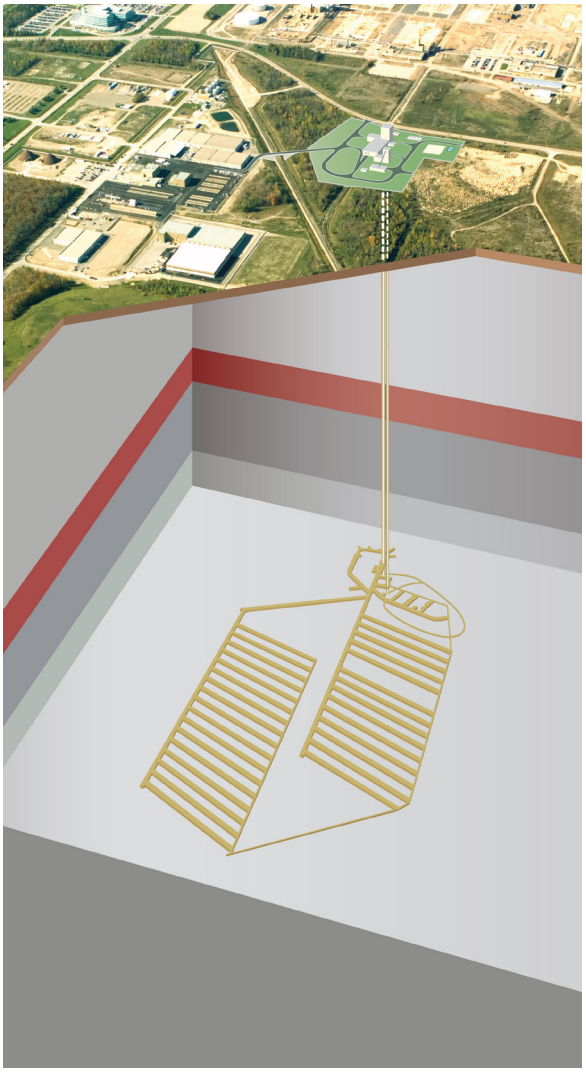
OPG's DEEP GEOLOGIC REPOSITORY PROJECT

For Low & Intermediate Level Waste

March 2011



Environmental Impact Statement

VOLUME 2: APPENDICES

00216-REP-07701-00001 R000

OPG's DEEP GEOLOGIC
REPOSITORY
FOR LOW & INTERMEDIATE LEVEL WASTE

Environmental Impact Statement

Volume 2: Appendices

00216-REP-07701-00001-R000

March 2011

Prepared by:
Golder Associates Ltd.

Document History

Title:	Environmental Impact Statement		
Report Number:	00216-REP-07701-00001		
Revision:	R000	**Date:**	March 2011
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EIS FOR DGR PROJECT

EA Consulting Team

	Golder Associates Ltd.	Environmental Impact Statement Aquatic Environment TSD Atmospheric Environment TSD Geology TSD Hydrology and Surface Water Quality TSD Terrestrial Environment TSD
	AECOM Canada Ltd.	Aboriginal Interests TSD Public Consultation and Engagement Socio-economic Environment TSD
	AMEC NSS Ltd.	Malfunctions, Accidents and Malevolent Acts TSD Radiation and Radioactivity TSD
	Nuclear Waste Management Organization	Environmental Impact Statement Geology TSD Malfunctions, Accidents and Malevolent Acts TSD Public Consultation and Engagement

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APPENDIX A1: EIS GUIDELINES

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Guidelines for the Preparation of the Environmental Impact Statement for the Deep Geologic Repository for Low- and Intermediate-Level Radioactive Wastes

January 2009

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PART 1 – INTRODUCTION

1. CONTEXT

1.1 Purpose of the Guidelines

The purpose of this document is to identify for the proponent, Ontario Power Generation (OPG), the nature, scope and extent of the information that must be addressed in the preparation of the Environmental Impact Statement (EIS) for its proposed Deep Geologic Repository (DGR) to store low- and intermediate-level radioactive waste. The proponent will prepare and submit an EIS that examines the potential environmental effects, including cumulative effects, of the site preparation, construction, operation, decommissioning and abandonment of the project and evaluates their significance. In addition, the proponent will address all requirements for a site preparation and construction licence, detailed in Appendix 2 of this document. This information will be used by a joint review panel established pursuant to the *Canadian Environmental Assessment Act* and the *Nuclear Safety and Control Act* as the basis for a public review.

While the EIS guidelines provide a framework for preparing a complete and accessible EIS, it is the responsibility of the proponent to provide sufficient data and analysis on any potential environmental effects to permit proper evaluation by a joint review panel, the public, and technical and regulatory agencies. The EIS guidelines outline the minimum information requirements while providing the proponent with flexibility in selecting methods to compile data for the EIS.

Exchanges between the proponent and other government organizations, Aboriginal people and stakeholders, where appropriate, are encouraged to ensure that the EIS responds adequately to these guidelines.

1.2 Environmental Assessment and Regulatory Process

On December 2, 2005, OPG wrote to the Canadian Nuclear Safety Commission (CNSC) indicating its intent to initiate the regulatory process to prepare a site, construct and operate a DGR on the existing Bruce Nuclear Site within the Municipality of Kincardine, Ontario. The proposed DGR would receive low and intermediate level radioactive waste currently stored on the Bruce Site in an interim facility, as well as waste produced from the continued operation of OPG-owned generating stations at Bruce, Pickering and Darlington, in Ontario.

OPG's proposal includes the site preparation, construction, operation, decommissioning and abandonment of above-ground and below-ground facilities. The surface facilities would consist of components such as the underground access and ventilation buildings, associated temporary or permanent buildings and related infrastructure. The underground facilities would comprise components such as shafts, ramps and tunnels, emplacement

rooms, and various service areas and installations. Surface and underground facilities are expected to be located within the boundaries of the Bruce Nuclear Site.

DGR operations would involve those activities required to operate and maintain the DGR facility, including the transfer of waste from the existing interim storage facility and the receipt of waste at the repository, the emplacement of the waste in rooms within the repository and the closure of these rooms.

The project triggers the *Canadian Environmental Assessment Act* given that the proponent requires authorizations under subsection 24(2) of the *Nuclear Safety and Control Act* in order for the project to proceed. A comprehensive study for this proposed project was initiated January 30, 2006.

The CNSC held a public consultation and a public hearing on the scope of the environmental assessment. As a result of the public hearing the CNSC reported to the federal Minister of the Environment on the scope of the environmental assessment, public concerns, the possibility of adverse environmental effects and concerns regarding the comprehensive study's ability to address all of the questions raised by the project and provided a recommendation to the Minister of Environment to refer the environmental assessment to a review panel. On June 29, 2007, the Minister of the Environment announced that the DGR project would be referred to a joint review panel.

A joint review panel under the *Canadian Environmental Assessment Act* and the *Nuclear Safety and Control Act* is being established to undertake an environmental assessment and regulatory review of this project. The joint review panel process will examine environmental assessment issues that relate to the full life cycle of the project, from site preparation through to operations, as well as an examination of decommissioning, and abandonment activities. The joint review panel process will also consider OPG's application for a site preparation and construction licence. Separate licence applications and regulatory reviews would be required for OPG to operate the DGR, decommission, and to abandon the facility.

CNSC staff has confirmed with the Ontario Ministry of the Environment that there are no provincial EA requirements under the *Ontario Environmental Assessment Act* that are applicable to this proposal.

1.3 Preparation and Review of the EIS

The EIS guidelines were prepared by the Canadian Environmental Assessment Agency (CEAA) and the CNSC, and in consultation with other expert federal departments including Health Canada, Natural Resources Canada and Environment Canada. The draft EIS guidelines were subject to a public comment period from April 4, 2008 to June 18, 2008. After consideration of the comments received from Aboriginal groups and the public during the consultation period, the guidelines were revised and finalized, and submitted to the federal Minister of the Environment for approval. The guidelines were subsequently issued to the Proponent.

An EIS is a document prepared by the proponent that allows a joint review panel, regulators, Aboriginal groups and members of the public to understand the project, the existing environment, and the potential environmental effects of the project. The proponent must also provide all information required to support the application for a site preparation and construction licence for the joint review panel, as a panel of the Commission, to consider and render a licensing decision under the *Nuclear Safety and Control Act* and the regulations made under the Act (See Appendix 2).

The proponent will prepare an EIS that addresses the requirements of these guidelines for submission to the joint review panel that will be established for this project. The EIS will then be made available to the public and stakeholders for a comment period on whether the EIS is in conformity with these guidelines. The joint review panel will determine whether additional information must be provided before convening public hearings.

The EIS that is made available for public and stakeholder comment should not contain:

- Information that could cause specific, direct and substantial harm to the proponent, to a witness, or specific harm to the environment by the disclosure of;
- Information that involves national or nuclear security;
- information that is confidential (i.e., financial, commercial, scientific, technical, personal or other nature), that is treated consistently as confidential, and the person affected has not consented to the disclosure; or
- Information that is likely to endanger the life, liberty or security of a person through its disclosure.

The proponent must inform the joint review panel in writing for a determination as to whether specific information required by these guidelines should be submitted to, and retained by the joint review panel, as confidential.

Following public hearings, the joint review panel will prepare a report that includes, but is not limited to, the rationale, conclusions and recommendations of the joint review panel relating to the environmental assessment of the project, including any mitigation measures and follow-up program, and a summary of any comments received from the public and Aboriginal groups.

This joint review panel report will be submitted to the Minister of the Environment. The report will be made available to the public at that time. The government will then respond to the joint review panel's report. The Government of Canada's response to the joint review panel report will be made available by the Canadian Environmental Assessment Agency.

Subsequent to the Government of Canada's response, the joint review panel will render a licensing decision for a licence to Prepare Site and Construct under the *Nuclear Safety and Control Act*.

2. GUIDING PRINCIPLES

2.1 Environmental Assessment as a Planning Tool

Environmental assessment is a planning tool used to ensure that projects are considered in a careful and precautionary manner in order to avoid or mitigate the possible adverse effects of development on the environment and to encourage decision makers to take actions that promote sustainable development and thereby achieve or maintain a healthy environment and a healthy economy.

The environmental assessment of this project must, in a manner consistent with those purposes, identify possible environmental effects; propose measures to mitigate adverse effects and predict whether there will be likely significant adverse environmental effects after mitigation measures are implemented.

2.2 Public Participation and Aboriginal Engagement

Public participation[1] is a central objective of the overall review process. Meaningful public participation requires the proponent to address concerns of the general public regarding the anticipated or potential environmental effects of the project. In preparing the EIS, the proponent is required to engage residents and organizations in all affected communities, other interested organizations, and relevant government agencies. The proponent must provide in the EIS the highlights of this engagement, including the methods used, the results, and the ways in which the proponent intends to address the concerns identified, including a summary of issues raised during such engagement.

Another objective of the overall review process is to involve potentially affected Aboriginal people in order that the environmental assessment can identify and address concerns regarding any changes that the project may cause in the environment and the resulting effects of any such changes on the use of lands and resources for traditional purposes by Aboriginal persons. The proponent must ensure that it engages with Aboriginal people that have asserted or have established Aboriginal rights, Aboriginal title or treaty rights that may be affected by the project. In preparing the EIS, the proponent must ensure that Aboriginal people have the information that they require in respect of the project and of how the project may impact them. The proponent is required to describe in the EIS how the concerns respecting Aboriginal people will be addressed. That description should include a summary of discussions, the issues or concerns raised, and should consider and describe any asserted or established Aboriginal rights, Aboriginal title and treaty rights. The EIS must document the potential impact of the project on any asserted or established Aboriginal rights, Aboriginal title and treaty rights, and the measures to prevent or mitigate those potential impacts.

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[1] As described in CEAA's Public Participation Guide (May 2008), terms such as "participation," "consultation," "involvement," and "engagement" are often used interchangeably, although they may mean different things to different people. These guidelines endeavour to use these terms in a manner that is consistent with the 'Public Participation Terminology' described in this CEA Agency Guidance.

Meaningful involvement in the environmental assessment can only take place when all parties have a clear understanding of the proposed project as early as possible in the review process. Therefore, the proponent is required to:

- Continue to provide up-to-date information describing the project to the public and especially to the communities likely to be most affected by the project;
- Involve Aboriginal people in determining how best to deliver that information, e.g., the types of information required, translation needs, different formats, the possible need for community meetings; and
- Explain the results of the EIS in a clear and direct manner to make the issues comprehensible to as wide an audience as possible.

2.3 Traditional Knowledge

Traditional knowledge, which is rooted in the traditional life of Aboriginal people, has an important contribution to make to an environmental assessment. Traditional knowledge refers to the broad base of knowledge held by individuals and collectively by communities that may be based on spiritual teachings, personal observation and experience or passed on from one generation to another through oral and/or written traditions. This tradition is dynamic, substantive, and distinct living knowledge.

Traditional knowledge, in combination with other information sources is valuable in achieving a better understanding of potential impacts of projects. Traditional knowledge may, for example, contribute to the description of the existing physical, biological and human environments, natural cycles, resource distribution and abundance, long and short-term trends, and the use of lands, and land and water resources. It may also contribute to project siting and design, identification of issues, the evaluation of potential effects, and their significance, the effectiveness of proposed mitigation, cumulative impacts, and the consideration of follow-up and monitoring programs.

Certain issues relevant to the review process are firmly grounded in traditional knowledge, such as harvesting, cultural well-being, land use, heritage resources, and others. Although the basis for traditional knowledge and science-based knowledge can differ, they may on their own or together, contribute to the understanding of these issues.

The joint review panel will promote and facilitate the contribution of traditional knowledge to the review process. It is recognized that approaches to traditional knowledge, customs and protocols may differ among Aboriginal communities and persons with respect to the use, management and protection of this knowledge. The joint review panel can consider the views of communities and traditional knowledge holders during the joint review process and determine which information should be kept confidential. The proponent must incorporate into the EIS the local knowledge to which it has access or that it may reasonably be expected to acquire through appropriate due diligence, in keeping with appropriate ethical standards and without breaching obligations of confidentiality.

Alternatively, the proponent may facilitate the presentation of such knowledge by persons and parties having access to this information to the joint review panel during the course of the review. If requested by an Aboriginal people, the proponent should cooperate to develop a mutually agreed-upon arrangement for the Aboriginal people themselves to provide traditional knowledge throughout the joint review process, either by themselves or in collaboration with the proponent.

2.4 Sustainable Development

Sustainable development seeks to meet the needs of present generations without compromising the ability of future generations to meet their own needs.

Environmental assessment provides a systematic approach for identifying, predicting and evaluating the potential environmental effects of projects before decisions are made. In addition, environmental assessment provides the means to identify mitigation measures for adverse effects. Environmental assessment promotes sustainable development and contributes to decision making that can ultimately provide net ecological, economic and social benefits to society.

A project that is supportive of sustainable development must strive to integrate the objective of net ecological, economic and social benefits to society in the planning and decision-making process and must incorporate citizen participation. The project, including its alternative means, must take into account the relations and interactions among the various components of the ecosystems and meeting the needs of the population. The proponent must include in the EIS consideration of the extent to which the Project contributes to sustainable development. In doing so, the proponent should consider, in particular:

(a) The extent to which biological diversity may be affected by the Project; and
(b) The capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of present and future generations.

2.5 Precautionary Approach

One of the purposes of environmental assessment is to ensure that projects are considered in a careful and precautionary manner before authorities take action in connection with them, in order to ensure that such projects do not cause significant adverse environmental effects. The Precautionary Principle informs the decision-maker to take a cautionary approach, or to err on the side of caution, especially where there is a large degree of uncertainty or high risk.

The document *A Framework for the Application of Precaution in Science-based Decision Making About Risk* [Reference 1] sets out guiding principles for the application of precaution to science-based decision making in areas of federal regulatory activity for the protection of health and safety and the environment, and the conservation of natural resources.

The proponent must indicate how the precautionary principle was considered in the design of the project in at least the following ways:

- Demonstrate that all aspects of the project have been examined and planned in a careful and precautionary manner in order to ensure that they do not cause serious or irreversible damage to the environment and/or the human health of current or future generations;
- Outline and justify the assumptions made about the effects of all aspects of the project and the approaches to minimize these effects;
- Alternative means of carrying out the Project are evaluated and compared in light of risk avoidance, adaptive management capacity and preparation for surprise;
- That in designing and operating the project, priority has been and will be given to strategies that avoid the creation of adverse impacts;
- That contingency plans explicitly address accidents, malfunctions and malevolent acts and include risk assessments and evaluations of the degree of uncertainty;
- Identify any proposed follow-up and monitoring activities, particularly in areas where scientific uncertainty exists in the prediction of effects; and
- Present public views on the acceptability of all of the above.

In doing so, the proponent shall consider the guiding principles set out in the *Framework for the Application of Precaution in Science-based Decision Making About Risk*.

2.6 Study Strategy and Methodology

The proponent is expected to observe the intent of the EIS guidelines and to identify all environmental effects that are likely to arise from the project (including situations not explicitly identified in these guidelines), the mitigation measures that will be applied, and the significance of any residual effects. It is possible that these guidelines include matters that, in the judgment of the proponent, are not relevant or significant to the project. If such matters are omitted from the EIS, they must be clearly indicated with appropriate justification so that the public and other interested parties have an opportunity to comment on this judgment. Where the joint review panel disagrees with the proponent's decision, it may require the proponent to provide additional information.

The proponent must explain and justify methods used to predict impacts of the project on each valued environmental component (VEC), which includes biophysical and socio-economic components, the interactions among these components and the relations of these components within the environment. The information presented must be substantiated. In particular, the proponent must describe how the VECs were identified and what methods were used to predict and assess the adverse environmental effects of the project on these components. The value of a component not only relates to its role in the ecosystem, but also to the value placed on it by humans. The culture and way of life of the people using the area affected by the project may themselves be considered VECs.

In describing methods, the proponent must document how it used scientific, engineering, traditional and other knowledge to reach its conclusions. Assumptions made must be clearly identified and justified. All data, models and studies must be documented so that

the analyses are transparent and reproducible. All data collection methods must be specified. The uncertainty, reliability and sensitivity of models used to reach conclusions must be indicated. The sections in the EIS regarding the existing environment and the potential adverse environmental effects predictions and assessment must be prepared, using best available information and methods, to the highest standards in the relevant subject area. All conclusions must be substantiated.

The EIS must identify all significant gaps in knowledge and understanding where they are relevant to key conclusions presented in the EIS. The steps to be taken by the proponent to address these gaps must also be identified. Where the conclusions drawn from scientific and technical knowledge are inconsistent with the conclusions drawn from traditional knowledge, the EIS must contain a balanced presentation of the issues and a statement of the proponent's conclusions.

2.7 Use of Existing Information

In preparing the EIS, the proponent is encouraged to make use of existing information relevant to the project. When relying on existing information to meet the requirements of various sections of the EIS guidelines, the proponent must either include the information directly in the EIS or clearly direct (e.g., through cross-referencing) the joint review panel to where it may obtain the information. When relying on existing information, the proponent must also comment on how representative the data are, clearly separate factual lines of evidence from inference, and state any limitations on the inferences or conclusions that can be drawn from them, according to the criteria for information quality set out in section 2.6 of the EIS Guidelines. For instance:

- Assumptions should be clearly identified and justified;
- All data, models and studies must be documented such that the analyses are transparent and reproducible;
- The uncertainty, reliability and sensitivity of models used to reach conclusions must be indicated;
- Conclusions should be substantiated; and
- The studies should be prepared using best available information and methods, to the highest standards in the relevant subject area.

3. PRESENTATION OF THE EIS

For clarity and ease of reference, the EIS should be presented in the same order as the EIS guidelines. However, in certain sections of the EIS, the proponent may decide that the information is better presented following a different sequence. The EIS must include a guide that cross-references the EIS guidelines with the EIS so that points raised in the EIS guidelines are easily located in the EIS.

In the interest of brevity, the EIS should make reference to, rather than repeat, information that has already been presented in other sections of the document. A key subject index would also be useful and should reference locations in the text by volume, section and sub-section. The names of the proponent's key personnel and/or contractors

and sub-contractors responsible for preparing the EIS must be listed. Supporting documentation can be provided in separate volumes, and should be referenced by volume, section and page in the text of the EIS. The proponent must submit the EIS and all supporting documents in both an electronic format to facilitate internet access and in hard copy for record keeping and review.

The proponent should present the EIS in the clearest language possible. However, where the complexity of the issues addressed requires the use of technical language, a glossary defining technical words and acronyms must be included. The proponent should provide charts, diagrams and maps wherever useful to clarify the text, including perspective drawings that clearly convey what the developed project site would look like.

Information required to support the application for the Licence to Prepare Site and Construct must clearly cross-reference the EIS where appropriate.

3.1 Environmental Impact Statement Summary

The proponent must prepare a plain language summary of the EIS that provides the reader with a concise but complete overview of the EIS.

4. SCOPE

The following section outlines the scope of the project and the factors to be assessed. The scope of the project was based on the project description submitted in December 2005. While the details of the project are expected to change and develop through the environmental assessment process, the scope is sufficient to ensure the EIS will capture the project as it is planned to proceed.

4.1 Scope of the Project

Pursuant to paragraphs 15(1) (b) and 15(3) (b) of the *Canadian Environmental Assessment Act*, the Minister of the Environment is proposing that the scope of the project include the site preparation, construction, operation, decommissioning, and abandonment of the project components and activities proposed by OPG as described in *Deep Geologic Repository for Low and Intermediate Level Radioactive Waste – Project Description* [Reference 2]. The long-term management of used nuclear fuel under the mandate of the Nuclear Waste Management Organization is not within the scope of this project.

The physical works for this project include both surface facilities and underground facilities. Surface facilities could include two permanent buildings, plus any buildings required for ancillary facilities. The principal structures of the surface facilities expected are comprised of:

- Receipt/Access Building: this building could contain facilities for underground access by ramp or shaft. If access is by shaft, this building is expected to have a hoist/headframe/cage. If access is by ramp, this building would include ramp access. This building is likely to have facilities for staff, as well as the heating ventilation and air conditioning (HVAC) equipment. Low- and intermediate-level waste could be received at this building and may be staged for transfer to the DGR. This building may also be used for transfer and removal of excavated rock during construction activities; and
- Ventilation Shaft Headframe Building: this building may provide cover for the ventilation shaft, exhaust fans, sampling/monitoring devices, a hoist and mechanical/electrical systems.

Underground facilities would likely include the following:

- Ramp or Main Shaft: the main shaft would be excavated using drill and blast or other methods. The ramp would be tunnelled into the rock. Either the ramp or the shaft would be used to bring materials and waste into the DGR
- Ventilation Shaft: the ventilation shaft would be used to route air and provide emergency egress. This shaft would be excavated by drill and blast, raise bore, or other methods.
- Underground Tunnels: these tunnels would provide access from the underground receipt area to the operational level.
- Emplacement Rooms: these rooms would provide the storage space needed for the low- and intermediate-level waste, a volume estimated as 160,000 m^3.
- Operational Level Office, Amenities and Maintenance Areas: these may be constructed adjacent to the main shaft/ramp and possibly used for servicing underground equipment, or serve as a distribution point for services.

The physical works also consist of the site infrastructure, and would include such things as power, a sanitary sewer system, a potable water system, a storm water system, a subsurface drainage system, a construction laydown area, access roadways, fencing, waste rock storage and associated roads, security and roadways for linking the DGR to the existing Western Waste Management Facility.

The undertakings in relation to the physical works comprise those that are proposed in the project description (Section 8). This includes activities such as:

Site Preparation: clearing a portion of the proposed site (approximately 15 hectares are wooded) and development of roads to provide site access.

Construction: construction of surface facilities, the shaft or ramp, the ventilation shaft, and the underground excavation of tunnels and an initial set of emplacement rooms. Construction would also result in storage of rock on the Bruce site.

Operation: operational activities include transfer of low- and intermediate-level radioactive waste from the Western Waste Management Facility and waste emplacement in the DGR and any sealing of emplacement rooms during the operating period. The operational phase may also include construction campaigns for additional emplacement rooms.

Decommissioning: decommissioning activities includes activities such as dismantling the equipment, sealing the repository and access ways and decontamination and demolishing the surface facilities.

Abandonment: although there are no activities associated with abandonment, the long term performance of the facility must conform to CNSC Regulatory Policy P-290, *Managing Radioactive Waste* [Reference 3].

4.2 Factors to be considered in the EIS

The Minister of the Environment is proposing that the following factors be considered in the EIS in order to adequately understand and assess the potential adverse effects of the project:

a. The environmental effects of the project, including the environmental effects of malfunctions, accidents or malevolent acts that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
b. The significance of the effects referred to in (a);
c. Comments from the public that are received during the environmental assessment;
d. Measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
e. Purpose of the project;
f. Need for the project;
g. Alternatives to the project;
h. Alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;
i. Measures to enhance any beneficial environmental effects;
j. The requirements for a follow-up program in respect of the project;
k. The capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future; and
l. The consideration of community knowledge and Aboriginal traditional knowledge.

PART II – CONTENT OF THE EIS

Part II of the EIS guidelines provides specific instructions for the content of each section in the EIS. The EIS as a whole must reflect the Guiding Principles in section 2 of the guidelines.

5. CONTEXT

This section must orient the reader to the EIS by briefly introducing the geographic setting, the project, the underlying rationale for the project, the proponent, the federal joint review panel process and the content and format of the EIS.

5.1 Setting

This section must provide a concise description of the geographic setting in which the DGR is proposed to be constructed, demonstrating its proximity to Lake Huron, any National Parks or ecologically significant areas, the Municipality of Kincardine and the Town of Saugeen Shores, the Saugeen Ojibway Nation's two residential communities of Saugeen and Cape Crocker. This section must also outline current use of lands, waters (both ground and surface waters) and resources, including those used for traditional purposes by Aboriginal persons that may be affected by the project and those lands, waters and resources related to established or asserted Aboriginal rights, Aboriginal title or treaty rights. Maps at appropriate scales to illustrate the regional setting should be included. The description must be focused on those aspects of the environment important for understanding the potential environmental effects of the project. A brief description of current regional land uses is required to integrate the natural and human elements of the environment in order to explain the interrelationships between the physical and biological aspects and the people and their communities.

5.2 Project Overview and Purpose

The proponent will briefly summarize the project, its purpose, location, scale, components, activities, scheduling and costs. A more detailed description of the project is provided for in Section 8 in these guidelines.

5.3 Proponent

This section should introduce readers to the proponent with summary information on the nature of the current management structure and any reasonably foreseeable changes in management structure and organizational accountability for the:

- Design, construction, operation and modification of the project;
- Implementation of environmental mitigation measures and environmental monitoring; and
- Management of potential adverse environmental effects.

5.4 Environmental Assessment and Regulatory Process and Approvals

For the purpose of the environmental assessment, the proponent must:

- Identify the planning context for the environmental assessment of the project;
- Discuss government policies, regulations, and land use plans that have a bearing on the project;
- Identify the requirements for the environmental assessment under the *Canadian Environmental Assessment Act* and the *Nuclear Safety and Controls Act*;
- Summarize and discuss the approach, including the role of regulatory bodies, to ensure compliance with existing federal and provincial environmental legislation such as the *Nuclear Safety and Control Act*, *Migratory Birds Convention Act*, the *Fisheries Act*, *Species at Risk Act*, the *Canadian Environmental Protection Act 1999*, *Ontario Environmental Protection Act*, *Ontario Water Resources Act*, *Lakes and Rivers Improvement Act* and Ontario's *Endangered Species Act*;
- Summarize the main steps in the environmental assessment process and the main approvals required to undertake the project; and
- Describe the role of the EIS in the overall environmental assessment and regulatory process.

The joint review panel will also be considering information and evidence in support of OPG's application for a licence to prepare a site and construct a DGR for low- and intermediate- level waste in accordance with the *Nuclear Safety and Control Act* and its regulations. These requirements are outlined in section 8.1 and Appendix 2 of these guidelines.

5.5 International Agreements

The proponent must summarize and discuss in the EIS applicable international agreements, designations, or action plans, their implications and relationship to the planning and regulatory process described in section 5.4 and how they may influence the project or its environmental effects.

The location of the facility on the shores of a trans-boundary watershed requires specific attention be paid to the *Canada-U.S. Air Quality Agreement*, the *Great Lakes Water Quality Agreement* and other such bi-national treaties and agreements.

6. PUBLIC PARTICIPATION

Involvement of Aboriginal people, government agencies, non-governmental organizations, and other interested parties is a central objective of the overall review process. In preparing the EIS, the proponent will demonstrate how it has engaged (i.e., shared information with, and gathered input from) interested parties that may be affected or have an interest in the project, in keeping with the Guiding Principles in section 2 of the guidelines. The key issues identified must be summarized in the EIS:

- The types of support provided to communities, organizations and individuals involved in the public participation process.
- The role of public engagement in identifying VECs, issues, effect prediction and mitigation.
- An explanation of how the results of that engagement influenced the design of the project; and
- A description of the principles and methods will be employed to provide information to, obtain input from or otherwise engage communities and groups regarding the project activities over the lifespan of the project.

6.1 Aboriginal Peoples

The EIS must describe the proponent's involvement of the Chippewas of Saugeen First Nation, the Chippewas of Nawash Unceded First Nation and engagement of any other Aboriginal people, including Métis, that may be affected by the project, especially those Aboriginal people claiming Aboriginal rights, title or established treaty rights at the location or in the vicinity of the project.

This description will include a summary of the history of the proponent's relationship with Aboriginal people with respect to the Bruce Nuclear Site in general and the proposed project in specific. The EIS will describe the objectives of and the methods used for Aboriginal group engagement, issues or concerns raised through such engagement and any details not otherwise subject to confidentiality agreements, including a summary of the discussions, paper and electronic correspondence and meetings held. Details may include date and time, agenda, summary of discussions and a description of how the proponent has addressed the issues or concerns raised by Aboriginal people.

6.2 Government Agencies

The EIS must describe the proponent's involvement of provincial and federal government ministries, departments or agencies and local governments which should include the municipalities of Kincardine, Saugeen Shores, Arran-Elderslie, Brockton and Huron-Kinloss. This may also include the Ontario Ministry of Energy and Infrastructure, the Ontario Ministry of the Environment and the Ontario Ministry of Natural Resources Park Superintendents for McGregor Point and Inverhuron Provincial Parks. The EIS must describe the objectives of such engagement, the methods used, issues raised during such engagement and the ways in which the proponent has addressed these issues.

6.3 Stakeholders

The EIS must describe the proponent's involvement of stakeholders (e.g., local businesses, neighbouring residences, cottagers, outdoor recreational interests, and environmental non-government organizations). The EIS must describe the objectives of such engagement, the methods used, the issues raised and the ways in which the proponent has addressed these issues.

6.4 Other Public Participation

The EIS must describe any other public engagement undertaken by the proponent prior to submitting the EIS. The *Canadian Environmental Assessment Act* does not exclude the public outside of Canada, thus the EIS should describe any public participation opportunities for non-Canadians. This description must identify the objectives of such engagement, outline the methods used, and summarize the issues raised by the public and the ways in which the proponent has addressed these issues.

7. PROJECT JUSTIFICATION

7.1 Purpose and Need for the Project

The proponent must clearly describe the need for the proposed DGR. This description should define the problem or opportunity the project is intending to solve or satisfy and should establish the fundamental rationale for the project.

The proponent must describe the purpose of the project by defining what is to be achieved by carrying out the project.

The "need for" and "purpose of" the project should be established from the perspective of the project proponent and provide the context for the consideration of alternatives in sections 7.2 and 7.3 below.

7.2 Alternatives to the Project

An analysis of alternatives to the project must describe functionally different ways to meet the project's need and achieve the project's purpose from the perspective of the proponent. The analysis of alternatives to a project must be established in relation to the project need and purpose. The analysis of "alternatives to" a project may serve to validate that the preferred alternative is a reasonable approach to meeting need and purpose and is consistent with the aims of the *Canadian Environmental Assessment Act.*

This section of the EIS must: identify any alternatives to the DGR that are within the control and/or interests of the proponent; explain how the proponent developed the criteria to identify the major environmental, economic and technical costs and benefits of those alternatives; provide reasons for rejection of these alternatives; and identify the preferred alternative to the project based on the relative consideration of the environmental, economic and technical benefits and costs. This must be done to a level of detail which is sufficient to allow the joint review panel and the public to compare the project and its alternatives.

Alternatives to the project described in the EIS may include, but are not limited to:

- The *status quo* (i.e., the Western Waste Management Facility); and
- Surface and near-surface storage.

7.3 Alternative Means of Carrying out the Project

The EIS must identify and describe the alternative means to carry out the project that are, from the perspective of the proponent, technically and economically feasible. The EIS must also describe the environmental effects of each alternative means. In describing the preferred means, the EIS should identify the relative consideration of environmental effects, and technical and economic feasibility. The criteria used to identify alternative means as unacceptable, and how these criteria were applied, must be described, as must the criteria used to examine the environmental effects of each remaining alternative means to identify a preferred alternative.

