeng has real problems with leaving these radioactive materials in the ground in its Traditional Territory; that issue needs to be dealt with in a meaningful way. Sagkeeng members want to use the area in the future in a meaningful way that echoes how they preferred to use it in the past (Olson et al 2019a). They are currently constrained from using the area due to fears regarding radiation safety and country foods, lack of access, and lack of information about effects, which breeds and amplifies social stigma about the site. Sagkeeng has clearly and consistently stated it wants the materials taken out of the ground and removed from Sagkeeng territory. Canada brought these materials into Sagkeeng territory (or in some cases created the materials in the research reactor) without Sagkeeng's permission; Canada can take them right back out again. These materials are unnatural to Sagkeeng territory, and they are housed in a facility that is not designed to be a permanent radioactive waste disposal facility. It was never Sagkeeng's waste because they never had a right to choose. The impacts may be moved somewhere else, but there they will be housed in proper containment in a purpose-built facility.

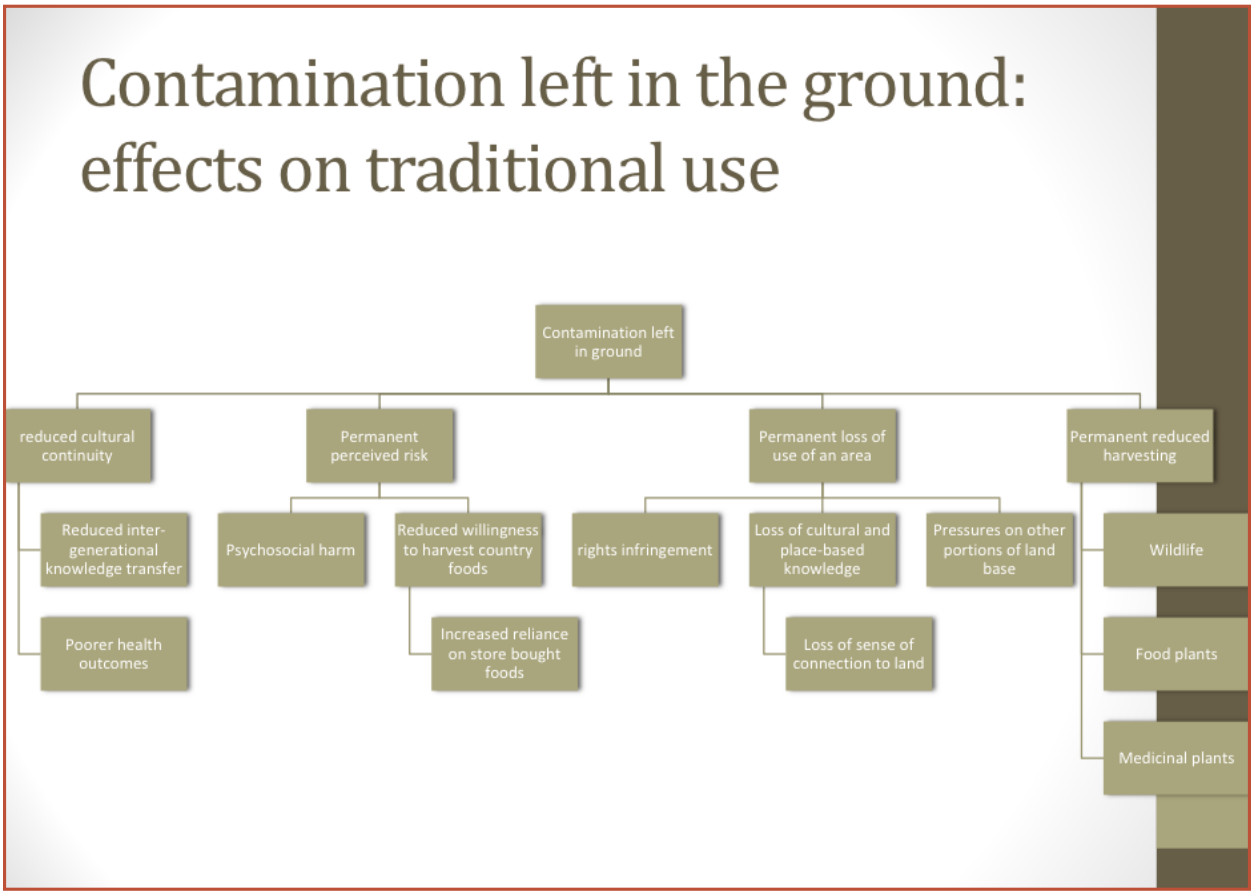
Sagkeeng's alternatives assessment convincingly demonstrates that ISD (Alternative 3) performs poorer against virtually all Sagkeeng values and preferences, especially against "full removal" alternatives 2 and 1 (in that order of preference). This assessment also shows that ISD performs poorly relative to full removal options on both a technical (Sagkeeng Tests 1 through 3) and a non-technical (Sagkeeng Tests 4 through 8) basis.

