



NUCLEAR WASTE SOCIÉTÉ DE GESTION
MANAGEMENT DES DÉCHETS
ORGANIZATION NUCLÉAIRES

Phase 2 Preliminary Assessments

Summary Findings and Decisions Based on Initial
Studies in Five Siting Areas



DECEMBER 2017

For more information, please contact:

Nuclear Waste Management Organization

22 St. Clair Avenue East, Sixth Floor

Toronto, Ontario M4T 2S3 Canada

Tel 416.934.9814

Toll Free 1.866.249.6966

Email contactus@nwmo.ca

www.nwmo.ca

Contents

- 1. Purpose of Document**
- 2. Background on Canada’s Plan and the Site Selection Process**
 - A Matter of Safety and Responsibility
 - Adaptive Phased Management
 - The Site Selection Process
- 3. Advancing Learning through Initial Studies**
 - Potential for Safety
 - Potential for Partnership
- 4. Findings from Initial Studies**
 - Potential Repository Areas in the vicinity of Elliot Lake and Blind River
 - Potential Repository Areas in the vicinity of Hornepayne, Manitouwadge and White River
- 5. The Way Forward**
 - Decisions
 - Acknowledging Leadership
- 6. Status of Studies in other Areas**
- 7. Moving Forward in Partnership**

1. Purpose of Document

The purpose of this document is to provide an overview of findings from initial studies recently completed in the area around five Ontario communities – Blind River, Elliot Lake, Hornepayne, Manitouwadge, and White River. The document identifies which areas will be the focus of more detailed study and further assessment, and the areas in which studies will now be concluded.

These five communities are among a larger list of communities that entered the site selection process to learn about Canada's plan and to explore the potential for hosting the project in their area. The initial studies included airborne surveys, geological and environmental mapping, and outreach and engagement both within these communities, and with First Nation, Métis and municipal communities in the area.

We are at a pivotal point in the site selection process. The process is advancing from a focus on the communities that initially entered the site selection process and triggered studies in their area, to now include exploring and building the broader partnerships needed to advance the project.

We are also at the point of deciding where to focus detailed studies involving borehole investigations at potential repository sites in order to better understand the sub-surface geology. As we transition to this new phase, it is a good time to take stock and reflect on where to focus our next activities.

Through further study and engagement of people in siting areas over the next five years, the NWMO is working to identify a single preferred safe site for the repository, in an area with a supportive partnership involving the initially interested community, and First Nation, Métis and municipal communities in the area.

2. Background on Canada's Plan and the Site Selection Process

A Matter of Safety and Responsibility

Used nuclear fuel is currently safely stored at nuclear generating stations in licensed, purpose-built, water-filled pools, and in concrete and steel containers referred to as dry storage. Used nuclear fuel needs to be contained and isolated from people and the environment for hundreds of thousands of years. Storage at nuclear plant sites is interim; a long-term management approach needs to be implemented.

Adaptive Phased Management is Canada's plan for the long-term management of used nuclear fuel. It was selected by the Government of Canada after a three-year study of management approaches that involved Canadians and Indigenous peoples across Canada between 2002 and 2005. During that study, Canadians identified Adaptive Phased Management as the long-term approach that best meets their objectives. They underlined that we have a responsibility to future generations to put in place a plan for the management of a waste we created and benefited from. Canadians said clearly we should not leave it to future generations to manage this waste.

Adaptive Phased Management

Canada's plan ultimately involves the emplacement of used nuclear fuel in a deep geological repository. It features a multiple barrier system to contain and isolate used nuclear fuel from people and the environment for the long period of time required.

Canada's plan also involves a management system that ensures decisions are made in phases and citizens are involved throughout. We continue to learn and adapt plans in response to advancements in

technical knowledge, evolving societal expectations and values, insight from Indigenous Knowledge and changes in public policy. The plan requires that the deep geological repository, and the accompanying Centre of Expertise, are only sited in an area where safety can be assured and where there is an informed and willing host.