To the extent that these alternative means are feasible for the proponent, this may include, but are not limited to, the following:

- Alternatives to "natural" containment (i.e., engineered barrier);
- Alternative storage systems;
- Timing options for various components and phases of the project;
- Construction methods;
- Layout and design of the DGR;
- Siting of the DGR in a different location within the existing site;
- Siting of the DGR in a location outside the existing site; and
- Reduction at source.

The alternative "reduction at source" represents the ways in which OPG could reduce the waste generated during the operation of the existing nuclear power generating stations but does not represent consideration of abandoning nuclear power. Consideration of provincial energy policy is not within the terms of reference of this joint review.

The Need for and Purpose of the project should include a description of how the site location was selected. If other potential sites were considered, they should be assessed under the context of alternative means.

8. DESCRIPTION OF THE PROJECT

The project description must address all phases of the project, within the scope outlined in section 4, in sufficient detail to allow the joint review panel to assess potential adverse environmental effects and take into account public concerns about the project. The proponent must describe the project as it is planned to proceed through the site preparation and construction, operation (including any potential modifications or refurbishments that may be required during operations), decommissioning, and abandonment of the facility. The description must include a timeline for all phases of the project. Where specific codes of practice, guidelines and policies apply to items to be addressed, those documents must be cited and may be included as appendices to the EIS.

The following information must be provided in summary form. Where applicable, reference may be made to more detailed information.

8.1 General Information and Design Description

Information to be provided in the EIS must include:

- The location of the project;
- A description of the site of the activity to be licensed, including the location of any exclusion zone and any structures within that zone;
- The DGR concept, its components and supporting infrastructure (including the basic configuration, layout, shape, size, and key design features);
- Plans showing the location, perimeter, areas, structures and systems of the nuclear facility;
- Plans showing the existing and planned structures, excavations and underground development;
- The design of the waste containers/packages, their performance and longevity with respect to their containment function, including reference to international experience if available and applicable;
- A description of the design of and the maintenance program for every eating area;
- A description of the proposed emergency power systems and their capacities;
- The proposed ventilation and dust control methods and equipment for controlling air quality;
- The proposed level of effectiveness of, and inspection schedule for, the ventilation and dust control systems;
- A description of the anticipated liquid and solid waste streams within the facility, including the ingress of water and any diversion or control of the flow of uncontaminated surface and groundwater;
- The type of waste streams to be emplaced in the DGR including the inventories and characteristics of nuclear substances and other hazardous materials to be stored at the facility;
- The description and characteristics of the waste containment system; identifying what components, both natural and man-made, comprise the system; and how these components will function to contain and isolate the waste from humans and the environment in the long-term;
- The description of the waste characteristics including source, chemical hazard, radiological hazard, and the non-fissile nature of the material, including the half-life of each isotope, and how the properties, chemical and radiological hazards will change with time;
- The transfer of waste packages, waste package handling, and final waste package emplacement processes;

- The sources, types, and quantities of radioactive, hazardous and non-hazardous waste predicted to be generated by the project;
- The processes for the collection, handling, transport, storage and disposal of radioactive, hazardous and non-hazardous waste to be generated by the project;
- The sources and characteristics of any fire hazards;
- The sources and characteristics of any noise, odour, dust and other likely nuisance effects from the project;
- The sources and characteristics of any potential risks (including radiological risks) to workers, the public and the environment from the project;
- The predicted doses to workers involved with the associated operations and activities that are within the scope of this project;
- The key operational procedures relevant to protection of workers, the public and the environment that are within the scope of this project;
- The key components of the facility and its physical security systems (excluding prescribed information) that are relevant to management of malfunctions and accidents that may occur during the site preparation and construction activities, and during the subsequent operations;
- The predicted sources, quantities and points of release from the project of emissions and effluents containing nuclear substances and hazardous materials;
- The proposed program for selecting, using and maintaining personal protective equipment;
- The proposed measures to control the spread of any radioactive contamination;
- The proposed quality assurance program for the activity to be licensed;
- The proposed worker health and safety policies, programs and procedures;
- The proposed environmental protection policies and procedures, and
- The proposed effluent and environmental monitoring programs.

Because the joint review panel will be considering the proponent's application for a licence under the *Nuclear Safety and Control Act* to prepare the site and construct the DGR facility, there is a need for the proponent to provide additional and more detailed information as described in section 8.2.

8.2 Site Preparation and Construction

The EIS will describe any relevant site clearing and preparation activities required for this project and will provide a description of the permanent or temporary structures that will be constructed, including construction practices, hours of operation and proposed construction schedules. This section should also include a description and schedule of activities relating to the construction of any additional emplacement rooms in the DGR after operation of the DGR has commenced.

To facilitate consideration of an application to prepare the site and construct the facility, the proponent must provide the information required by the *Nuclear Safety and Control Act* and its regulations for a Class 1B nuclear facility. The information requirements are described in the *General Nuclear Safety and Control Regulations* (http://laws.justice.gc.ca/en/n-28.3/sor-2000-202/153798.html) and the *Class I Nuclear Facilities Regulations* (http://laws.justice.gc.ca/en/n-28.3/sor-2000-204/153624.html) of the *Nuclear Safety and Control Act* (Appendix 2).

The following information requirements are required for the EIS and do not replace the requirements referred to in the *Nuclear Safety and Control Act* and its regulations noted above.

For site preparation, the EIS must describe, but should not be limited to, the following:

- Drilling, stripping of vegetation, clearing and grubbing;
- Blasting (handling procedures, frequency and size, pre-blast surveys, weather condition considerations);
- Topsoil and overburden storage (location and dimensions);
- Rock stockpile (location and dimensions);
- Site access roads;
- Sewage treatment and waste management systems;
- Storage areas for the management of site preparation and construction waste;
- Dangerous goods storage areas;
- Dams, watercourse crossings and diversions, including wetland alteration;
- Surface facilities and utilities;
- Groundwater seepage and surface runoff management;
- Erosion and sedimentation control measures; and
- Risk management (e.g., contingency plans for uncontrolled release of substances, emergency response plans).

For construction of the facility, the EIS must provide, but should not be limited to, the following information:

- The proposed construction program, including its schedule and capital costs;
- A description of the components, systems and equipment proposed to be installed, including their design operating conditions;
- The proposed quality assurance program for the design of the facility;
- The results of a process-hazard analysis and a description of how those results have been taken into account;
- A description of the proposed design, construction and operation of any waste management system, including the measures to monitor its construction and operation, the construction schedule, the contingency plans for construction and the measures to control the movement of water in existing waterways;

- The anticipated quantities and quality of waste rock that will be removed, their proposed storage location, and the proposed method for managing the waste rock in the near and long term;
- The proposed excavation methods and programs; and
- The preliminary commissioning plan for the components, systems and equipment to be installed at the facility.

The proponent is also required to provide, or reference, the policies, programs and procedures that would be followed for site preparation and construction of the facility in order to provide some assurance that the facility could be constructed safely and in accordance with the *Nuclear Safety and Control Act* and its regulations.

8.3 Operation

For the operations of the facility, the EIS must describe, but not be limited to, the following information:

- For each project phase, the proponent must describe the number of workers required by occupation and/or skill;
- A description of the material handling, treatment, and disposal plans.
- A description of the provisions for onsite transfer of waste and other materials, including proposed modes and routes of transfer, the volumes and quantities to be transferred and how they will be placed into storage in the DGR;
- Any construction campaigns to add additional emplacement rooms to the DGR and how this will affect normal operations of the DGR; and
- Information on how emplacement rooms will be sealed off, once full, should be included.

The proponent is also required to provide, or reference, the policies, programs and procedures that would be followed for the operation of the facility in order to provide some assurance that the facility could be operated safely and in accordance with the *Nuclear Safety and Control Act* and its regulations following construction.

8.4 Modifications

The proponent must describe the management approach to, and conceptual plans for, potential modifications, including expansion or discontinuation, to the proposed project. The proponent must specify the conditions or potential risks which would necessitate modifications to the project. The proposed process to follow when proposing modifications to the project should be described and include a description of plans for informing the public.

8.5 Decommissioning

A decommissioning plan for the facility must be included in the EIS. The proponent should refer to CNSC Guide G-219, *Decommissioning Planning for Licensed Activities* [Reference 4] for more details.

The preliminary plan will document the preferred decommissioning strategy, including a justification of why this is the preferred strategy. The preliminary decommissioning plan will also include:

- End-state objectives;
- The major decontamination, disassembly and remediation of surface and underground facilities;
- The closure activities associated with sealing the shafts to the underground facilities;
- The nature and approximate quantities and types of waste generated during decommissioning; and
- An overview of the principal hazards and protection strategies envisioned for decommissioning.

8.6 Abandonment

An abandonment plan is required to determine the safety of the facility and its potential impact on human health and the environment. Section 13 of these guidelines provides more details regarding the long-term safety of the DGR. Refer also to CNSC Regulatory Guide G-320 *Assessing the Long-Term Safety of Radioactive Waste Management* [Reference 5] and CNSC Regulatory Policy P-290 *"Managing Radioactive Waste"* for the standards and practices for the management and control of radioactive waste.

8.7 Malfunctions, Accidents and Malevolent Acts

Information on malfunctions and accidents, including intentional malevolent acts, are necessary to permit consideration of relevant environmental effects in the environmental assessment. A summary of information on malfunctions and accidents should be presented in this section of the EIS. A separate section of the EIS should provide more details regarding the information requirements relating to malfunctions and accidents as per section 12.0 of these guidelines.

8.8 Environmental Protection Policies and Procedures

Paragraph 3(g) of the Class I Nuclear Facilities Regulations stipulates that application for a Licence to Prepare Site and Construct shall contain the proposed environmental protection policies and procedures. CNSC Regulatory Standard S-296, *Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills* (March 2006) [Reference 6] and Regulatory Guide G-296, *Developing Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills* (March 2006) [Reference 7] provide more information regarding these requirements. The fundamental direction of these regulatory documents is towards the establishment, implementation and maintenance of an Environmental Management System (EMS) by the proponent that meets the requirements of IS 14001-2004 "Environmental Management Systems – Requirements with Guidance for Use" in the context of Canadian environmental protection policy and regulation and the specific environmental protection requirements of the *Nuclear Safety and Control Act* and its Regulations.

The proponent must therefore submit its proposed environmental protection policies and procedures (i.e., EMS documentation) and demonstrate that the EMS will carry forward the results of the environmental assessment so that it covers the Site Preparation, Construction and Operational phases of the project. The EIS should describe how the mitigation measures described through sections 11 through 14 and the Follow-up Program, as outlined in section 16 of these guidelines, would be integrated into the EMS.

9. ENVIRONMENTAL ASSESSMENT BOUNDARIES

Scoping establishes the boundaries of the environmental assessment and focuses the assessment on relevant issues and concerns. By defining the spatial and temporal boundaries, a frame of reference for identifying and assessing the environmental effects associated with the DGR will be established. Different boundaries may be appropriate for each Valued Ecosystem Component (VEC).

A description of the boundaries of the proposed project in a regional context showing existing and planned future land use, current infrastructure and proposed improvements to these infrastructure, including transportation (all modes), power distribution corridors and lines, urban areas and water supplies (individual and community), must be provided. A description of any traditional land use, any established or asserted Aboriginal rights, Aboriginal title or treaty rights from Aboriginal people within the wider regional context should be provided. Sensitive areas including wetlands, critical habitats as defined under the *Species at Risk Act* and archaeological sites found within the regional context must also be described.

9.1 Spatial Boundaries and Scale

In determining the spatial boundaries to be used in assessing the potential adverse environmental effects, the proponent must consider, but not be limited to, the following criteria:

a. The physical extent of the proposed project, including any offsite facilities or activities;
b. The extent of aquatic and terrestrial ecosystems potentially affected by the project;
c. The extent of potential effects arising from noise, light and atmospheric emissions;
d. The extent to which traditional land use, asserted or established Aboriginal rights, Aboriginal title or treaty rights could potentially be affected by the project;
e. Land use for residential, commercial, industrial, recreational, cultural and aesthetic purposes by communities whose areas include the physical extent of the project; and
f. The size, nature and location of past, present and reasonably foreseeable projects and activities which could interact with items (b), (c), (d) and (e).

These boundaries also indicate the range of appropriate scales at which particular baseline descriptions and the assessment of environmental effects must be presented. The proponent is not required to provide a comprehensive baseline description of the environment at each scale, but must provide sufficient detail to address the relevant environmental effects of the project and the alternative means. The EIS must contain a justification and rationale for all boundaries and scales chosen.

The geographic study areas for the EIS must encompass the areas of the environment that can reasonably be expected to be affected by the project, or which may be relevant to the assessment of cumulative environmental effects. Study areas must encompass all relevant components of the environment, including the people, non-human biota, land, surface water, groundwater, air and other aspects of the natural and human environment, notably, traditional land use. Study boundaries will be defined taking into account traditional knowledge, ecological, technical, social and political considerations.

The following geographic study areas should serve as the basis for developing project-specific and effect-specific study areas:

- *Site Study Area*: the Site Study Area includes the facilities, buildings and infrastructure at the Bruce Nuclear Site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the DGR is proposed.

- *Local Study Area*: the Local Study Area is defined as that area existing outside the Site Study Area boundary, where there is a reasonable potential for direct effects on the environment from any phase of the project, either through normal activities, or from possible accidents or malfunctions. The Local Study Area should include all of the Bruce Nuclear Site and the lands within the Municipality of Kincardine closest to it, as well as the area of Lake Huron adjacent to the facility. The boundaries must change if appropriate following an assessment of the spatial extent of potential effects.

- *Regional Study Area*: the Regional Study Area is defined as the area within which there is the potential for cumulative biophysical and socio-economic effects. This area includes lands, communities and portions of Lake Huron around the Bruce Nuclear Site that may be relevant to the assessment of any wider-spread direct and indirect effects of the project.

Within the aforementioned study areas, the boundary of concern will extend to a depth that will include the full extent of the surface water and groundwater.

9.2 Temporal Boundaries

In characterizing the environmental effects of the project, the proponent must consider the current baseline environment and environmental trends within the study areas. The description of the existing baseline and the environmental trends should include a

consideration of past projects and activities carried out by the proponent and/or others within the regional study area.

In describing and predicting the environmental effects of the project, the proponent must cover the period from the start of any site preparation activity associated with the project through construction, operation, including maintenance and repairs, and any modifications through the proposed life of the project, leading to the eventual decommissioning, abandonment, and the long-term performance of the DGR.

In assessing cumulative environmental effects within the study area, the proponent must consider the effects of the project in combination with other past, present and future projects that are either "certain" or "reasonably foreseeable" as defined in CEAA's *Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act* [Reference 8].

As is the case for the determination of spatial boundaries, the temporal boundaries must indicate the range of appropriate scales at which particular baseline descriptions and the assessment of environmental effects are presented.

At a minimum, the assessment is expected to include the period of time during which the maximum impact is predicted to occur. The approach taken to determine the temporal boundary of assessment should take into account the following elements:

- Hazardous lifetime of the contaminants associated with waste or with releases to the environment during both normal operation and postulated accidents and malfunctions;
- Duration of the operational period (before the facility reaches its end state);
- Design life of engineered barriers;
- Duration of both active and passive institutional controls; and
- Frequency and duration of natural events and human-induced environmental changes (e.g., seismic occurrence, flood, drought, glaciation, climate change, etc).

9.3 Valued Ecosystem Components

The EIS must describe the general criteria used to identify VECs that may be affected by the project. The EIS must identify the methods used to predict and assess the effects of the project on VECs, and will explain the criteria used to assign significance ratings to any predicted adverse effects. The spatial and temporal boundaries used in the assessment may vary as appropriate, depending on the VEC.

Table 1 presents a preliminary list of VECs for each environmental component of the assessment. This list of VECs should be modified as appropriate by the proponent in the EIS, following consultations with the public, Aboriginal people, federal and provincial government departments and relevant stakeholders, including those comments received by the Canadian Environmental Assessment Agency and the Canadian Nuclear Safety Commission during the April 4 to June 18, 2008 comment period.

TABLE 1: PRELIMINARY LIST OF VALUED ECOSYSTEM COMPONENTS

Environmental Component	VEC	VEC Category
Physical Environment	Air Quality	Physical
	Noise Levels	Physical
	Surface Water Quality	Physical
	Surface Water Quantity and Flow	Physical
	Soil Quality	Physical
	Groundwater Quality	Physical
	Groundwater Quantity and Flow	Physical
Plants	Eastern White Cedar	Biological
	Heal-all	Biological
	Common Cattail	Biological
	Variable Leaf Pondweed	Biological
Mammals	Muskrat	Biological
	White-tailed Deer	Biological
	Meadow Vole	Biological
Amphibians and Reptiles	Midland Painted Turtle	Biological
	Northern Leopard Frog	Biological
Birds	Mallard	Biological
	Red-eyed Vireo	Biological
	Wild Turkey	Biological
	Yellow Warbler	Biological
	Bald Eagle	Biological
Benthic Fish	Redbelly Dace	Biological
	Creek Chub	Biological
	Lake Whitefish	Biological
Invertebrates	Benthic Invertebrates	Biological
	Burrowing Crayfish	Biological
Pelagic Fish	Smallmouth Bass	Biological
	Brook Trout	Biological
	Benthic Invertebrates	Biological
Human and Social Factors	Human Health	Human/Socio-economic
	Population	Human/Socio-economic
	Employment	Human/Socio-economic

Environmental Component	VEC	VEC Category
	Business Activity	Human/Socio-economic
	Tourism	Human/Socio-economic
	Inverhuron Provincial Park	Human/Socio-economic
	Housing and Property Values	Human/Socio-economic
	Municipal Finance, Infrastructure, Services and Facilities/Resources	Human/Socio-economic
Aboriginal Factors	First Nation Communities	Human/Socio-economic
	Native Heritage and Cultural Resources	Human/Socio-economic
	Traditional Use of Lands and Resources	Human/Socio-economic
Ecological Features	Lake Huron	Physical
	Stream C	Physical
	Railway Ditch	Physical
	Wetland	Physical

10. EXISTING ENVIRONMENT

The EIS must provide a baseline description of the environment, including the components of the existing environment and environmental processes, their interrelations and interactions as well as the variability in these components, processes and interactions over time scales appropriate to this EIS. The proponent's description of the existing environment must be in sufficient detail to permit the identification, assessment and determination of the significance of potentially adverse environmental effects that may be caused by the project, to adequately identify and characterize the beneficial effects of the project, and provide the data necessary to enable effective testing of predictions during the follow-up program and support the conclusions on the long-term safety assessment (Section 13).

The baseline description should include results from studies done prior to any physical disruption of the environment due to initial site clearing activities planned as part of the site preparation phase. The baseline description must include characterization of environmental conditions resulting from historical and present activities in the local and regional study areas (see section 14 - Cumulative Effects). The EIS must compare baseline data with applicable federal, provincial, municipal or other legislative requirements, standards, guidelines or objectives.

This description must include, but not necessarily be limited to those VECs, processes, and interactions that either were identified to be of concern during any workshops or meetings held by the proponent, or that the proponent considers likely to be affected by the project. In doing so, the proponent must indicate to whom these concerns are

important and the reasons why, including social, economic, recreational, and aesthetic considerations. The proponent must describe the nature and sensitivity of the area within and surrounding the project and any planned or existing land and water use in the area. The proponent must also indicate the specific geographical areas or ecosystems that are of particular concern, and their relation to the broader regional environment and economy. This includes, but is not limited to, a detailed description of those areas of Lake Huron potentially affected by the project, the Baie du Doré Provincially Significant Wetland, Huron Fringe Woodland, Douglas Point Swamp Environmentally Significant Area, Stream C, the Scott Point Provincially Significant Life Science Area of Natural and Scientific Interest, and Inverhuron Provincial Park. Relevant information about the VECs is to be presented graphically to document physical and biological (e.g., home range) characteristics.

The subsurface environment will play a dominant role in containing and isolating the waste from humans and the environment in the long term. It is therefore expected that the information on subsurface site characterization will be sufficient to allow the development of site specific assessment models that will predict with reasonable confidence the long-term performance of the proposed DGR.

In describing the physical and biological environment, the proponent must take an ecosystem approach that considers both scientific and traditional knowledge and perspectives regarding ecosystem health and integrity. The proponent must identify and justify the indicators and measures of ecosystem health and social health. These must be related to project monitoring and follow-up measures.

For the biological environment, baseline data in the form of inventories alone is not sufficient for the joint review panel to assess effects. The proponent must consider the resilience of species, communities, and their habitats. The proponent must summarize all pertinent historical information on the size and geographic extent of animal populations as well as density. Habitat at regional and local scales should be defined in ecological mapping of aquatic and terrestrial vegetation types and species (e.g., ecological land classification mapping). Habitat use should be characterized by type of use (e.g., spawning, breeding, migration, feeding, nursery, rearing, wintering), frequency and duration. Emphasis must be on those species, communities and processes identified as VECs. However, the interrelations of these components and their relation to the entire ecosystem and communities of which they are a part must be indicated. The proponent must address issues such as habitat, nutrient and chemical cycles, food chains, productivity, as these may be appropriate to understanding the effect of the project on ecosystem health and integrity. Range and probability of natural variation over time must also be considered.

In describing the socio-economic environment, the proponent must provide information on the functioning and health of the socio-economic environment, encompassing a broad range of matters that affect the people and communities in the study areas in a way that recognizes interrelationships, system functions and vulnerabilities. A description of the rural and urban settings likely to be affected by the project should be provided.

Information on existing and projected population densities and distributions in the region, including resident populations and transient populations, must be provided by project phase, and for the entire life of the project. Information such as present and future use of land and resources, including transportation infrastructure, public health infrastructure and services (municipal water treatment for domestic use or human consumption, wastewater treatment, landfill), housing and housing values, commercial fisheries in the area, recreation and tourism should also be provided as this information would be required to assess potential adverse effects of the project on human health and socio-economic conditions in the area, and to assess the effects of the environment on the project. The proponent must also describe any agreements with the surrounding municipalities or other jurisdictions regarding emergency plans or protective actions.

Traditional activities carried out by Aboriginal people must be described by the proponent. The proponent should provide information that would include a description of traditional dietary habits and dependence on country foods and harvesting for other purposes, including harvesting of plants for medicinal purposes. The analysis should focus on the identification of potential adverse effects of the project on the ability of future generations of Aboriginal people (up to seven generations) to pursue traditional activities or lifestyle.

If the background data have been extrapolated or otherwise manipulated to depict environmental conditions in the project area, modeling methods and equations must be described and must include calculations of margins of error and other relevant statistical information, such as confidence intervals and possible sources of error.

10.1 Biophysical Environment

10.1.1 Geology and Geomorphology

The EIS must describe the bedrock and quaternary/surficial geology, geomorphology, topography, petrology, geochemistry, hydrogeology and geomechanics for the region and the area that will be disturbed by the project. The EIS must describe the geology and structural geology, such as fractures and faults, at the site and within the local and regional study areas from the bedrock surface through and into the top of the basement rock, the Precambrian formation. Geotechnical properties of the overburden must also be provided, including shear strength and liquefaction potential, to allow the assessment of slope stability and bearing capacity of foundations under both static and dynamic conditions.

The EIS must describe and assess any geotechnical and geophysical hazards within the study areas, including consideration of subsidence, uplift, seismicity and faulting, as well as consideration of the possibility of movements of the ground surface (including co-seismic rupture) and earthquake ground motions. Where appropriate, the narrative descriptions should be supplemented by illustrations such as maps, figures, cross sections and borehole logs.

10.1.2 Surface Water

The EIS must describe surface water quality, hydrology and sediment quality at the site, local and regional study areas. The description must include delineation of drainage basins at the appropriate scales and include a description of hydrological data such as water levels and flow rates collected over the years. The proponent must describe hydrological regimes, including seasonal fluctuations and year-to-year variability of all surface waters and assess normal flow, flooding, and drought properties of water bodies as well as the interactions between surface water and groundwater flow systems.

The EIS must identify watersheds within the project area and identify recharge and discharge areas, streams, ponds and lakes. The proponent must describe the flow regimes, seasonal flow patterns, quantity and quality of all surface waters. The description must include a discussion of existing surface runoff water management regimes within the project area. The proponent must describe all surface water sources used for drinking water in the area, including source water intakes for drinking water treatment facilities. The proponent must provide information on whether any bodies of water within the study areas are used for recreational purposes.

The EIS must provide a description of sampling protocols and analytical methods, and provide maps and figures where appropriate.

10.1.3 Groundwater

The EIS must describe the hydrogeology at the site, local and regional study areas, from the ground surface through and into the top of the basement rock, the Precambrian formation. This should include a discussion of both groundwater quality and quantity.

The EIS must characterize the hydraulic conductivities, effective porosities, longitudinal and transverse dispersivities, diffusivities, pore-space tortuosities and mass transfer coefficients/retardation factors, for the various geological units. The proponent should also describe the characteristics of groundwater interactions under different climatic and seasonal conditions.

The EIS must provide a conceptual hydrogeologic model that demonstrates the groundwater flow systems and patterns. The hydrogeologic model should describe the changes to groundwater characteristics with depth and identify groundwater discharge and recharge areas. Further information describing the importance of modeling and characterization to the long-term safety of the DGR is provided in section 13 of these guidelines.

The EIS must identify any hydrogeologic features such as aquitards. Describe any groundwater use in the area, including both current and potential future uses.

The proponent must describe all groundwater sources used for drinking water in the area, including sources that are consumed directly (i.e. wells).

10.1.4 Terrestrial Environment

The EIS must describe the terrestrial species at the site and within the local and regional study areas, including flora, fauna and their habitat. The EIS must describe any wildlife corridors and physical barriers to movement that exist within the project area. Any biological species of natural conservation status (e.g., rare, vulnerable, endangered, threatened and uncommon) at a federal, provincial, regional or local level and their critical habitats must be identified.

All protected and conservation areas established by federal, provincial, and municipal jurisdictions (e.g., wilderness areas, parks, sites of historical or ecological significance, and nature reserves, federal migratory bird sanctuaries and wildlife management areas, municipal protected water supply areas) must be identified.

Sites within the local or regional study area subject to contamination from previous nuclear or non-nuclear industrial activities may require baseline characterization of radionuclide and hazardous substance levels within soil, vegetation and non-human biota.

Field surveys must be described in terms of representativeness of the target populations, the design for allocation of samples in space and time, measurement methods and results.

10.1.5 Aquatic Environment

The EIS must describe the aquatic and wetland species at the site and within the local and regional study areas, including a description of the flora, fauna and their habitat. The proponent should seek from relevant authorities, such as the Department of Fisheries and Oceans and the Ontario Ministry of Natural Resources, any available information on aquatic and wetland species and habitat for the local and regional study areas.

The EIS must provide detailed habitat mapping in order to understand habitat usage by fish within the study area. This information must include depth profiles, substrate mapping, water temperature profiles, and a description of potential and known habitat usage (i.e., nursery, rearing, feeding and migratory) by fish that occur in the study areas.

The EIS must identify any biological species of natural conservation status (e.g., rare, vulnerable, endangered, threatened, and uncommon) at a federal, provincial, regional or local level and their critical habitats.

10.1.6 Ambient Radioactivity

The EIS must describe the ambient radiological conditions at the site and within the local and regional study areas. The EIS must provide information on the existing conditions in this regard, including an inventory of sources, their activity levels, and their origin (natural or anthropogenic), for all environmental media including air, soil, food, water, aquatic sediments, plant and animal tissue in the appropriate subsections of the EIS.

Humans and non-human biota exposed to ambient radioactivity must be assessed for all relevant routes of exposure (both internal and external exposure scenarios). Information on radiation levels to which workers and members of the public are exposed to must be provided. This must also include consideration of consumers of country food whose exposure pathways may differ due to cultural norms, including any dietary characteristics of Aboriginal peoples.

A description of the current radiological monitoring and management programs must be provided.

10.1.7 Climate, Weather Conditions and Air Quality

The EIS must describe the climatic conditions at the site, local and regional study areas. The EIS must also provide a description of seasonal variations in weather conditions within the above-noted study areas, to allow the assessment of effects on the project. Meteorological information provided should include air temperature, relative humidity, precipitation, wind speed and direction, atmospheric pressure, solar radiation, and describe the occurrence of weather phenomena including events such as tornadoes, lightning, temperature inversions and fog. Special consideration must be given in the analysis of extreme and rare meteorological phenomena. Uncertainties should be described and taken into account when discussing the reliability of the information presented.

The influence of regional topography or other features that could affect weather conditions in the study areas must be described.

A description of the ambient air quality in the study areas must be provided, with emphasis on those parameters for which there will be radiological and non-radiological emissions resulting from the project.

10.1.8 Noise

The EIS must describe current ambient noise levels at the site and in the local study areas, and include information on its source(s), geographic extent and temporal variations. The description must also provide ambient noise levels for other areas which could be affected by the project, such as increased traffic along transportation corridors to and from the site during construction. The EIS must describe the anticipated noise levels during all phases of the project. The EIS must provide information on all potential receptors within the local and site study areas, especially residences and sensitive sites such as hospitals, schools, daycares, seniors' residences and places of worship. Baseline sound measurements at representative receptors should be taken and information on both daytime and night time noise levels be provided.

10.2 Socio-economic Conditions

In describing the socio-economic environment, the proponent must provide information on the functioning and health of the socio-economic environment, encompassing a broad

range of matters that affect the people and communities, including Aboriginal communities, in the study area.

10.2.1 Economy

The EIS must describe the general socio-economic conditions at the local and regional study areas. The proponent must describe population and community distribution and density in the regional study area. The description must include the proximity of the project to affected communities, fluctuations in population and population attributes (e.g., age groups, employment).

A description of the local and regional economies must also be provided, including workforce and employment. Information must be provided on the available labour supply and rates of employment in the surrounding communities and region.

10.2.2 Land Use and Value

This EIS must describe land use in the local and regional study areas. The proponent must identify the past, current and planned land use(s) of the study areas. This must include a description of the current and planned operations on the Bruce Nuclear Site and a discussion of existing land-based infrastructure that is likely to be affected by the project, such as sewer and water treatment and distribution systems, wells and waste management areas.

A description of any commercial fisheries that could be affected by the project must be provided.

Estimates of the current and projected value of the recreational and tourist industry (e.g., hunting, fishing, hiking, parks, kayaking, and cottages along the shores of Lake Huron) for the study areas must be provided.

A description of current or of proposed future local, regional or provincial land use or urban development policies, programs and plans must also be provided.

10.2.3 Aboriginal Land, Aquatic Areas and Resource Use

In keeping with the Guiding Principles in Section 2.3 of these Guidelines, the EIS must describe land use at the site and within the local and regional study areas. The proponent should identify the lands, waters and resources of specific social, economic, archaeological, cultural or spiritual value to the Chippewas of Saugeen First Nation, the Chippewas of Nawash Unceded First Nations and any other Aboriginal people, including Métis, that assert Aboriginal rights or title or treaty rights or in relation to which Aboriginal rights or title or treaty rights have been established and that may be affected by the project. The EIS must identify traditional activities, including activities for food, social, ceremonial and other cultural purposes, in relation to such lands, waters and resources with a focus on the current use of lands, waters and resources for traditional purposes. Traditional land use may include areas where traditional activities such as

camping, travel on traditional routes, gathering of country foods (hunting, fishing, trapping, planting and harvesting) activities were carried out. Spiritual sites must also be considered as a traditional use activity of significance to Aboriginal people.

10.2.4 Land Based Transportation

This section of the EIS must describe the existing conditions of the proposed modes and routes of transportation (e.g., provincial highways, arterial highways, on-site access roads) that will be used throughout the development. The EIS must provide information on the existing types and volumes of traffic and a description of the areas through which trucks will travel, in particular residential or school areas.

10.2.5 Navigable Waters

This EIS must identify any navigational use or issues along Lake Huron, or any other waterbodies that may be affected by the project. Information on location (latitude and longitude), width, and depth must be provided, where appropriate.

10.2.6 Human Health

The EIS must describe the current health profiles of the communities likely to be affected by the project. The proponent should examine the aspects of human health that are defined by the World Health Organization, and include consideration of physical health and well-being, and associated emotional, social, cultural, and economic aspects.

The EIS must provide information on population health of the communities in the regional study area. A description of community and public health services available to the residents of communities and to Aboriginal people in the regional study area must also be included.

In keeping with the Guiding Principles in section 2.3 of these guidelines, a discussion on Aboriginal people's health-related traditional activities, including the accessibility to spiritual sites within the regional study area, should be included. Health-related traditional activities could include gathering of country foods for consumption (hunting, fishing, trapping, planting and harvesting of plants for medicinal purposes), and activities of spiritual significance. Information on current consumption of country foods and its quality by food type, amounts consumed, parts consumed (whole body as opposed to a specific organ) by Aboriginal people must be provided where available.