In addition, ISD:

- Is not the approved plan Canada has committed to for WR-1;
- Would leave Intermediate Level Nuclear Wastes in the ground in Sagkeeng territory, which can be avoided with full removal;
- Is not proven long term;
- Will inevitably see some radiation seep out to the Winnipeg River over time, which can be avoided with full removal;
- Will complicate any future efforts to manage the radioactive wastes if ISD fails to perform as intended;
- Has the highest likelihood of adverse risks on the site in the future;
- Requires the longest active management of the site;
- Would see the site likely never reintegrated into Sagkeeng use, which may be avoided with full removal;
- Causes the highest amount of fear and stigma to Sagkeeng; and
- Has the potential to compound Sagkeeng existing health risk perceptions long term.

The biggest concern for Sagkeeng in relation to ISD is that it would leave long-lasting radioactive materials under the ground, near the surface, and near the Winnipeg River, in perpetuity. As Figure 5 below shows, this can lead to multiple adverse effects on Sagkeeng members, primarily but not exclusively on Sagkeeng traditional use of the impacted area. These adverse effects can come from both potential adverse biophysical changes if the radioactivity is not properly contained by ISD, and – equally importantly – from fear and stigma caused and/or extended in life by the continued presence of these materials in the area. Both types of impacts can be avoided if the material is – as Canada is currently committed to – all removed to a dedicated off-site radioactive waste management and disposal facility.

Figure 5: Likely Effects of ISD on Sagkeeng Traditional Use and Associated Values



Sagkeeng recognizes that the healing that comes with full removal will not be an overnight occurrence. Much damage has been done since the Whiteshell Laboratories opened in 1963. But the community wants the opportunity for the land to heal, and ISD would not allow for that to occur. As one member of Council put it:

> *Take it all away [and] at some point we will use it. People won't use it immediately. They will wait and see what happens but at least if it is all gone they can then again trust. It is the building of trust in the land; if you don't remove it, they are not going to go there. If you remove it, it will take time for people to realize, "now it is gone and so I can use the land again.*

3.2 Recommended Next Steps

Sagkeeng is not saying its values are the only values that need to be considered in the alternative means assessment. They are very important values, however, that have not been considered by the Proponent's work or Canada's environmental assessment to date. Specifically, they have not been considered in the Proponent's alternatives assessment. Those Sagkeeng values are also tied to Constitutionally-enshrined Treaty and Aboriginal rights that must be considered meaningfully in this decision-making process.

As early as January 2018, Sagkeeng recommended the Proponent engage in a multiple accounts evaluation to identify a preferred alternative means to decommission the WR-1 Reactor. The Proponent has declined to do so to date. Sagkeeng has herein provided strong inputs to fuel a multi-party, multiple accounts evaluation of alternative means. It shows from a technical and a Sagkeeng values and impacts perspective, that full removal is preferable to ISD. That suggests CNL, AECL and CNSC should stick with the currently approved plan for full removal.

A true multi-party and multiple accounts evaluation would look at differing perspectives and findings, and try to find a jointly preferred, or at minimum a jointly acceptable, solution. Sagkeeng has opened the door with this work, we look forward to Canada and CNL engaging us to take the opportunity to work together toward a more meaningful, collaborative alternative means assessment for this important nuclear decommissioning Project on our Traditional Territory. The results of this report, as well as the forthcoming Sagkeeng psycho-social effects study (Narratives Inc. 2020), can be used to fuel these further discussions and collaborative efforts.