The key components of Canada's plan

Canada's plan is described in more detail in "Description of a Deep Geological Repository and Centre of Expertise for Canada's Used Nuclear Fuel", available at www.nwmo.ca/brochures. The plan continues to be refined through an active technical demonstration and testing program, and discussion with communities involved in the site selection process.

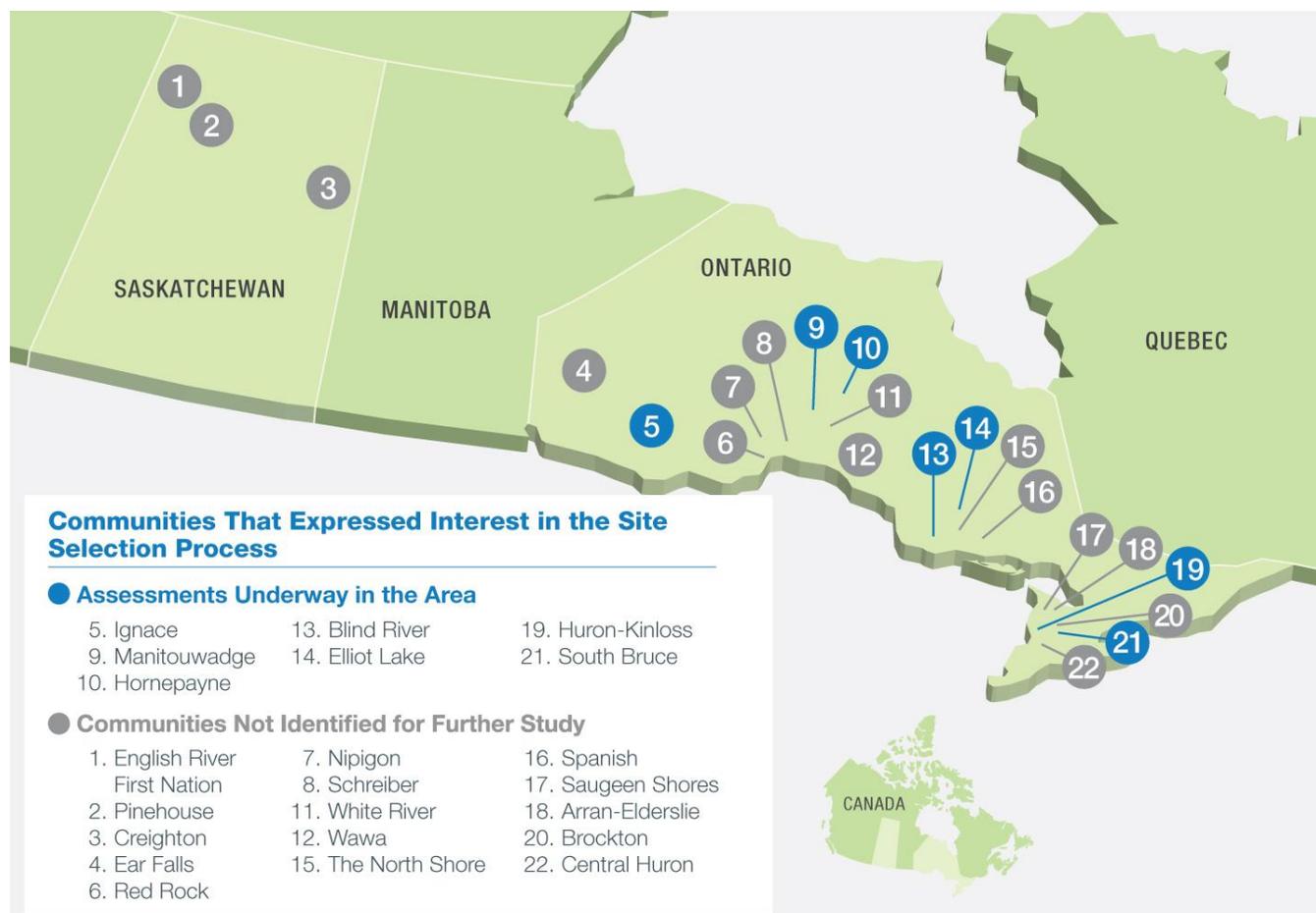
The Site Selection Process

The site selection process was initiated in 2010 with the publication of a roadmap developed collaboratively with a cross-section of Canadians, including Indigenous people, through a two-year dialogue. Siting activities were initiated by communities coming forward to learn about Canada's plan and the site selection process, and to begin studies to explore whether their area has potential to meet the project's detailed requirements.

Over time, technical and social studies are becoming progressively more detailed as they are planned and implemented collaboratively with people in the area. As work advances, engagement activities are broadening to involve First Nation and Métis communities and surrounding communities in studies and reflection on whether the project is a good fit for the area.

Twenty-two communities initially came forward to participate in the siting process. Through progressively more detailed studies, the NWMO's focus narrowed to seven areas that appeared to

have strong potential to meet project requirements. The map below identifies the communities that came forward to initiate the siting process in their area, as well as the subset of those communities whose area has continued to be a focus of study.



3. Advancing Learning through Initial Studies

Preliminary Assessments are a key component of Step 3 of the site selection process and are conducted in two phases. Initial studies, completed as part of Phase 2 Preliminary Assessments, build on earlier studies and are designed to deepen understanding of rock characteristics at potential repository sites, potential for a willing host, and beyond that the potential to develop a supportive partnership to implement the project in the area. This latest stock taking and reflection is timed to correspond with the conclusion of Phase 2 initial studies in five areas and will direct where the next set of more detailed studies will focus.