10.2.7 Physical and Cultural Heritage Resources

The EIS must identify any terrestrial and aquatic areas containing features of historical, archaeological, paleontological, architectural or cultural importance. A description of the nature of the features located in those areas must be provided. Particular attention must be given to Aboriginal cultural, archaeological and historical resources since there is documented evidence of the presence of such resources in the study area.

11. EFFECTS PREDICTION, MITIGATION MEASURES AND SIGNIFICANCE OF RESIDUAL EFFECTS

11.1 Effects Prediction

This section must contain a description of any changes in the environment caused by the project, including the effects of these environmental changes on health and socio-economic conditions, physical and cultural heritage, current use of lands and resources for traditional purposes by Aboriginal persons, and any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. Specific attention must be given to interactions between the project and the identified VECs. This section must also include changes to the project caused by the environment. Each environmental change must be described in terms of whether it is direct or indirect and positive or adverse.

The EIS must describe comprehensive analyses of both the short and long term effects of the project on the environment. The proponent must indicate the degree of uncertainty in predicting the environmental effects identified. When numerical models are used (e.g., a hydrogeological model) scientific defensibility must be demonstrated by performing model verification (e.g., peer review of model theory), calibration (e.g., adjusting key parameters to site-specific data), validation (e.g., comparison of predicted to observed), sensitivity and uncertainty analysis.

The proponent is expected to employ standard ecological risk assessment frameworks that categorize the levels of detail and quality of the data required for the assessment. These tiers are as follows:

- Tier 1: Qualitative (Expert opinion, literature review, and existing site information);
- Tier 2: Semi-quantitative (Measured site-specific data and existing site information); and
- Tier 3: Quantitative (Recent field surveys and detailed quantitative methods).

Thus, if the Tier 2 assessment still indicates a potential for effects for valued receptors then a Tier 3 assessment would need to be conducted to reduce the level of uncertainty. If the risk characterization component is uncertain this may necessitate the probabilistic modeling of the population level consequences of the proposed project.

An accepted approach to population-level ecological risk assessment and it use in environmental decision-making has been developed through recent scientific work. This approach includes a determination of when a population-level risk assessment is warranted (Tier 1 and Tier 2 assessments), the consideration of exit criteria, and a determination of the value of the assessment [Reference 9].

The consideration of views from the public and Aboriginal groups, including any perceived changes attributed to the project, should be recognized and addressed in the assessment method.

11.2 Mitigation Measures

Mitigation is the elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means. The proponent must describe general and specific measures intended to mitigate the potentially adverse environmental effects of the project. The proponent must indicate which measures respond directly to statutory or regulatory requirements.

All proposed mitigation must be described by phase, timing and duration. Information must be provided on methods, equipment, procedures and policies associated with the proposed mitigation. The proponent must discuss and evaluate the effectiveness of the proposed measures and assess the risk of mitigation failure and the potential severity of the consequences of such failures. Information must be provided on similar mitigation methods used with similar Projects and the degree of success achieved.

The proponent must indicate what other mitigation measures were considered (including the various components of mitigation) and explain why they were rejected. Trade-offs between cost savings and effectiveness of the various forms of mitigation must be justified. The proponent must identify who is responsible for the implementation of these measures and the system of accountability.

For species at risk defined by the federal *Species at Risk Act*, pursuant to subsection 79(1) of that Act, the Responsible Authority under the *Canadian Environmental Assessment Act* must notify the appropriate federal Minister of any listed wildlife species, its critical habitat or the residences of individuals of that species that may be adversely impacted by the project. Pursuant to subsection 79(2) of the *Species at Risk Act*, if the project is carried out, the Responsible Authority must also ensure that measures are taken to avoid or lessen those effects and to monitor them; these measures must be taken in a way that is consistent with any applicable recovery strategy and action plans. Therefore, the proponent must include information in the EIS that will allow the Responsible Authority to meet this requirement.

Compliance monitoring verifies whether required mitigation measures were implemented. Compliance monitoring on its own does not satisfy the requirements for a follow-up program described in section 16, but serves to track conditions or issues during the project lifespan or at certain times. For each environmental component potentially affected by the project, the EIS must describe any proposed monitoring programs.

11.3 Significance of Residual Effects

The proponent is expected to take all reasonable precautions to protect the environment.

Hence, all reasonable means (e.g., best available technologies, industry best practices) are expected to be used to eliminate or mitigate adverse environmental effects. Any residual effects that persist, despite all mitigative activities, are to be assessed as to their significance.

The EIS must identify the criteria used to assign significance ratings to any predicted adverse effects. The EIS must contain a detailed analysis of the significance of the potential residual adverse environmental effects it predicts. It must contain clear and sufficient information to enable the joint review panel and the public to understand and review the proponent's judgment of the significance of effects. The proponent must define the terms used to describe the level of significance.

The proponent must assess the significance of predicted effects according to the following categories:

- Magnitude of the effect;
- Geographic extent of the effect;
- Timing, duration and frequency of the effect;
- Degree to which effects are reversible or mitigable;
- Ecological and social/cultural context; and
- Probability of occurrence.

In assessing significance against these criteria, the EIS must, where possible, employ relevant existing regulatory documents, environmental standards, guidelines, or objectives such as prescribed maximum levels of emissions or discharges of specific hazardous agents into the environment or maximum acceptable levels of specific hazardous agents in the environment. If the level of an adverse environmental effect is less than the standard, guideline, or objective, it may be not significant.

The EIS must avoid repetition by identifying the potential adverse environmental effects, the proposed mitigation measures and the significance of the effects after mitigation measures have been taken into account, on each VEC, both biophysical and socio-economic, in the same discussion. A summary of the effects, mitigation and significance associated with each VEC should be provided in tabular format to provide clarity and ease of reference.

The EIS must clearly explain the method and definitions used to describe the level of the adverse effect (e.g., low, medium, high) for each of the above categories and how these levels were combined to produce an overall conclusion on the significance of adverse effects for each VEC. This method must be transparent and reproducible.

11.4 Biophysical Environment

11.4.1 Geology and Geomorphology

The EIS must describe the predicted effects on any geological formations and how those effects will be avoided or minimized. Potential effects to be considered must include, but not be limited to, effects on physical stability conditions (including physical strength characteristics), geochemical conditions and thermal regime.

The proponent will discuss how these effects will be monitored, if required.

The EIS must identify potential effects of the project on the environment when bedrock, unconsolidated deposits, soils or sediments are disturbed, and stockpiled, or used for construction purposes. Where the proponent has identified alternative sites for the disposal of waste rock, the EIS must provide sufficient information about the effects of each technically and economically feasible alternative to explain the preferred option.

11.4.2 Surface Water

The EIS must identify and quantify the predicted effects on existing surface waterbodies and wetlands.

11.4.3 Groundwater

The proponent will discuss how the DGR development may affect surrounding groundwater quantity or quality and provide detail on how the effects to groundwater will be avoided or mitigated. Modelling work may be required to predict these effects. All parameter estimates (e.g. precipitation, evaporation, groundwater flows, soil permeability, hydraulic roughness, water balance, etc.) reported by the proponent must include the source of information (either estimates or empirical) and make reference to measurement standards or collection protocols used, assumptions built into the data, and data reporting that includes ranges and confidence estimates for the parameters.

The proponent should justify all parameter choices (base-case values, ranges, statistical distributions) for groundwater flow and solute transport modeling and sensitivity analyses. Describe any monitoring programs, including sampling protocol and monitoring station locations that will be designed to provide information on effects on groundwater quality and quantity.

11.4.4 Terrestrial Environment

For all phases of the project, the EIS must describe the effects of the project on terrestrial fauna and flora and include a full accounting of effects on species of natural conservation status and their habitat. This effects evaluation should be based on results of field monitoring studies and predictions from an ecological risk assessment model. It must be clear how predicted effects to the biota exposed to the project stressor compare to the expected “reference condition” for unexposed biota on a biological population basis taking into account natural variation. Potential effects may include but are not limited to:

- Effect of loss of terrestrial habitat and the quality of lost habitat for relevant species;

- Disturbance of feeding, nesting or breeding habitats;
- Physical barriers to wildlife;
- Disruption, blockage, impediment and sensory disturbance (e.g., noise and light effects) of daily or seasonal wildlife movements (e.g., migration, home ranges, etc.);
- Direct and indirect wildlife mortality;
- Reduction in wildlife productivity; and
- Contaminant concentration of the food chain.

The proponent must describe any proposed monitoring programs that will be designed to provide information on the effects of the project on the terrestrial environment and biota.

11.4.5 Aquatic Environment

The proponent will describe the effects of the project on aquatic fauna and flora, and include a full accounting of effects on species of natural conservation status and their habitat. Potential effects may include but are not limited to:

- Effects on habitat, including aquatic vegetation and sensitive areas such as spawning grounds, nursery areas, winter refuges and migrations corridors;
- Effects on aquatic species, including rare and/or sensitive species;
- Effects of blasting on fish and fish habitat on local aquatic systems; And
- Contaminant concentration of the food chain.

Descriptions of potential effects must include changes to food chain and food web dynamics as a habitat component as this relates to fish populations. Particular attention must be placed on the effects to the existing sport fishing and Aboriginal commercial fishing industry.

The proponent must describe any proposed monitoring programs that will be designed to provide information on the effects of the project on the aquatic environment and biota.

11.4.6 Radiological Conditions

For all phases of the project, the EIS must describe in the appropriate sections any changes to radiation and radioactivity present in the terrestrial and aquatic environments, the atmosphere, and to workers and members of nearby communities as a result of the project. Any mitigation to reduce negative effects and any monitoring programs to monitor effects must also be described.

11.4.7 Atmosphere

The EIS must identify all air emissions including maximum emissions from point source and fugitive releases, including greenhouse gases, expected to be generated during all phases of the project. The proponent must describe how these emissions will

affect the environment and indicate what will be done to avoid or mitigate adverse effects. The EIS must include a comparison of the project's marginal contribution to total national and provincial emissions on an annual basis. The proponent must describe any monitoring programs that will be designed to provide information regarding effects on air quality and the success of mitigation measures employed.

11.4.8 Noise and Vibration

For all phases of the project, the EIS must describe the predicted effects (with rationale) of any change in noise or vibration levels on terrestrial and aquatic species and on workers and nearby residents and communities, The methods to be used to monitor noise and vibration levels must also be described. The proponent must model sound levels during both construction and operation and predicted sound levels must be compared against existing levels. This should include both daytime and night time noise levels and tonal noise.

11.4.9 Effects of the Environment on the Project

The EIS must describe the potential effects that the environment may have on the project. The assessment must take into account how local lake conditions and natural hazards, such as severe weather conditions and external events (e.g. flooding, tornado, fire and seismic events), could adversely affect the project. Longer-term effects of climate change must also be discussed in relation to the long-term performance of the project. Information regarding applicable climate elements must include, but not be limited to:

- An estimate of its importance to the project;
- An estimate of how sensitive the project is to variations of this element;
- A discussion of climate data used; and
- Change in lake level.

The sensitivity of the project to long-term variability and effects must be identified and discussed. The Canadian Environmental Assessment Agency document *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners* [Reference 10] provides guidance for incorporating climate change considerations into an environmental assessment.

11.5 Socio-economic Effects

This section of the EIS must describe the predicted changes to health and socio-economic conditions, physical and cultural heritage, and current use of lands and resources, including those used for traditional purposes by Aboriginal people that result from any changes the project may cause in the environment.

11.5.1 Economy

For all phases of the project, the EIS must describe the expected effects on the regional study area's economy, including effects on employment and economic sectors such as

commercial, retail and recreational sectors. It must also describe what measures are within the proponent's control to avoid or mitigate adverse economic effects.

11.5.2 Land Use and Value

The EIS must describe the predicted effects (with rationale) that the proposed DGR development will have on the existing and planned operation on the Bruce Nuclear Site as well as on other land and water uses, including changes in tourism, aesthetics, education, and recreational opportunities caused by the construction, operation and modification of the project in terms of increased noise levels, lowered air and water quality, alteration or visual and topographic characteristics of the area. Discuss the potential effects on existing structures (e.g., building foundations, wells, etc.) caused by blasting, etc. Discuss plans to conduct a pre-blast survey prior to any blasting activities. Also discuss temporary and permanent restrictions on land use during construction and operation.

For all phases of the project, the EIS must describe the expected effects or pressures on, but not limited to, land use, the housing market (including local and regional residential rental market), property taxes, and property values.

11.5.3 Aboriginal Traditional Land Use

The EIS must identify any change that the project is likely to cause in the environment, and any effect of any such change on the use of lands and resources for traditional purposes by the Chippewas of Saugeen First Nation, the Chippewas of Nawash Unceded First Nations and any other Aboriginal group including, but not limited to, effects to hunting, trapping, fishing and gathering. For each effect, the EIS must specify where possible the particular area that may be affected. The EIS must identify any concerns raised by such Aboriginal people about the project or other past or present means of storing or disposing of nuclear waste, and regarding the cumulative effects of the project in combination with any other over these areas.

11.5.4 Land-based Transportation

For all phases of the project, the EIS must describe the expected effects on transportation infrastructure in the regional study area. The discussion on the predicted effects, (with rationale) to local and regional traffic volumes and road conditions, including provincial highways, arterial highways and on-site access roads, must be provided. Information on the potential effects on the areas, through which trucks will travel, such as residential or school areas, must also be included. The proposed methods for avoiding effects on the existing transportation infrastructure must be described.

11.5.5 Navigable Waters

The EIS will identify potential effects on navigability on Lake Huron and other water bodies that may be affected by the project.

11.5.6 Human Health

The EIS must provide a discussion on the potential effects on the physical, mental, and social well-being of workers, the public and communities.

The information must include, but not be limited to, the following:

- An analysis of the effects of the project on the health and safety of all workers, including the possible effects of any malfunctions or accidents;
- The predicted doses to workers, including doses to contract workers, and to members of the project resulting from activities within the scope of this project;
- A description of quantitative risk assessment modeling conducted, where necessary, for any malfunctions and accidents;
- An assessment of the project's potential effects on human health through sources of contaminants from the project and potential exposure pathways into air and potable water;
- Any potential effects of air emissions associated with the project on human receptors within the project study area, such as health effects of nitrogen oxides, sulphur oxides, VOCs, carbon monoxide, dioxins/furans, metals, hydrogen chloride, and any other emissions from fossil fuel combustion, and explosives use; and
- Any potential effects of project-generated noise on human receptors within the study area.

The effects of the project on local and regional health services and public health infrastructure (water supplies for domestic use and sewage treatment) must also be described.

11.5.7 Physical and Cultural Heritage Resources

If it has been determined that sites of historical, archaeological, paleontological or architectural importance exist, the potential effects of the project on these sites and on any physical and cultural heritage resources that are likely to be affected by the project must be identified and discussed. The proposed measures to preserve, protect or recover these resources must be described.

12. ACCIDENTS, MALFUNCTIONS AND MALEVOLENT ACTS

The proponent must identify and describe the probability of possible malfunctions or accidents associated with the project, and the potential adverse environmental effects of these events. Sufficient quantitative information must be provided on all radioactive and hazardous substances that could be released to the environment in significant quantities.

The description must include the safeguards that have been established by the proponent to protect against such occurrences and the contingency procedures in place. Accident management typically relies heavily on the evacuation of personnel and of the population,

as required. The proponent must demonstrate that the requirements for adequate infrastructure external to the DGR site are met. The need for any necessary administrative measures must also be identified together with the responsibilities of organizations other than the proponent.

The proponent must provide a description of any contingency, clean-up or restoration work in the surrounding environment that would be required during, or immediately following, the postulated malfunctions and accidents.

Early in the conduct of the environmental assessment, the accidents and malfunction scenarios to be considered in the environmental assessment will be subject to review and acceptance by the joint review panel or its technical support staff. Expected scenarios include, but are not limited to, container collapse/failure, and various degrees of barrier loss including total loss of barrier.

The proponent must describe:

- Specific malfunction and accident events that have a reasonable probability of occurring during the life of the project, including an explanation of how these events were identified for the purpose of this environmental assessment;
- Source, quantity, mechanism, rate, form and characteristics of contaminants and other materials (physical, chemical and radiological) likely to be released to the surrounding environment during the postulated malfunctions and accidents and the effect this will have on the environment and health and safety of the nuclear energy worker and the general public; and
- Any contingency, clean-up or restoration work in the surrounding environment that would be required during, immediately following, or in the longer term following the postulated malfunction and accident scenarios.

The EIS must address potential environmental effects that could result from intentional malevolent acts. While intentional malevolent acts are not accidents, the proponent must compare the environmental effects resulting from malevolent acts with the effects identified for accidents and malfunctions involving the DGR.

13 LONG-TERM SAFETY OF THE DGR

13.1 Demonstrating the Long term Safety of the DGR

Demonstrating long-term safety consists of providing reasonable assurance that the proposed DGR will perform in a manner that protects human health and the environment. This demonstration is achieved through the development of a safety case. The safety case includes a safety assessment complemented by additional arguments and evidence in order to provide confidence in the long-term safety of the facility.

The safety assessment is central to the safety case. It involves an analysis to evaluate the

performance of the overall waste disposal facility and its impact on human health and the environment. A long-term safety assessment is generally based on a pathways analysis of contaminant releases, contaminant transport, receptor exposure and potential effects based on a scenario of expected evolution of the disposal facility and the site. Additional information and explanation can be found in CNSC Regulatory Guide G-320, *Assessment the Long Term Safety of Radioactive Waste Management,* CNSC Regulatory Policy P-290, *Managing Radioactive Waste*, and the International Atomic Energy Agency (IAEA) document WS-R-4, *IAEA Safety Standards Geological Disposal of Radioactive Waste, Safety Requirements* [Reference 11].

13.2 Selection of Assessment Scenarios

The first step in conducting a safety assessment is the development of scenarios. A scenario is a postulated or assumed set of future conditions or events to be modeled in an assessment. Long-term assessment scenarios should be sufficiently comprehensive to account for all of the potential future states of the site and the environment. It is common for a safety assessment to include a central scenario of the normal (or expected) evolution of the site and facility with time, and additional scenarios that examine the impacts of disruptive events or modes of containment failure.

A normal evolution scenario should be based on reasonable extrapolation of present-day site features and receptors lifestyles. It should include expected evolution of the site and degradation of the waste disposal system (gradual or total loss of barrier function) as it ages. Disruptive event scenarios postulate the occurrence of low- probability events leading to the possible abnormal degradation and loss of containment. Scenarios should be developed in a systematic, transparent and traceable manner based on current and future conditions of site characteristics, waste properties and receptor characteristics and their lifestyles.

The safety assessment should demonstrate that the set of scenarios developed is credible and comprehensive. Some scenarios may be excluded from the assessment because there is an extremely low likelihood that they would occur or because they would have trivial consequences. The approach and screening criteria used to exclude or include scenarios should be justified and well-documented.

The anticipated evolution of the repository under different scenarios has to be supported by a combination of expert judgment, field data on the past evolution of the site, and also mathematical models that might need to couple chemical, thermal, hydrologic, hydrogeologic and mechanical processes that play key roles in the repository evolution.

13.3 Additional Arguments in the Safety Case

Due to increasing uncertainty as predictions are made far into the future, the long-term safety assessment should also be supported by additional arguments and multiple lines of reasoning such as:

- Use of different safety assessment strategies: for example by using a combination of assessment approaches such as scoping and bounding calculations, deterministic and probabilistic approaches;
- Demonstration of the robustness of the waste disposal system: this entails demonstrating that the waste disposal system will maintain its safety function under extreme conditions, disruptive events or unexpected containment failure. The safety case should illustrate and explain the relative role of the different components of the disposal system that contribute to its overall robustness; and
- Use of complementary safety indicators to doses and environmental concentrations that are usually calculated for comparison with regulatory limits. Other parameters that are illustrative of safety include: waste dissolution rates; groundwater age and travel time; fluxes of contaminants; concentrations of contaminants in specific environmental media (e.g., concentration of radium in groundwater); or changes in toxicity of the waste.

13.4 Confidence in Mathematical Models

The proponent should provide adequate confidence in the mathematical models used to support the safety case. The equations of the mathematical models are usually solved numerically with computer codes. Proper verification of these codes has to be demonstrated, to ensure that the codes adequately solve the equations of the mathematical models. In addition, confidence in the mathematical models can be provided by performing any or all of the following activities:

- Performing independent predictions using entirely different assessment strategies and computer tools;
- Demonstrating consistency amongst the results of the long-term assessment model and complementary scoping and bounding assessments;
- Applying the assessment model to an analog of the waste management system to build confidence through a post-audit of the real data available from an analog; and
- Performing model intercomparison studies of benchmark problems.

In particular, the proponent should justify the choice of solute transport modeling codes to be used and provide supporting information on code verification and validation.

In addition, scientific peer review by publication in open literature and widespread use by the scientific and technical community will add to the confidence in the assessment model.

13.5 Interpretation of Assessment Results and Comparison with Acceptance Criteria

Compliance with the acceptance criteria and with regulatory guidance must be evaluated, and the uncertainties associated with the assessment should be analyzed. Acceptance criteria are the numerical values (regulatory limits) used to judge the results of

assessment model calculations. These acceptance criteria ensure compliance with the *Nuclear Safety and Control Act* and its associated regulations, and by other applicable legislation, including CNSC Regulatory Guide G—320, *"Assessing the Long Terms Safety of Radioactive Waste Management"* and Regulatory Policy P-290, *"Managing Radioactive Waste"*. The principal regulatory limits are the radiological dose and environmental concentrations of hazardous substances, and it is expected that these parameters are calculated in long-term assessments as primary indicators of safety.

Acceptance criteria for a long-term assessment are current regulatory limits, standards, objectives and benchmarks. Adopting a fraction of these acceptance criteria (such as dose constraints or factors of safety) for a long-term assessment provides additional assurance that the uncertainty in the predictions and in future human actions would not result in unreasonable risk in the future. It is expected that the proponent will establish and justify the acceptance criteria adopted for any assessment.

When interpreting the assessment results, the applicant should demonstrate a thorough understanding of the underlying science and engineering principles which are controlling the assessment results. The results of the assessment should be analyzed to show they are consistent with expectations of system performance and with the complete set of assumptions and simplifications used in developing the model(s) and scenarios. Any unexpected assessment results or discrepancies should be investigated and explained.

An uncertainty analysis of the predictions should be performed to identify the sources of uncetainty and determine the effects of these uncertainties on safety (e.g., through sensitivity analysis). This analysis should distinguish between uncertainties arising from uncertainties in site characterization data, in the conceptual site description model, in assumptions of the scenario, and in the mathematics of the assessment model. For the uncertainties which have important impacts on long-term safety, follow-up field and laboratory investigation programs in combination with refinement of mathematical models should be proposed.

14. CUMULATIVE EFFECTS

The proponent must identify and assess the cumulative adverse and beneficial environmental effects of the project in combination with other past, present or reasonably foreseeable projects and/or activities within the study area. The management of decommissioning waste, for example, would be a potential future project that would be included in an assessment of cumulative effects. The approach and methods used to identify and assess cumulative effects must be explained. The *Canadian Environmental Assessment Act* Operational Policy Statement OPS-EPO/2 – 2007, "*Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act*" provides guidance for assessing cumulative effects.

The assessment of cumulative environmental effects of the project must include the following, but may also address other items:

- Identify the VECs, or their indicators, on which the cumulative effects assessment is focused, including the rationale for their selection. Present spatial and temporal boundaries for the cumulative effect assessment for each VEC selected. Emphasize VECs with special environmental sensitivities or where significant risks are involved.
- Identify the sources of potential cumulative effects. Specify other projects or activities that have been or will be carried out that could produce effects on each selected VEC within the boundaries defined, and whose effects would act in combination with the residual effects of the project.
- Evaluate the likelihood of development by the proponent or others that may appear feasible because of the proximity of the project's infrastructure. Limit assessment to cumulative effects on the physical, biological, and human environments that are likely and for which measurable or detectable residual effects are predicted.

A reasonable degree of certainty should exist that proposed projects and activities will actually proceed for them to be included. Projects that are conceptual in nature or limited as to available information may be insufficiently developed to contribute to this assessment in a meaningful manner. In either case, provide a rationale for inclusion or exclusion.

The EIS must describe the analysis of the total cumulative effect on a VEC over the life of the project, which requires knowledge of the incremental contribution of all projects and activities, in addition to that of the project. The EIS must include different forms of effects (e.g., synergistic, additive, induced, spatial or temporal) and identify impact pathways and trends.

Potential effects on a VEC are not necessarily the result of one project. While a Project-specific assessment of cumulative effects is not responsible for assessing all external effects; the effect assessment must consider how a project-specific effect, or suite of project-specific effects, would interact with these external factors. The EIS must make clear the contribution of the project to a total potential cumulative effect, and place potential cumulative project effects in an appropriate regional context; consider regional plans, community conservation plans, species recovery plans, management plans, objectives and/or guidelines need in an integrated manner in order to understand the aspirations of people and communities in the region.

In assessing the cumulative environmental effects of the project in combination with other projects and/or activities, the proponent must identify any changes in the original environmental effects and significance predictions for the project. The proponent must also discuss the effectiveness of the proposed mitigation measures and the response to such changes, as well as the implications for monitoring and follow-up programs as described in section 16.

This section should provide a brief historical overview of the timelines of the construction, commissioning and operating periods of various facilities at the Bruce site,

beginning with the first construction in 1960.

15. CAPACITY OF RENEWABLE RESOURCES

The EIS must describe the effects of the project on the capacity of renewable resources to meet the needs of the present and those of the future. The EIS must identify those resources likely to be significantly impacted by the project, and describe how the project could affect their sustainable use. The EIS must also identify and describe any criteria used in considering sustainable use. Sustainable use may be based on ecological considerations such as integrity, productivity, and carrying capacity.

16. FOLLOW-UP PROGRAM

The proponent must include a framework upon which effects monitoring and follow-up actions will be based throughout the life of the project, should the project proceed.

A follow-up program must be designed to verify the accuracy of the environmental assessment and to determine the effectiveness of the measures implemented to mitigate the adverse environmental effects of the project. The follow-up program must be designed to incorporate pre-project information which would provide the baseline data, compliance data such as established benchmarks, regulatory documents, standards or guidelines, and real time data which would consist of observed data gathered in the field. As part of the follow-up program, the proponent must describe the compliance reporting methods to be used, including reporting frequency, methods and format.

Environmental assessment effects predictions, assumptions and mitigation actions that are to be tested in the follow-up monitoring program must be converted into field-testable monitoring objectives. The monitoring design must include a statistical evaluation of the adequacy of existing baseline data to provide a benchmark against which to test for project effects, and the need for any additional pre-construction or pre-operational monitoring to establish a firmer project baseline.

The proponent must propose a schedule for the follow-up program. The schedule should indicate the frequency and duration of effects monitoring. This schedule would be developed after statistical evaluation of the length of time needed to detect effects given estimated baseline variability, likely environmental effect size and desired level of statistical confidence in the results (Type 1 and Type 2 errors).

The description of the follow-up program must include any contingency procedures/plans or other adaptive management provisions as a means of addressing unforeseen effects or for correcting exceedances, as required, so as to comply/conform to benchmarks, regulatory standards or guidelines.

The follow-up program must describe roles and responsibilities for the program and its review process, by both peers and the public.

The EIS should provide discussion on the need for, and requirements of, a follow-up program, and include:

- The need for such a program and its objectives;
- Tabular summary and explanatory text of the main components of the program including a description of each monitoring activity under that component, which of the three generic program objectives the activity is relevant to (e.g., confirm mitigation or assumptions, verify effect) and the specific statement from environmental assessment that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no adverse effects at the population level for white-tailed deer because of vehicle strikes due to increased traffic within the site study area), as well as the specific monitoring objective for that activity (e.g.. record occurrence of vehicular collisions with deer on-site to verify predicted effects);
- How it would be structured;
- Roles to be played by the proponent, regulatory agencies, Aboriginal people and others in such a program;
- Possible involvement of independent researchers;
- The sources of funding for the program; and
- Information management and reporting.

The follow-up program plan should be described in the EIS in sufficient detail to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them), confirm environmental assessment assumptions and confirm the effectiveness of mitigation.

17. ASSESSMENT SUMMARY AND CONCLUSION

This section of the report must summarize the overall findings with emphasis on the main environmental issues identified.

18. REFERENCES

1. Canadian Privy Council Office. *A Framework for the Application of Precaution in Science-based Decision Making about Risk*. ISBN 0-662-67486-3 Cat. no. CP22-70/2003.
2. Ontario Power Generation, *Deep Geologic Repository for Low and Intermediate Level Radioactive Wastes – Project Description*, OPG, November 2005.
3. CNSC Regulatory Policy P-290, *Managing Radioactive Waste*, Canadian Nuclear Safety Commission, Ottawa, July 2004.
4. CNSC Regulatory Guide G-219, *Decommissioning Planning for Licensed Activities*, Canadian Nuclear Safety Commission, Ottawa, June 2000.
5. CNSC Regulatory Guide G-320, *Assessing the Long Term Safety of Radioactive Waste Management*, Canadian Nuclear Safety Commission, Ottawa, December 2006.
6. CNSC Regulatory Standard S-296, *Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills*, Canadian Nuclear Safety Commission, Ottawa, March 2006.
7. CNSC Regulatory Guide G-296, *Developing Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills*, Canadian Nuclear Safety Commission, Ottawa, March 2006.
8. CEAA Operational Policy Statement OPS-EPO/3- 2007, *Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act*, Ottawa, November 2007.
9. Barnthouse, L.W., W. R. Munns Jr. and M. T. Sorensen. 2008. "Population-Level Ecological Risk Assessment". CRC Taylor and Francis, NY. Society of Environmental Toxicology and Chemistry.
10. CEAA Procedural Guide, *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners*, prepared by: The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, November 2003.
11. International Atomic Energy Agency, *IAEA Safety Standards Geological Disposal of Radioactive Waste, Safety Requirements No. WS-R-4*.

APPENDIX 1

Glossary and Acronyms

Aboriginal Rights mean those rights of Aboriginal peoples which are not found in treaties or land claims agreements.

Aboriginal Title means the form of land ownership belonging to Aboriginal people and the rights coming from the aboriginal relationship with land.

Aboriginal Traditional Knowledge (ATK) means knowledge that is held by, and unique to Aboriginal peoples. It is a living body of knowledge that is cumulative and dynamic and adapted over time to reflect changes in the social, economic, environmental, spiritual and political spheres of the Aboriginal knowledge holders. It often includes knowledge about the land and its resources, spiritual beliefs, language, mythology, culture, laws, customs and medicines. It may be considered in the environmental assessment of a proposed project. The term traditional ecological knowledge (TEK) is often used interchangeably with the term Aboriginal traditional knowledge (see, ATK). However, TEK is generally considered to be a subset of ATK that is primarily concerned with knowledge about the environment.

Aquatic Environment means the components related to, living in, or located in or on water or the beds or shores of a water body, including but not limited to all organic and inorganic matter, and living organisms and their habitat, including fish habitat, and their interacting natural systems.

Bounding Assessment means an assessment designed to provide limiting or worst-case predictions, based on simplification of the processes being simulated or the use of data limits (such as maximum possible precipitation, or thermodynamic solubility limits).

CEAA means the Canadian Environmental Assessment Agency.

CNSC means Canadian Nuclear Safety Commission.

Country Food means a diet of local meat and fish and wild plants gained through subsistence harvest.

DGR means deep geologic repository.

Ecological Risk Assessment means the process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors. This definition recognizes that a risk does not exist unless: (1) the stressor has an inherent ability to cause adverse effects, and (2) it is coincident with or in contact with the ecological component long enough and at sufficient intensity to elicit the identified adverse effect(s).

EIS means environmental impact statement.

Environmental Assessment means a process for identifying project and environment interactions, predicting environmental effects, identifying mitigation measures,

evaluating significance, reporting and following-up to verify accuracy and effectiveness. Environmental assessment is used as a planning tool to help guide decision making, as well as project design and implementation.

Environmental Effect means as defined in the *Canadian Environmental Assessment Act*.

Hazardous Substance means a substance, other than a nuclear substance, that is used or produced in the course of carrying on a licensed activity and that may pose a risk to the environment or the health and safety of persons.

Institutional Control means the control of residual risks at a site after it has been decommissioned. Institutional controls can include active measures (requiring activities on the site such as water treatment, monitoring, surveillance and maintenance) and passive measures (that do not require activities on the site, such as land use restrictions, markers, etc.).

Joint Review Panel means a review panel appointed pursuant to the *Canadian Environmental Assessment Act.*

Long Term means in radioactive waste disposal, any period of time after active institutional controls can be expected to cease.

OPG means Ontario Power Generation.

Project means the proposal to construct and operate a deep geologic repository (DGR) to store low and intermediate level radioactive waste.