Citations Referred to in this Alternatives Assessment

Brown, T. (2019). Whiteshell Laboratories Decommissioning: Independent Evaluation of CNL Alternatives Assessment. Presentation prepared and delivered on behalf of Sagkeeng First Nation, February 2019.

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Olson, R., Firelight Research Inc., with the Sagkeeng Anicinabe. (2019b). *Sagkeeng Anicinabe Land Use and Occupancy Study Specific to Manitoba Hydro's Winnipeg River Dams*. Vancouver: Firelight Research Inc.

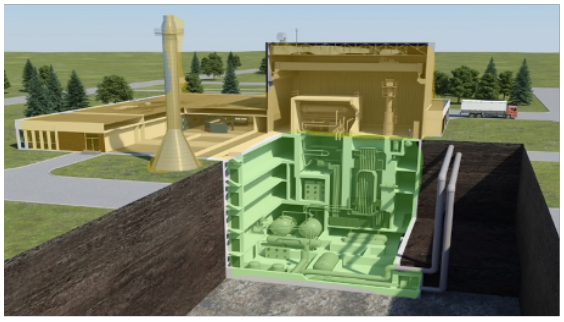
Sagkeeng First Nation (2018). *Sagkeeng Priority Issues with Whiteshell WR-1 Decommissioning EIS*. Filed with the Canadian Nuclear Safety Commission, January 15, 2018.

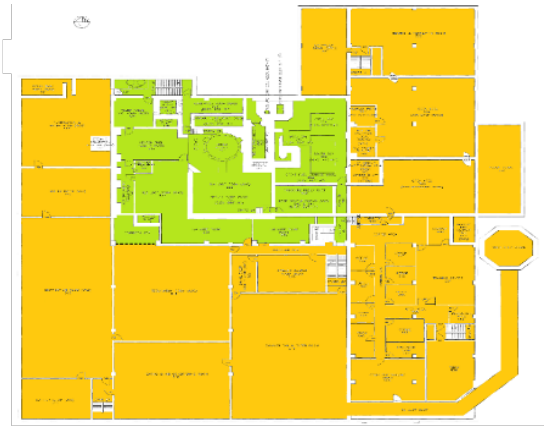
Appendix A: CNL's Four Technically and Economically Feasible Alternative Means

Note: The following description of the four alternative means deemed technically and economically feasible by CNL was provided by CNL to Sagkeeng on Jun 11, 2020. This material is provided verbatim from that CNL document to assist the reader in understanding how the four alternative means are understood by Sagkeeng representatives.

Whiteshell Reactor #1 (WR-1) Current Status

Building 100 on the Whiteshell site, is the building that contains WR-1 and all the systems that support it. This includes laboratories, control rooms, and building services (HVAC, power etc.). The building is about 18m (60ft) tall, and its foundation extends 5 stories down to bedrock (about 18m deep). It has a central area (green shading below) that houses the reactor systems. The outer wings of the building contained support systems and laboratory space (orange shading below). The picture below on the left, provides a cut-out of the reactor building showing the location of the reactor components below grade (below the surface of the ground). The image on the right, is a floorplan view (as looking from above) of the ground level floor of the reactor. Only the green shaded area (approximately 20m by 20m) is proposed for in situ decommissioning. The orange shaded areas will be demolished and all waste removed.





The building was built in 1963 and the reactor was operated until 1985, at which time it was permanently shut down. From 1985 to 1996, all fuel (high level waste) was removed from the reactor and fuel storage pools, for safe storage at the waste management area. No fuel remains in the building. The reactor was also bulk drained of operating fluids, including the heavy water moderator and reactor coolant. Some small amounts of coolant remain in low spots or tank heels. The coolant contains contamination in some places. In others it does not.

