



NUCLEAR WASTE MANAGEMENT ORGANIZATION SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

May 14, 2012

Municipality of Brockton
100 Scott Street
P.O. Box 68
Walkerton, Ontario N0G 2V0

Attn: Mr. Richard Radford, CAO

Re: Adaptive Phased Management Initial Screening – The Municipality of Brockton

Dear Mr. Radford,

Further to the Municipality of Brockton's request to Learn More about the Adaptive Phased Management program and request for an initial screening, I am pleased to attach a report outlining the findings from the initial screening, as described in the Process for Selecting a Site for Canada's Deep Geological Repository for Used Nuclear Fuel (May, 2010). As you know, the purpose of the initial screening in Step 2 of the process is to determine whether, based on readily-available information and five screening criteria, there are any obvious conditions that would exclude the Municipality of Brockton from further consideration in the site selection process.

As the report indicates, the review of readily available information and the application of the five initial screening criteria did not identify any obvious conditions that would exclude the Municipality of Brockton from further consideration in the NWMO site selection process. The initial screening suggests that the Municipality comprises geological formations that are potentially suitable for hosting a deep geological repository for Canada's used nuclear fuel. It is important to note that this initial screening has not confirmed the suitability of your community. Should your community choose to continue to explore its potential interest in the project, your area would be the subject of progressively more detailed assessments against both technical and social factors. Several years of studies would be required to confirm whether a site within your area could be demonstrated to safely contain and isolate used nuclear fuel.

The process for identifying an informed and willing host community for a deep geological repository for the long-term management of Canada's used nuclear fuel is designed to ensure, above all, that the site which is selected is safe and secure for people and the environment, now and in the future. The NWMO expects that the selection of a preferred site would take between seven to ten years. It is important that any community which decides to host this project base its decisions on an understanding of the best scientific and social research available and its own aspirations. Should the Municipality of Brockton continue to be interested in exploring the project, over this period there would be ongoing engagement of your community, surrounding communities and others who may be affected. By the end of this process, Brockton as a whole community would need to clearly demonstrate that it is willing to host the repository in order for this project to proceed.

Tel 416.934.9814
Fax 416.934.9526
Toll Free 1.866.249.6966

22 St. Clair Avenue East 6th Floor
Toronto Ontario Canada M4T 2S3
www.nwmo.ca

The next evaluation step would be to conduct a feasibility study as described in Step 3 of the site selection process. This feasibility study would focus on areas selected in collaboration with the community. As your community considers whether it is interested in advancing to the feasibility study phase, the NWMO encourages you to continue community discussion and further learning about the project. Support programs are available to assist your community to reflect on its long-term vision and whether this project is consistent with achieving that vision. Programs and resources are also available to engage your community residents in learning more about this project and becoming involved. We would be very pleased to provide further information about these programs.

Once again, I thank you for taking the time to learn about Canada's plan for the safe, secure management of Canada's used nuclear fuel.

Sincerely,

M. Ben Belfadhel for -

Kathryn Shaver,
Vice President, APM Public Engagement and Site Selection

c. Mayor David Inglis

**SUMMARY REPORT
INITIAL SCREENING FOR SITING A DEEP GEOLOGICAL
REPOSITORY FOR CANADA'S USED NUCLEAR FUEL**

Municipality of Brockton, Ontario

Report

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INITIAL SCREENING FOR SITING A DEEP GEOLOGICAL
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Municipality of Brockton, Ontario

Prepared by:

AECOM

300 – 300 Town Centre Boulevard

Markham, ON, Canada L3R 5Z6

www.aecom.com

905 477 8400 tel

905 477 1456 fax


Project Number:

60247068-1

Date:

May, 2012

AECOM Signatures



Report Prepared By:

Robin Frizzell, M.Sc., P.Geol
Senior Hydrogeologist



Report Reviewed By:

Robert E.J. Leech, P.Geol
Practice Lead, Environment

Executive Summary

On January 9, 2012, the Municipality of Brockton expressed interest in learning more about the Nuclear Waste Management Organization (NWMO) site selection process to find an informed and willing community to host a deep geological repository for Canada's used nuclear fuel (NWMO, 2010). This report summarizes the findings of an initial screening, conducted by AECOM, to evaluate the potential suitability of the Municipality of Brockton against five screening criteria using readily available information (AECOM, 2012). The purpose of the initial screening is to identify whether there are any obvious conditions that would exclude the Municipality of Brockton from further consideration in the site selection process. The initial screening focused only on the area within the boundaries of the Municipality of Brockton. Areas within neighbouring municipalities were not included in the initial screening.

The review of readily available information and the application of the five initial screening criteria did not identify any obvious conditions that would exclude the Municipality of Brockton from being further considered in the NWMO site selection process. The initial screening indicates that there are geological formations within the boundaries of the Municipality that are potentially suitable for safely hosting a deep geological repository. Potentially suitable host formations include the Upper Ordovician shale and limestone units that comprise the geology of the Municipality at typical repository depths.