Proponent means Ontario Power Generation.

Radioactive Waste means any material (liquid, gaseous, or solid) that contains a radioactive "nuclear substance," as defined in section 2 of the *Nuclear Safety and Control Act*, and which the owner has declared to be waste.

Safety Case means an integrated collection of arguments and evidence to demonstrate the safety of a facility. This will normally include a safety assessment, but could also typically include information (including supporting evidence and reasoning) on the robustness and reliability of the safety assessment and the assumptions made therein.

Scenario means a postulated or assumed set of conditions or events. They are most commonly used in analysis or assessment to represent possible future conditions or events to be modeled, such as possible accidents at a nuclear facility, or the possible future evolution of a repository and its surroundings.

Species at Risk means as defined in the federal *Species at Risk Act.*

Terrestrial Environment means the components related to, living on, or located on the Earth's land areas, including but not limited to all organic and inorganic matter, living organisms and their habitat, and their interacting natural systems.

Treaty Rights means rights arising from the terms of a treaty

Valued Ecosystem Component (VEC) means the environmental element of an ecosystem that is identified as having scientific, social, cultural, economic, historical, archaeological or aesthetic importance.

Western Waste Management Facility means the existing interim facility located on the Bruce Nuclear Site to store low and intermediate level radioactive waste.

APPENDIX 2

***General Nuclear Safety and Control Regulations* and the**
***Class I Nuclear Facilities Regulations* of the**
Nuclear Safety and Control Act

Registration
SOR/2000-202 31 May, 2000

NUCLEAR SAFETY AND CONTROL ACT

General Nuclear Safety and Control Regulations

P.C. 2000-782 31 May, 2000

Her Excellency the Governor General in Council, on the recommendation of the Minister of Natural Resources, pursuant to section 44 of the *Nuclear Safety and Control Act*[a], hereby approves the annexed *General Nuclear Safety and Control Regulations* made by the Canadian Nuclear Safety Commission on May 31, 2000.

Enregistrement
DORS/2000-202 31 mai 2000

LOI SUR LA SÛRETÉ ET LA RÉGLEMENTATION NUCLÉAIRES

Règlement général sur la sûreté et la réglementation nucléaires

C.P. 2000-782 31 mai 2000

Sur recommandation du ministre des Ressources naturelles et en vertu de l'article 44 de la *Loi sur la sûreté et la réglementation nucléaires*[a], Son Excellence la Gouverneure générale en conseil agrée le *Règlement général sur la sûreté et la réglementation nucléaires*, ci-après, pris le 31 mai 2000 par la Commission canadienne de sûreté nucléaire.

[a] S.C. 1997, c. 9

[a] L.C. 1997, ch. 9

CANADIAN NUCLEAR SAFETY COMMISSION

GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS

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GENERAL NUCLEAR SAFETY AND CONTROL REGULATIONS

INTERPRETATION AND APPLICATION

Interpretation

1. The definitions in this section apply in these Regulations.

"Act" means the *Nuclear Safety and Control Act*. (*Loi*)

"brachytherapy machine" means a device that is designed to place, by remote control, a sealed source inside or in contact with a person for therapeutic purposes. (*appareil de curiethérapie*)

"effective dose" has the meaning assigned to that term by subsection 1(1) of the *Radiation Protection Regulations*. (*dose efficace*)

"equivalent dose" has the meaning assigned to that term by subsection 1(1) of the *Radiation Protection Regulations*. (*dose équivalente*)

"hazardous substance" or "hazardous waste" means a substance or waste, other than a nuclear substance, that is used or produced in the course of carrying on a licensed activity and that may pose a risk to the environment or the health and safety of persons. (*substance dangereuse ou déchet dangereux*)

"IAEA" means the International Atomic Energy Agency. (*AIEA*)

"*IAEA Agreement*" means the *Agreement between the Government of Canada and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-proliferation of Nuclear Weapons*, effective on February 21, 1972; INFCIRC/164; UNTS vol. 814, R. No. 11596. (*Accord avec l'AIEA*)

"irradiator" means a device that is designed to contain a nuclear substance and to deliver controlled doses of radiation to any target material except persons. (*irradiateur*)

"licensed activity" means an activity described in any of paragraphs 26(*a*) to (*f*) of the Act that a licence authorizes the licensee to carry on. (*activité autorisée*)

"licensee" means a person who is licensed to carry on an activity described in any of paragraphs 26(*a*) to (*f*) of the Act. (*titulaire de permis*)

"prescribed equipment" means the equipment prescribed by section 20. (*équipement réglementé*)

"prescribed information" means the information prescribed by section 21. (*renseignements réglementés*)

"radioactive source teletherapy machine" means a teletherapy machine that is designed to deliver doses of radiation produced by a nuclear substance. (*appareil de téléthérapie à source radioactive*)

"safeguards" means a verification system that is established in accordance with a safeguards agreement. (*garanties*)

"safeguards agreement" means

(*a*) the *IAEA Agreement* and any arrangement between Canada and the IAEA made under that agreement; and

(*b*) any agreement to which Canada is a party for the establishment in Canada of a verification system in respect of nuclear substances, prescribed equipment or prescribed information, and any arrangements made under such an agreement. (*accord relatif aux garanties*)

"safeguards equipment" means equipment that is used in accordance with a safeguards agreement. (*équipement de garanties*)

RÈGLEMENT GÉNÉRAL SUR LA SÛRETÉ ET LA RÉGLEMENTATION NUCLÉAIRES

DÉFINITIONS ET CHAMP D'APPLICATION

Définitions

1. Les définitions qui suivent s'appliquent au présent règlement.

« *Accord avec l'AIEA* » L'*Accord entre le Gouvernement du Canada et l'Agence internationale de l'énergie atomique relatif à l'application de garanties dans le cadre du Traité sur la non-prolifération des armes nucléaires*, entré en vigueur le 21 février 1972; INFCIRC/164; UNTS vol. 814, R. n° 11596. (*IAEA Agreement*)

« accord relatif aux garanties »

a) L'*Accord avec l'AIEA*, ainsi que tout arrangement conclu entre le Canada et l'AIEA dans le cadre de cet accord;

b) toute entente à laquelle le Canada est partie et qui concerne la mise en oeuvre au Canada d'un système de vérification visant des substances nucléaires, de l'équipement réglementé ou des renseignements réglementés, de même que tout arrangement conclu dans le cadre d'une telle entente. (*safeguards agreement*)

« activité autorisée » Activité visée à l'un des alinéas 26*a*) à *f*) de la Loi que le titulaire de permis est autorisé à exercer. (*licensed activity*)

« AIEA » L'Agence internationale de l'énergie atomique. (*IAEA*)

« appareil de curiethérapie » Appareil conçu pour placer par télécommande une source scellée dans ou sur le corps humain à des fins thérapeutiques. (*brachytherapy machine*)

« appareil de téléthérapie » Appareil conçu pour administrer, à des fins thérapeutiques, des doses contrôlées de rayonnement dans un faisceau aux dimensions délimitées. (*teletherapy machine*)

« appareil de téléthérapie à source radioactive » Appareil de téléthérapie conçu pour administrer des doses de rayonnement produites par une substance nucléaire. (*radioactive source teletherapy machine*)

« dose efficace » S'entend au sens du paragraphe 1(1) du *Règlement sur la radioprotection*. (*effective dose*)

« dose équivalente » S'entend au sens du paragraphe 1(1) du *Règlement sur la radioprotection*. (*equivalent dose*)

« équipement de garanties » Équipement utilisé conformément à un accord relatif aux garanties. (*safeguards equipment*)

« équipement réglementé » Équipement visé à l'article 20. (*prescribed equipment*)

« garanties » Système de vérification établi en vertu de l'accord relatif aux garanties. (*safeguards*)

« irradiateur » Appareil conçu pour contenir une substance nucléaire et administrer des doses contrôlées de rayonnement à des cibles non humaines. (*irradiator*)

« Loi » La *Loi sur la sûreté et la réglementation nucléaires*. (*Act*)

« renseignements réglementés » Renseignements visés à l'article 21. (*prescribed information*)

« substance dangereuse » ou « déchet dangereux » Substance ou déchet, autre qu'une substance nucléaire, qui est utilisé ou produit au cours d'une activité autorisée et qui peut présenter un danger pour l'environnement ou pour la santé et la sécurité des personnes. (*hazardous substance or hazardous waste*)

« titulaire de permis » Personne autorisée par permis à exercer toute activité visée à l'un des alinéas 26*a*) à *f*) de la Loi. (*licensee*)

"teletherapy machine" means a device that is designed to deliver controlled doses of radiation in a collimated beam for therapeutic purposes. (*appareil de téléthérapie*)

"transit" means the process of being transported through Canada after being imported into and before being exported from Canada, in a situation where the place of initial loading and the final destination are outside Canada. (*transit*)

"worker" means a person who performs work that is referred to in a licence. (*travailleur*)

Application

2. These Regulations apply generally for the purposes of the Act.

LICENCES

General Application Requirements

3. (1) An application for a licence shall contain the following information:

(*a*) the applicant's name and business address;

(*b*) the activity to be licensed and its purpose;

(*c*) the name, maximum quantity and form of any nuclear substance to be encompassed by the licence;

(*d*) a description of any nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence;

(*e*) the proposed measures to ensure compliance with the *Radiation Protection Regulations* and the *Nuclear Security Regulations*;

(*f*) any proposed action level for the purpose of section 6 of the *Radiation Protection Regulations*;

(*g*) the proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information;

(*h*) the proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information;

(*i*) a description and the results of any test, analysis or calculation performed to substantiate the information included in the application;

(*j*) the name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored, managed, processed or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste;

(*k*) the applicant's organizational management structure insofar as it may bear on the applicant's compliance with the Act and the regulations made under the Act, including the internal allocation of functions, responsibilities and authority;

(*l*) a description of any proposed financial guarantee relating to the activity to be licensed;

(*m*) any other information required by the Act or the regulations made under the Act for the activity to be licensed and the nuclear substance, nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence; and

(*n*) at the request of the Commission, any other information that is necessary to enable the Commission to determine whether the applicant

« transit » Transport via le Canada après l'importation et avant l'exportation, lorsque le point de chargement initial et la destination finale sont à l'étranger. (*transit*)

« travailleur » Personne qui effectue un travail mentionné dans un permis. (*worker*)

Champ d'application

2. Le présent règlement s'applique de façon générale aux fins de la Loi.

PERMIS

Dispositions générales

3. (1) La demande de permis comprend les renseignements suivants :

a) le nom et l'adresse d'affaires du demandeur;

b) la nature et l'objet de l'activité visée par la demande;

c) le nom, la quantité maximale et la forme des substances nucléaires visées par la demande;

d) une description de l'installation nucléaire, de l'équipement réglementé ou des renseignements réglementés visés par la demande;

e) les mesures proposées pour assurer l'observation du *Règlement sur la radioprotection* et du *Règlement sur la sécurité nucléaire*;

f) tout seuil d'intervention proposé pour l'application de l'article 6 du *Règlement sur la radioprotection*;

g) les mesures proposées pour contrôler l'accès aux lieux où se déroulera l'activité visée par la demande et se trouvent les substances nucléaires, l'équipement réglementé ou les renseignements réglementés;

h) les mesures proposées pour éviter l'utilisation, la possession ou l'enlèvement illégaux ou la perte des substances nucléaires, de l'équipement réglementé ou des renseignements réglementés;

i) une description et les résultats des épreuves, analyses ou calculs effectués pour corroborer les renseignements compris dans la demande;

j) le nom, la quantité, la forme, l'origine et le volume des déchets radioactifs ou des déchets dangereux que l'activité visée par la demande peut produire, y compris les déchets qui peuvent être stockés provisoirement ou en permanence, gérés, traités, évacués ou éliminés sur les lieux de l'activité, et la méthode proposée pour les gérer et les stocker en permanence, les évacuer ou les éliminer;

k) la structure de gestion du demandeur dans la mesure où elle peut influer sur l'observation de la Loi et de ses règlements, y compris la répartition interne des fonctions, des responsabilités et des pouvoirs;

l) une description de la garantie financière proposée pour l'activité visée par la demande;

m) tout autre renseignement exigé par la Loi ou ses règlements relativement à l'activité, aux substances nucléaires, aux installations nucléaires, à l'équipement réglementé ou aux renseignements réglementés visés par la demande;

(i) is qualified to carry on the activity to be licensed, or

(ii) will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

(2) Subsection (1) does not apply in respect of an application for a licence to import or export for which the information requirements are prescribed by the *Nuclear Non-Proliferation Import and Export Control Regulations*, or in respect of an application for a licence to transport while in transit for which the information requirements are prescribed by the *Packaging and Transport of Nuclear Substances Regulations*.

Application for Licence to Abandon

4. An application for a licence to abandon a nuclear substance, a nuclear facility, prescribed equipment or prescribed information shall contain the following information in addition to the information required by section 3:

(*a*) the name and location of the land, buildings, structures, components and equipment that are to be abandoned;

(*b*) the proposed time and location of the abandonment;

(*c*) the proposed method of and procedure for abandonment; and

(*d*) the effects on the environment and the health and safety of persons that may result from the abandonment, and the measures that will be taken to prevent or mitigate those effects.

Application for Renewal of Licence

5. An application for the renewal of a licence shall contain

(*a*) the information required to be contained in an application for that licence by the applicable regulations made under the Act; and

(*b*) a statement identifying the changes in the information that was previously submitted.

Application for Amendment, Revocation or Replacement of Licence

6. An application for the amendment, revocation or replacement of a licence shall contain the following information:

(*a*) a description of the amendment, revocation or replacement and of the measures that will be taken and the methods and procedures that will be used to implement it;

(*b*) a statement identifying the changes in the information contained in the most recent application for the licence;

(*c*) a description of the nuclear substances, land, areas, buildings, structures, components, equipment and systems that will be affected by the amendment, revocation or replacement and of the manner in which they will be affected; and

(*d*) the proposed starting date and the expected completion date of any modification encompassed by the application.

Incorporation of Material in Application

7. An application for a licence or for the renewal, suspension in whole or in part, amendment, revocation or replacement of a licence may incorporate by reference any information that is included in a valid, expired or revoked licence.

n) sur demande de la Commission, tout autre renseignement dont celle-ci a besoin pour déterminer si le demandeur :

(i) est compétent pour exercer l'activité visée par la demande,

(ii) prendra, dans le cadre de l'activité, les mesures voulues pour préserver la santé et la sécurité des personnes, protéger l'environnement, maintenir la sécurité nationale et respecter les obligations internationales que le Canada a assumées.

(2) Le paragraphe (1) ne s'applique pas à la demande de permis d'importation ou d'exportation pour laquelle les renseignements exigés sont prévus par le *Règlement sur le contrôle de l'importation et de l'exportation aux fins de la non-prolifération nucléaire*, ou à la demande de permis de transit pour laquelle les renseignements exigés sont prévus par le *Règlement sur l'emballage et le transport des substances nucléaires*.

Demande de permis d'abandon

4. La demande de permis pour abandonner des substances nucléaires, des installations nucléaires, de l'équipement réglementé ou des renseignements réglementés comprend les renseignements suivants, outre ceux exigés à l'article 3 :

a) le nom et l'emplacement des terrains, des bâtiments, des structures, des composants et de l'équipement visés par la demande;

b) la date et le lieu proposés de l'abandon;

c) la méthode et les procédures d'abandon proposées;

d) les effets que l'abandon peut avoir sur l'environnement ainsi que sur la santé et la sécurité des personnes, de même que les mesures qui seront prises pour éviter ou atténuer ces effets.

Demande de renouvellement de permis

5. La demande de renouvellement d'un permis comprend :

a) les renseignements que doit comprendre la demande pour un tel permis aux termes des règlements applicables pris en vertu de la Loi;

b) un énoncé des changements apportés aux renseignements soumis antérieurement.

Demande de modification, de révocation ou de remplacement de permis

6. La demande de modification, de révocation ou de remplacement d'un permis comprend les renseignements suivants :

a) une description de la modification, de la révocation ou du remplacement, de même que les mesures qui seront prises et les méthodes et les procédures qui seront utilisées pour ce faire;

b) un énoncé des changements apportés aux renseignements contenus dans la demande de permis la plus récente;

c) une description des substances nucléaires, des terrains, des zones, des bâtiments, des structures, des composants, de l'équipement et des systèmes qui seront touchés, et de la façon dont ils le seront;

d) les dates de début et de fin proposées pour toute modification visée par la demande.

Incorporation de renseignements dans la demande

7. La demande de permis ou la demande de renouvellement, de suspension en tout ou en partie, de modification, de révocation ou de remplacement d'un permis peut incorporer par renvoi les renseignements compris dans un permis valide, expiré ou révoqué.

Renewal, Suspension, Amendment, Revocation or Replacement of Licence on Commission's Own Motion

8. (1) For the purpose of section 25 of the Act, the Commission may renew a licence on its own motion if failure to renew the licence could pose an unreasonable risk to the environment, the health and safety of persons or national security.

(2) For the purpose of section 25 of the Act, the Commission may, on its own motion, suspend in whole or in part, amend, revoke or replace a licence under any of the following conditions:

(*a*) the licensee is not qualified to carry on the licensed activity;

(*b*) the licensed activity poses an unreasonable risk to the environment, the health and safety of persons or the maintenance of security;

(*c*) the licensee has failed to comply with the Act, the regulations made under the Act or the licence;

(*d*) the licensee has been convicted of an offence under the Act;

(*e*) a record referred to in the licence has been modified in a manner not permitted by the licence;

(*f*) the licensee no longer carries on the licensed activity;

(*g*) the licensee has not paid the licence fee prescribed by the *Cost Recovery Fees Regulations*; or

(*h*) failure to do so could pose an unreasonable risk to the environment, the health and safety of persons or national security.

Renouvellement, suspension, modification, révocation ou remplacement de permis par la Commission

8. (1) Pour l'application de l'article 25 de la Loi, la Commission peut, de sa propre initiative, renouveler un permis si le non-renouvellement pourrait créer un danger inacceptable pour l'environnement, la santé et la sécurité des personnes ou la sécurité nationale.

(2) Pour l'application de l'article 25 de la Loi, la Commission peut, de sa propre initiative, suspendre en tout ou en partie, modifier, révoquer ou remplacer un permis dans les cas suivants :

a) le titulaire de permis n'est pas compétent pour exercer l'activité autorisée;

b) l'activité autorisée crée un danger inacceptable pour l'environnement, la santé et la sécurité des personnes ou le maintien de la sécurité;

c) le titulaire de permis ne s'est pas conformé à la Loi, à ses règlements ou au permis;

d) le titulaire de permis a été reconnu coupable d'une infraction à la Loi;

e) un document mentionné dans le permis a été modifié d'une façon non autorisée par celui-ci;

f) le titulaire de permis n'exerce plus l'activité autorisée;

g) le titulaire de permis n'a pas versé les droits prévus pour le permis dans le *Règlement sur les droits pour le recouvrement des coûts*;

h) le fait de ne pas suspendre, modifier, révoquer ou remplacer le permis pourrait créer un danger inacceptable pour l'environnement, la santé et la sécurité des personnes ou la sécurité nationale.

EXEMPTIONS

Exemptions from Licence Requirement for Inspectors, Designated Officers and Peace Officers

9. (1) An inspector, a designated officer or a peace officer may carry on any of the following activities without a licence to carry on that activity if the activity is carried on by that person to enforce the Act or the regulations made under the Act:

(*a*) possess, transfer, transport or store a nuclear substance; and

(*b*) possess or transfer prescribed equipment or prescribed information.

(2) An inspector or a designated officer may service prescribed equipment without a licence to carry on that activity if the servicing is carried on by that person to enforce the Act or the regulations made under the Act.

(3) For greater certainty, the exemptions established in subsections (1) and (2) relate only to the activities specified in those subsections and do not derogate from the licence requirement imposed by section 26 of the Act in relation to other activities.

(4) Every person who carries on an activity without a licence in accordance with subsection (1) or (2) shall immediately notify the Commission of that fact.

EXEMPTIONS

Exemptions de permis pour l'inspecteur, le fonctionnaire désigné et l'agent de la paix

9. (1) L'inspecteur, le fonctionnaire désigné ou l'agent de la paix peut, sans y être autorisé par un permis, exercer les activités suivantes s'il le fait en vue de faire appliquer la Loi ou ses règlements :

a) avoir en sa possession, transférer, transporter ou stocker provisoirement une substance nucléaire;

b) avoir en sa possession ou transférer de l'équipement réglementé ou des renseignements réglementés.

(2) L'inspecteur ou le fonctionnaire désigné peut, sans y être autorisé par un permis, entretenir de l'équipement réglementé s'il le fait en vue de faire appliquer la Loi ou ses règlements.

(3) Il demeure entendu que les exemptions prévues aux paragraphes (1) et (2) ne visent que les activités qui y sont spécifiées et n'écartent pas l'obligation prévue à l'article 26 de la Loi d'obtenir un permis ou une licence pour exercer d'autres activités.

(4) La personne qui exerce une activité sans y être autorisée par un permis aux termes des paragraphes (1) ou (2) en avise immédiatement la Commission.

Exemption of Naturally Occurring Nuclear Substances

10. Naturally occurring nuclear substances, other than those that are or have been associated with the development, production or use of nuclear energy, are exempt from the application of all provisions of the Act and the regulations made under the Act except the following:

Exemption des substances nucléaires naturelles

10. Les substances nucléaires naturelles, autres que celles qui ont été ou sont associées au développement, à la production ou à l'utilisation de l'énergie nucléaire, sont exemptées de l'application de la Loi et de ses règlements à l'exception :

(*a*) the provisions that govern the transport of nuclear substances; and

(*b*) in the case of a nuclear substance listed in the schedule to the *Nuclear Non-proliferation Import and Export Control Regulations*, the provisions that govern the import and export of nuclear substances.

Exemption by the Commission

11. For the purpose of section 7 of the Act, the Commission may grant an exemption if doing so will not

(*a*) pose an unreasonable risk to the environment or the health and safety of persons;

(*b*) pose an unreasonable risk to national security; or

(*c*) result in a failure to achieve conformity with measures of control and international obligations to which Canada has agreed.

OBLIGATIONS

Obligations of Licensees

12. (1) Every licensee shall

(*a*) ensure the presence of a sufficient number of qualified workers to carry on the licensed activity safely and in accordance with the Act, the regulations made under the Act and the licence;

(*b*) train the workers to carry on the licensed activity in accordance with the Act, the regulations made under the Act and the licence;

(*c*) take all reasonable precautions to protect the environment and the health and safety of persons and to maintain security;

(*d*) provide the devices required by the Act, the regulations made under the Act and the licence and maintain them within the manufacturer's specifications;

(*e*) require that every person at the site of the licensed activity use equipment, devices, clothing and procedures in accordance with the Act, the regulations made under the Act and the licence;

(*f*) take all reasonable precautions to control the release of radioactive nuclear substances or hazardous substances within the site of the licensed activity and into the environment as a result of the licensed activity;

(*g*) implement measures for alerting the licensee to the illegal use or removal of a nuclear substance, prescribed equipment or prescribed information, or the illegal use of a nuclear facility;

(*h*) implement measures for alerting the licensee to acts of sabotage or attempted sabotage anywhere at the site of the licensed activity;

(*i*) take all necessary measures to facilitate Canada's compliance with any applicable safeguards agreement;

(*j*) instruct the workers on the physical security program at the site of the licensed activity and on their obligations under that program; and

(*k*) keep a copy of the Act and the regulations made under the Act that apply to the licensed activity readily available for consultation by the workers.

(2) Every licensee who receives a request from the Commission or a person who is authorized by the Commission for the purpose of this subsection, to conduct a test, analysis, inventory

a) des dispositions régissant le transport des substances nucléaires;

b) des dispositions régissant l'importation et l'exportation des substances nucléaires, dans le cas des substances nucléaires qui figurent à l'annexe du *Règlement sur le contrôle de l'importation et de l'exportation aux fins de la non-prolifération nucléaire*.

Exemption par la Commission

11. Pour l'application de l'article 7 de la Loi, la Commission peut accorder une exemption si cela :

a) ne crée pas de danger inacceptable pour l'environnement ou la santé et la sécurité des personnes;

b) ne crée pas de danger inacceptable pour la sécurité nationale;

c) n'entraîne pas la non-conformité avec les mesures de contrôle et les obligations internationales que le Canada a assumées.

OBLIGATIONS

Obligations du titulaire de permis

12. (1) Le titulaire de permis :

a) veille à ce qu'il y ait suffisamment de travailleurs qualifiés pour exercer l'activité autorisée en toute sécurité et conformément à la Loi, à ses règlements et au permis;

b) forme les travailleurs pour qu'ils exercent l'activité autorisée conformément à la Loi, à ses règlements et au permis;

c) prend toutes les précautions raisonnables pour protéger l'environnement, préserver la santé et la sécurité des personnes et maintenir la sécurité;

d) fournit les appareils exigés par la Loi, ses règlements et le permis et les entretient conformément aux spécifications du fabricant;

e) exige de toute personne se trouvant sur les lieux de l'activité autorisée qu'elle utilise l'équipement, les appareils et les vêtements et qu'elle suive les procédures conformément à la Loi, à ses règlements et au permis;

f) prend toutes les précautions raisonnables pour contrôler le rejet de substances nucléaires radioactives ou de substances dangereuses que l'activité autorisée peut entraîner là où elle est exercée et dans l'environnement;

g) met en oeuvre des mesures pour être alerté en cas d'utilisation ou d'enlèvement illégal d'une substance nucléaire, d'équipement réglementé ou de renseignements réglementés, ou d'utilisation illégale d'une installation nucléaire;

h) met en oeuvre des mesures pour être alerté en cas d'acte ou de tentative de sabotage sur les lieux de l'activité autorisée;

i) prend toutes les mesures nécessaires pour aider le Canada à respecter tout accord relatif aux garanties qui s'applique;

j) donne aux travailleurs de la formation sur le programme de sécurité matérielle sur les lieux de l'activité autorisée et sur leurs obligations aux termes du programme;

k) conserve un exemplaire de la Loi et de ses règlements applicables à l'activité autorisée à un endroit où les travailleurs peuvent les consulter facilement.

(2) Le titulaire de permis qui reçoit une demande de la Commission ou d'une personne autorisée par elle à agir en son nom pour l'application du présent paragraphe, le priant d'effectuer une

or inspection in respect of the licensed activity or to review or to modify a design, to modify equipment, to modify procedures or to install a new system or new equipment shall file, within the time specified in the request, a report with the Commission that contains the following information:

(*a*) confirmation that the request will or will not be carried out or will be carried out in part;

(*b*) any action that the licensee has taken to carry out the request or any part of it;

(*c*) any reasons why the request or any part of it will not be carried out;

(*d*) any proposed alternative means to achieve the objectives of the request; and

(*e*) any proposed alternative period within which the licensee proposes to carry out the request.

Transfers

13. No licensee shall transfer a nuclear substance, prescribed equipment or prescribed information to a person who does not hold the licence, if any, that is required to possess the nuclear substance, prescribed equipment or prescribed information by the Act and the regulations made under the Act.

Notice of Licence

14. (1) Every licensee other than a licensee who is conducting field operations shall post, at the location specified in the licence or, if no location is specified in the licence, in a conspicuous place at the site of the licensed activity,

(*a*) a copy of the licence, with or without the licence number, and a notice indicating the place where any record referred to in the licence may be consulted; or

(*b*) a notice containing

(i) the name of the licensee,

(ii) a description of the licensed activity,

(iii) a description of the nuclear substance, nuclear facility or prescribed equipment encompassed by the licence, and

(iv) a statement of the location of the licence and any record referred to in it.

(2) Every licensee who is conducting field operations shall keep a copy of the licence at the place where the field operations are being conducted.

(3) Subsections (1) and (2) do not apply to a licensee in respect of

(*a*) a licence to import or export a nuclear substance, prescribed equipment or prescribed information;

(*b*) a licence to transport a nuclear substance; or

(*c*) a licence to abandon a nuclear substance, a nuclear facility, prescribed equipment or prescribed information.

Representatives of Applicants and Licensees

15. Every applicant for a licence and every licensee shall notify the Commission of

(*a*) the persons who have authority to act for them in their dealings with the Commission;

(*b*) the names and position titles of the persons who are responsible for the management and control of the licensed activity

épreuve, une analyse, un inventaire ou une inspection relativement à l'activité autorisée, d'examiner ou de modifier une conception, de modifier de l'équipement, de modifier des procédures ou d'installer un nouveau système ou équipement, dépose auprès de la Commission, dans le délai mentionné dans la demande, un rapport qui comprend les renseignements suivants :

a) la confirmation qu'il donnera suite ou non à la demande en tout ou en partie;

b) les mesures qu'il a prises pour donner suite à la demande en tout ou en partie;

c) tout motif pour lequel il ne donnera pas suite à la demande en tout ou en partie;

d) toute mesure de rechange proposée pour atteindre les objectifs de la demande;

e) tout autre délai proposé pour donner suite à la demande.

Transferts

13. Il est interdit au titulaire de permis de transférer une substance nucléaire, de l'équipement réglementé ou des renseignements réglementés à une personne qui ne détient pas le permis requis, le cas échéant, par la Loi et ses règlements pour avoir en sa possession la substance, l'équipement ou les renseignements.

Avis de permis

14. (1) Sauf lorsqu'il mène des opérations sur le terrain, le titulaire de permis affiche à l'endroit spécifié dans le permis ou, à défaut, dans un endroit bien en évidence sur les lieux de l'activité autorisée :

a) une copie du permis, avec ou sans son numéro, et un avis indiquant l'endroit où tout document mentionné dans le permis peut être consulté;

b) un avis sur lequel figurent :

(i) le nom du titulaire de permis,

(ii) une description de l'activité autorisée,

(iii) une description de la substance nucléaire, de l'installation nucléaire ou de l'équipement réglementé visés par le permis,

(iv) une mention de l'endroit où peuvent être consultés le permis et les documents qui y sont mentionnés.

(2) Le titulaire de permis qui mène des opérations sur le terrain y conserve une copie du permis.

(3) Les paragraphes (1) et (2) ne s'appliquent pas au titulaire d'un permis :

a) d'importation ou d'exportation d'une substance nucléaire, d'équipement réglementé ou de renseignements réglementés;

b) de transport d'une substance nucléaire;

c) d'abandon d'une substance nucléaire, d'une installation nucléaire, d'équipement réglementé ou de renseignements réglementés.

Mandataires du demandeur et du titulaire de permis

15. Le demandeur de permis et le titulaire de permis avisent la Commission :

a) des personnes qui ont le pouvoir d'agir en leur nom auprès de la Commission;

b) des noms et titres des personnes qui sont chargées de gérer et de contrôler l'activité autorisée ainsi que la substance

and the nuclear substance, nuclear facility, prescribed equipment or prescribed information encompassed by the licence; and

(*c*) any change in the information referred to in paragraphs (*a*) and (*b*), within 15 days after the change occurs.

Publication of Health and Safety Information

16. (1) Every licensee shall make available to all workers the health and safety information with respect to their workplace that has been collected by the licensee in accordance with the Act, the regulations made under the Act and the licence.

(2) Subsection (1) does not apply in respect of personal dose records and prescribed information.

Obligations of Workers

17. Every worker shall

(*a*) use equipment, devices, facilities and clothing for protecting the environment or the health and safety of persons, or for determining doses of radiation, dose rates or concentrations of radioactive nuclear substances, in a responsible and reasonable manner and in accordance with the Act, the regulations made under the Act and the licence;

(*b*) comply with the measures established by the licensee to protect the environment and the health and safety of persons, maintain security, control the levels and doses of radiation, and control releases of radioactive nuclear substances and hazardous substances into the environment;

(*c*) promptly inform the licensee or the worker's supervisor of any situation in which the worker believes there may be

(i) a significant increase in the risk to the environment or the health and safety of persons,

(ii) a threat to the maintenance of security or an incident with respect to security,

(iii) a failure to comply with the Act, the regulations made under the Act or the licence,

(iv) an act of sabotage, theft, loss or illegal use or possession of a nuclear substance, prescribed equipment or prescribed information, or

(v) a release into the environment of a quantity of a radioactive nuclear substance or hazardous substance that has not been authorized by the licensee;

(*d*) observe and obey all notices and warning signs posted by the licensee in accordance with the *Radiation Protection Regulations*; and

(*e*) take all reasonable precautions to ensure the worker's own safety, the safety of the other persons at the site of the licensed activity, the protection of the environment, the protection of the public and the maintenance of security.

Presentation of Licence to Customs Officer

18. On importing or exporting a nuclear substance, prescribed equipment or prescribed information, the licensee shall present the required import or export licence to a customs officer.

nucléaire, l'installation nucléaire, l'équipement réglementé ou les renseignements réglementés visés par le permis;

c) de tout changement apporté aux renseignements visés aux alinéas *a*) et *b*) dans les 15 jours suivant le changement.