The power, HVAC and sump systems are still in operation to maintain safe access to the building. Most of the outer wings have been emptied and cleaned up to be demolition ready. At this time, the 50 ton overhead crane in the reactor hall (which will be used to move equipment and open concrete access hatches under all four

options) is still operational, and a small compliment of experienced building staff (one former reactor operator) remain employed at the site.

The foundation of the building (e.g.: walls and floors) is built from thick, strong reinforced concrete. Many walls are up to 1 m thick and the floor overlying the granite bedrock is approximately 1 m thick.

The foundation of the building is sound, as proven by concrete core samples recently pulled and tested. There are no immediate maintenance issues, or repairs expected in the short term (~5 years) to maintain safe operations.

WR-1 is currently in what is called a 'storage with surveillance' state, meaning it is safely shutdown, and regularly monitored and maintained, to ensure it remains in a safe state, until it is eventually decommissioned.

The following four alternatives considered for dismantling the reactor were considered technically feasible and each could be completed safely:

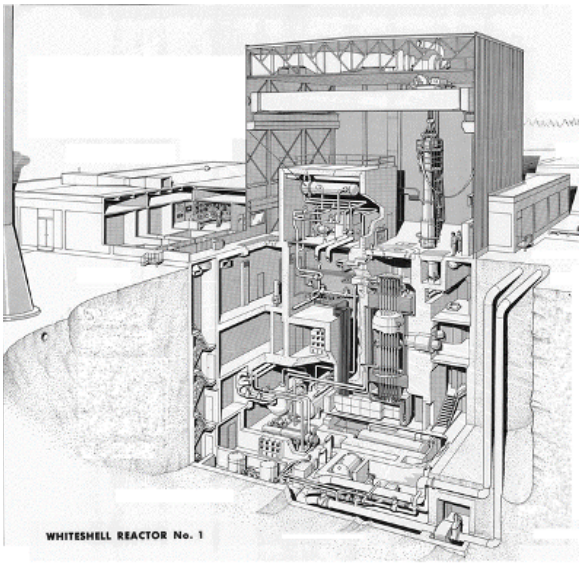
1) Deferred Dismantling (Continue Storage with Surveillance)

2) Immediate Dismantling

3) In Situ (in place) Disposal

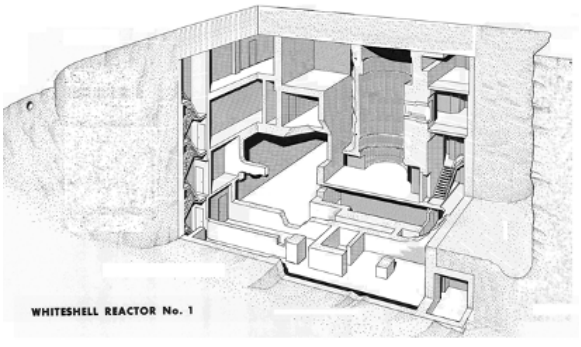
4) Partial In Situ (in place) Disposal

Alternative #1 – Deferred Dismantling (Continue Storage with Surveillance)



Cut out view of current WR-1 reactor facility

Decades in the Future



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Cut out of reactor facility below 1.5 m

Off Site Storage for Intermediate Level Waste

Under Deferred Dismantling, the WR-1 Reactor Building would remain intact for several decades under storage with surveillance. At some point in the future, either as a result of aging of the building or availability of long-term or permanent storage, dismantling of the building would proceed.

The general approach for Alternative 1 includes:

1. Continue maintaining and monitoring reactor building for the next several decades.
2. At an appropriate time in the future, due to age of building or the availability of long-term or permanent storage, perform complete dismantling of the reactor building, including:

    a. Cut all contaminated components (pipes, tanks etc.) into manageable sizes to fit through doorways or hatchways.

    b. Rig and hoist all components out of the below grade structure.
3. Demolish all above ground building structures.
4. Demolish below ground structure down to 1.5m below grade
5. Backfill the foundation structure with clay or other suitable material containing similar properties to soils in the area.
6. Sort all removed and demolished materials into 'Radioactively Contaminated' vs 'Non-contaminated'.
7. Dispose of all **non-contaminated** demolition waste to municipal landfill or recycle facilities, as per standards in place at that time.
8. Package all **contaminated** materials into certified waste containers.
9. Transport all contaminated wastes (building and reactor components) to a waste storage facility at Chalk River Laboratories to await final disposal.
10. Monitor stored wastes until final disposal.