The next set of studies will involve beginning borehole investigations at locations that could be repository sites. The next set of activities will also begin to advance along a ‘partnership roadmap’ – a sequence of activities that will focus more intensively on exploring the ability to create the needed partnerships for the project and culminate in draft project implementation plans and potential hosting agreements.

These next set of activities will demand more intensive effort by municipal, First Nation and Métis communities in siting areas, as well as for the NWMO. Completion of initial studies is an opportunity to continue to reflect on the ability to find a safe site and proceed in partnership with communities in each siting area so that these more intensive activities focus on areas with strong potential to meet the requirements of the project.

Potential for Safety

The site selection process is designed to ensure, above all, that the site selected for the repository is safe and secure for people and the environment, now and in the future. Any site that is selected to host the facility must be demonstrated to be able to safely contain and isolate used nuclear fuel for a very long period of time. As identified in “Moving Forward Together: Process for Selecting a Site for Canada’s Deep Geological Repository for Used Nuclear Fuel”, any site selected will need to address scientific and technical siting factors that will acknowledge precaution and ensure protection for present and future generations. These include the following key safety considerations:

- Containment and isolation characteristics of the host rock: Are the characteristics of the rock at the site appropriate to ensuring the long-term containment and isolation of used nuclear fuel from humans, the environment and surface disturbances caused by human activities and natural events?
- Long-term stability of the site: Is the rock formation at the site geologically stable and likely to remain stable over the very long term in a manner that will ensure the repository will not be substantially affected by geological and climate change processes such as earthquakes and glacial cycles?
- Repository construction, operation and closure: Are conditions at the site suitable for the safe construction, operation and closure of the repository?
- Human intrusion: Is human intrusion at the site unlikely, for instance through future exploration or mining?
- Site characterization: Can the geological conditions at the site be practically studied and described on dimensions that are important for demonstrating long-term safety?