Publication des renseignements sur la santé et la sécurité

16. (1) Le titulaire de permis met à la disposition de tous les travailleurs les renseignements sur la santé et la sécurité qu'il a recueillis concernant leur lieu de travail conformément à la Loi, à ses règlements et au permis.

(2) Le paragraphe (1) ne s'applique pas aux dossiers de doses personnelles et aux renseignements réglementés.

Obligations du travailleur

17. Le travailleur :

a) utilise d'une manière responsable, raisonnable et conforme à la Loi, à ses règlements et au permis, l'équipement, les appareils, les installations et les vêtements pour protéger l'environnement, préserver la santé et la sécurité des personnes, ou déterminer les doses de rayonnement, les débits de dose ou les concentrations de substances nucléaires radioactives;

b) se conforme aux mesures prévues par le titulaire de permis pour protéger l'environnement, préserver la santé et la sécurité des personnes, maintenir la sécurité et contrôler les niveaux et les doses de rayonnement, ainsi que le rejet de substances nucléaires radioactives et de substances dangereuses dans l'environnement;

c) signale sans délai à son supérieur ou au titulaire de permis toute situation où, à son avis, il pourrait y avoir :

(i) une augmentation considérable du niveau de risque pour l'environnement ou pour la santé et la sécurité des personnes,

(ii) une menace pour le maintien de la sécurité ou un incident en matière de sécurité,

(iii) un manquement à la Loi, à ses règlements ou au permis,

(iv) un acte de sabotage à l'égard d'une substance nucléaire, d'équipement réglementé ou de renseignements réglementés, ou leur vol, leur perte ou leur utilisation ou possession illégales,

(v) le rejet, non autorisé par le titulaire de permis, d'une quantité d'une substance nucléaire radioactive ou d'une substance dangereuse dans l'environnement;

d) observe et respecte tous les avis et mises en garde affichés par le titulaire de permis conformément au *Règlement sur la radioprotection*;

e) prend toutes les précautions raisonnables pour veiller à sa propre sécurité et à celle des personnes se trouvant sur les lieux de l'activité autorisée, à la protection de l'environnement et du public ainsi qu'au maintien de la sécurité.

Présentation du permis à l'agent des douanes

18. Le titulaire de permis présente à un agent des douanes le permis requis pour importer ou exporter une substance nucléaire, de l'équipement réglementé ou des renseignements réglementés avant de les importer ou de les exporter.

PRESCRIBED NUCLEAR FACILITIES

19. The following facilities are prescribed as nuclear facilities for the purpose of paragraph (*i*) of the definition "nuclear facility" in section 2 of the Act:

(*a*) a facility for the management, storage or disposal of waste containing radioactive nuclear substances at which the resident inventory of radioactive nuclear substances contained in the waste is 10^{15} Bq or more;

(*b*) a plant for the production of deuterium or deuterium compounds using hydrogen sulphide; and

(*c*) a facility that consists of

(i) an irradiator that uses more than 10^{15} Bq of a nuclear substance,

(ii) an irradiator that requires shielding which is not part of the irradiator and that can deliver radiation at a dose rate exceeding 1 centigray per minute at 1 m,

(iii) a radioactive source teletherapy machine, or

(iv) a brachytherapy machine.

INSTALLATIONS NUCLÉAIRES RÉGLEMENTÉES

19. Sont désignées comme installations nucléaires pour l'application de l'alinéa *i*) de la définition de « installation nucléaire » à l'article 2 de la Loi :

a) une installation pour la gestion, le stockage, temporaire ou permanent, l'évacuation ou l'élimination des déchets qui contiennent des substances nucléaires radioactives et dont l'inventaire fixe en substances nucléaires radioactives est d'au moins 10^{15} Bq;

b) une usine produisant du deutérium ou des composés du deutérium à l'aide d'hydrogène sulfuré;

c) une installation qui consiste en un :

(i) irradiateur qui utilise plus de 10^{15} Bq d'une substance nucléaire,

(ii) irradiateur qui nécessite un blindage qui n'en fait pas partie et qui peut produire une dose de rayonnement à un débit dépassant 1 centigray par minute à 1 m,

(iii) appareil de téléthérapie à source radioactive,

(iv) appareil de curiethérapie.

PRESCRIBED EQUIPMENT

20. Each of the following items is prescribed equipment for the purposes of the Act:

(*a*) a package and special form radioactive material, as defined in subsection 1(1) of the *Packaging and Transport of Nuclear Substances Regulations*;

(*b*) a radiation device and a sealed source, as defined in section 1 of the *Nuclear Substances and Radiation Devices Regulations*;

(*c*) Class II prescribed equipment, as defined in section 1 of the *Class II Nuclear Facilities and Prescribed Equipment Regulations*; and

(*d*) equipment that is capable of being used in the design, production, operation or maintenance of a nuclear weapon or nuclear explosive device.

ÉQUIPEMENT RÉGLEMENTÉ

20. Sont désignés comme de l'équipement réglementé pour l'application de la Loi :

a) les colis et les matières radioactives sous forme spéciale au sens du paragraphe 1(1) du *Règlement sur l'emballage et le transport des substances nucléaires*;

b) les appareils à rayonnement et les sources scellées au sens de l'article 1 du *Règlement sur les substances nucléaires et les appareils à rayonnement*;

c) l'équipement réglementé de catégorie II au sens de l'article 1 du *Règlement sur les installations nucléaires et l'équipement réglementé de catégorie II*;

d) l'équipement qui peut servir à concevoir, produire, utiliser, faire fonctionner ou entretenir des armes nucléaires ou des engins explosifs nucléaires.

PRESCRIBED INFORMATION

Prescription

21. (1) Information that concerns any of the following, including a record of that information, is prescribed information for the purposes of the Act:

(*a*) a nuclear substance that is required for the design, production, operation or maintenance of a nuclear weapon or nuclear explosive device, including the properties of the nuclear substance;

(*b*) the design, production, use, operation or maintenance of a nuclear weapon or nuclear explosive device;

(*c*) the security arrangements, security equipment, security systems and security procedures established by a licensee in accordance with the Act, the regulations made under the Act or the licence, and any incident relating to security; and

(*d*) the route or schedule for the transport of Category I, II or III nuclear material, as defined in section 1 of the *Nuclear Security Regulations*.

RENSEIGNEMENTS RÉGLEMENTÉS

Désignation

21. (1) Pour l'application de la Loi, sont désignés comme renseignements réglementés les renseignements qui portent sur ce qui suit, y compris les documents sur ces renseignements :

a) les substances nucléaires, y compris leurs propriétés, qui sont nécessaires à la conception, la production, l'utilisation, le fonctionnement ou l'entretien des armes nucléaires ou des engins explosifs nucléaires;

b) la conception, la production, l'utilisation, le fonctionnement ou l'entretien des armes nucléaires ou des engins explosifs nucléaires;

c) les arrangements, l'équipement, les systèmes et les procédures en matière de sécurité que le titulaire de permis a mis en place conformément à la Loi, à ses règlements ou au permis, y compris tout incident relatif à la sécurité;

d) l'itinéraire ou le calendrier de transport des matières nucléaires de catégorie I, II ou III au sens de l'article 1 du *Règlement sur la sécurité nucléaire*.

(2) Information that is made public in accordance with the Act, the regulations made under the Act or a licence is not prescribed information for the purposes of the Act.

Exemptions from Licence Requirement

22. (1) The following persons may possess, transfer, import, export or use prescribed information without a licence to carry on that activity:

(*a*) a minister, employee or other person acting on behalf of or under the direction of the Government of Canada, the government of a province or any of their agencies, for the purpose of assisting themselves in exercising a power or performing a duty or function lawfully conferred or imposed on them; and

(*b*) an official of a foreign government or an international agency, for the purpose of meeting obligations imposed by an arrangement made between the Government of Canada and the foreign government or international agency.

(2) The following persons may possess, transfer or use prescribed information without a licence to carry on that activity:

(*a*) a worker, for the purpose of enabling the worker to perform duties assigned by the licensee; and

(*b*) a person who is legally required or legally authorized to obtain or receive the information.

(3) For greater certainty, the exemptions established in subsections (1) and (2) relate only to the activities specified in those subsections and do not derogate from the licence requirement imposed by section 26 of the Act in relation to other activities.

Transfer and Disclosure

23. (1) No person shall transfer or disclose prescribed information unless the person

(*a*) is legally required to do so; or

(*b*) transfers or discloses it to

(i) a minister, employee or other person acting on behalf or under the direction of the Government of Canada, the government of a province or any of their agencies, for the purpose of assisting themselves in exercising a power or performing a duty or function lawfully conferred or imposed on them,

(ii) an official of a foreign government or an international agency, for the purpose of meeting obligations imposed by an arrangement made between the Government of Canada and the foreign government or international agency,

(iii) a worker, for the purpose of enabling the worker to perform duties assigned by the licensee, or

(iv) a person who is legally required or legally authorized to obtain or receive the information.

(2) A person who possesses or has knowledge of prescribed information shall take all necessary precautions to prevent any transfer or disclosure of the prescribed information that is not authorized by the Act and the regulations made under the Act.

CONTAMINATION

Prescribed Limits

24. For the purposes of paragraph 45(*a*) and subsection 46(1) of the Act, the prescribed limit of contamination for a place or vehicle where no licensed activity is being carried on is any quantity of a radioactive nuclear substance that may, based on the

(2) Les renseignements qui sont rendus publics conformément à la Loi, à ses règlements et au permis ne sont pas renseignements réglementés pour l'application de la Loi.

Exemption de permis

22. (1) Les personnes suivantes peuvent avoir en leur possession des renseignements réglementés ou les transférer, importer, exporter ou utiliser, sans y être autorisées par un permis :

a) un ministre, un employé ou un mandataire du gouvernement du Canada ou d'une province, ou de l'un de ses organismes, pour s'aider à exercer une attribution qui lui est dûment conférée;

b) le représentant d'un gouvernement étranger ou d'une organisation internationale, pour assurer le respect des obligations d'une entente conclue par le gouvernement du Canada et ce gouvernement ou cette organisation.

(2) Les personnes suivantes peuvent avoir en leur possession des renseignements réglementés ou les transférer ou les utiliser, sans y être autorisées par un permis :

a) un travailleur, pour remplir les fonctions que le titulaire de permis lui assigne;

b) une personne qui, aux termes de la loi, a l'autorisation ou l'obligation de les obtenir ou de les recevoir.

(3) Il demeure entendu que les exemptions prévues aux paragraphes (1) et (2) ne visent que les activités qui y sont spécifiées et n'écartent pas l'obligation, prévue à l'article 26 de la Loi, d'obtenir un permis ou une licence pour exercer d'autres activités.

Transfert et communication

23. (1) Il est interdit à quiconque de transférer ou de communiquer des renseignements réglementés, sauf si :

a) la loi l'y oblige;

b) les renseignements sont transférés ou communiqués :

(i) à un ministre, un employé ou un mandataire du gouvernement du Canada ou d'une province, ou de l'un de ses organismes, pour s'aider à exercer une attribution qui lui est dûment conférée,

(ii) à un représentant d'un gouvernement étranger ou d'une organisation internationale, pour assurer le respect des obligations d'une entente conclue par le gouvernement du Canada et ce gouvernement ou cette organisation,

(iii) à un travailleur, pour remplir les fonctions que lui assigne le titulaire de permis,

(iv) à une personne qui, aux termes de la loi, a l'autorisation ou l'obligation de les obtenir ou de les recevoir.

(2) Quiconque a en sa possession des renseignements réglementés ou en a connaissance prend toutes les précautions nécessaires pour en prévenir le transfert ou la communication non autorisé par la Loi et ses règlements.

CONTAMINATION

Seuil réglementaire

24. Pour l'application de l'article 45 et du paragraphe 46(1) de la Loi, le seuil réglementaire de contamination à l'égard d'un lieu ou d'un véhicule où n'est exercée aucune activité autorisée s'entend de toute quantité d'une substance nucléaire radioactive

circumstances, increase a person's effective dose by 1 mSv or more per year in excess of the background radiation for the place or vehicle.

Prescribed Public Offices

25. For the purpose of subsection 46(2) of the Act, a municipal office, a public library and a public community centre are prescribed public offices.

Prescribed Measures

26. For the purpose of subsection 46(3) of the Act, the prescribed measures to reduce the level of contamination are any measures to control access to or clean the place, or to cover or remove the contamination, that are appropriate for the substance and location and that will reduce the level of contamination to below the limit prescribed by section 24.

RECORDS AND REPORTS

Record of Licence Information

27. Every licensee shall keep a record of all information relating to the licence that is submitted by the licensee to the Commission.

Retention and Disposal of Records

28. (1) Every person who is required to keep a record by the Act, the regulations made under the Act or a licence shall retain the record for the period specified in the applicable regulations made under the Act or, if no period is specified in the regulations, for the period ending one year after the expiry of the licence that authorizes the activity in respect of which the records are kept.

(2) No person shall dispose of a record referred to in the Act, the regulations made under the Act or a licence unless the person

(*a*) is no longer required to keep the record by the Act, the regulations made under the Act or the licence; and

(*b*) has notified the Commission of the date of disposal and of the nature of the record at least 90 days before the date of disposal.

(3) A person who notifies the Commission in accordance with subsection (2) shall file the record, or a copy of the record, with the Commission at its request.

General Reports

29. (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it:

(*a*) a situation referred to in paragraph 27(*b*) of the Act;

(*b*) the occurrence of an event that is likely to result in the exposure of persons to radiation in excess of the applicable radiation dose limits prescribed by the *Radiation Protection Regulations*;

(*c*) a release, not authorized by the licence, of a quantity of radioactive nuclear substance into the environment;

(*d*) a situation or event that requires the implementation of a contingency plan in accordance with the licence;

(*e*) an attempted or actual breach of security or an attempted or actual act of sabotage at the site of the licensed activity;

qui est susceptible, compte tenu des circonstances, d'augmenter la dose efficace d'une personne de 1 mSv ou plus par année au-delà du rayonnement de fond à l'égard du lieu ou du véhicule.

Bureaux ouverts au public et désignés

25. Pour l'application du paragraphe 46(2) de la Loi, sont des bureaux ouverts au public et désignés les bureaux municipaux, les bibliothèques publiques et les centres communautaires publics.

Mesures réglementaires

26. Pour l'application du paragraphe 46(3) de la Loi, les mesures réglementaires de décontamination sont celles servant à nettoyer un lieu, en contrôler l'accès ou couvrir ou enlever la contamination, qui ramèneront la contamination à un niveau inférieur au seuil prévu à l'article 24, et qui conviennent à la substance et au lieu en cause.

DOCUMENTS ET RAPPORTS

Document sur les renseignements liés au permis

27. Le titulaire de permis conserve un document sur tous les renseignements liés au permis qu'il présente à la Commission.

Conservation et aliénation des documents

28. (1) La personne qui est tenue de conserver un document aux termes de la Loi, de ses règlements ou d'un permis, le fait pour la période indiquée dans le règlement applicable ou, à défaut, pendant une année suivant l'expiration du permis qui autorise l'activité pour laquelle les documents sont conservés.

(2) Il est interdit à quiconque d'aliéner un document mentionné dans la Loi, ses règlements ou un permis à moins :

a) de ne plus être tenu de le conserver aux termes de la Loi, de ses règlements ou du permis;

b) de donner à la Commission un préavis d'au moins 90 jours indiquant la date d'aliénation et la nature du document.

(3) La personne qui avise la Commission conformément au paragraphe (2) dépose l'original ou une copie du document auprès d'elle sur demande.

Rapports généraux

29. (1) Le titulaire de permis qui a connaissance de l'un des faits suivants présente immédiatement à la Commission un rapport préliminaire faisant état du lieu où survient ce fait et des circonstances l'entourant ainsi que des mesures qu'il a prises ou compte prendre à cet égard :

a) une situation mentionnée à l'alinéa 27*b*) de la Loi;

b) la survenance d'un événement susceptible d'entraîner l'exposition des personnes à des rayonnements dépassant les limites de dose applicables prévues par le *Règlement sur la radioprotection*;

c) le rejet, non autorisé par le permis, d'une quantité d'une substance nucléaire radioactive dans l'environnement;

d) une situation ou un événement nécessitant la mise en oeuvre d'un plan d'urgence conformément au permis;

e) un manquement ou une tentative de manquement à la sécurité ou un acte ou une tentative de sabotage sur le lieu de l'activité autorisée;

(*f*) information that reveals the incipient failure, abnormal degradation or weakening of any component or system at the site of the licensed activity, the failure of which could have a serious adverse effect on the environment or constitutes or is likely to constitute or contribute to a serious risk to the health and safety of persons or the maintenance of security;

(*g*) an actual, threatened or planned work disruption by workers;

(*h*) a serious illness or injury incurred or possibly incurred as a result of the licensed activity;

(*i*) the death of any person at a nuclear facility; or

(*j*) the occurrence of any of the following events:

(i) the making of an assignment by or in respect of the licensee under the *Bankruptcy and Insolvency Act*,

(ii) the making of a proposal by or in respect of the licensee under the *Bankruptcy and Insolvency Act*,

(iii) the filing of a notice of intention by the licensee under the *Bankruptcy and Insolvency Act*,

(iv) the filing of a petition for a receiving order against the licensee under the *Bankruptcy and Insolvency Act*,

(v) the enforcement by a secured creditor of a security on all or substantially all of the inventory, accounts receivable or other property of the licensee that was acquired for, or used in relation to, a business carried on by the licensee,

(vi) the filing in court by the licensee of an application to propose a compromise or an arrangement with its unsecured creditors or any class of them under section 4 of the *Companies' Creditors Arrangement Act*,

(vii) the filing in court by the licensee of an application to propose a compromise or an arrangement with its secured creditors or any class of them under section 5 of the *Companies' Creditors Arrangement Act*,

(viii) the making of an application for a winding-up order by or in respect of the licensee under the *Winding-up and Restructuring Act*,

(ix) the making of a liquidation, bankruptcy, insolvency, reorganization or like order in respect of the licensee under provincial or foreign legislation, or

(x) the making of a liquidation, bankruptcy, insolvency, reorganization or like order in respect of a body corporate that controls the licensee under provincial or foreign legislation.

(2) Every licensee who becomes aware of a situation referred to in subsection (1) shall file a full report of the situation with the Commission within 21 days after becoming aware of it, unless some other period is specified in the licence, and the report shall contain the following information:

(*a*) the date, time and location of becoming aware of the situation;

(*b*) a description of the situation and the circumstances;

(*c*) the probable cause of the situation;

(*d*) the effects on the environment, the health and safety of persons and the maintenance of security that have resulted or may result from the situation;

f) tout renseignement sur le début de la défaillance, la dégradation anormale ou l'affaiblissement, sur le lieu de l'activité autorisée, d'un composant ou d'un système dont la défaillance pourrait entraîner des effets négatifs graves sur l'environnement ou constitue un grand danger pour la santé et la sécurité des personnes ou pour le maintien de la sécurité ou est susceptible de le faire ou d'y contribuer;

g) un arrêt de travail réel ou planifié des travailleurs ou que ceux-ci menacent de tenir;

h) une maladie ou une blessure grave qui a ou aurait été subie en raison de l'activité autorisée;

i) la mort d'une personne à l'installation nucléaire;

j) la survenance de l'un ou l'autre des faits suivants :

(i) une cession visant le titulaire de permis et faite en vertu de la *Loi sur la faillite et l'insolvabilité*,

(ii) une proposition visant le titulaire de permis et faite en vertu de la *Loi sur la faillite et l'insolvabilité*,

(iii) le dépôt d'un avis d'intention par le titulaire de permis en vertu de la *Loi sur la faillite et l'insolvabilité*,

(iv) le dépôt d'une pétition en vue d'obtenir une ordonnance de séquestre contre le titulaire de permis en vertu de la *Loi sur la faillite et l'insolvabilité*,

(v) la mise à exécution par un créancier garanti d'une garantie constituée sur la totalité ou la quasi-totalité du stock, des comptes recevables ou des autres biens du titulaire de permis acquis ou utilisés dans le cadre des affaires,

(vi) le dépôt devant la cour par le titulaire de permis d'une requête pour proposer une transaction ou un arrangement avec ses créanciers chirographaires ou toute catégorie de ces derniers aux termes de l'article 4 de la *Loi sur les arrangements avec les créanciers des compagnies*,

(vii) le dépôt devant la cour par le titulaire de permis d'une requête pour proposer une transaction ou un arrangement avec ses créanciers garantis ou toute catégorie de ces derniers aux termes de l'article 5 de la *Loi sur les arrangements avec les créanciers des compagnies*,

(viii) une demande en vue d'obtenir une ordonnance de mise en liquidation visant le titulaire de permis en vertu de la *Loi sur les liquidations et les restructurations*,

(ix) la prise d'une ordonnance de mise en liquidation, de faillite, d'insolvabilité, de réorganisation ou autre ordonnance semblable visant le titulaire de permis en vertu des lois d'une province ou d'un gouvernement étranger,

(x) la prise d'une ordonnance de mise en liquidation, de faillite, d'insolvabilité, de réorganisation ou autre ordonnance similaire visant une personne morale qui contrôle le titulaire de permis en vertu des lois d'une province ou d'un gouvernement étranger.

(2) Le titulaire de permis qui a connaissance d'un fait mentionné au paragraphe (1) dépose auprès de la Commission, dans les 21 jours après en avoir pris connaissance, sauf si le permis précise un autre délai, un rapport complet sur le fait qui comprend les renseignements suivants :

a) la date, l'heure et le lieu où il a eu connaissance du fait;

b) une description du fait et des circonstances;

c) la cause probable du fait;

d) les effets que le fait a entraînés ou est susceptible d'entraîner sur l'environnement, la santé et la sécurité des personnes ainsi que le maintien de la sécurité;

(*e*) the effective dose and equivalent dose of radiation received by any person as a result of the situation; and

(*f*) the actions that the licensee has taken or proposes to take with respect to the situation.

(3) Subsections (1) and (2) do not require a licensee to report a situation referred to in paragraphs (1)(*a*) to (*j*) if the licence contains a term or condition requiring the licensee to report that situation, or any situation of that nature, to the Commission.

Safeguards Reports

30. (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the situation and of any action that the licensee has taken or proposes to take with respect to it:

(*a*) interference with or an interruption in the operation of safeguards equipment or the alteration, defacement or breakage of a safeguards seal, other than in accordance with the safeguards agreement, the Act, the regulations made under the Act or the licence; and

(*b*) the theft, loss or sabotage of safeguards equipment or samples collected for the purpose of a safeguards inspection, damage to such equipment or samples, or the illegal use, possession, operation or removal of such equipment or samples.

(2) Every licensee who becomes aware of a situation referred to in subsection (1) shall file a full report of the situation with the Commission within 21 days after becoming aware of it, unless some other period is specified in the licence, and the report shall contain the following information:

(*a*) the date, time and location of becoming aware of the situation;

(*b*) a description of the situation and the circumstances;

(*c*) the probable cause of the situation;

(*d*) the adverse effects on the environment, the health and safety of persons and the maintenance of national and international security that have resulted or may result from the situation;

(*e*) the effective dose and equivalent dose of radiation received by any person as a result of the situation; and

(*f*) the actions that the licensee has taken or proposes to take with respect to the situation.

Report of Deficiency in Record

31. (1) Every licensee who becomes aware of an inaccuracy or incompleteness in a record that the licensee is required to keep by the Act, the regulations made under the Act or the licence shall file a report of the inaccuracy or incompleteness with the Commission within 21 days after becoming aware of it, and the report shall contain the following information:

(*a*) the details of the inaccuracy or incompleteness; and

(*b*) any action that the licensee has taken or proposes to take with respect to the inaccuracy or incompleteness.

(2) Subsection (1) does not apply to a licensee if

(*a*) the licence contains a term or condition that requires the licensee to report inaccuracies or incompleteness in a record to the Commission; or

(*b*) the inaccuracy or incompleteness in the record could not reasonably be expected to lead to a situation in which the environment, the health and safety of persons or national security is adversely affected.

e) la dose efficace et la dose équivalente de rayonnement reçues par toute personne en raison du fait;

f) les mesures que le titulaire de permis a prises ou compte prendre relativement au fait.

(3) Le titulaire de permis n'est pas tenu, aux termes des paragraphes (1) et (2), de signaler un fait mentionné aux alinéas (1)*a*) à *j*) si le permis est assorti d'une condition exigeant qu'il signale le fait, ou tout fait de cette nature, à la Commission.

Rapport relatif aux garanties

30. (1) Le titulaire de permis qui a connaissance de l'un ou l'autre des faits suivants présente immédiatement à la Commission un rapport préliminaire faisant état du fait et des mesures qu'il a prises ou compte prendre à cet égard :

a) une ingérence ou une interruption affectant le fonctionnement de l'équipement de garanties, ou la modification, la dégradation ou le bris d'un sceau de garanties, sauf aux termes de l'accord relatif aux garanties, de la Loi, de ses règlements ou du permis;

b) le vol, la perte ou le sabotage de l'équipement de garanties ou des échantillons prélevés aux fins d'une inspection de garanties, leur endommagement ainsi que leur utilisation, leur possession ou leur enlèvement illégaux.

(2) Le titulaire de permis qui a connaissance d'un fait mentionné au paragraphe (1) dépose auprès de la Commission, dans les 21 jours après en avoir pris connaissance, sauf si le permis précise un autre délai, un rapport complet sur le fait qui comprend les renseignements suivants :

a) la date, l'heure et le lieu où il a eu connaissance du fait;

b) une description du fait et des circonstances;

c) la cause probable du fait;

d) les effets négatifs que le fait a entraînés ou est susceptible d'entraîner sur l'environnement, la santé et la sécurité des personnes ainsi que le maintien de la sécurité nationale et internationale;

e) la dose efficace et la dose équivalente de rayonnement reçues par toute personne en raison du fait;

f) les mesures que le titulaire de permis a prises ou compte prendre relativement au fait.

Renseignements inexacts ou incomplets dans les documents

31. (1) Le titulaire de permis qui relève des renseignements inexacts ou incomplets dans un document qu'il est tenu de conserver aux termes de la Loi, de ses règlements ou du permis dépose auprès de la Commission, dans les 21 jours qui suivent, un rapport à cet égard qui :

a) indique de façon précise les renseignements qui sont inexacts ou incomplets;

b) identifie les mesures qu'il a prises ou compte prendre pour remédier à la situation.

(2) Le paragraphe (1) ne s'applique pas au titulaire de permis dans les cas suivants :

a) son permis est assorti d'une condition exigeant qu'il fasse rapport à la Commission des renseignements inexacts ou incomplets que contiennent les documents;

b) le fait que le document contient des renseignements inexacts ou incomplets ne risquerait pas, selon toute vraisemblance, de donner lieu à une situation qui entraîne des effets négatifs sur

Filing of Reports

32. (1) Every report shall include the name and address of its sender and the date on which it was completed.

(2) The date of filing of a report is the date on which it is received by the Commission.

INSPECTORS AND DESIGNATED OFFICERS

Certificate of Inspector

33. An inspector's certificate issued under section 29 of the Act shall be in the form set out in the schedule and shall include, in addition to the information required by subsection 29(2) of the Act,

(*a*) the name and signature of the inspector;

(*b*) a photograph showing the face of the inspector;

(*c*) the name of the employer of the inspector;

(*d*) a statement of designation;

(*e*) the name, position and signature of the person who issued the certificate; and

(*f*) the expiry date of the certificate.

Certificate of Designated Officer

34. A designated officer's certificate issued under section 37 of the Act shall include, in addition to the information required by subsection 37(1) of the Act,

(*a*) the name and position or title of the designated officer;

(*b*) the name of the employer of the designated officer;

(*c*) a statement of designation;

(*d*) the name, position and signature of the person who issued the certificate; and

(*e*) the expiry date of the certificate.

Notification and Surrender of Certificate

35. (1) An inspector and a designated officer shall notify the Commission of any of the following situations:

(*a*) the loss or theft of their certificate;

(*b*) any change in their employment that results in their no longer exercising a function that relates to the purpose of the certificate; and

(*c*) the suspension or termination of their employment with the employer named in the certificate.

(2) An inspector and a designated officer shall surrender their certificate to the Commission

(*a*) if the information contained in the certificate is not accurate;

(*b*) when the certificate expires; or

(*c*) on termination by the Commission of their designation as an inspector or a designated officer, as the case may be.

l'environnement, la santé et la sécurité des personnes ou la sécurité nationale.

Dépôt des rapports

32. (1) Le rapport comprend les nom et adresse de l'expéditeur ainsi que la date d'achèvement.

(2) La date de dépôt est la date de réception par la Commission.

INSPECTEURS ET FONCTIONNAIRES DÉSIGNÉS

Certificat de l'inspecteur

33. Le certificat de l'inspecteur, délivré en vertu de l'article 29 de la Loi, est en la forme établie dans l'annexe et comprend les renseignements suivants, outre ceux exigés au paragraphe 29(2) de la Loi :

a) les nom et signature de l'inspecteur;

b) une photographie montrant l'inspecteur de face;

c) le nom de l'employeur de l'inspecteur;

d) l'attestation de la qualité d'inspecteur;

e) les nom, poste et signature de la personne qui a délivré le certificat;

f) la date d'expiration du certificat.

Certificat du fonctionnaire désigné

34. Le certificat du fonctionnaire désigné, délivré en vertu de l'article 37 de la Loi, comprend les renseignements suivants, outre ceux exigés au paragraphe 37(1) de la Loi :

a) les nom et poste ou titre du fonctionnaire désigné;

b) le nom de l'employeur du fonctionnaire désigné;

c) l'attestation de la qualité de fonctionnaire désigné;

d) les nom, poste et signature de la personne qui a délivré le certificat;

e) la date d'expiration du certificat.

Avis et remise du certificat

35. (1) L'inspecteur et le fonctionnaire désigné avisent la Commission de l'un ou l'autre des faits suivants :

a) la perte ou le vol de leur certificat;

b) tout changement concernant leur emploi à la suite duquel ils n'exercent plus des fonctions liées à l'objet du certificat;

c) la suspension ou la fin de leur emploi chez l'employeur nommé au certificat.

(2) L'inspecteur et le fonctionnaire désigné remettent leur certificat à la Commission dans les cas suivants :

a) les renseignements figurant sur le certificat ne sont plus exacts;

b) le certificat est expiré;

c) la Commission met un terme à leur désignation à titre d'inspecteur ou de fonctionnaire désigné.

REPEAL

36. The *Atomic Energy Control Regulations*[1] are repealed.

37. The *Transport Packaging of Radioactive Materials Regulations*[2] are repealed.

38. The *Uranium and Thorium Mining Regulations*[3] are repealed.

39. The *Physical Security Regulations*[4] are repealed.

COMING INTO FORCE

40. These Regulations come into force on the day on which they are approved by the Governor in Council.

ABROGATIONS

36. Le *Règlement sur le contrôle de l'énergie atomique*[1] est abrogé.

37. Le *Règlement sur l'emballage des matières radioactives destinées au transport*[2] est abrogé.

38. Le *Règlement sur les mines d'uranium et de thorium*[3] est abrogé.

39. Le *Règlement sur la sécurité matérielle*[4] est abrogé.

ENTRÉE EN VIGUEUR

40. Le présent règlement entre en vigueur à la date de son agrément par le gouverneur en conseil.

SCHEDULE
(Section 33)

CERTIFICATE OF INSPECTOR

ANNEXE
(article 33)

CERTIFICAT DE L'INSPECTEUR

This is to certify that
Le présent certificat atteste que

employed by
employé de

is designated as an inspector by the Canadian Nuclear Safety Commission pursuant to section 29 of the *Nuclear Safety and Control Act*.

est un inspecteur désigné par la Commission canadienne de sûreté nucléaire conformément à l'article 29 de la *Loi sur la sûreté et la réglementation nucléaires*.

This certificate expires on
Ce certificat expire le

Inspector / Inspecteur

Secretary, CNSC / Secrétaire, CCSN

Canadian Nuclear Safety Commission / Commission canadienne de sûreté nucléaire

Canada

The person identified on this certificate may exercise the powers granted to an inspector under the *Nuclear Safety and Control Act* in respect of the following places or vehicles:

La personne identifiée sur ce certificat peut exercer les pouvoirs d'un inspecteur prévus à la *Loi sur la sûreté et la réglementation nucléaires* dans les lieux ou véhicules suivants :

This certificate is not transferable and is to be surrendered on the termination of this designation.

Le certificat est incessible et doit être remis lorsque la désignation prend fin.

REGULATORY IMPACT ANALYSIS STATEMENT

(*This statement is not part of the Regulations nor the Rules.*)

1. *Description*

This Regulatory Impact Analysis Statement (RIAS) pertains to the regulations and rules made under the *Nuclear Safety and Control Act* (NSC Act). A draft version of nine technical regulations was published for comment in the *Canada Gazette*, Part I on October 10, 1998, and the *Canadian Nuclear Safety Commission Rules of Procedure* were similarly published on February 13, 1999. Changes have been made to the draft version of the RIAS, regulations and rules based on comments received during the consultation phase.