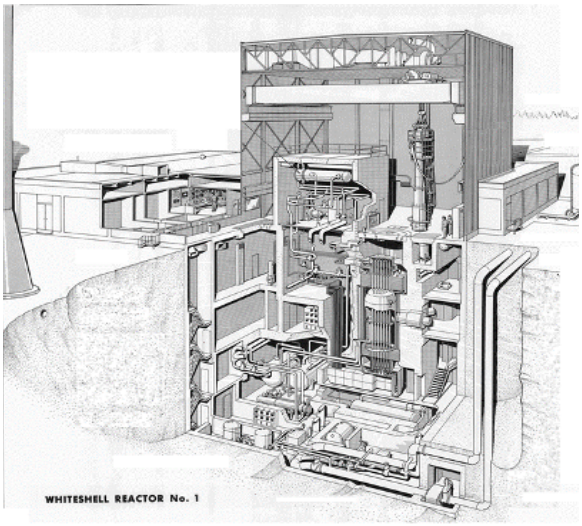
What is left at the site:

1. Clean concrete foundation below 1.5m
2. Clean soil used to backfill

Considerations:

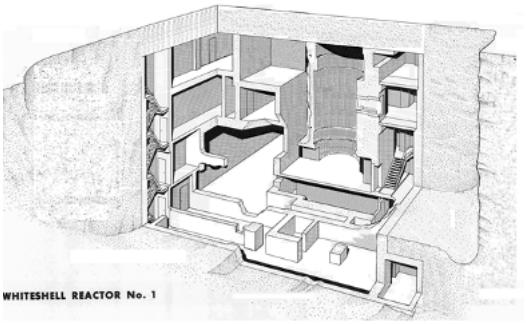
1. Waiting longer (decades) reduces short-lived radioactive materials, but does not reduce longer-lived radioactive material.
2. Reactor was not designed with decommissioning in mind, so dismantling is not a simple process.
3. In the future, no staff will remain with operational knowledge of the facility and infrastructure such as the 50 ton overhead crane may no longer be operational.
4. Biggest risks from nuclear work are industrial hazards (cuts, falls, crush injuries etc.).
5. Canada has not identified a disposal facility for reactor core components.
6. The waste is not destroyed or eliminated, only relocated to another community, so the liability is not retired.

Alternative #2 – Immediate Dismantling



Cut out view of current WR-1 reactor facility

Immediately



Cut out of reactor facility remaining below 1.5 m

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Off Site Storage for Intermediate Level Waste

With Immediate Dismantling, the WR-1 facility undergoes immediate and complete dismantling.

The general approach for Alternative 2 includes:

1. Perform complete dismantling, which would include:

   a. Cut all contaminated components (pipes, tanks etc.) into manageable sizes to fit through doorways or hatchways.

   b. Rig and hoist all components out of the below grade structure.

2. Demolish all above ground building structures.
3. Demolish below ground structure down to 1.5m below grade
4. Backfill the foundation structure with clay or other suitable material containing similar properties to soils in the area.
5. Sort all removed and demolished materials into 'Radioactively Contaminated' vs 'Non-contaminated'.
6. Dispose of all **non-contaminated** demolition waste by municipal landfill or recycle facilities, as per regulations / guidelines.
7. Package all **contaminated** materials into certified waste containers
8. Transport all contaminated wastes (building and reactor components) to a waste storage facility at Chalk River Laboratories to await final disposal.
9. Monitor stored wastes until final disposal.