Initial field studies have advanced our understanding of each of the five areas, and whether it is possible to identify potential repository areas to be the focus of further studies. These initial studies have provided new data and have included the following key activities:

- Acquisition and processing of high-resolution airborne geophysical data (magnetic and gravity) data;
- Detailed interpretation of the high-resolution gravity and magnetic data to better understand the bedrock geology such as geological contacts, depth and extent of rock units, lithological and structural heterogeneity;
- Detailed interpretation of surficial and magnetic lineaments using high-resolution remote sensing and magnetic surveys to identify possible structural features such as fractures and shear zones; and
- Geological mapping to assess geologic characteristics such as lithology, structures, bedrock exposure and surface constraints.

The acquisition and interpretation of this new data has improved understanding of the geology of the areas studied, and allowed for a more detailed assessment of the geoscientific uncertainties and complexities identified in earlier desktop preliminary assessments (www.nwmo.ca/reports).

The findings of these latest geoscience studies are documented in four reports produced for each area: Findings from Initial Field Studies; Acquisition, Processing and Interpretation of High-resolution Airborne Geophysical Data; Lineament Interpretation; and Geological Mapping. All are available on the NWMO website.

Initial studies also included preliminary desktop and field studies to better understand the environmental features and conditions in the area. Preliminary environmental studies were focused on verifying desktop assessments through non-intrusive on-site observations and field mapping. They included:

- Updating the natural features maps incorporating the latest Ministry of Natural Resources and Forestry (MNR) information;
- Identification of sensitive species habitat use and/or suitability in the areas;
- Updating the mapping of terrestrial and aquatic habitat areas; and
- Preparing preliminary ecological land classification (ELC) maps.

Findings of these environment studies are documented in a report for each area: Phase 2: Preliminary Environmental Assessment. These reports are available on the NWMO website.

Potential for Partnership

The site selection process is designed to ensure that any preferred site has an informed and willing host. Beyond this, the NWMO is seeking a supportive partnership involving the community that initiated the siting process in the area, First Nation and Métis communities and surrounding communities in the area.

Engagement activities are designed to help explore potential to implement the project in partnership with communities in the area. Engagement helps advance learning and dialogue among individuals and communities, and explores willingness. Engagement also advances discussions to explore potential to foster the well-being of the community, as defined by people in the area, through the implementation of the project. This is considered an important foundation piece for willingness and partnership.

Building on earlier studies, assessment at this stage has focussed on potential for:

- Support for the project in an area, including level of awareness, interest and ability to sustain learning about the project in the area;
- Confidence in the safety of the project within the area, including level of understanding of the safety case and confidence and acceptance of the safety case for the APM project as presented;
- Support for field investigations to identify a potentially acceptable repository site, including extent to which communities express support for planned and ongoing field studies;
- Identifying a socially acceptable repository site, including consideration of the extent to which communities express support for one or more potential repository sites in the area and participate in discussions about repository sites; and
- Alignment of project well-being opportunities with community vision and strategies, including the extent to which well-being opportunities that can be fostered by the project are recognized, understood and are responsive to the priorities and objectives of communities.

As studies advance in individual areas, assessment is also beginning to factor in the time it may take to advance towards partnership in each area. More specifically, not only is the potential to develop a binding and sustainable partnership formed around the implementation of the project in an area a

critical consideration, but also whether the partnership can be realized within the general planning timelines the NWMO is using to advance the project.

Recent engagement and assessment activities have involved:

- Facilitating learning activities to share the basis of confidence in safety of the project, and to understand interest and ability to sustain learning as would be required for the community to make an informed decision;
- Seeking involvement of people in the area to review potential technically suitable sites and identify which might be socially acceptable for borehole drilling and ultimately siting the project; and
- Exploring potential to foster area well-being through implementation of the project involving understanding the priorities, objectives and vision of people in the area and their alignment with what the project can provide.

Engagement and assessment activities have built on earlier work. Our continued learning is documented for each area in more detailed reports, available on the NWMO website.