RÉSUMÉ DE L'ÉTUDE D'IMPACT DE LA RÉGLEMENTATION

(*Ce résumé ne fait pas partie des règlements ni des règles.*)

1. *Description*

Le présent Résumé de l'étude d'impact de la réglementation (RÉIR) se rapporte aux règlements et aux règles pris aux termes de la *Loi sur la sûreté et la réglementation nucléaires*. Une version provisoire de neuf règlements techniques a été publiée aux fins de commentaires dans la *Gazette du Canada* Partie I le 10 octobre 1998, tout comme les *Règles de procédures de la Commission canadienne de sûreté nucléaire*, qui ont paru le 13 février 1999. La version provisoire du RÉIR, les règles et les règlements ont été modifiés à partir des commentaires recueillis au cours de la période de consultation.

[1] C.R.C., c. 365
[2] SOR/83-740
[3] SOR/88-243
[4] SOR/83-77

[1] C.R.C., ch. 365
[2] DORS/83-740
[3] DORS/88-243
[4] DORS/83-77

Nuclear activities in Canada are regulated by the Atomic Energy Control Board (AECB) under the *Atomic Energy Control Act* (AEC Act) of 1946. These activities are carried out by approximately 3,700 licensees and occur, for example, in power and research reactors, uranium mines and mills, accelerators, waste management facilities, nuclear medicine, packaging and transport of radioactive materials, industrial gauges and research involving radioisotopes. The AEC Act is out of date in many significant areas and to correct the situation, Parliament passed the NSC Act on March 20, 1997. This new legislation is intended to come into force when new regulations, based on the powers set out in the NSC Act, have been finalized. This will allow continuation of the regulatory system administered by the AECB. Under the provisions of the NSC Act, the AECB will be replaced by the Canadian Nuclear Safety Commission (CNSC) and, with the exception of the ex officio position on the Board, the members and staff of the AECB will become the members and staff of the CNSC.

In order to simplify the transition to the new regulatory system under the NSC Act, the AECB has minimized the number of substantive changes in the new regulations. For the most part, the new regulations consist of the requirements in the AEC Act, AEC Regulations and licence conditions, but in a format compatible with the NSC Act. These unchanged requirements are not discussed in this document. Some new regulatory requirements have been added and these are discussed in detail below.

Under the AEC Act, the technical requirements are specified in the *Atomic Energy Control Regulations*, the *Transport Packaging of Radioactive Materials Regulations* and the *Uranium and Thorium Mining Regulations*. Under the NSC Act, these requirements are specified in nine regulations, each of which is described separately in section 3 below. Where significant changes are made, the alternatives, costs and benefits of the changes are described under the specific regulation. Consultation and compliance issues that are common to all of the new regulations are addressed in sections 5 and 6, rather than under each separate regulation. Consultations on a specific issue however, are described in the section dealing with the issue.

The regulations continue the practice of allowing licensees considerable flexibility in how they comply with the requirements. With some exceptions, such as the dose limits, transport packaging and licence exemption criteria for certain devices, the regulations do not specify in detail the criteria that will be used in assessing a licence application or judging compliance. The regulations provide licence applicants with general performance criteria and lists of information that they must supply. If the information is acceptable, it may be referenced in the licence, thus making it a legal requirement for the licensee in question. This approach to nuclear regulation is consistent with the practice followed to date in Canada.

The CNSC intends to continue the use of regulatory documents to inform applicants of its regulatory expectations. Not all documents have been completed but those with an immediate or significant impact on licensees' operations have been identified. High priority has been given to their completion and many have been approved or have been published in draft form for comments. Those that are unavailable are expected in the near future and where necessary, their lack is addressed in the CNSC's plan for transition to the new regulatory regime. During development

La Commission de contrôle de l'énergie atomique (CCEA) réglemente toutes les activités nucléaires au Canada aux termes de la *Loi sur le contrôle de l'énergie atomique* (LCEA) de 1946. Environ 3 700 titulaires de permis exercent ces activités dans les domaines suivants : réacteurs de puissance ou de recherche, mines ou installations de concentration d'uranium, accélérateurs, installations de gestion des déchets, médecine nucléaire, emballage et transport de matières radioactives, utilisation d'instruments industriels calibrés et recherche impliquant des radioisotopes. La LCEA étant périmée dans nombre de domaines importants, le Parlement a adopté le 20 mars 1997 la *Loi sur la sûreté et la réglementation nucléaires* (LSRN). La nouvelle loi entrera en vigueur lorsque ses règlements d'application seront complétés, assurant ainsi la continuité du régime de réglementation administré par la CCEA. Aux termes de la LSRN, la CCEA sera remplacée par la Commission canadienne de sûreté nucléaire (CCSN) et, à l'exception du poste de membre d'office de la Commission, les commissaires et le personnel de la CCEA passeront au service de la CCSN.

Afin de simplifier la transition au nouveau régime de réglementation de la LSRN, la CCEA a réduit au minimum le nombre de changements réglementaires significatifs apportés à la nouvelle réglementation, qui reprend essentiellement les exigences, les règlements et les conditions de permis stipulées dans la LCEA, et les rend compatibles avec la LSRN. Nous n'aborderons pas ici les exigences réglementaires qui demeurent inchangées, mais nous expliquerons en détail celles qui viennent s'ajouter.

Aux termes de la LCEA, les exigences techniques étaient énoncées dans le *Règlement sur le contrôle de l'énergie atomique*, le *Règlement sur l'emballage des matières radioactives destinées au transport* et le *Règlement sur les mines d'uranium et de thorium*. Aux termes de la LSRN, ces exigences figurent dans neuf règlements, décrits plus loin à la rubrique 3. Lorsque des modifications importantes ont été apportées, les coûts et les avantages qui en découlent ainsi que les solutions de rechange qui ont été envisagées sont décrites. Les questions de consultation et de conformité communes à tous les nouveaux règlements sont traitées aux rubriques 5 et 6. Par contre, les consultations entreprises sur une question particulière sont rapportées dans la rubrique qui s'y rattache.

Les règlements continuent de laisser aux titulaires de permis une souplesse considérable quant à la façon de satisfaire aux exigences. Mises à part quelques exceptions comme les limites de dose, l'emballage destiné au transport et les critères d'exemption de permis pour certains appareils, ils ne précisent pas en détail les critères qui serviront à l'évaluation d'une demande de permis ou de la conformité au règlement. Ils indiquent aux demandeurs de permis les critères généraux de rendement et les renseignements qu'ils doivent fournir. Si les renseignements fournis sont jugés acceptables, ils pourront être cités au permis, devenant ainsi exigence légale pour ce titulaire de permis. Cette approche de la réglementation nucléaire est conforme aux pratiques courantes au Canada.

La CCSN souhaite continuer d'utiliser les documents d'application de la réglementation pour informer les demandeurs de permis de ses attentes en matière de réglementation. Ces documents ne sont pas entièrement achevés, mais tous ceux qui ont une incidence directe ou importante sur les activités des titulaires de permis ont été cernés. Plusieurs documents, qui font l'objet d'une attention prioritaire, ont déjà été soit approuvés, soit publiés en version provisoire aux fins de commentaires. Les documents qui ne sont pas achevés sont attendus dans un proche avenir et,

of each regulatory document, the CNSC is committed to extensive consultation on all aspects of the document and the Act provides an opportunity for those affected by CNSC actions to be heard by the Commission.

2. ***Alternatives to New Regulations***

Since the nuclear regulatory control system must function after the transition from the AEC Act to the NSC Act, new compatible regulations must be issued simultaneously with the introduction of the new NSC Act to allow the scheme to operate. Therefore, there are no alternatives to passage of new regulations.

3. ***Regulatory Initiatives***

This section describes the significant new requirements of the regulations together with their impact on licensees and the significant changes that were made to the regulations as a result of comments received following publication in the *Canada Gazette*, Part I. Many changes were also made to improve clarity but these are not described in this document unless they had a significant effect on the requirements.

3.1 ***General Nuclear Safety and Control Regulations***

The *General Nuclear Safety and Control Regulations* contain the general requirements that apply to all licensees. They consist primarily of the regulatory requirements contained in the AEC Regulations and licence conditions. They also continue the exemption for naturally occurring radioactive materials that have not been associated with the development, production or use of nuclear energy. As authorized by the NSC Act, a requirement to provide information on any proposed financial guarantees has been added. Except for section 12 as described below, there were no major changes to these Regulations as a result of comments received following publication in the *Canada Gazette*, Part I.

3.1.1 Financial Guarantees

Under the AEC Act and Regulations, only a few licensees were required to provide financial assurances for decommissioning and waste management. A possible consequence of this was the costs associated with these activities would fall on the taxpayer if the licensee had not set aside sufficient funds for their completion. To address this, subsection 24(5) of the NSC Act provides the CNSC with the authority to include a licence condition requiring financial guarantees in a form that is acceptable to the Commission. The financial guarantees section of the NSC Act is being implemented by regulations requiring licence applicants to provide information on proposed financial guarantees and to describe their plans for decommissioning and waste management at the end of the life of the nuclear facility. The estimated costs of these plans and the financial guarantees proposed to cover these costs will be reviewed by the Commission. The resulting requirements would be imposed by licence condition.

The regulations permit substantial flexibility in the ways that licensees can meet the financial requirements. Options acceptable to the Commission are described in a draft regulatory document.

s'il y a lieu, leur absence sera compensée dans le plan de transition au nouveau régime de réglementation de la CCSN. L'élaboration de chacun des documents d'application de la réglementation continuera d'être le résultat de vastes consultations effectuées par la CCSN, et la LSRN permet aux personnes touchées par les mesures envisagées d'être entendues par la Commission.

2. ***Solutions envisagées***

Puisque le régime de réglementation nucléaire doit être mis en application après la transition de la LCEA à la LSRN, les règlements d'application de la LSRN doivent être prêts au moment de l'entrée en vigueur de la LSRN. Il n'y a donc pas d'autre solution que d'adopter les nouveaux règlements.

3. ***Initiatives en matière de réglementation***

Cette section fait état des exigences significatives contenues dans les nouveaux règlements, de leurs conséquences pour les titulaires de permis ainsi que des changements notables apportés aux règlements à partir des commentaires qui ont suivi la publication des projets de règlement dans la *Gazette du Canada* Partie I. Plusieurs modifications ont aussi été apportées par souci de clarté, mais elles ne sont pas mentionnées ici si elles n'ont pas de conséquences notables sur les exigences.

3.1 ***Règlement général sur la sûreté et la réglementation nucléaires***

Le *Règlement général sur la sûreté et la réglementation nucléaires* renferme les exigences générales qui s'appliquent à tous les titulaires de permis. Il contient principalement les exigences actuellement prévues au *Règlement sur le contrôle de l'énergie atomique* et aux conditions de permis. Il maintient aussi l'exemption accordée relativement aux matières radioactives naturelles qui ne sont pas associées au développement, à la production ou à l'utilisation d'énergie nucléaire. En conformité avec la LSRN, il est dorénavant requis de fournir des renseignements sur toute garantie financière proposée. À l'exception de l'article 12 (explications ci-dessous), le règlement n'a subi aucune modification importante à la suite de commentaires reçus après sa publication dans la *Gazette du Canada* Partie I.

3.1.1 Garanties financières

Aux termes de la LCEA et de ses règlements, seuls quelques-uns des titulaires de permis étaient tenus de fournir des assurances financières en prévision du déclassement de leurs installations et de la gestion de leurs déchets. Or, il pourrait en résulter que ce fardeau financier retombe sur les épaules des contribuables dans le cas où les titulaires de permis n'auraient pas réservé les sommes suffisantes pour achever ces travaux. Pour régler ce problème, le paragraphe 24(5) de la LSRN stipule que la CCSN peut assortir un permis d'une condition exigeant une garantie financière sous une forme qu'elle juge acceptable. L'article relatif aux garanties financières de la LSRN est mis en application par le biais du règlement selon lequel le demandeur de permis doit décrire ses garanties financières et ses plans de déclassement et de gestion des déchets à la fin de la vie utile de l'installation nucléaire. La CCSN examinera les coûts estimés de ces plans et les garanties financières proposées. Les exigences découlant de cette analyse seraient imposées comme conditions du permis.

Le règlement est très souple quant à la façon dont le titulaire de permis peut satisfaire aux exigences financières. Les options que la CCSN juge acceptables sont décrites

(*a*) Alternatives to Financial Guarantees

It was clearly the intent of Parliament to authorize the CNSC to require financial guarantees, and consequently, the consideration of alternatives does not apply.

(*b*) Costs

Licensees have always been responsible for the costs associated with decommissioning their facilities. Therefore, the cost resulting from the application of subsection 24(5) of the NSC Act is limited to the incremental cost of providing a financial guarantee. Financial guarantees are already required under the *Uranium and Thorium Mining Regulations* so for these licensees, there are no incremental costs. There will be several types of mechanisms that a licensee may use to satisfy the CNSC requirement for a financial guarantee, but there are factors outside the control of the CNSC that can significantly affect the cost of providing a financial guarantee. The most important of these factors is the willingness of governments (federal and provincial) to underwrite the decommissioning costs of facilities they own or that operate within the province. Depending on these decisions, the cost of financial guarantees could range from zero if there is a commitment from government to millions of dollars in the case of major facilities with high decommissioning costs. It is therefore difficult to estimate the actual financial impact of this requirement.

The AECB is currently reviewing the comments received on the draft regulatory document on financial guarantees. Until this document is finalized and until other decisions are made, in particular those referred to above, it will not be possible to estimate with any degree of accuracy, the total cost resulting from implementing subsection 24(5) of the NSC Act. For this reason, no costs are included in this document.

(*c*) Benefits

Requiring financial guarantees will reduce the risk that taxpayers will eventually have to pay the decommissioning costs.

3.1.2 Obligations of Licensees

In the version of the regulations published in the *Canada Gazette*, Part I, subsection 12(2) required licensees to take certain actions, such as conducting a test or modifying equipment, when requested to do so by the Commission. It was pointed out that these requests were in effect the same as orders under section 35 of the NSC Act, without the appeal mechanisms provided by the Act. Subsection 12(2) of the regulations has been changed to require only that licensees provide a response to a request from the Commission within the time period specified. A request will therefore not have the effect of an order.

3.2 *Radiation Protection Regulations*

These Regulations contain the radiation protection requirements and as such, they apply to all licensees and others who fall within the mandate of the Commission. Medical doses, doses to caregivers who do not do this as a profession and doses to

dans une version provisoire d'un document d'application de la réglementation.

***a*) Solutions de rechange aux garanties financières**

Le Parlement avait clairement l'intention d'autoriser la CCSN à exiger des garanties financières. Aucune solution de rechange n'a donc été envisagée.

***b*) Coûts**

Le titulaire de permis a toujours été responsable des coûts relatifs au déclassement de ses installations. Le coût résultant de l'application du paragraphe 24(5) de la LSRN est donc limité au coût additionnel de la garantie financière. Des garanties financières sont déjà exigées aux termes du *Règlement sur les mines d'uranium et de thorium*. Par conséquent, les titulaires de permis concernés n'auront pas à engager de coûts additionnels. Un titulaire de permis aura le choix parmi plusieurs mécanismes pour satisfaire aux exigences de garantie financière de la CCSN. Il existe cependant des facteurs hors du contrôle de la CCSN qui peuvent affecter le coût d'une garantie financière, le principal étant le consentement des pouvoirs publics (fédéraux et provinciaux) de soutenir financièrement les coûts de déclassement des installations qu'ils possèdent ou qui sont exploitées dans leur province. Selon ces décisions, le coût des garanties financières pourrait varier entre zéro, s'il y a engagement gouvernemental, et plusieurs millions de dollars dans le cas d'installations importantes dont les coûts de déclassement sont élevés. Il est donc difficile d'estimer l'ampleur des répercussions financières de cette exigence.

La CCEA étudie actuellement les commentaires recueillis sur la version provisoire d'un document d'application de la réglementation traitant des garanties financières. Il sera impossible d'estimer avec précision le coût total que représente la mise en application du paragraphe 24(5) de la LSRN tant que ce document ne sera pas achevé et que d'autres décisions n'auront pas été prises, notamment celles qui sont mentionnées plus haut. C'est pour cette raison que les coûts ne figurent pas ici.

***c*) Avantages**

En imposant des garanties financières, on réduit considérablement le risque pour les contribuables d'avoir à payer les coûts de déclassement.

3.1.2 Obligations du titulaire de permis

Le paragraphe 12(2) de la version du règlement publiée dans la *Gazette du Canada* Partie I stipulait que, sur demande de la Commission, le titulaire de permis est tenu de prendre certaines mesures comme la mise à l'essai ou la modification d'équipement. Il est apparu qu'une telle demande est, en fait, identique à l'ordre mentionné à l'article 35 de la LSRN, sans les mécanismes d'appel que prévoit la loi. On a donc modifié le paragraphe 12(2) du règlement de façon à exiger du titulaire de permis uniquement une réponse à la demande de la Commission dans le délai donné. Une demande n'aura donc plus l'effet d'un ordre.

3.2 *Règlement sur la radioprotection*

Ce règlement stipule les exigences en matière de radioprotection et, à ce titre, il s'applique à tous les titulaires de permis et autres organismes assujettis à la réglementation de la CCSN. Les doses médicales, les doses reçues par les bénévoles qui dispensent

volunteers in biomedical research are specifically excluded from the regulations.

As a result of comments received following publication in the *Canada Gazette*, Part I, changes were made to the definitions in sections 1 and 12 and to the application of ALARA (as low as reasonably achievable) in paragraph 4(*a*) to improve clarity and make these Canadian requirements consistent with international practice.

The *Radiation Protection Regulations* represent regulatory requirements under the AEC Act with revised dose limits and the addition of action levels.

3.2.1 New Dose Limits

The dose limits in most countries are based on the recommendations of the International Commission on Radiation Protection (ICRP). Using the most recent data on the effects of radiation, the ICRP recommended lowering the dose limits in 1991 as follows:

— for nuclear energy workers, from 50 millisievert* (mSv)/year to 100 mSv for five years (i.e., an average of 20 mSv/year);

— for pregnant nuclear energy workers, from 10 mSv/year to 2 mSv/year; and

— for members of the public, from 5 mSv/year to 1 mSv/year.

Except for pregnant workers as described below, the new regulations reflect these recommendations.

* A millisievert is the unit used to measure the dose equivalents from different types of radiation. Typically, Canadians receive between 2 and 3 mSv per year from background radiation.

In July 1991, the AECB published consultative document C-122, which contained the basic proposal for reduction of the dose limits. Based on the comments received, it was clear that the dose limit for pregnant workers required special consideration since it was a significant decrease from existing practice and could affect employment opportunities for women in the nuclear industry. In 1992, a series of eight workshops was held across Canada specifically on the topic of dose limits for pregnant workers. A total of 338 persons attended the meetings and based on these consultations and a thorough review of the risks of radiation, the maximum effective dose to the worker during the period of the pregnancy was set at 4 mSv in the new regulations. The new regulations also require licensees to take any measure that does not constitute undue hardship to the licensee, to continue to employ the pregnant worker and meet the dose limit. In 1997, the ICRP also recognized the possibility of employment discrimination and as a result, stated that its recommended dose limit for pregnant workers should not be interpreted too rigidly.

Since 1992, the AECB has consulted extensively with the nuclear industry and the Canadian public on the issue of implementing ICRP 60 recommendations as the standard for the Canadian dose limits. The AECB has also been working closely with workers and the industry to lower exposures and thus make introduction of the proposed dose limits less of a burden.

des soins et les doses administrées aux volontaires qui collaborent à la recherche biomédicale sont expressément exclues du règlement.

Les définitions des articles 1 et 12 et l'application du principe ALARA (le niveau le plus faible qu'il soit raisonnablement possible d'atteindre) du paragraphe 4*a*) ont été modifiées en fonction des commentaires qui ont suivi la publication du règlement dans la *Gazette du Canada* Partie I afin de les rendre plus claires et d'harmoniser les exigences canadiennes avec les pratiques internationales.

À l'exception des nouvelles limites de dose et des nouveaux seuils d'intervention, le *Règlement sur la radioprotection* reprend les exigences réglementaires de la LCEA.

3.2.1 Nouvelles limites de dose

Dans la plupart des pays, les limites de dose sont fondées sur les recommandations de la Commission internationale de protection radiologique (CIPR). D'après les données les plus récentes sur les effets des rayonnements, la CIPR a recommandé en 1991 que ces limites soient réduites et passent :

— pour le travailleur du secteur nucléaire, de 50 mSv* par année à 100 mSv pour cinq ans (soit une moyenne de 20 mSv par année);

— pour la travailleuse enceinte du secteur nucléaire, de 10 à 2 mSv;

— pour le public, de 5 à 1 mSv par année.

Les nouveaux règlements reflètent ces recommandations, sauf en ce qui concerne la travailleuse enceinte.

* Un millisievert est l'unité de mesure la plus communément utilisée pour évaluer les doses équivalentes des différents types de rayonnement. En général, un Canadien reçoit entre 2 et 3 mSv par année de rayonnement naturel.

En juillet 1991, la CCEA publiait le document de consultation C-122, qui contenait la proposition de base pour la réduction des limites de doses. À la lumière des commentaires reçus, il était clair qu'il fallait accorder une attention particulière à la limite de dose pour la travailleuse enceinte puisqu'il s'agissait d'une diminution importante par rapport à la pratique existante et que cette mesure pouvait avoir des répercussions sur les perpectives d'emploi des femmes dans l'industrie nucléaire. En 1992, 338 personnes ont participé à huit ateliers organisés partout au Canada sur ce sujet particulier de la limite de dose pour la travailleuse enceinte. À la suite de ces consultations et d'un examen complet des risques du rayonnement, la dose maximale efficace pour la travailleuse enceinte a été fixée dans le nouveau règlement à 4 mSv. Le nouveau règlement exige aussi du titulaire de permis qu'il prenne toutes les mesures qui ne représentent pas pour lui des contraintes excessives afin de garder la travailleuse enceinte comme employée tout en respectant la limite de dose fixée. En 1997, ayant également reconnu la possibilité de discrimination dans l'emploi, la CIPR a par la suite déclaré que la limite de dose recommandée pour la travailleuse enceinte ne devrait pas être interprétée de façon trop rigoureuse.

Depuis 1992, la CCEA mène de vastes consultations auprès des représentants de l'industrie nucléaire et du public canadien au sujet de l'adoption des recommandations de la CIPR (Publication 60) à titre de norme visant les limites de

(*a*) Alternatives to New Dose Limits

The ICRP recommendations are becoming the world standard for radiation exposure. These values represent a risk level that is recognized as "acceptably low" by the international scientific community, and there is no sound rationale to adopt different limits, with the exception of the pregnant worker dose limit described above.

(*b*) Costs

The proposal to reduce the dose limits for workers has been under discussion since the publication of AECB consultative document C-122 in 1991. To avoid problems associated with dose averaging, this document proposed a dose limit of 20 mSv/year for workers in the nuclear energy industries. In the same year, an AECB-funded study by Price-Waterhouse concluded the costs associated with this lower limit would be very significant, increasing overall costs by approximately 17% for reactor operations and 4% for mining operations. Since then, a number of changes have occurred that have convinced the AECB that the flexibility of the ICRP's five-year limit should be introduced in Canada. These changes include modification of the National Dose Registry to accommodate averaging and reductions in the average exposure of Canadian workers.

In 1997, Health Canada reported that for the five-year period ending in 1995, no nuclear worker at a reactor site received a dose that exceeded 100 mSv. Therefore, the new dose limit should have no significant effect on reactor operations or costs. For the uranium mining industry during the same five-year period, 72 underground miners and support workers from a total of 1,485 in these categories exceeded 100 mSv by an average of 22%. During the 10-year period ending in 1995, the average dose for these categories decreased by approximately 4% per year and if this trend continues, the excess should be eliminated within several years. A preliminary analysis by Health Canada of the dosimetry data for 1998 indicates that no reactor or mining worker received a dose that exceeded 20 mSv/year as compared with 9 reactor workers and 37 mining workers who exceeded that limit in 1997.

For both reactor and mining licensees, some new costs will be associated with increased surveillance caused by the new dose limits and averaging. Some greater attention will need to be paid to work scheduling and dose monitoring to reduce exposures. The incremental cost is estimated to be less than $200,000 annually for all reactor licensees. Based on information from the mining industry, the annual incremental costs will be approximately $100,000 per mining facility for a total industry cost estimated to be $600,000 per year.

Thirty-seven from a total of 3,444 industrial radiographers received a dose that exceeded 100 mSv during the five-year period ending in 1995. The average dose for the 37 workers must be decreased by 40% using a combination of retraining, better supervision, rearranged workloads, and better use of time, distance and shielding. Reducing by an average of 40% the dose received by 1% of the workers in this industry is estimated to cost $200,000 per year.

The new public dose limits will result in a number of licensees' staff being designated as nuclear energy workers who were not considered atomic radiation workers under the AEC Act. Data from the National Dose Registry shows that, approximately 6,000 workers received doses between

dose au Canada. La CCEA a également collaboré étroitement avec les travailleurs et l'industrie afin de diminuer les expositions pour ainsi faciliter l'instauration des limites de dose proposées.

a) **Solutions de rechange aux nouvelles limites de dose**

Les recommandations de la CIPR sont en train de s'imposer comme norme mondiale en matière d'exposition aux rayonnements. Ces valeurs représentent ce que la communauté scientifique internationale considère comme un niveau de risque « assez faible pour être acceptable » et, sauf en ce qui concerne la travailleuse enceinte tel qu'expliqué plus haut, il n'y a aucune raison valable d'adopter des limites différentes.

***b*) Coûts**

La proposition visant à abaisser la limite de dose des travailleurs a fait l'objet de discussions depuis la publication en 1991 du document de consultation C-122 de la CCEA. Pour éviter les problèmes liés à l'utilisation d'une dose moyenne, ce document préconisait un maximum de 20 mSv par année pour le travailleur des industries utilisant l'énergie nucléaire. Au cours de la même année, à la suite d'une étude financée par la CCEA, Price-Waterhouse a conclu que les coûts de cette réduction de la limite de dose seraient très élevés puisqu'ils se traduiraient par une augmentation des coûts globaux d'environ 17 % pour les centrales nucléaires et de 4 % pour les mines d'uranium. Depuis, un certain nombre de changements, comme les modifications apportées au Fichier dosimétrique national pour permettre l'utilisation de doses moyennes et incorporer la réduction de l'exposition moyenne du travailleur canadien, ont convaincu la CCEA que la souplesse de la limite de cinq ans de la CIPR méritait d'être introduite au Canada.

En 1997, Santé Canada a rapporté que, pour la période de cinq ans se terminant en 1995, aucun travailleur de centrale nucléaire n'avait été soumis à un rayonnement de plus de 100 mSv. La nouvelle limite ne devrait donc pas affecter les opérations ou les coûts des centrales de façon notable. Pour la même période dans l'industrie minière de l'uranium, 72 mineurs de fond et travailleurs auxiliaires sur un total de 1 485 ont reçu plus de 100 mSv dans 22 % des cas. Pendant la période de dix ans se terminant en 1995, la dose moyenne pour ces catégories a diminué d'environ 4 % par année et, si cette tendance se maintient, le dépassement devrait être éliminé d'ici à plusieurs années. Une analyse préliminaire des données dosimétriques réalisée par Santé Canada pour 1998 indique qu'aucun travailleur de centrale ou de mine n'a reçu de dose supérieure à 20 mSv par an alors qu'en 1997, cette limite avait été dépassée dans le cas de neuf travailleurs de centrale et de 37 mineurs.

Les titulaires de permis de centrales et de mines devront exercer une surveillance accrue quant aux nouvelles limites de dose et au calcul de la moyenne et porter plus d'attention à l'établissement des horaires de travail et à la surveillance des doses afin de réduire les expositions. On estime à moins de 200 000 $ par année pour l'ensemble des titulaires de permis de centrales le coût additionnel qui sera associé à ces mesures. Des renseignements recueillis auprès des industries minières indiquent qu'elles devront pour leur part envisager des coûts d'environ 100 000 $ pour chacune des installations, pour un coût total estimé à 600 000 $ par année.

1 mSv and 5 mSv during 1997. People occupying these positions will have to be notified that they are nuclear energy workers and provided with information about the risks of radiation. This information can be obtained from sources such as the CNSC and the International Atomic Energy Agency (IAEA). The majority of affected licensees are involved with power reactors or uranium mining, and in such cases, programs and procedures already exist for their atomic radiation workers. Incremental costs therefore should be minimal. Approximately 1,000 licensees primarily involved with medical or research uses will have to establish a notification program. The average cost per licensee is estimated to be $1,000. The one-time cost to the industry is therefore estimated to be $1 million.

(*c*) Benefits

The basic benefit from lower dose limits is the reduced risk to workers and members of the public from radiation resulting from the nuclear industry. This will make Canada's dose limits consistent with international standards. Providing nuclear energy workers with information about radiation protection and risks will tend to reduce exposures.

Chez les opérateurs de gammagraphie, 37 travailleurs sur un total de 3 444 ont reçu des doses dépassant 100 mSv pendant cette même période de cinq ans se terminant en 1995. La dose moyenne pour ces travailleurs devrait donc diminuer de 40 % grâce à l'effet combiné des mesures suivantes : perfectionnement des connaissances, amélioration de la supervision, réaménagement des horaires et utilisation efficace du temps, de la distance et du blindage. La hausse des coûts correspondant à une réduction en moyenne de 40 % de la dose pour 1 % des travailleurs de cette industrie ne devrait pas se chiffrer à plus de 200 000 $.

En raison des nouvelles limites de dose pour le public, un grand nombre de personnes employées par des titulaires de permis seront désignées comme travailleurs de l'industrie nucléaire alors qu'aux termes de la LCEA ces personnes n'étaient pas considérées comme travailleurs sous rayonnements. Les données du Fichier dosimétrique national montrent qu'environ 6 000 travailleurs ont reçu en 1997 des doses variant entre 1 mSv et 5 mSv. Les personnes qui occupaient ces postes devront être informées qu'elles sont dorénavant considérées comme des travailleurs de l'industrie nucléaire et devront recevoir de l'information sur les risques de l'exposition aux rayonnements. On peut obtenir cette information à la CCSN et à l'Agence internationale de l'énergie atomique (AIEA). Comme la majorité des titulaires de permis concernés appartiennent au secteur des centrales nucléaires ou à celui des mines d'uranium, ils possèdent déjà des programmes et des procédures visant leurs travailleurs sous rayonnements. Les coûts supplémentaires associés à cette mesure devraient donc être mineurs. Environ 1 000 titulaires de permis, notamment dans les secteurs de la médecine et de la recherche, devront mettre sur pied un programme de notification dont le coût moyen est estimé à 1 000 $ par titulaire de permis. On prévoit donc que l'industrie aura à assumer un coût ponctuel d'environ 1 million de dollars.

***c*) Avantages**

Le principal avantage des nouvelles limites de dose est de réduire les risques d'exposition aux rayonnements pour les travailleurs et les membres du public provenant de l'industrie nucléaire. Les limites de dose en vigueur au Canada seront dorénavant conformes aux normes internationales. De plus, les expositions devraient être diminuées grâce à l'information qui sera distribuée aux travailleurs du secteur de l'énergie nucléaire au sujet de la radioprotection et des risques reliés aux rayonnements.

3.2.2 Action Levels

An action level is a specific dose or other parameter which, if reached, may indicate a partial loss of control of the radiation protection program. The *General Nuclear Safety and Control Regulations* require applicants to submit information on any action level they use or propose to use. If an action level is referred to in a licence, the *Radiation Protection Regulations* require the licensee to investigate, take appropriate actions and notify the Commission when an action level is exceeded.

The establishment of action levels is consistent with the recommendations of the ICRP. Most major licensees have action levels, but they may be identified as reference levels, investigation levels, etc. Reporting when one of these levels is exceeded was not a regulatory requirement under the AEC Act or Regulations.

3.2.2 Seuils d'intervention

Un seuil d'intervention peut être une dose particulière ou un autre paramètre qui, une fois atteint, pourrait indiquer la perte de contrôle d'une partie du programme de radioprotection. Le *Règlement général sur la sûreté et la réglementation nucléaires* exige que le demandeur présente des renseignements sur les seuils d'intervention qu'il utilise ou se propose d'utiliser; si un seuil d'intervention indiqué dans un permis est dépassé, le *Règlement sur la radioprotection* exige que le titulaire de permis fasse enquête, prenne les mesures voulues et avise la Commission.