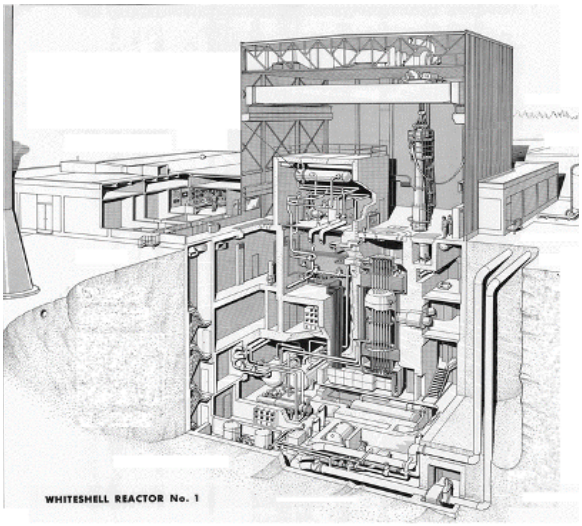
What is left at the site:

1. Clean concrete foundation below 1.5m
2. Clean soil used to backfill

Considerations

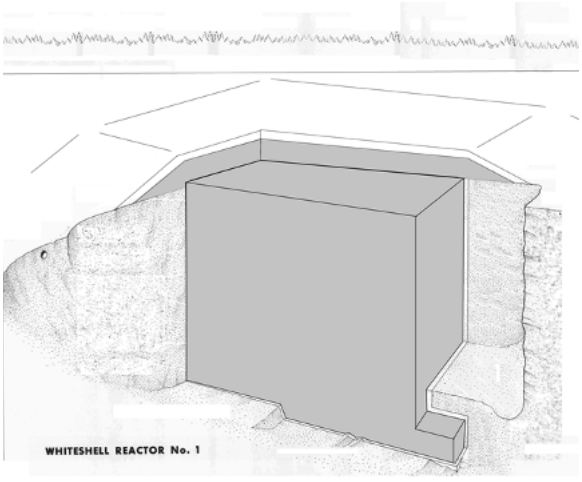
1. Reactor was not designed with decommissioning in mind, so dismantling is not a simple process.
2. Biggest risks from nuclear work are industrial hazards (cuts, falls, crush injuries etc.)
3. There are no plans for a disposal facility for reactor core components.
4. The waste is not destroyed or eliminated, only relocated to another community.

Alternative #3 –In Situ (in place) Disposal



Cut out view of current WR-1 reactor facility

Immediately



In Situ Disposed Reactor

With *In Situ* Disposal (ISD), the building above ground is decommissioned and dismantled, and PCB's and accessible lead below ground are removed. The remainder of the below ground structure is filled with grout and covered with an engineered cap, which includes a concrete pad meant to prevent intrusion, overlaid by a cover of natural and man-made materials designed to shed water away.

The general approach for Alternative 3 includes:

1. Remove hazardous materials, such as PCBs, not suitable for in situ disposal.
2. Cut open reactor system pipes, and tanks to allow grout to fill them.
3. Seal all openings into the underground foundation.
4. Fill the underground reactor rooms with grout.
5. Demolish all above ground building structures.
6. Backfill the foundation structure with clay or other suitable material containing similar properties to soils in the area.
7. Sort all removed and demolished materials into 'Radioactively Contaminated' vs 'Non-contaminated'.
8. Dispose of all **non-contaminated** demolition waste by municipal landfill or recycle facilities, as per regulations in place.
9. Package all **contaminated** materials into certified waste containers.
10. Transport all contaminated wastes (building and reactor components) to a waste storage facility at Chalk River Laboratories to await final disposal.
11. Install a cap and cover over the grouted underground structure.
12. Install fencing, signs, and monitoring equipment.
13. Monitor both the grouted underground structure, and the wastes transported to Chalk River Laboratories awaiting final disposal, until such time as CNSC, or the replacement governing body, determines that institutional and administrative controls are no longer required.