4. Findings from Initial Studies

Initial studies suggest that **in all areas there is potential to meet the robust safety requirements of the project and to build the kind of partnership required to advance the project in an area. There are, however, varying degrees of technical and social uncertainties and complexities.** The decision to narrow down the number of areas in the process reflects assessment of these technical and social uncertainties and complexities and their impact on potential to meet the robust criteria for the project.

Potential Repository Areas in the vicinity of Elliot Lake and Blind River

Within the communities of **Elliot Lake** and **Blind River**, there appears to be potential to support the project and for the project to align with long-term opportunities, vision and strategies. There has been active learning led by strong Community Liaison Committees, with participation of local social service and economic development groups to advance dialogue, discussion and learning. The neighbouring communities of Spanish and The North Shore continue to be supportive of study activities. With respect to the lands under study, Elliot Lake and Blind River residents, and many individuals and businesses are open to exploring siting the repository in the study area, although further outreach and engagement is needed including to other communities in the area. The potential repository areas currently under study are remote from Elliot Lake and Blind River.

One First Nation in the area, Sagamok First Nation, is actively involved in learning and discussion about the project as well as planning and advancing technical studies on land within their traditional territory. With their involvement in learning and studies, there appears to be potential to involve them in a supportive partnership for the project on land within their traditional territory. The Métis in the area are also actively involved in learning.

Other First Nations in the area are not involved in active learning about the project. There currently appears to be low potential to involve them in a supportive partnership for the project in the broad area.

Technical studies have been limited to potential repository areas within Sagamok traditional territory. These studies did not identify specific environmental or geological features that would preclude these areas from further consideration. However, as described in the geological reports (see

www.nwmo.ca/en/reports), the interpretation of the new data emerging from initial studies confirmed some geological complexities that could increase the difficulty of locating a suitable repository site in the area. More specifically, the general potential repository areas identified over the course of study were relatively small in size, and bounded by zones of tightly spaced dykes. In addition, the area is crossed by several swarms of dykes, which depending on their subsurface properties, could have an impact on the long-term performance of a deep geological repository. Avoiding subsurface features would generally require a larger repository footprint at depth, however there is a somewhat limited opportunity for expanding the repository footprint due to the bounding zones of tightly spaced dykes.

The area also has limited access, rugged terrain and there are significant variations in topography, with a large portion of the available land located within the area of the greatest elevation differential. This compounds the complexity of locating a potential repository area when combining surface and underground facility constraints.

Potential Repository Areas in the vicinity of Hornepayne, Manitouwadge and White River

Within the communities of **Hornepayne and Manitouwadge**, there appears to be potential to support the project and for the project to align with their long term vision and aspirations. There has been active learning in the area led by strong Community Liaison Committees and the participation of social service and economic development groups to advance dialogue, discussion and learning throughout the community.

Several potential repository areas have been identified and explored in the vicinity of each of these two communities. Engagement has included municipal residents, and many of the individuals and businesses with an interest in the land in the broader area have commented on the potential for technically suitable repository areas to also be socially acceptable as a repository site. Initial studies suggest there is potential to identify technically suitable and socially acceptable repository areas.

Several First Nations and Métis in the area are actively involved in learning and discussion about the project and have been involved in technical studies on land within their traditional territory. With their involvement in learning and studies, there appears to be potential to involve them in a supportive partnership for the project in the area. There are also several First Nations in the area that are not involved in active learning about the project.

Technical studies, as described in the more detailed geological reports, identified a number of fairly large potential repository areas. These potential repository areas capture areas of lower density of interpreted features, with favourable lithological and structural characteristics. The identified general potential repository areas appear to have favourable geoscientific characteristics for hosting a deep geological repository, however there remain a number of uncertainties that would need to be addressed during subsequent stages of the site evaluation process through borehole drilling.

Earlier this year the NWMO announced it will no longer focus studies in the **White River** area, citing challenges in sustaining an active and inclusive learning program about the project within the community. This is considered an important input to ultimate support for the project and building the partnership needed to implement it. The NWMO understands the community supports the advancement of studies in the larger area and is prepared to play an important role in advancing studies in the area as a neighbouring community.