L'établissement de seuils d'intervention correspond aux recommandations de la CIPR. La plupart des titulaires de permis importants possèdent déjà des seuils d'intervention, parfois désignés sous le nom de seuils de référence,

(*a*) Alternatives to Action Levels

One alternative to action levels is to allow licensees to delay any response to an anomaly until a regulatory limit is reached, thus increasing the risk that a person may be exposed to doses in excess of the limits before the problem is identified and corrected. This is not considered acceptable in protecting persons and the environment.

Allowing licensees complete flexibility in the establishment of action levels and in notification to the CNSC has been effective for some licensees but such flexibility is not considered acceptable for the industry as a whole.

(*b*) Costs

Most licensees already have established levels and take actions before regulatory limits are reached, so no major costs are anticipated. Some additional documentation and reporting may be necessary, but the associated incremental costs per licensee are not considered to be significant (i.e., approximately $100,000 per year for all licensees).

(*c*) Benefits

By taking action before regulatory limits are reached, the frequency and severity of noncompliance with regulatory limits will be minimized.

3.3 ***Class I Nuclear Facilities Regulations***

The *Atomic Energy Control Regulations* include reactors, particle accelerators, uranium processing plants and waste management facilities in the definition of "nuclear facilities." Under the NSC Act, the definition has been expanded to include those plants that possess, process or use large quantities of radioactive material because their level of risk falls within the range of other nuclear facilities. Since the licensing criteria vary significantly for this expanded list of nuclear facilities, it was decided to separate the group of licensees into two classes of facilities that better reflect their operations and the risks associated with them. Class II nuclear facilities therefore consist of low-energy particle accelerators and equipment containing only sealed sources because of the lower risk these types of facilities represent.

The requirements specified in the *Class I Nuclear Facilities Regulations* for major facilities such as reactors, high-energy accelerators and uranium processing facilities are essentially the same as those under the AEC Act, regulations and licence conditions. The impact of the new regulations on operator recertification and uranium or large radioisotope processing plants that are included as class I nuclear facilities, are discussed below.

The only major change to these Regulations resulting from the comments received following publication in the *Canada Gazette*, Part I concerned the subdivision of the class I nuclear facilities into class IA and class IB. The rationale for this change is explained as part of section 3.3.2.

niveaux d'investigation, etc. La LCEA et ses règlements ne prévoyaient pas que le titulaire de permis soit tenu de signaler le dépassement de ces seuils.

***a*) Solutions de rechange aux seuils d'intervention**

Une solution de rechange serait de permettre au titulaire de permis de reporter tout rapport d'anomalie tant que la limite réglementaire n'est pas atteinte. Or, cette solution augmente le risque qu'une personne soit exposée à des doses supérieures aux limites avant que le problème ne soit identifié et corrigé, ce qui n'est pas jugé acceptable lorsqu'il s'agit d'assurer la protection des personnes et de l'environnement.

Une entière flexibilité dans l'établissement des seuils d'intervention et des rapports à communiquer à la CCSN convient à certains titulaires de permis, mais n'est pas jugée acceptable pour l'industrie dans son ensemble.

***b*) Coûts**

La plupart des titulaires de permis établissent déjà des seuils d'intervention et prennent des mesures avant que les limites réglementaires ne soient atteintes. Cette initiative ne devrait donc pas entraîner de coûts importants. Il pourrait être pertinent d'ajouter de la documentation et des rapports, mais le coût supplémentaire par titulaire de permis ne sera pas élevé (ex. : environ 100 000 $ par année pour l'ensemble des titulaires de permis.)

***c*) Avantages**

Lorsque des mesures sont prises avant que les limites réglementaires ne soient atteintes, les cas de non-conformité sont moins fréquents et moins graves.

3.3 ***Règlement sur les installations nucléaires de catégorie I***

La définition d'« installation nucléaire » figurant dans le *Règlement sur le contrôle de l'énergie atomique* désigne les réacteurs, les accélérateurs de particules, les usines de traitement d'uranium et les installations de gestion des déchets. Aux termes de la LSRN, cette définition a été élargie pour inclure les usines qui possèdent, traitent ou utilisent de grandes quantités de matière radioactive, car leur seuil de risque est semblable à celui d'autres installations nucléaires. Puisque les critères menant à l'obtention du permis varient considérablement entre les installations nucléaires apparaissant sur cette nouvelle liste élargie, ces installations ont été regroupées en deux catégories, qui reflètent mieux leurs activités et les risques qu'elles représentent. Dans la catégorie II se trouvent réunis les accélérateurs de particules à faible énergie et les équipements n'utilisant que des sources scellées, vu le moindre risque que représente ce type d'installation.

Le *Règlement sur les installations nucléaires* de catégorie I, qui précise les exigences applicables aux grandes installations comme les centrales, les accélérateurs à haute énergie et les usines de traitement d'uranium, reprend essentiellement les termes de la LCEA, de ses règlements et des conditions de permis. Nous décrirons plus loin l'effet du nouveau règlement, en ce qui a trait au renouvellement de l'accréditation des opérateurs et aux usines de traitement d'uranium ou aux grandes usines de traitement des radio-isotopes, qui font partie des installations nucléaires de catégorie I.

La seule modification importante apportée à ce règlement à la lumière des commentaires reçus à la suite de la publication dans la *Gazette du Canada* Partie I a trait à la subdivision des installations nucléaires de catégorie I en catégories IA et IB. Les motifs de ce changement sont expliqués à la section 3.3.2.

3.3.1 Operator Certification

The AECB required the senior control room staff of nuclear power reactors to pass examinations administered by the AECB that tested their competence to operate nuclear reactors safely. Only examinations for initial certification were required, but licensees were expected to maintain the competence of their staff through regular training. For some time, the AECB has considered that a mechanism for verifying continuing competence is necessary and under the AEC Act, it began the process by adding an expiry date to all existing certifications.

Under the *Class I Nuclear Facilities Regulations*, certifications issued by the CNSC expire after five years, and in order to be recertified, senior control room staff will be required to successfully complete a continuing training program and requalification tests administered by the licensee to demonstrate continuing competence. The licensee's continuing training program and tests will be evaluated regularly by Commission staff.

A recertification process, which has been under discussion with the industry for more than five years, was started under the AEC Act and Regulations. A series of meetings was held with the power reactor operators on implementation of a five-year recertification program. The power utilities made presentations to the Board at its August 12, 1999, meeting in which they expressed concern about the proposed recertification program. The Board concluded that further consultation was necessary, and at its November 4, 1999, meeting, it received five presentations from union and other groups representing affected workers at the three power generation licensees. The Board confirmed the decision to implement a five-year recertification process.

(*a*) Alternatives to Operator Recertification

There are no alternatives to recertification to provide the regulator with adequate assurance of continuing competency. High standards of performance are expected and as with safety-critical jobs in other industries, a formal demonstration that those standards continue to be met is considered essential. Periodic renewal of certification is consistent with the practices in many other countries where nuclear power plants operate.

(*b*) Costs

It is estimated that reactor licensees will need to invest about $500,000 in total to develop recertification training programs for their nuclear operators. The continued management and conduct of this training are expected to require additional staff for a total cost of $350,000 per year. Additional staff will be required at the Commission to monitor these requalification programs conducted by the licensees. This cost, which is estimated to be approximately $200,000 per year, is expected to be reflected in licensing fees charged to the affected licensees. The incremental operating cost to the industry for this new regulatory requirement is therefore estimated to be $550,000 per year.

(*c*) Benefits

The safe operation of nuclear power plants in Canada is dependent upon highly trained and competent staff. The initial training and examination programs for senior control room operators are comprehensive to allow the regulator to be satisfied that staff can meet the high standards required to perform their duties. The continuing training programs

3.3.1 Accréditation des opérateurs

La CCEA a exigé que les membres supérieurs du personnel de la salle de commande d'une centrale nucléaire passent des examens administrés par la CCEA et ce, pour permettre d'évaluer leur compétence à exploiter des réacteurs nucléaires en toute sûreté. Jusqu'à présent, les examens n'étaient exigés que pour l'accréditation initiale, et il incombait au titulaire de permis de maintenir la compétence de son personnel grâce à une formation régulière. Depuis un certain temps, la CCEA est d'avis qu'il faut implanter un mécanisme visant à vérifier le maintien du niveau de compétence; ce processus a été amorcé avec la LCEA puisque toutes les accréditations existantes sont limitées par une date d'expiration.

Le *Règlement sur les installations nucléaires de catégorie I* stipule que l'accréditation accordée par la CCSN expire après une période de cinq ans et que, pour obtenir le renouvellement de leur accréditation, les membres supérieurs du personnel de la salle de commande doivent suivre et réussir un programme de formation et des examens de requalification administrés par le titulaire de permis afin de démontrer que leurs compétences sont maintenues à niveau. La CCSN évaluera régulièrement les programmes de formation continue et les examens utilisés par les titulaires de permis.

Un processus de renouvellement de l'accréditation, à l'étude avec les représentants de l'industrie depuis plus de cinq ans, a débuté sous le régime de la LCEA et de ses règlements. La mise sur pied d'un programme de renouvellement de l'accréditation de cinq ans a été l'objet d'une série de réunions tenues avec des exploitants de centrales. Lors de la réunion de l'actuelle Commission du 12 août 1999, les services publics d'électricité ont fait des présentations dans lesquelles ils exprimaient leurs inquiétudes par rapport au programme proposé de renouvellement de l'accréditation. La CCSN a conclu que des consultations supplémentaires s'imposaient et a entendu les présentations des syndicats et d'autres groupes qui représentaient les travailleurs concernés chez les trois titulaires de permis centrales nucléaires. La CCSN a confirmé par la suite sa décision d'implanter un processus de réaccréditation de cinq ans.

***a*) Solutions de rechange au renouvellement de l'accréditation**

Aucune solution de rechange au renouvellement de l'accréditation ne permettrait d'assurer un maintien adéquat des compétences. On s'attend à ce que le rendement d'un exploitant d'installation nucléaire satisfasse à des normes élevées et, à l'instar d'autres industries où certains emplois ont une grande incidence sur la sûreté, on juge essentiel qu'il soit formellement démontré que ces normes sont respectées en permanence. Le renouvellement périodique de l'accréditation fait partie des pratiques en vigueur dans de nombreux pays où sont exploitées des centrales nucléaires.

***b*) Coûts**

On estime que les titulaires de permis de centrales nucléaires devront investir environ 500 000 $ pour mettre sur pied des cours et des programmes pour assurer le renouvellement de l'accréditation de leurs opérateurs. La gestion de la formation et la formation elle-même pourraient exiger du personnel supplémentaire, ce qui représente un coût de 350 000 $ par année. En outre, la CCSN aura besoin de personnel supplémentaire pour assurer la surveillance des

and periodic requalification tests by this new initiative will provide confidence that operators will maintain the competence required for safe reactor operation.

3.3.2 Reclassification

Based on the definition of a class I nuclear facility, the large processors of radioactive material will become class I nuclear facilities. They have expressed concerns that because of this new categorization, they would be subjected to the same standards as applied to reactors which are also class I facilities and that these standards are not commensurate with the level of risk associated with the operation of their facilities. The AECB has provided assurances that this will not be the case. The regulatory requirements will reflect the risk and not the classification of the facility. Alternatives to and the impact of reclassification have been discussed at a series of meetings with industry.

The uranium processing facilities have suggested that it would be more appropriate if they were included in the *Uranium Mines and Mills Regulations* rather than the *Class I Nuclear Facilities Regulations*. As discussed below, the AECB does not believe that such a change is appropriate.

The same processors of radioactive material have also commented that these Regulations were not as clear as they could be with respect to the application of operator certification to their facilities. To clarify the AECB's intentions on this matter, the definition of class I nuclear facilities has been modified. Class I nuclear facilities have been subdivided into class IA and class IB and the text of section 9 has been modified to state that sections 9-13, which deal with certification of persons, do not apply to class IB nuclear facilities.

(*a*) Alternatives to Reclassification

The AECB has undertaken an initiative to promote greater consistency in the application of regulatory tools to all licensees, and in particular, to adjust AECB activities to relate more closely to the risk associated with each facility. This initiative is consistent with the 1994 recommendations of the Office of the Auditor General concerning the need for a clearly documented regulatory strategy and formal program evaluation. A review indicated that the risks associated with three large processors of radioactive material and the uranium processing facilities more closely match those of class I nuclear facilities than those associated with radioisotope licences, uranium mines or class II nuclear facilities. Therefore, in the interest of a consistent risk-based

programmes de renouvellement de l'accréditation des titulaires de permis, entraînant des frais supplémentaires d'environ 200 000 $ par année, qui se refléteront dans les droits de permis des titulaires concernés. Cette nouvelle exigence réglementaire représentera donc pour l'industrie des coûts supplémentaires de 550 000 $ par année.

***c*) Avantages**

L'exploitation sûre des centrales nucléaires au Canada dépend étroitement de la compétence et de la bonne formation de leur personnel. La formation initiale et les programmes d'examen des membres supérieurs du personnel des salles de commande sont exhaustifs, et la CCSN peut ainsi être convaincue que le personnel peut satisfaire à la norme élevée de compétence nécessaire pour effectuer ses tâches. La formation continue et les examens périodiques de renouvellement de l'accréditation apporteront l'assurance que les opérateurs maintiennent le niveau de compétence exigé pour une exploitation sûre des centrales nucléaires.

3.3.2 Reclassification

La définition d'une installation nucléaire de catégorie I entraînera la reclassification des grandes installations de transformation des matières radioactives dans cette catégorie. Ces industries ont des réserves, car ces nouvelles classifications les assujettissent aux mêmes normes que les centrales nucléaires, qui sont aussi classées dans la catégorie I, alors que leur seuil de risque n'est pas comparable. À cet égard, elles ont reçu l'assurance de la CCEA que ce ne serait pas le cas. Les exigences réglementaires correspondront au seuil de risque de chacun et non à la classification des installations. Les solutions de rechange à la reclassification et les répercussions de la reclassification ont fait l'objet de discussions au cours d'une série de réunions tenues avec les représentants de l'industrie.

Les représentants des installations de traitement de l'uranium estiment qu'il serait plus approprié de les régir par l'application du *Règlement sur les mines et les usines de concentration d'uranium* plutôt que du *Règlement sur les installations nucléaires de catégorie I*. Or, comme il a été expliqué plus haut, la CCEA ne croit pas qu'un tel changement est approprié.

Les mêmes installations de transformation de matières radioactives ont aussi fait observer que le règlement pourrait mieux préciser si les dispositions visant l'accréditation du personnel s'appliquent également à leurs installations. Pour clarifier son intention à ce sujet, la CCEA a modifié la définition des installations nucléaires de catégorie I. Ces installations ont été subdivisées en deux catégories, soit la catégorie IA et la catégorie IB. De plus, l'énoncé de l'article 9 a été modifié pour indiquer que les articles 9 à 13 inclusivement, portant sur l'accréditation des personnes, ne s'appliquent pas aux installations nucléaires de catégorie IB.

***a*) Solutions de rechange à la reclassification**

La CCEA a entrepris une initiative visant à promouvoir une plus grande uniformité dans l'application des outils de réglementation envers tous les titulaires de permis et surtout à adapter les activités de la CCEA de façon à ce qu'elles correspondent plus étroitement aux risques associés à chacune des installations. Cette initiative s'inscrit dans la perspective des recommandations faites en 1994 par le Bureau du vérificateur général concernant la nécessité d'une stratégie

approach to licensing, the proposed classification scheme is appropriate.

An alternative to classifying the large processors as class I nuclear facilities is to create a separate class of facility regulations to clearly differentiate them from reactors. The AECB has systematically reviewed each section of the *Class I Nuclear Facilities Regulations* with a view to identifying any changes in regulatory requirements that would be appropriate for a new set of regulations. The AECB concluded that a new set of regulations would be identical to the existing draft except for the operator certification requirement. Therefore, from a regulation drafting point of view, another class of nuclear facility would serve no useful purpose. However, the subdivision of class I nuclear facilities into classes IA and IB permits a clearer identification of which facilities are not subject to the requirements relating to the certification of personnel.

The uranium processing facilities have suggested that it would be more appropriate if they were included in the *Uranium Mines and Mills Regulations*. This would be a change from their status under the AEC Act. A similar review of these Regulations also indicates that the uranium processing facilities are more appropriately regulated under the *Class I Nuclear Facilities Regulations*.

(*b*) Costs

The *Class I Nuclear Facilities Regulations* contain no regulatory requirements other than the list of information to be supplied with a licence application and operator recertification which was discussed previously. Consequently, the incremental cost associated with reclassification itself will not be significant. It is recognized, however, that certain documentation and procedures will require updating to reflect the risk associated with these facilities. Based on data provided by the largest processor, the incremental cost to implement these changes for the three licensees involved is estimated to be $275,000. Ongoing costs are estimated to be $110,000 per year.

(*c*) Benefits

The benefit of the new classification scheme is greater consistency in licensing based on risk.

de réglementation clairement documentée et d'un mécanisme d'évaluation formelle du programme. Une étude de la question a indiqué qu'en matière de risque, les trois grandes installations de traitement de matières radioactives et les installations de traitement de l'uranium s'apparentent plus aux installations nucléaires de catégorie I qu'aux installations qui sont titulaires de permis de radio-isotopes, aux mines d'uranium ou aux installations nucléaires de catégorie II. Par conséquent, le plan de classification proposé est jugé approprié à une approche axée sur la similarité des seuils de risque.

La classification des grandes installations de traitement de matières radioactives comme celles de catégorie I pourrait être remplacée par la création d'une catégorie distincte qui établisse une distinction claire entre ces installations et les réacteurs. Or, la CCEA a examiné systématiquement chaque article du *Règlement sur les installations nucléaires de catégorie I* en tentant d'identifier toute modification des exigences réglementaires qui pourrait constituer un nouveau règlement. La CCEA a conclu que, mis à part l'exigence de renouvellement de l'accréditation des opérateurs, tout nouveau règlement serait identique à la version existante. Vu sous l'angle de la rédaction des règlements, il serait donc inutile de créer une nouvelle catégorie d'installations nucléaires. Toutefois, la subdivision des installations nucléaires de catégorie I en catégories IA et IB permet de bien clarifier les installations nucléaires auxquelles les exigences en matière d'accréditation du personnel ne s'appliquent pas.

Les représentants des installations de traitement de l'uranium estiment qu'il serait plus approprié de les soumettre au *Règlement sur les mines et les usines de concentration d'uranium*, ce qui représenterait un changement par rapport au statut qu'elles avaient en vertu de la LCEA. Un examen similaire de ce règlement démontre que le *Règlement sur les installations nucléaires de catégorie I* est plus approprié pour les installations de traitement de l'uranium.

***b*) Coûts**

Le *Règlement sur les installations nucléaires de catégorie I* ne renferme pas d'exigences autre que la liste des renseignements qui doit accompagner une demande de permis et un renouvellement d'accréditation tel qu'expliqué ci-dessus. Par conséquent, le coût supplémentaire associé à la reclassification proprement dite sera négligeable. Il est cependant reconnu que certains documents et certaines procédures devront être mis à jour afin de refléter le risque associé aux installations. Selon les données communiquées par la plus grosse installation de traitement, la CCEA estime le coût additionnel de ces modifications à 275 000 $ pour les trois titulaires concernés, et les coûts permanents à 110 000 $ par année.

***c*) Avantages**

Le nouveau plan de classification a pour avantage de proposer une plus grande uniformité dans l'attribution de permis correspondant aux risques.

3.4 *Class II Nuclear Facilities Regulations*

The *Class II Nuclear Facilities Regulations* specify the requirements for nuclear facilities that pose a lower risk than class I facilities. These include low-energy accelerators, irradiators and radiation therapy installations. These Regulations introduce new

3.4 *Règlement sur les installations nucléaires de catégorie II*

Le *Règlement sur les installations nucléaires de catégorie II* prévoit les exigences pour les installations nucléaires dont le seuil de risque est inférieur à celui des installations de catégorie I. Il s'agit notamment des accélérateurs à basse énergie, des

requirements for servicing licences and therapy room interlocks and the impact of these requirements is discussed below.

As a result of comments received following publication in the *Canada Gazette*, Part I, changes were made to clarify that these Regulations do not apply to diagnostic X-ray machines. Changes were also made to the requirements for geographical logging accelerators. Since these changes reflect the requirements under the AEC Act, they have no significant effect on licensees.

3.4.1 Servicing Licences

Many companies provide technical services to class II nuclear facility operators and to holders of nuclear substance licences. Many of these services, such as repairs to safety systems, are essential for the safe operation of the nuclear facility or the safe handling of the radioactive material. The AECB had insufficient information about, and no control over, the work these companies perform, the training and qualification of their staff and their quality assurance programs. This Regulation proposes to licence these service providers where nuclear safety-related services are concerned.

(*a*) Alternatives to Servicing Licences

The alternative of leaving these essential safety-related services unregulated is not considered acceptable since these services contribute directly to the safe management of nuclear facilities and materials.

Another alternative is to require licensees to develop in-house expertise, but this is considered too restrictive for licensees who do not need these services performed frequently. It is also doubtful that in-house expertise would continue to be current when used infrequently.

(*b*) Costs

It is estimated that there are five organizations that service class II equipment without a licence from the AECB. Many cancer clinics perform in-house servicing that will require a licence but as health care institutions, they are exempt from the *AECB Cost Recovery Fees Regulations*. The total cost for the five service companies is estimated to be $20,000 to become licensed plus incremental costs of $10,000 per year.

(*c*) Benefits

Safety-related activities that are contracted out to technical service providers will be approved and monitored in the same way as the training and qualification of licensees' staff who perform safety-related activities. This will ensure that equivalent standards of safety are applied to licensees and to contracted technical service providers.

irradiateurs et des appareils de radiothérapie. Ce règlement introduit de nouvelles exigences en matière de permis d'entretien et de verrouillage des commandes des salles de traitement. L'impact de ces exigences est expliqué en détail ci-dessous.

Les commentaires qui ont suivi la publication du règlement dans la *Gazette du Canada* Partie I ont entraîné des modifications pour clarifier que le règlement ne s'applique pas aux appareils de radiographie diagnostiques. Certains changements ont aussi touché les exigences relatives aux accélérateurs de diagraphie. Ils n'auront pas de répercussions importantes pour les titulaires de permis puiqu'ils ne font que refléter les exigences de la LCEA.

3.4.1 Permis d'entretien

Plusieurs compagnies fournissent des services techniques aux exploitants d'installations nucléaires de catégorie II et aux titulaires de permis de substances nucléaires. Plusieurs de ces services, par exemple la réparation des systèmes de sûreté, sont essentiels à une exploitation sûre de l'installation nucléaire ou à une manutention sans danger des matières radioactives. La CCEA ne disposait pas de renseignements suffisants et n'avait aucun contrôle sur les travaux que ces compagnies effectuent, sur la formation et la compétence de leur personnel ou sur leurs programmes d'assurance de la qualité. Ce règlement propose que les fournisseurs de services ayant une incidence sur la sûreté nucléaire soient tenus d'obtenir un permis.

***a*) Solutions de rechange aux permis d'entretien**

La solution de rechange consistant à ne pas réglementer ces services essentiels à la sûreté n'est pas jugée acceptable dans la mesure où ces services contribuent directement à une gestion sûre des installations et des matières nucléaires.

Une autre solution de rechange serait d'exiger du titulaire de permis qu'il développe des compétences techniques internes, mais cette mesure est considérée trop restrictive pour les titulaires de permis qui n'exigent pas fréquemment ces services d'entretien. Il est également peu probable que ces compétences internes demeurent à jour si elle ne sont que rarement utilisées.

***b*) Coûts**

On estime qu'il y a cinq entreprises qui fournissent des services d'entretien à des installations de catégorie II sans détenir de permis de la CCEA. De nombreux centres anti-cancer entretiennent eux-mêmes leurs équipements et devront donc obtenir un permis. Cependant, à titre d'établissements de santé, ils sont exemptés du *Règlement sur les droits pour le recouvrement des coûts de la CCEA*. Le coût total d'acquisition des permis est estimé pour l'ensemble des cinq fournisseurs à 20 000 $, somme à laquelle s'ajouteront des coûts supplémentaires de 10 000 $ par année.

***c*) Avantages**

Les activités faites à contrat par des fournisseurs de services techniques externes et qui sont associés à la sûreté devront être approuvées et surveillées de la même manière que la formation et la qualification du personnel du titulaire de permis qui effectue lui-même ces tâches. Ainsi, les fournisseurs de services techniques seront soumis aux mêmes normes de sûreté que les titulaires de permis.

3.4.2 Therapy Room Interlocks

All cancer therapy treatment rooms will be required to have interlocks that prevent the production of a radiation beam unless the operator initiates the start-up sequence inside the treatment room before moving to the external control console within a preset period of time. This minimizes the likelihood that an unauthorized person would be in the room when a treatment is being given. Most treatment rooms have this system.

(*a*) Alternatives to Therapy Room Interlocks

The risk of accidental exposures is significantly reduced when the operator is forced to initiate the start-up sequence from inside the treatment room. The alternative is to rely on administrative procedures. The AECB is aware of cases where administrative procedures have not been effective, so this alternative is not considered to be acceptable.

(*b*) Costs

It is estimated that there are 20 treatment rooms in Canada that will require the installation of wiring, a timer and a switch. The incremental cost is not expected to exceed $1,000 per room, so the total cost to hospitals will be $20,000.

(*c*) Benefits

The installation of safety interlocks will reduce the risk of inadvertent exposure of staff or the public to radiation.

3.5 *Uranium Mines and Mills Regulations*

The *Uranium Mines and Mills Regulations* consist primarily of the requirements contained in the *Uranium and Thorium Mining Regulations* and certain licence conditions. Only minor wording changes were made following publication in the *Canada Gazette*, Part I to improve the clarity of the Regulations.

The mining industry has expressed concern that some information, such as a preliminary safety analysis report, will now be required at an earlier stage in the life-cycle of a mine or mill. The Commission believes this information is necessary at an early stage if it is to be satisfied that the operating mine or mill will be capable of meeting regulatory requirements.

3.6 *Nuclear Substances and Radiation Devices Regulations*

The *Nuclear Substances and Radiation Devices Regulations* apply to all nuclear substances, sealed sources and radiation devices not covered by other regulations. As such, they apply to almost every licensee and result in the vast majority of AECB licences. They also contain the criteria for consumer products such as smoke detectors and safety signs using tritium. In general, these Regulations reflect international practice but there are some minor variations based upon Canadian policy and circumstances.

3.4.2 Verrouillage des commandes des salles de thérapie

Toutes les salles de traitement du cancer devront être munies de dispositifs de verrouillage des commandes, qui empêchent la production d'un faisceau de rayonnement tant que l'opérateur n'a pas déclenché la séquence de démarrage à l'intérieur de la salle avant de se déplacer au tableau de commande dans un laps de temps préréglé. Cette procédure réduit la possibilité qu'une personne non autorisée se trouve à l'intérieur de la pièce pendant l'administration du traitement. La plupart des salles de thérapie sont déjà munies de ce système.

***a*) Solutions de rechange au verrouillage des commandes des salles de thérapie**

Le risque d'exposition accidentelle est réduit de façon notable lorsque l'opérateur est forcé de lancer la séquence de démarrage de l'intérieur de la pièce. La solution de rechange serait de s'en remettre aux procédures administratives. Or, cette solution de rechange n'est pas jugée acceptable puisque la CCEA est au fait de cas où ces procédures administratives n'ont pas été efficaces.

***b*) Coûts**

On estime qu'il y a 20 salles de thérapie au Canada qui nécessiteront l'installation de câblage, d'une minuterie et d'un interrupteur. On prévoit donc que les coûts supplémentaires n'excéderont pas 1 000 $ par salle, pour un total de 20 000 $ pour l'ensemble des hôpitaux.

***c*) Avantages**

L'installation de dispositifs de verrouillage de sécurité réduira le risque d'exposition par inadvertance à la fois pour le personnel et pour le public.

3.5 *Règlement sur les mines et les usines de concentration d'uranium*

Le *Règlement sur les mines et les usines de concentration d'uranium* reprend principalement les exigences énoncées dans le *Règlement sur les mines d'uranium et de thorium* et dans certaines conditions de permis. Seuls des changements mineurs dans la formulation effectués pour plus de clarté ont suivi la publication du document dans la *Gazette du Canada* Partie I.

L'industrie minière a exprimé ses préoccupations quant au fait que certains renseignements tels que le rapport préliminaire de sûreté sera dorénavant exigé dans les premiers stades de l'existence de la mine ou de l'usine de concentration. La CCSN croit, pour sa part, que cette information est nécessaire dès les débuts de façon à ce qu'une fois en phase d'exploitation, la mine ou l'usine de concentration soit en mesure de satisfaire aux exigences réglementaires.

3.6 *Règlement sur les substances nucléaires et les appareils à rayonnement*

Le *Règlement sur les substances nucléaires et les appareils à rayonnement* s'applique à toutes les substances nucléaires, sources scellées et appareils à rayonnement qui ne sont pas régis par d'autres règlements. Ainsi, il s'applique à presque tous les titulaires de permis et figure dans la grande majorité des permis de la CCEA. Il contient aussi les critères relatifs à des produits de consommation comme les détecteurs de fumée et les panneaux de sécurité au tritium. Généralement, le règlement reflète les pratiques internationales, mais certaines variations mineures sont fondées sur une politique et des circonstances typiquement canadiennes.

The regulations consist of the requirements under the AEC Regulations and licence conditions, with the addition of servicing licences similar to those described previously in section 3.4.1 for class II nuclear facilities, and audible alarming dosimeters for exposure device operators. The scheduled quantities defined in the AEC Regulations have also been replaced with exemption quantities. This means that the quantities of radioactive material that are exempt from licensing have generally decreased.

Following publication in the *Canada Gazette*, Part I, changes were made to the regulations to clarify the requirements for the use of calibrated survey meters and to remove several sections that upon review were found to be redundant. Other minor changes were made to improve clarity.

3.6.1 Exemption Quantities

The schedule to the *Nuclear Substances and Radiation Devices Regulations* contains a list of the quantities of radioactive material below which no licence is required. The AEC Regulations also contain exemption values called "scheduled quantities", but the exemption quantities proposed under the NSC Act, which are based on current radiation protection knowledge and the new dose limits, are generally smaller than those found in the AEC Regulations.

The AEC Regulations exempt from licensing most materials that contain less than one scheduled quantity per kilogram. This exemption was not included in the Regulations under the NSC Act because of concerns about the risks posed by large volumes of materials that contain low concentrations of radioactive material.

(*a*) Alternatives to the Schedule of Exemption Quantities

The schedule of exemption quantities is calculated from models based on assumptions about the hazards and uses of small quantities of nuclear material. As knowledge and experience has grown, these models have been refined to reflect current information. One alternative would be to continue to use the 1974 values. This is considered to be unacceptable because it would not recognize the new lower dose limits and recent information on the effects of radiation. Another alternative would be to adopt one of the sets of values used in other countries. These have been considered, but the AECB has concluded that the proposed exemption quantities are more appropriate because they provide better protection for Canadians.

The regulations could also continue the exemption for materials that contain less than one scheduled quantity per kilogram. The AECB believes, however, that the blanket exemption should be removed because of the potential risk posed by large quantities of materials containing small concentrations of radioactive materials. In cases where such materials pose no significant risk, the Commission may use section 7 of the NSC Act to exempt them from the application of the Act and Regulations.

(*b*) Costs

Most users of small sources already have a licence from the AECB for other activities, so no significant additional costs are anticipated. However, some abandoned nuclear sites will require consideration for licensing under the new

Le règlement reprend les exigences prévues par le *Règlement sur le contrôle de l'énergie atomique* et les conditions de permis actuelles, auxquelles s'ajoute l'exigence de permis d'entretien déjà décrite à la section 3.4.1 pour les installations de catégorie II et les dosimètres munis de dispositif d'alarme sonore pour les opérateurs d'appareil d'exposition. Les quantités réglementaires déterminées dans le *Règlement sur le contrôle de l'énergie atomique* ont également été remplacées par des quantités exemptées. Ainsi les quantités de matière radioactive exemptées ont en général diminué.

À la suite de la publication du règlement dans la *Gazette du Canada* Partie I, certaines modifications ont été apportées au règlement dans le but de préciser les exigences relatives à l'utilisation des radiamètres étalonnés et de retirer certains articles jugés redondants après examen. Des changements mineurs ont aussi été apportés pour plus de clarté.

3.6.1 Quantités exemptées

L'annexe du *Règlement sur les substances nucléaires et les appareils à rayonnement* renferme une liste des quantités de matière radioactive au-dessous desquelles un permis n'est pas nécessaire. Le *Règlement sur le contrôle de l'énergie atomique* contient également des valeurs d'exemption appelées « quantités réglementaires », mais les quantités exemptées proposées dans la LSRN — fondées sur les connaissances actuelles en radioprotection et sur les nouvelles limites de dose — sont en général plus faibles que celles qu'on trouve dans le *Règlement sur le contrôle de l'énergie atomique*.

