JULY 2016

NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

PRELIMINARY ASSESSMENT OF POTENTIAL SUITABILITY

Initial Borehole Drilling and Testing in Central Huron, Huron-Kinloss and South Bruce

DRAFT FOR DISCUSSION WITH COMMUNITIES

In 2012, at the request of the communities of Central Huron, Huron-Kinloss and South Bruce, the Nuclear Waste Management Organization (NWMO) began conducting a series of increasingly detailed technical and social studies to assess suitability for safely hosting a deep geological repository for the long-term management of Canada's used nuclear fuel.

Before selecting a potential repository site, the NWMO needs to be confident that a deep geological repository can be developed with a strong safety case. A safety case brings together all the information that contribute towards understanding whether or not a repository at the site could safely contain and isolate used nuclear fuel. This information includes Indigenous Knowledge, geoscientific assessments, environmental surveys and monitoring, engineering design studies, and safety assessment analyses.

The focus of early geoscientific studies is to determine if the rock in the area has the potential to satisfy the NWMO's safety requirements for a deep geological repository for the long-term management of Canada's used nuclear fuel.

Geoscientific studies conducted to date have involved desktop studies, which make use of publicly available information about the geology of the area. A next step in the process involves drilling one initial borehole within each municipality to further understand the general

geology across the communities. These initial boreholes may be drilled on municipal land.

Additional borehole drilling and testing in other locations may be warranted in this phase of work.

Beyond ensuring safety, the NWMO has committed to communities that the project will be implemented in a way that fosters long-term well-being as defined by the community.

Key Steps

To date, the NWMO has completed desktop studies to explore potential suitability of the area to meet the robust technical safety requirements to host the project. The NWMO has shared these findings with people in the area and published reports on its website.

- Desktop studies, using available information, identified broad areas within the communities of Central Huron (2015), Huron-Kinloss and South Bruce (2014) that have potential to host a deep geological repository.
- Initial studies are designed to better understand regional geology. They include geological mapping, 2-D seismic reflection studies, and drilling initial boreholes.
- The Central Huron, Huron-Kinloss and South Bruce Councils have each expressed an interest in beginning initial studies and considering an initial borehole in each community.
- Each community has identified municipal lands in the communities as potential locations for these initial boreholes for NWMO review.
- Each community has asked the NWMO to engage community members in planning these studies and selecting a site for the initial boreholes.

Selecting a Site for the Long-Term Management of Canada's Used Nuclear Fuel

Canada has a comprehensive plan for the safe, long-term management of the used nuclear fuel produced by its nuclear power plants. The plan includes a process to identify an informed and willing host for a deep geological repository that will contain and isolate the material.

Next steps involve the NWMO and people in the area working together to plan the next set of activities, beginning with identifying locations, scope and timing of initial borehole drilling on municipal lands. Together, we will:

1. Review findings from desktop studies and discuss available options for the location of initial boreholes on municipal lands;
2. Plan locations and timing of initial borehole drilling. The locations for these boreholes will be selected to help advance understanding of the general geology in the area, be accessible to community members to observe the drilling activity, and provide an opportunity for learning about the project. The NWMO will seek permits as required. These boreholes are not expected to be a repository site location;
3. Initiate borehole drilling and testing; and
4. Review study findings and decide on next steps.

Should the community proceed beyond these initial studies, the next phase of work would involve additional borehole drilling and testing focused at a preferred potential repository site. Before we can do this, we will need to work together to develop a process for considering and securing land for future borehole drilling and testing, since private land may be involved. Ultimately, the location of the preferred site will need to meet robust safety requirements, will need to be respectful of the sensitivities of community members and the wishes of private land owners, must foster the well-being of the area as defined by people who live there, and will need to be supported by strong partnerships. The project will only proceed with the involvement of the interested community, First Nation and Métis communities in the area, and surrounding communities.

What is borehole drilling?

A borehole is a narrow, deep, circular hole made in the ground using motorized equipment (drilling equipment). The process involves drilling the borehole and retrieving cylinder-shaped rock samples, called core. A wide range of testing is performed on samples of the core and in the borehole to investigate properties of the rock.

Examples of core

What is the purpose of this initial borehole drilling and testing?

Initial borehole drilling will provide more information about whether the geology in the area could be a safe place for a repository. Borehole drilling and testing will help further assess and understand key geological features and uncertainties identified in previous studies. It will provide information of true orientation, thickness and other characteristics of the rock layers, such as whether or not they contain hydrocarbon resources.

Where will initial boreholes be drilled?

Initial boreholes may be drilled on municipal land – one in

the Municipality of Central Huron, one in the Township of Huron-Kinloss, and one in the Municipality of South Bruce. Possible locations for initial borehole drilling will need to be decided together with people in the area. In addition to meeting technical objectives, borehole drilling locations will be selected to respect the land use, and cultural and spiritual values of people in the area. These boreholes are not expected to be a repository site location.