5. The Way Forward

Decisions

At this time, **NWMO is announcing its intention to focus the next set of more detailed studies on potential repository areas in the vicinity of Hornepayne and Manitouwadge** in order to continue to explore their potential to meet the requirements of the project, both in terms of technical safety and potential to advance the project in partnership.

Over the course of the next set of activities, the NWMO will engage individuals and communities, and formally consult First Nation and Métis communities in the area, on borehole drilling plans that identify specific borehole sites. These activities will help deepen the NWMO's understanding of the ability to proceed in partnership in this area.

The NWMO will also explore potential for partnership by beginning to advance along a 'partnership roadmap'- a sequence of activities which will explore the ability to create the needed partnership for the project and culminating in a draft project implementation plan for the area and potential hosting agreement.

At this time, the NWMO is concluding studies in the vicinity of Blind River and Elliot Lake.

Acknowledging Leadership

With this announcement, studies will no longer continue in potential repository areas in the vicinity of Blind River and Elliot Lake. We would like to acknowledge the leadership of communities in this area and their contribution on behalf of all Canadians to advancing Canada's plan.

An investment will be made in the well-being of Municipal and Indigenous communities that have led siting activities in this area.

6. Status of Studies in other Areas

Studies are currently ongoing in two other siting areas at this time.

Potential repository areas in the vicinity of Ignace: Findings from initial studies were published in February 2015 and showed strong potential to meet the technical requirements of the project. Potential technically suitable repository areas were the subject of engagement with people in the area, including Ignace and Wabigoon Lake Ojibway Nation community members, and a socially preferred area was identified for the next phase of work involving borehole studies. At this time, there appears to be strong potential to meet the technical requirements of the project and build a supportive partnership to advance the project in this area. Borehole studies were collaboratively planned and initiated in October and drilling of the first borehole has begun.

Potential repository areas in the vicinity of Huron-Kinloss, South Bruce and Central Huron: There has been a great deal of available sub-surface investigation to advance other projects in the vicinity of these communities, and the data gives confidence there is strong potential to meet the technical requirements of the project. Unlike the crystalline rock of the Canadian Shield, the sedimentary rock of the Michigan Basin in this area is understood to be homogeneous over a large area. The potential to develop a supportive partnership in the area continues to be explored through embarking on partnership roadmap activities.

Earlier this year, the NWMO announced it will no longer focus studies in Central Huron, citing challenges in sustaining an active and inclusive learning program about the project in the community.

This is considered an important input to ultimate support for the project and building the partnership needed to implement it. The NWMO understands that the community supports the advancement of studies in the larger area, and is prepared to play an important role in advancing studies in the area as a neighbouring community.

7. Moving Forward in Partnership

The NWMO will continue the process of narrowing down potential sites to host the project until it arrives at one preferred safe and socially acceptable site to become the focus of more detailed site characterization. The preferred site must have a suitable rock formation in an area with an informed and willing host. The project will only move forward in an area with the involvement of the interested community, along with First Nation, Métis and surrounding communities, working together to implement it.

Additional studies and engagement are needed to better understand the potential for a repository area to meet the requirements of the project. Technical uncertainties will be further explored and addressed through borehole drilling during subsequent stages of the site evaluation process. Additional focussed engagement will bring greater understanding of the social acceptability of potential repository sites, as well as the potential to proceed to implement the project in partnership with communities in the area.

The NWMO continues to progressively identify a smaller number of communities and areas with strong potential to meet the requirements of the project to be the focus of detailed studies and broadened dialogue. Several more years of detailed studies will be required before confidence can be established that the project requirements can be met in an area and potential repository site. We look forward to continuing to work collaboratively with communities to implement Canada's plan for the long-term management of Canada's used nuclear fuel.