It is important to note that the intent of this initial screening is not to confirm the suitability of the Municipality of Brockton to host a deep geological repository, but rather to provide early feedback on whether there are known reasons to exclude it from further consideration. Should the community of Brockton remain interested in continuing with the site selection process, more detailed studies would be required to confirm and demonstrate whether the Municipality of Brockton contains sites that can safely contain and isolate used nuclear fuel. The process for identifying an informed and willing host community for a deep geological repository for Canada's used nuclear fuel is designed to ensure, above all, that the site which is selected is safe and secure for people and the environment, now and in the future.

The five initial screening criteria are defined in the site selection process document (NWMO, 2010) and relate to: having sufficient space to accommodate surface and underground facilities, being outside protected areas and heritage features, absence of known groundwater resources at repository depth, absence of known natural resources and avoiding known hydrogeologic and geologic conditions that would make an area or site unsuitable for hosting a deep geological repository.

1. Introduction

In May 2010, the NWMO published and initiated a nine-step site selection process to find an informed and willing community to host a deep geological repository for Canada's used nuclear fuel (NWMO, 2010). The site selection process is designed to address a broad range of technical and social, economic and cultural factors as identified through dialogue with Canadians and Aboriginal peoples, and draws from experiences and lessons learned from past work and processes developed in Canada to site facilities for the management of other hazardous material. It also draws from similar projects in other countries pursuing the development of deep geological repositories for used nuclear fuel. The suitability of potential candidate sites will ultimately be assessed against a number of site evaluation factors, both technical and social in nature.

The site evaluation process includes three main phases over a period of several years, with each step designed to evaluate the site in progressively greater detail upon request of the community. These are: Initial Screenings (Step 2) to evaluate the potential suitability of the community against a list of initial screening criteria; Feasibility Studies (Step 3) to determine if candidate sites within the proposed areas may be potentially suitable for developing a safe used nuclear fuel repository; and Detailed Site Evaluations (Step 4), at one or more selected sites, to confirm suitability based on detailed site evaluation criteria. It is up to the communities to decide whether they wish to continue to participate in each step of the process.

2. Objective of the Initial Screening

The overall objective of the initial screening is to evaluate proposed geographic areas against a list of screening criteria using readily available information. Initial screening criteria (NWMO, 2010) require that:

1. The site must have enough available land of sufficient size to accommodate the surface and underground facilities.
2. This available land must be outside of protected areas, heritage sites, provincial parks and national parks.
3. This available land must not contain known groundwater resources at the repository depth, so that the repository site is unlikely to be disturbed by future generations.
4. This available land must not contain economically exploitable natural resources as known today, so that the repository site is unlikely to be disturbed by future generations.
5. This available land must not be located in areas with known geological and hydrogeological characteristics that would prevent the site from being safe, considering the safety factors outlined in Section 6 of the Site Selection Document (NWMO, 2010).

For cases where readily available information is limited and where assessment of some of the criteria is not possible at the initial screening stage, the area would be advanced to the feasibility study stage for more detailed evaluation, if the community remains interested in participating in the siting process.

3. Initial Screening Assessment

This section provides a summary evaluation of each of the five initial screening criteria for the Municipality of Brockton, based on readily available information (AECOM, 2012). The intent of this evaluation is not to conduct a detailed analysis of all available information or identify specific potentially suitable sites, but rather to identify any obvious conditions that would exclude the Municipality of Brockton from being further considered in the site selection process.

The Municipality of Brockton is approximately 565 km² in size and is located within Bruce County in southern Ontario, between Owen Sound and Goderich.

Screening Criterion 1: The site must have enough available land of sufficient size to accommodate the surface and underground facilities.

The review of readily available information shows that the Municipality of Brockton contains sufficient land to accommodate the repository surface facilities. Surface facilities will require a land parcel of about 1 km by 1 km (100 ha) in size, although some additional space may be required to satisfy regulatory requirements. The underground footprint of the repository is about 1.5 km by 2.5 km (375 ha) at a typical depth of about 500 m.

Review of available mapping and satellite imagery shows that the Municipality of Brockton contains limited constraints that would prevent the development of the repository's surface facilities. These would mainly include the small portion of the Municipality that is covered by residential and industrial infrastructure, largely in the southeast portion of the Municipality in proximity to the community of Walkerton. The remainder of the Municipality of Brockton is largely agricultural land with development limited primarily to roadways and settlement areas. The review of available geological information suggests that the Municipality of Brockton contains geological formations with sufficient volumes of rock at depth to accommodate the repository underground facilities (see Screening Criterion 5).

Screening Criterion 2: Available land must be outside of protected areas, heritage sites, provincial parks and national parks.