To get the discussion started, the municipalities have identified some municipally held land that might be considered for initial boreholes. The NWMO is currently assessing these locations. The NWMO will review potential locations together with people in the area to determine where it should focus initial borehole drilling and testing activities.

How many boreholes will the NWMO drill initially?

The NWMO anticipates drilling three initial boreholes – one in the Municipality of Central Huron, one in the Township of Huron-Kinloss, and one in the Municipality of South Bruce.

Eventually, more extensive borehole drilling and testing may be undertaken at a location identified together with those in the area as a preferred repository site.

How will the NWMO interweave Indigenous Knowledge into initial borehole drilling and testing?

As part of its promise to work collaboratively with First Nation and Métis communities, the NWMO is committed to interweaving local Indigenous Knowledge in all phases of its work.

The NWMO will work together with Aboriginal peoples in the area to respectfully apply Indigenous Knowledge of the natural environment and traditional lands, and cultural and spiritual values they may wish to share to guide borehole drilling and testing.

The NWMO will ensure Aboriginal intellectual property is protected as agreed to with Aboriginal peoples who choose to share that knowledge.

Aboriginal peoples have a special relationship with the natural environment, and unique stewardship responsibilities that are part of this relationship. The knowledge that comes from this relationship with the land brings special understanding to the broad range of factors that should be considered in field studies, social assessments, and assessing benefits and effects to be managed.

What permits are required?

Borehole drilling in southern Ontario is strictly regulated by the Ontario Ministry of Natural Resources and Forestry (MNRF), under the *Oil, Gas and Salt Resources Act* of Ontario.

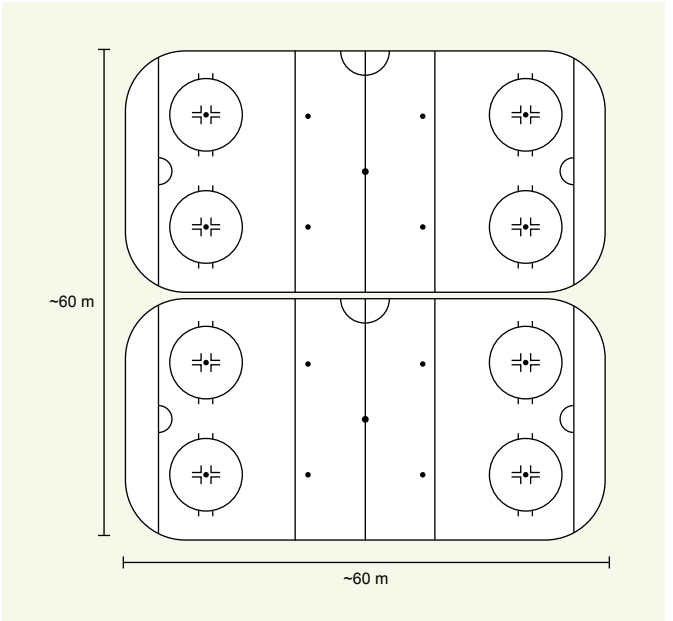
Each initial borehole will require a well licence before drilling can proceed. The NWMO will prepare these licence applications in collaboration with the municipalities.

When will the initial boreholes be drilled?

Scheduling for the first stage of borehole drilling and testing will depend on the time needed to identify preferred locations, engage community members in the development of work plans, and obtain the necessary well licences from the MNRF.

How much land is needed to drill a borehole?

The footprint required for a drill site is about 60 metres by 60 metres, or about the size of two NHL-sized hockey rinks side by side. The area will be fenced.



Footprint required to drill a borehole

Rotary drilling

What equipment is used?

Boreholes are drilled using a conventional truck-mounted or track-mounted rotary drill rig. The drill site will likely need to be prepared and graded using granular materials, such as sand and gravel.

Trailers will be set up at the site for use as field offices, for on-site equipment storage, and for a small field lab for on-site testing and preserving rock core and water samples. Electricity for these facilities will be supplied by power generators.

Rock core will be stored in a core storage facility at a nearby location within Central Huron, Huron-Kinloss and/or South Bruce. Depending on the location of the borehole, rock core may be stored on a temporary basis at the drill site, and later, moved to the core storage facility.

Will drilling and testing cause any impact to the environment?

Drilling activities will be managed to minimize impact on the environment. During all stages of fieldwork, the natural environment will be protected.

A source of water and a drill water management system will be required. The NWMO may bring water to the site or source it from a nearby surface water body.

Water will be recycled on-site during drilling to minimize use and release to the environment. Drilling water and cuttings will be managed safely in accordance with provincial regulations. This may involve on-site management or transportation off-site.