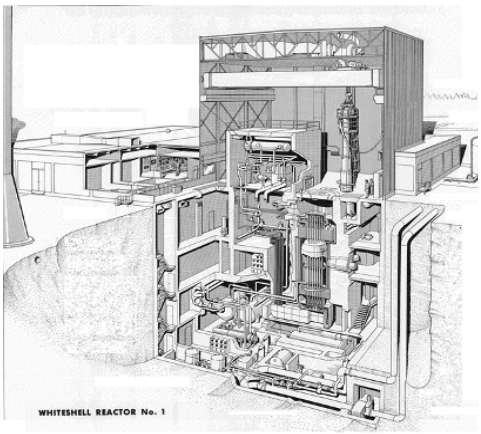
What is left at the site:

1. Building Foundation Concrete
2. Clean soil used to backfill demolished areas
3. Grout placed in the underground structure and reactor systems
4. Radioactive reactor system components (tanks, pipes etc)
5. Concrete Cap and Cover
6. Fencing, Signs and Monitoring Equipment

Considerations:

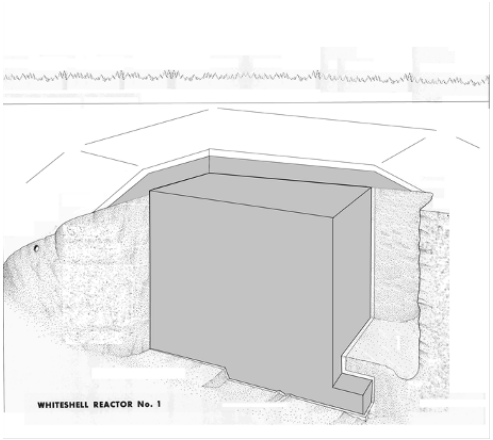
1. Almost all radioactivity in the building is trapped in the metal reactor core components, taking tens of thousands of years to corrode, maintaining containment of the radiation.
2. ISD is a final disposal option where no additional future work is required.
3. Grout and Concrete are long lived strong materials.
4. Groundwater at the site moves very slowly and benefits containment.
5. The same rules, regulations and standards apply to all waste disposal or storage facilities.

Alternative #4 – Partial In Situ (in place) Disposal



Cut out view of current WR-1 reactor facility

Immediately



In Situ Disposed Reactor

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Off Site Storage for Intermediate Level Waste

Partial *In Situ* Disposal involves the removal of the reactor core components (the largest source of radioactivity in the reactor) which include the calandria (or tank housing the core), and fuel channels. The remainder of the below ground structure is filled with grout and covered with a protective engineered cap.

The general approach for Alternative 4 includes:

1. Remove Deck Plate (62 tonnes), Upper Shield (55 tonnes), Radial Shield (55 tonnes), Fuel Channels (~15 tonnes), and Calandria (16 tonnes), from the reactor facility.
2. Remove hazardous materials, such as PCBs, not suitable for in situ disposal.
3. Cut open all reactor system pipes, and tanks to allow grout to fill them.
4. Seal all openings into the underground reactor rooms.
5. Fill the underground reactor rooms, pipes and tanks with grout.
6. Demolish all above ground building structures.
7. Backfill the foundation structure with clay or other suitable material containing similar properties to soils in the area.
8. Sort all removed and demolished materials into 'Radioactively Contaminated' vs 'Non-contaminated'.
9. Dispose of all non-contaminated demolition waste by municipal landfill or recycle facilities, as per standards in place.
10. Package all contaminated materials into certified waste containers.
11. Transport all contaminated wastes (building and reactor components) to a waste storage facility at Chalk River Laboratories to await final disposal.
12. Install a cap and cover over the grouted underground structure.
13. Install fencing, signs, and monitoring equipment.
14. Monitor both the grouted underground structure, and the wastes transported to Chalk River Laboratories awaiting final disposal until such time as CNSC, or the replacement governing body, determines that institutional and administrative controls are no longer required.

What is left at the site:

1. Building Foundation Concrete
2. Clean soil used to backfill demolished areas
3. Grout placed in the underground structure and reactor systems
4. Radioactive reactor system components (tanks, pipes etc).
5. Concrete Cap and Cover
6. Fencing, Signs and Monitoring Equipment

Considerations:

1. Alternative #4 is effectively a combination of Alternative #2 and #3.
2. Involves most hazardous work of both Alternatives 2 and 3.
   a. Grouting preparation (cutting holes)
   b. Reactor core removal (highest radiation exposure risk)
3. Requires three waste disposal/storage locations (ISD, Intermediate Level Waste Storage, and Low Level Waste Disposal/Storage) instead of two (ISD and Low Level Waste Disposal/Storage).