The review of readily available information shows that the Municipality of Brockton contains sufficient land outside of protected areas, heritage sites, provincial parks and national parks to accommodate the repository's facilities. There are no provincial or national parks or conservation areas within the Municipality of Brockton. Three Provincially Significant Wetlands have been identified within the Municipality of Brockton. These include the Greenock Swamp, the Edengrove Wetland Complex and the Chepstow Swamp, which account for approximately 13 % of the total area of the Municipality. Most of the land in the Municipality of Brockton is free of known heritage constraints. Known archeological sites within the Municipality are small and generally concentrated around water features such as lakes and rivers and the present day town of Walkerton in the southeastern corner of the Municipality.

The absence of locally protected areas or heritage sites would need to be confirmed in discussion with the community and Aboriginal peoples in the area during subsequent site evaluation stages, if the community remains interested in continuing with the site selection process.

Screening Criterion 3: Available land must not contain known groundwater resources at the repository depth, so that the repository site is unlikely to be disturbed by future generations.

The review of available information did not identify any known groundwater resources at repository depth (typically 500 m) beneath the Municipality of Brockton. The Ontario Ministry of the Environment Water Well Records indicates that no potable water supply wells are known to exploit aquifers at typical repository depths within the Municipality of

Brockton or the surrounding areas. Water wells in the Municipality of Brockton obtain water from overburden or shallow bedrock sources at depths ranging from 5 to 134 m. Experience from other areas in southern Ontario, and the detailed site characterization work recently completed at the nearby Bruce nuclear site for OPG's proposed DGR for low and intermediate level radioactive waste, has shown that there is no active deep groundwater system at typical repository depths. The active groundwater system is shallow and limited to the upper approximately 200 m.

The absence of groundwater resources at repository depth would need to be confirmed during subsequent site evaluation stages, if the community remains interested in continuing with the site selection process.

Screening Criterion 4: Available land must not contain economically exploitable natural resources as known today, so that the repository site is unlikely to be disturbed by future generations.

Based on the review of available information, the Municipality of Brockton contains sufficient land, free of known economically exploitable natural resources, to accommodate the required repository's facilities.

The Municipality of Brockton has a generally low potential for oil and gas resources and economic minerals. Six historic exploration wells drilled within the Municipality of Brockton for hydrocarbon exploration resulted in dry holes with no production potential. There is no record of metallic mineral production in the past, and no exploration potential for metallic minerals has been identified within the Municipality of Brockton. Known non-metallic mineral resources in the Municipality of Brockton include bedrock-derived crushed stone, natural surficial sand and gravel resources, salt and building stone. However, the risk that these resources pose for future human intrusion is negligible, as quarrying operations would be limited to very shallow depths.

Screening Criterion 5: Available land must not be located in areas with known geological and hydrogeological characteristics that would prevent the site from being safe, considering the outlined safety factors in Section 6 of the Site Selection Document.

Based on the review of available geological and hydrogeological information, the Municipality of Brockton comprises large areas of lands that do not contain obvious known geological and hydrogeological conditions that would make the area unsuitable for hosting a deep geological repository.

The safety-related geoscientific factors outlined in Section 6 of the Site Selection Document (NWMO, 2010) relate to: safe containment and isolation of used nuclear fuel; long-term resilience to future geological processes and climate change; safe construction, operation and closure of the repository; isolation from future human activities; and amenability to site characterization and data interpretation activities. At this early stage of the site evaluation process, where limited data at repository depth exist, these factors are assessed using readily available information, with the objective of identifying any obvious unfavourable hydrogeological and geological conditions that would exclude the Municipality of Brockton from further consideration. They would be gradually assessed in more detail as the site evaluation process progresses and more site specific data are collected during subsequent evaluation phases, provided the community remains interested in continuing in the site selection process.

3.1 Safe Containment and Isolation

The geological and hydrogeological conditions of a suitable site should promote long-term containment and isolation of used nuclear fuel and retard the movement of any potentially released radioactive material. This requires that the repository be located at a sufficient depth, typically around 500 m, in a sufficient rock volume with characteristics that limit groundwater movement.

The review of readily available information indicates that the Municipality of Brockton contains areas with no obvious geological and hydrogeological conditions that would fail the containment and isolation requirements. The geology of the Municipality of Brockton at typical repository depth is dominated by the Upper Ordovician shale and limestone units. These geological formations exist at a sufficient depth and in sufficient volumes to potentially host a deep geological repository. They are also expected to have low porosity and low hydraulic conductivity which would greatly limit groundwater movement. Experience from other areas in southern Ontario indicates that the deep groundwater regime within the Upper Ordovician shale and limestone units in southern Ontario is diffusion dominated and isolated from the shallow groundwater system. The hydrogeochemical characteristics of the deep brines, in particular their high salinities and distinct isotopic signatures, also suggest that the deep system has remained isolated from the shallow groundwater system.