During preparation of access routes and use of water, drilling fluids and solids will be managed in accordance with provincial regulations. The NWMO will work with communities to confirm plans, including how it will minimize the impact of these drilling activities on the local environment.

How deep will the boreholes be?

Initial boreholes will be drilled through the entire sedimentary sequence in the area. Boreholes will be drilled and cored to a depth of about one kilometre, depending on the location that is selected.

What kind of testing is conducted?

Findings from testing will be used to develop a better understanding of the general geology in the area.

Testing includes:

- Logging of the rock core, which involves a geologist inspecting the core to find out the main rock types present, as well as the location and direction of any natural breaks in the core (fractures or faults), and recording this information;
- Geomechanical measurements, which involve testing rock core samples taken from the borehole to provide information about rock strength;
- Geophysical measurements made along the length of the borehole to provide information on minerals, fractures and zones of groundwater flow present within the rock;
- Hydraulic conductivity measurements made at selected locations along the length of the borehole will provide information on groundwater flow conditions; and
- Chemical and isotopic analyses of groundwater samples collected from within the borehole, to determine the nature of the groundwater (e.g., whether it is fresh or saline) and to begin to understand how the groundwater has changed over time.

Example of geomechanical testing

As field studies progress, the NWMO will work with community members to share information and build awareness and understanding.

How long will it take to complete the borehole drilling and testing?

For a borehole approximately one kilometre deep, the entire process can last about 90 days depending on the number of shifts worked each day.

Once initial borehole drilling and testing is complete, geoscience, environmental, engineering, and repository safety specialists will need several months to review the data and share the findings with an expert group for peer review. Once that is complete, the NWMO will share findings with the community. The findings, along with those from earlier studies, will guide the NWMO in working with community members in planning any future study activities.

What happens to the borehole once drilling and testing is complete?

Upon completion of the planned tests, drilled boreholes will be sealed on a temporary basis using hard rubber plugs. The NWMO will review findings with people in the area and reflect on whether or not to continue with further studies.

If the decision is taken not to conduct further studies at a borehole location, the temporary seals will be removed, and the borehole will be permanently sealed along its entire length in accordance with MNRF requirements.

If the decision is taken to proceed with further studies in the area, then the temporary plugs could be removed, and the boreholes instrumented. Instrumentation would be installed in the open borehole to measure and record bedrock properties, such as the water pressures over time frames of months to years. These types of measurements provide additional information about the characteristics of the groundwater systems.

Will the repository be sited where this initial borehole is drilled?

The sites for the initial boreholes are not expected to be repository sites. The initial borehole locations will be selected to help advance understanding of general geology of the area, be accessible to community members to observe the activity, and provide an opportunity for learning about the project.

When will a site be selected for a repository?

Confirming a safe site will take several years of progressively more detailed technical, scientific, social, cultural, and economic studies, as well as engagement with the interested community, First Nation and Métis communities in the area, and surrounding communities. The NWMO is conducting studies to explore suitability to host the project in a number of areas in Ontario, including both crystalline rock sites, such as those found in northern Ontario, and sedimentary rock sites, such as those found in southern Ontario.

If the findings from drilling and testing of initial boreholes provide additional confidence in the geology across Central Huron, Huron-Kinloss and South Bruce, the next phase of work would involve additional borehole drilling and testing focused at a preferred potential repository site. Before the NWMO could proceed, we would need to work together to develop a process for considering and securing land for that future borehole drilling and testing since private land may be involved.

Should the community proceed to the next step in the site selection process, detailed site characterization studies would be conducted over several more years at this preferred site. These more detailed studies would allow the NWMO to collect additional information and complete analyses required to assemble a safety case for a deep geological repository at that location.

Ultimately, the location of the preferred site will need to meet robust safety requirements, will need to be respectful of the sensitivities of community members and the wishes of private land owners, must foster the well-being of the area as defined by people who live there, and will need to be supported by strong partnerships. The project will only proceed with the involvement of the interested community, First Nation and Métis communities in the area, and surrounding communities.

Be Involved

Be involved in this initial borehole drilling phase of work as we select drilling sites, plan, and complete these studies together.

Drop by your local NWMO community office and participate in upcoming community events such as meetings and open houses.

For more information, please contact:

APM Learn More Centre (Central Huron)
38 Albert Street
Clinton, ON N0M 1L0

APM Learn More Centre (Huron-Kinloss)
46 Queen Street
Ripley, ON N0G 2R0
huronkinloss.com/nuclear-waste-committee.cfm

APM Learn More Centre (South Bruce)
10 Clinton Street
Teeswater, ON N0G 2S0
clcinfo.ca/southbruce

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
Website: www.nwmo.ca