3.2 Long-Term Stability

A suitable site for hosting a repository is a site that would remain stable over the very long-term in a manner that will ensure that the performance of the repository will not be substantially altered by future geological and climate change processes, such as earthquakes or glaciation. A full assessment of this geoscientific factor requires detailed site specific data that would be typically collected and analyzed through detailed field investigations. At this early stage of the site evaluation process, the long-term stability factor is evaluated by assessing whether there is any evidence that would raise concerns about the long-term hydrogeological and geological stability of the Municipality of Brockton.

The review did not reveal any obvious geological or hydrogeological conditions that would clearly fail to meet the long-term stability requirement for a potential repository within the Municipality of Brockton. The Municipality of Brockton is underlain by the Precambrian crystalline basement of the Grenville Province, which has remained tectonically stable since approximately 970 million years ago. The geology of the Municipality of Brockton is typical of many areas of southern Ontario, which has been subjected to numerous glacial cycles during the last million years. Glaciation is a significant past perturbation that could occur in the future. However, findings from studies conducted in other areas of southern Ontario suggest that the deep subsurface Paleozoic sedimentary formations have remained largely unaffected by past perturbations such as glaciations.

3.3 Potential for Human Intrusion

The site should not be located in areas where the containment and isolation functions of the repository are likely to be disrupted by future human activities such as exploration or mining. This factor has already been addressed under Screening Criterion 3 and 4 above, which concluded that the potential for deep groundwater resources at repository depths and known economically exploitable natural resources is low in the Municipality of Brockton.

3.4 Amenability to Construction and Site Characterization

The characteristics of a suitable site should be favourable for the safe construction, operation, closure and long-term performance of the repository. This requires that the strength of the host rock and in situ stress at repository depth are such that the repository could be safely excavated, operated and closed without unacceptable rock instabilities; and that the soil cover depth over the host rock should not adversely impact repository construction and site investigation activities. Similarly, the host rock geometry and structure should be predictable and amenable to site characterization and interpretation activities.

From a constructability perspective, limited site specific information is available on the local rock strength characteristics and in situ stresses for the Municipality of Brockton. However, available information from other

locations in southern Ontario suggests that the Upper Ordovician shale and limestone units have favourable geomechanical characteristics and are amenable to the type of excavation activities involved with the development of a deep geological repository for used nuclear fuel.

In terms of predictability of the geologic formations and amenability to site characterization activities, the review of available information on the bedrock geology for the Municipality of Brockton did not reveal any conditions that would make the rock mass unusually difficult to characterize. The Upper Ordovician shale and limestone units are expected to have a simple geometry with limited structural complexities that would make them difficult to characterize.

4. Initial Screening Findings

This report presents the results of an initial screening to assess the potential suitability of the Municipality of Brockton against five initial screening criteria using readily available information. The initial screening focused on the areas within the boundaries of the Municipality of Brockton. Areas within neighbouring municipalities were not included in the initial screening. As outlined in NWMO's site selection process (NWMO, 2010), the five initial screening criteria relate to: having sufficient space to accommodate surface facilities, being outside protected areas and heritage sites, absence of known groundwater resources at repository depth, absence of known natural resources and avoiding known hydrogeologic and geologic conditions that would make an area or site unsuitable for hosting a deep geological repository.

The review of readily available information and the application of the five initial screening criteria did not identify any obvious conditions that would exclude the Municipality of Brockton from being further considered in the NWMO site selection process. The initial screening indicates that there are geological formations within the boundaries of the Municipality that are potentially suitable for safely hosting a deep geological repository. Potentially suitable host formations include the Upper Ordovician shale and limestone units that dominate the geology of the Municipality at typical repository depths.

It is important to note that at this early stage of the site evaluation process, the intent of the initial screening was not to confirm the suitability of the Municipality of Brockton, but rather to identify whether there are any obvious conditions that would exclude it from the site selection process. Should the community of Brockton remain interested in continuing with the site selection process, several years of progressively more detailed studies would be required to confirm and demonstrate whether the Municipality of Brockton contains sites that can safely contain and isolate used nuclear fuel.

The process for identifying an informed and willing host community for a deep geological repository for Canada's used nuclear fuel is designed to ensure, above all, that the site which is selected is safe and secure for people and the environment, now and in the future.

5. References

AECOM, 2012:

Initial Screening for Siting a Deep Geological Repository for Canada's Used Nuclear Fuel – Municipality of Brockton, Ontario. AECOM Report Number 60247068-1

NWMO, 2010:

Moving Forward Together: Process for Selecting a Site for Canada's Deep Geological Repository for Used Nuclear Fuel, Nuclear Waste Management Organization, May 2010. (Available at www.nwmo.ca)