Le *Règlement sur le contrôle de l'énergie atomique* prévoit une exemption de permis pour la plupart des matières qui contiennent moins qu'une quantité réglementaire par kilogramme. Cette exemption n'a pas été stipulée dans les règlements d'application de la LSRN en raison des inquiétudes suscitées par les gros volumes de produits contenant de faibles concentrations de matières radioactives.

***a*) Solutions de rechange à l'annexe relativement aux quantités d'exemptions**

Les quantités d'exemptions sont calculées d'après des modèles fondés sur les hypothèses qui ont été formulées au sujet des dangers des matières nucléaires et de l'utilisation de petites quantités de ces matières. Les modèles sont affinés à mesure que l'on acquiert de l'expérience et de nouvelles connaissances. Une solution de rechange serait de continuer à utiliser les valeurs adoptées en 1974. Cette solution est cependant jugée inacceptable parce qu'elle ne tiendrait pas compte des nouvelles limites de dose moins élevées, ni des découvertes récentes sur les effets du rayonnement. Une autre solution de rechange serait d'adopter l'un des ensembles de valeurs utilisés dans d'autres pays. Ces solutions ont été envisagées, mais la CCEA juge que les exemptions proposées sont plus aptes à protéger les Canadiens.

Le règlement pourrait aussi poursuivre l'exemption accordée aux matières qui contiennent moins qu'une quantité réglementaire par kilogramme. La CCEA croit cependant que l'exemption générale doit être retirée à cause du risque potentiel que représentent les gros volumes de produits contenant de faibles concentrations de matières radioactives. Dans les cas où ces matières ne constituent pas un risque significatif, la CCSN peut utiliser l'article 7 de la LSRN pour les exempter de l'application de la LSRN et des règlements.

regulations. The AECB is aware of approximately 45 such contaminated sites. Most of these, if they do require licensing, would incur incremental costs estimated at less than $2,000 per year per site. For five or six of the sites, the incremental costs for licensing and monitoring are estimated to be as much as $10,000 per year per site.

(*c*) Benefits

The revised exemption quantities will reflect improved safety standards that are based on current scientific knowledge. Removal of the blanket exemption for materials containing low concentrations of radioactive material allows for regulatory control when justified due to the volume of material involved.

3.6.2 Audible Alarming Dosimeters

The use of radiation sources to radiograph structures such as pipeline welds, aircraft components and pressure vessels for flaws is one of the most hazardous activities licensed by the AECB. The new regulations therefore require all exposure device operators to wear an audible alarming dosimeter to alert them to dangerous levels of radiation before significant exposures occur. Under the AEC Regulations, only trainees were required to have these devices. Audible alarms have been a requirement in the United States for several years.

(*a*) Alternatives to Audible Alarming Dosimeters

Due to the conditions under which radiography may be performed, operators are often unable to observe the ambient dose rate on a survey meter as frequently as safe practice would require. Therefore, the only way operators can be informed of high radiation levels under such circumstances is with an audible alarm. Audible alarms have been a requirement for trainees since 1983, but they were not made mandatory for everyone at that time because they were judged to lack adequate reliability. Technology has advanced to the point where their reliability is now considered acceptable. The AECB is aware of significant exposures that would have been prevented by an audible alarming dosimeter, so the AECB believes that there is no alternative to making them mandatory.

(*b*) Costs

Basic audible alarming dosimeters that meet the requirements of the regulations cost approximately $200, but sophisticated units can cost up to $1,500 per unit. Many operators already have audible alarms. It is therefore assumed that 500 units will have to be purchased at a cost of $200 for a total cost to industry of $100,000. Assuming units last five years on average, the incremental replacement cost for the industry will be $20,000 per year.

(*c*) Benefits

Industrial radiography causes the largest number of overexposures and radiation incidents in Canada. Alerting operators to hazardous dose rates before large exposures occur is one of the most effective measures available to meet the new lower dose limits.

***b*) Coûts**

La plupart des utilisateurs de petites sources ont déjà un permis de la CCEA pour d'autres activités. On ne s'attend donc pas à des coûts supplémentaires. Il faudra cependant analyser le cas des sites nucléaires abandonnés avant de leur accorder des permis qui soient conformes au nouveau règlement. La CCEA connaît l'existence d'environ 45 de ces sites contaminés dont la plupart, s'ils devaient se munir de permis, ne devraient faire face qu'à des coûts supplémentaires de moins de 2 000 $ par année. Toutefois, pour cinq ou six d'entre eux, les coûts de permis et de surveillance pourraient atteindre jusqu'à 10 000 $ par année, par site.

***c*) Avantages**

La version révisée des quantités d'exemption reflétera les normes de sûreté améliorées, qui sont fondées sur les connaissances scientifiques courantes. Le retrait de l'exemption générale pour des matières contenant de faibles concentrations de matières radioactives prévoit un contrôle réglementaire lorsque le volume de ces matières le justifie.

3.6.2 Dosimètres sonores

L'utilisation de sources de rayonnement pour détecter des vices cachés dans des structures comme les soudures de pipelines, les pièces d'aéronef et les récipients sous pression est une des activités les plus dangereuses autorisées par la CCEA. Par conséquent, le nouveau règlement exige que tous les opérateurs d'appareils à rayonnement portent un dosimètre sonore pour les avertir avant que l'exposition au rayonnement ne devienne dangereuse. Le *Règlement sur le contrôle de l'énergie atomique* exige seulement que les stagiaires portent ces dosimètres. Aux États-Unis, les alarmes sonores sont obligatoires depuis plusieurs années.

***a*) Solutions de rechange aux dosimètres sonores**

En raison des conditions dans lesquelles les travaux de radiographie doivent être effectués, les opérateurs sont souvent incapables de lire le débit de dose ambiant sur le radiamètre aussi souvent que l'exigent les pratiques de sécurité. Par conséquent, dans ces circonstances, une alarme sonore est la seule façon qu'ils ont de savoir s'ils sont exposés à des niveaux élevées de rayonnement. Les alarmes sonores sont obligatoires pour les stagiaires depuis 1983, mais, à l'époque, elles ne l'étaient pas pour tout le monde puisqu'on ne les considérait pas assez fiables. La technologie a fait de tels progrès que ce n'est maintenant plus le cas. La CCEA n'est pas sans savoir que le port de dosimètres sonores aurait empêché des expositions importantes aux rayonnements. Voilà pourquoi elle croit qu'elle n'a pas d'autre choix que de les rendre obligatoires.

***b*) Coûts**

Les alarmes sonores de base qui satisfont aux exigences du règlement coûtent environ 200 $, mais des alarmes de type avancé peuvent coûter jusqu'à 1 500 $ l'unité. De nombreux opérateurs possèdent déjà des alarmes sonores. On présume donc qu'il faudra acheter 500 alarmes de 200 $ chacune, pour un total de 100 000 $ pour l'industrie. Si les alarmes durent en moyenne cinq ans, il est à prévoir que le coût de remplacement additionnel pour l'industrie sera de 20 000 $ par année.

***c*) Avantages**

La radiographie industrielle est à l'origine du plus grand nombre de surexpositions et d'incidents liés au rayonnement

3.7 *Packaging and Transport Regulations*

All industrialized countries use the recommendations of the International Atomic Energy Agency (IAEA) to regulate the transport packaging of radioactive materials. The Canadian requirements in the *Transport Packaging of Radioactive Materials Regulations* are based on the 1973 IAEA recommendations, and the new Regulations are based on the 1985 recommendations, as amended in 1990. Many countries and international organizations have already adopted the latter recommendations, so most Canadian exporters and shippers are already in compliance with the packaging requirements. Therefore, the major changes are the requirement for carriers to have a radiation protection program, the expansion of those activities that require quality assurance programs and the use of Type 2 Industrial Packages (IP-2 packages).

The AECB has been a major participant in the development of the IAEA recommendations on the packaging and transport of nuclear materials. In developing a position on transportation issues, the AECB has communicated regularly with Transport Canada and the major Canadian shippers. Transport Canada is normally represented at the IAEA meetings, and experts from the industry have accompanied AECB staff to IAEA meetings when specific topics have been discussed.

Numerous changes were made to these Regulations as a result of consultation. The major changes consist of the removal of the requirement for a licence to package nuclear substances for most types of shipments, allowing additional methods to demonstrate that packages comply with the performance requirements and acceptance of emergency response plans that comply with the requirements of the *Transportation of Dangerous Goods Regulations* (TDG Regulations). Other changes were made to improve clarity and consistency with the TDG Regulations.

Since the regulations make frequent reference to the IAEA recommendations, the Commission has obtained the approval of the IAEA to reproduce the reference material to respond to a frequent concern expressed during the consultation process. This material will be made available to stakeholders free of charge.

3.7.1 Radiation Protection Program for Carriers

The use in Canada of nuclear materials for research, industrial applications, medicine and export is substantial and growing. It is estimated that approximately one million packages containing radioactive material are transported in Canada each year. The safety record of this industry is good because of the continued efforts of licensees, Transport Canada, the transportation industry and the AECB to improve the packaging and safe handling of nuclear materials. However, as the number of shipments has increased, more drivers and handlers have become involved. The AECB is aware that some of these drivers and handlers do not have adequate knowledge of radiation to protect

au Canada. Le fait de prévenir l'opérateur avant qu'il ne soit exposé à un niveau élevé de rayonnement est l'une des mesures les plus efficaces qui soient pour respecter les nouvelles limites de dose moins élevées.

3.7 *Règlement sur l'emballage et le transport des substances nucléaires*

Tous les pays industrialisés suivent les recommandations de l'Agence internationale de l'énergie atomique (AIEA) pour la réglementation de l'emballage des matières radioactives destinées au transport. Au Canada, les exigences du *Règlement sur l'emballage des matières radioactives destinées au transport* sont basées sur les recommandations de l'AIEA de 1973, et le nouveau règlement est basé sur les recommandations de 1985, revues en 1990. Nombre de pays et d'organisations internationales ont adopté les dernières recommandations, de sorte que la plupart des exportateurs et expéditeurs canadiens se conforment déjà aux exigences en matière d'emballage. Par conséquent, les principaux changements concernent la nécessité pour les transporteurs d'avoir un programme de formation en radioprotection, d'élargir les activités qui nécessitent des programmes d'assurance de la qualité et d'utiliser des colis industriels de type 2 (colis CI-2).

La CCEA a participé activement à l'élaboration des recommandations de l'AIEA sur l'emballage et le transport de matières nucléaires. Lors de l'élaboration de sa position sur les questions relatives au transport, la CCEA a communiqué régulièrement avec Transports Canada et les principaux expéditeurs canadiens. Transports Canada est habituellement représenté aux réunions de l'AIEA, et les spécialistes de l'industrie ont accompagné les employés de la CCEA aux réunions de l'AIEA lorsque des sujets particuliers y étaient discutés.

De nombreux changements ont été apportés à ce règlement à la suite des consultations. Les principaux changements comprennent le retrait de l'obligation de posséder un permis pour l'emballage de substances nucléaires pour la plupart des types d'expédition. On pourra ainsi recourir à d'autres méthodes pour démontrer que les colis sont conformes aux exigences de rendement et pour accepter les plans d'interventions d'urgence qui sont conformes au *Règlement sur le transport des matières dangereuses*. D'autres modifications ont été apportées pour améliorer la clarté ainsi que l'harmonisation avec le *Règlement sur le transport des matières dangereuses.*

Puisque le règlement fait souvent renvoi aux recommandations de l'AIEA, la CCSN a obtenu l'autorisation de celle-ci pour reproduire la documentation de référence afin de répondre à des préoccupations maintes fois exprimées au cours du processus de consultation. Les parties intéressées pourront se procurer cette documentation sans frais.

3.7.1 Programme de radioprotection des transporteurs

Les matières nucléaires sont beaucoup utilisées au Canada pour la recherche, les applications industrielles, la médecine et l'exportation, et cette utilisation augmente. On estime qu'environ un million de colis contenant des matières radioactives sont transportés au Canada par année. Le dossier de sécurité de l'industrie du transport est bon parce que les titulaires de permis, Transports Canada, l'industrie du transport et la CCEA s'efforcent constamment d'améliorer l'emballage et la manutention sûres des matières nucléaires. Toutefois, l'augmentation du nombre d'expéditions a aussi entraîné une hausse du nombre de conducteurs et de manutentionnaires. La CCEA sait que certains conducteurs et

themselves, the public and the environment in all transportation situations. In addition, some exposures will have to be reduced to comply with the new dose limits, and training in radiation protection is one of the most effective ways to achieve this.

(*a*) Alternatives to Radiation Protection Program for Carriers

Given the growing volume and complexity of transportation activities, and the need to maintain high safety standards, the alternative of no regulation is considered unacceptable. Alternatives such as licensing carriers or setting examinations for drivers and handlers are considered to be too costly and too difficult to implement. The best alternative is considered to be requiring carriers to introduce training programs for their staff that can be integrated into the general training program for drivers and handlers. The AECB plans to work closely with Transport Canada, the provinces and industry associations to promote training and monitor compliance with this requirement.

(*b*) Costs

Most major carriers of radioactive material are already licenced to use radioactive materials and thus have radiation protection programs in place, or they provide staff with training in the transportation of all dangerous goods. For the smaller or infrequent carriers, radiation protection training is lacking, but it is expected that major shippers, consultants or transport associations will develop basic radiation protection programs for implementation by carriers, much as was done to comply with the *Transport of Dangerous Goods Regulations*. The technical requirements are not complex, and it is estimated that the training should not exceed a half day per person for approximately 2,000 drivers and handlers. The estimated initial cost for the transportation industry to meet this new requirement is therefore approximately $400,000. The incremental costs should not be significant because radiation protection can be incorporated into the training provided to new staff.

Some licensees have commented that the additional requirements may force some carriers out of the business or raise the charges for those who remain in the business. The costs described above will likely be passed on to the shippers but given that there are approximately 800,000 packages of radioactive material shipped in Canada each year, the initial costs per package are not significant. Once staff is trained, ongoing incremental costs should be minimal.

(*c*) Benefits

Teaching radiation protection to staff directly involved in the transport of radioactive materials will reduce exposures and reduce the number of reports of incidents that upon investigation, are found to be insignificant. Such incidents delay shipments of all types of cargo and cause unnecessary use of resources.

manutentionnaires ne possèdent pas une connaissance suffisante des dangers du rayonnement pour bien se protéger et assurer la protection du public et de l'environnement dans toutes les situations de transport. De plus, il faudra réduire le taux d'exposition pour se conformer aux nouvelles limites de dose; la formation en matière de radioprotection est l'un des moyens les plus efficaces pour y parvenir.

***a*) Solutions de rechange au programme de radioprotection des transporteurs**

Vu le volume croissant et la complexité des activités de transport, et étant donné qu'il est nécessaire de maintenir des normes de sécurité élevées, l'absence de réglementation n'est pas considérée comme une solution de rechange acceptable. Les solutions de rechange telles que forcer les transporteurs à obtenir un permis ou faire passer des examens aux conducteurs et aux manutentionnaires sont jugés trop coûteuses et difficiles à mettre en oeuvre. La meilleure solution consiste à exiger que les transporteurs offrent des programmes de formation en radioprotection à leurs employés. Le programme de formation en radioprotection peut être intégré au programme de formation général des conducteurs et des manutentionnaires. La CCEA prévoit travailler en étroite collaboration avec Transports Canada, les provinces et les associations de l'industrie pour promouvoir la formation et vérifier si cette exigence a été respectée.

***b*) Coûts**

La plupart des grands transporteurs de matières radioactives sont déjà titulaires d'un permis d'utilisation de matières radioactives et ont donc des programmes de radioprotection en place, ou bien ils dispensent à leur personnel une formation sur le transport des marchandises dangereuses. Les transporteurs dont le volume est moins élevé ou moins fréquent ne possèdent pas de formation en radioprotection, mais on s'attend à ce que les grands expéditeurs, les consultants ou les associations de transporteurs élaborent de concert un programme de base en radioprotection destiné à tous les transporteurs. Beaucoup a été fait pour se conformer au *Règlement sur le transport des matières dangereuses*. Les exigences techniques ne sont pas complexes, et on estime que la formation en radioprotection ne devrait pas dépasser une demi-journée par personne et devrait être offerte à environ 2 000 conducteurs et manutentionnaires. Pour l'industrie du transport, le coût initial prévu pour satisfaire à cette nouvelle exigence s'élève à environ 400 000 $. Les coûts additionnels ne devraient pas être très élevés, car la formation en radioprotection peut être intégrée à la formation offerte aux nouveaux employés.

Certains titulaires de permis ont soutenu que les exigences additionnelles pourraient contraindre certains transporteurs à se retirer des affaires ou augmenter les frais de ceux qui restent. Les coûts ci-dessus seront probablement transmis aux expéditeurs, mais étant donné qu'il y a environ 800 000 colis contenant des matières radioactives expédiés chaque année au Canada, les coûts initiaux par colis ne sont pas élevés. Une fois que les employés auront reçu une formation, les coûts additionnels permanents seront minimes.

***c*) Avantages**

Une meilleure formation pour aider les employés directement impliqués dans le transport de matières radioactives à se protéger contre le rayonnement réduira les expositions et le nombre de rapports d'accidents qui, après enquête, sont jugés peu importants. De tels incidents retardent les

3.7.2 Quality Assurance Programs

In accordance with the recommendations of the IAEA, the new regulations require every person who designs, produces, tests, uses, services or inspects a package containing radioactive material, or special form material, to have a quality assurance program. This expands the types of packages and the licensed activities that require a quality assurance program under the AEC Act and the *Transport Packaging of Radioactive Materials Regulations*. The Commission will expect licensees to implement staff training programs and verify that work is performed according to documented procedures. The requirements, which will vary depending on the risks associated with the given activity, will be explained in guidance documents.

(*a*) Alternatives to Quality Assurance Programs

Canada is a strong supporter of international harmonization in the requirements for the transport of radioactive materials, because without harmonization, shipments will be delayed, costs will increase and safety will decrease. Through agencies such as the IAEA, international and most domestic regulations already require quality assurance programs for the handling of radioactive materials and other dangerous goods. There is no alternative to adopting this Regulation if we are to protect workers and the public from deficient packages and meet international requirements.

(*b*) Costs

Since companies that design and produce packages have had to demonstrate compliance with the *Transport Packaging of Radioactive Materials Regulations*, they essentially meet the new quality assurance requirements. Discussions with some major shippers of radioactive material indicate that this requirement will not be a significant burden because they already have corporate quality assurance programs and for several years, they have been required to have a quality assurance program for their international shipments.

A graded approach to quality assurance will be used, based on the risk associated with the shipment. It is estimated that there are 500 infrequent shippers who will have to modify their practices, each at an average cost of $1,000. The incremental cost to industry is therefore estimated to be $500,000. Once established, the ongoing costs should not be significant because the program should not require any additional staff. It is expected that Commission staff will inspect quality assurance programs as part of regular compliance activities, so no significant incremental costs are anticipated.

(*c*) Benefits

A quality assurance program will ensure that all packages are designed, manufactured, used and maintained in accordance with Canadian and international packaging requirements. This will reduce the risk of package failures and high exposures.

3.7.2 Programmes d'assurance de la qualité

Conformément aux recommandations de l'AIEA, le nouveau règlement exige que chaque personne qui conçoit, produit, essaie, utilise, entretient ou inspecte un colis contenant des matières radioactives, ou des matières radioactives sous forme spéciale, possède un programme d'assurance de la qualité. Cela augmente les types de colis et les activités nécessitant un permis exigeant un programme d'assurance de la qualité en vertu de la *Loi sur le contrôle de l'énergie atomique* et du *Règlement sur l'emballage des matières radioactives destinées au transport*. La CCSN s'attend à ce que les titulaires de permis mettent sur pied des programmes de formation pour les employés et vérifient que le travail se déroule conformément aux procédures écrites. Les exigences, qui seront modifiées selon les risques associés à l'activité donnée, seront expliquées dans des guides d'application de la réglementation.

***a*) Solutions de rechange aux programmes d'assurance de la qualité**

Le Canada est un partisan convaincu de l'harmonisation internationale des exigences en matière de transport de matières radioactives, parce que, sans harmonisation, les expéditions seront retardées, les coûts augmenteront et la sécurité diminuera. Par le biais d'agences comme l'AIEA, les règlements internationaux et la plupart des règlements nationaux exigent déjà des programmes d'assurance de la qualité pour la manutention de matières radioactives et d'autres matières dangereuses. Il n'y a aucune solution de rechange à ce règlement si nous voulons protéger les travailleurs et le public contre les colis non sécuritaires ou satisfaire aux exigences internationales.

***b*) Coûts**

Les entreprises qui conçoivent et fabriquent les colis ayant déjà dû se conformer au *Règlement sur l'emballage des matières radioactives destinées au transport* n'ont désormais qu'à satisfaire aux nouvelles exigences sur l'assurance de la qualité. Des discussions avec certains gros expéditeurs de matières radioactives indiquent que les exigences ne seront pas un trop gros fardeau puisqu'ils possèdent déjà des programmes d'assurance de la qualité et que, depuis plusieurs années, ils étaient tenus d'en posséder un pour les expéditions internationales.

L'établissement de programmes d'assurance de la qualité se fera d'une manière progressive, en fonction des risques associés à l'expédition. On estime qu'il y a 500 expéditeurs dont le volume est peu fréquent qui devront modifier leur façon de faire, ce qui coûtera 1 000 $ en moyenne à chacun d'eux. Les coûts additionnels pour l'industrie sont par conséquent estimés à 500 000 $. Une fois le programme en place, les coûts permanents ne seront guère élevés, car le programme ne nécessite pas l'embauche d'employés additionnels. On ne prévoit pas d'autres coûts importants puisque l'inspection des programmes d'assurance de la qualité par les employés de la CCSN se fera dans le cadre de leurs activités régulières de surveillance de la conformité.

***c*) Avantages**

Un programme d'assurance de la qualité permettra d'assurer que tous les colis sont conçus, fabriqués, utilisés et entretenus conformément aux exigences canadiennes et

3.7.3 IP-2 Packages for Ore Samples Containing More than 2% Uranium

The properties of high-grade Canadian ores are such that the hazard they pose is consistent with that of type 2 low specific activity (LSA-2) materials, and as such, the use of IP-2 packages is more appropriate. If the IAEA Regulations had been followed, all grades of uranium ores would have been considered as LSA-1 material that could be shipped in IP-1 packages. However, this provision was developed in the 1960s, when the known ore grades were approximately 1% uranium.

(*a*) Alternatives to IP-2 Packages

The only alternative to this Regulation is to allow ore samples containing more than 2% uranium to be shipped in IP-1 packages that do not have to undergo any performance tests. This is not considered acceptable given the hazard posed by high-grade ore samples. This is also inconsistent with the packaging requirements for medical isotope shipments that pose a risk similar to that of ore samples containing more than 2% uranium.

(*b*) Costs

The costs associated with this requirement consist of developing, testing and producing an IP-2 package, mainly for small ore samples taken for analytical purposes. This is not considered to be a significant expense because there are many examples of existing IP-3 and Type A packages that must meet slightly higher performance standards than the IP-2 package being proposed. A one-time cost of $20,000 for the one licensee involved has been estimated based upon the development, testing and production of similar packages.

(*c*) Benefits

The benefit of using IP-2 packages is the decreased risk that in normal transport situations or in an accident, uranium ore samples will be released into the environment or unacceptably high radiation levels will exist.

3.7.4 IP-2 Packages

Adoption of the IAEA's definition of an (IP-2 package) will require packaging of low specific activity radioactive materials to meet new drop and puncture tests when shipped under exclusive use (i.e., when packages are not combined with cargo from other shippers). This will affect primarily waste and heavy water shipments from the power utilities. It should be noted that for shipments that are not exclusive use, there is no change to the requirements.

(*a*) Alternatives to IP-2 Packages

To be consistent with the IAEA's recommendations, there is no alternative to adopting this Regulation.

(*b*) Costs

During the consultation phase, three licensees commented on this requirement. Each of these licensees will have to determine if their packages meet the requirements, and if not, they will have to develop or purchase new packages. If new packages are required, the costs are not expected to

internationales en matière d'emballage. Cela réduira les risques de colis défectueux et d'expositions élevées.

3.7.3 Colis CI-2 pour échantillons de minerai contenant plus de 2 % d'uranium

Les propriétés du minerai à haute teneur du Canada sont telles que les dangers qu'ils présentent correspondent à ceux des matières FAS-2 à faible activité spécifique. Pour cette raison, il vaut mieux utiliser des colis CI-2. Si on avait respecté les règlements de l'AIEA, toutes les teneurs du minerai d'uranium auraient été considérées comme des matières à faible activité spécifique pouvant être expédiées dans des colis CI-1. Toutefois, cette disposition date des années 1960, à l'époque où la teneur en uranium était d'environ 1 %.

***a*) Solutions de rechange aux colis CI-2**

La seule solution de rechange au règlement est de permettre la livraison d'échantillons de minerai contenant plus de 2 % d'uranium dans des colis CI-1 qui n'ont pas à subir d'épreuves de rendement. Cela n'est pas acceptable étant donné les dangers que présentent les échantillons de minerai à haute teneur. Cela est aussi incompatible avec les exigences d'emballage relatives aux expéditions d'isotopes médicaux, qui présentent un risque similaire à celui des échantillons de minerai contenant plus de 2 % d'uranium.

***b*) Coûts**

Les coûts associés à cette exigence concernent le développement, la mise à l'épreuve et la fabrication des colis CI-2 pour le transport des petits échantillons de minerai destinés à l'analyse. Cela n'est pas considéré comme une dépense importante puisqu'il existe déjà de nombreux spécimens de colis CI-3 et de type A qui doivent satisfaire à des normes de rendement légèrement plus élevées que les colis CI-2. Le coût unique de 20 000 $ pour le seul titulaire de permis concerné a été estimé en fonction du développement, de la mise à l'épreuve et de la fabrication d'un colis semblable.

***c*) Avantages**

L'utilisation de colis CI-2 se traduit par la diminution du risque de rejet dans l'environnement des échantillons de minerai d'uranium ou des niveaux de rayonnement élevés inadmissibles qui pourraient se produire au cours d'un transport régulier ou d'un accident.

3.7.4 Colis CI-2

L'adoption de la définition de l'AIEA d'un colis CI-2 exigera l'emballage de matières radioactives de faible activité spécifique pour satisfaire aux épreuves de chute et de perforation lorsqu'ils sont transportés dans un conteneur à usage exclusif (c.-à-d. lorsque les colis ne sont pas combinés aux marchandises d'autres expéditeurs). Cela touche surtout les expéditions de déchets et d'eau lourde des services publics d'électricité. Les exigences demeurent inchangées en ce qui concerne les expéditions qui ne sont pas dans un conteneur à usage exclusif.

***a*) Solutions de rechange aux colis CI-2**

Afin de respecter les recommandations de l'AIEA, il ne peut y avoir de solutions de rechange à l'adoption de cette exigence.

***b*) Coûts**

Durant la phase de consultation, trois titulaires de permis ont offert des commentaires concernant cette exigence.

exceed $100,000 for each licensee to meet the minimum requirements of the regulations. Some cost information has been submitted that is higher than the above estimate but the AECB believes the additional costs are not required to meet the requirements. Licensees may decide to spend larger sums for reasons that are not directly related to the regulations; these additional costs are not included in the above estimate. Operating costs are not expected to be affected.

(*c*) Benefits

The requirement to use an IP-2 package for low specific activity material will reduce the risk of package failure during transit.

Chacun aura à déterminer si ses colis satisfont aux exigences, et dans la négative, il devra développer ou acheter de nouveaux colis. Les coûts d'acquisition de nouveaux colis satisfaisant aux exigences minimales ne devraient pas dépasser 100 000 $ par titulaire de permis. Certains renseignements présentés concernant les coûts signalent des coûts plus élevés que l'estimation ci-dessus, mais la CCEA croit que ces coûts additionnels ne sont pas nécessaires pour satisfaire aux exigences. Les titulaires de permis peuvent dépenser des sommes plus importantes pour des raisons qui ne sont pas directement liées au règlement. Ces coûts additionnels ne font donc pas partie des estimations susmentionnées. On ne prévoit pas d'augmentation des coûts d'exploitation.

***c*) Avantages**

Les exigences relatives à l'utilisation de colis CI-2 pour les matières à faible activité spécifique réduiront les risques de défaillance du colis pendant le transport.

3.8 *Nuclear Security Regulations*

The three new security requirements in the *Nuclear Security Regulations* described below are considered necessary to bring Canadian nuclear facilities up to the internationally accepted recommendations of the IAEA. In developing these new requirements, the Commission has given consideration to the Canadian security context.

Security experts of the AECB have visited the most affected licensees to discuss these proposals directly with their security experts. The figures used in the cost sections below have been obtained primarily from the affected licensees.

As a result of consultation, the requirements for searching those entering or leaving a protected area have been modified. Details can be found in section 3.8.3 below.

3.8 *Règlement sur la sécurité nucléaire*

Les trois nouvelles mesures de sécurité du *Règlement sur la sécurité nucléaire*, décrites ci-dessous, sont nécessaires pour que les installations nucléaires canadiennes soient protégées selon les normes internationales recommandées par l'AIEA. La CCSN a pris en considération le contexte canadien en matière de sécurité.

Les spécialistes de la sécurité de la CCEA ont rendu visite aux titulaires de permis les plus touchés afin de discuter de ces propositions directement avec leurs spécialistes de la sécurité. Les chiffres figurant dans les sections sur les coûts ci-dessous proviennent principalement des titulaires de permis touchés.

À la suite de consultations, les exigences relatives à la recherche de personnes entrant dans une aire protégée, ou en sortant, ont été modifiées. On trouvera les renseignements détaillés sur ce sujet à la section 3.8.3 ci-dessous.

3.8.1 Alarm Assessment System for Protected Areas

Major nuclear facilities in Canada have security measures that are intended to protect them from unauthorized entry. These measures include protected areas and alarm systems. At some sites, a guard is dispatched to investigate the alarm and to report on the cause. This can take some time and the delay in investigating the alarm adds to the response time to address the problem if the alarm is genuine. A new provision has therefore been included in the regulations which will require licensees to continuously maintain, and in some cases, install additional assessment equipment in order to provide accurate and timely alarm assessment.

(*a*) Alternatives to Alarm Assessment Systems for Protected Areas

One alternative to the assessment system is to trigger the emergency response team on each alarm from the protected area. This would be very expensive, since nuisance alarms, caused by environmental conditions or animals, are difficult to eliminate completely. Nuisance alarms reduce the credibility of the overall security system and reduce the capacity of the response team to deal with a real emergency. Costs might also result from the need to improve the quality of systems to minimize nuisance alarms.

3.8.1 Système d'évaluation des alertes dans les aires protégées

Au Canada, les grandes installations nucléaires ont adopté des mesures de sécurité destinées à empêcher l'entrée non autorisée. Ces mesures comprennent l'établissement des aires protégées et la mise en place des systèmes d'alarme. À certains emplacements, un garde est dépêché sur le lieu de l'alerte pour faire enquête. Cela peut prendre du temps, et le délai s'ajoute au temps nécessaire pour régler le problème s'il s'agit d'une alerte réelle. Par conséquent, une nouvelle disposition a été ajoutée au règlement, qui exigera que le titulaire de permis maintienne en permanence l'équipement de surveillance et, dans certains cas, installe de l'équipement supplémentaire pour pouvoir évaluer avec précision et rapidité la cause de l'alerte.

***a*) Solutions de rechange aux systèmes d'évaluation des alertes dans les aires protégées**

Une solution de rechange serait de faire intervenir une équipe d'intervention d'urgence à chaque alerte dans une aire protégée. Cela serait très coûteux puisque les fausses alertes causées par les conditions environnementales et les animaux sont difficiles à éliminer complètement. Les fausses alertes compromettent la crédibilité de l'ensemble du système de sécurité et la capacité de l'équipe d'intervention de s'occuper d'une urgence réelle. Des coûts

Having a guard investigate the alarm is not acceptable at large sites where the delay in reaching the alarm location could be considerable. This delay would create a serious weakness in the security system since the response team is not normally called into action unless an alarm is confirmed as a real breach of security.

(*b*) Costs

Since an alarm assessment system is already in place for the affected licensees, and equipment maintenance systems are already established, the initial costs will be limited to the purchase and installation of additional equipment. These costs are estimated to total $6,000 for the five licensees affected. Based on the figures supplied by the industry, the operating costs for maintenance and for security guards are estimated at $600,000 per year for all licensees concerned.

(*c*) Benefits

Maintenance of security at nuclear facilities in Canada is crucial to protect against terrorism and sabotage. Canadian security precautions should provide a standard of protection that is consistent with those of other countries that have facilities with similar levels of risk. The alarm assessment system provides a remote means of assessing the cause of an alarm from the protected area and will provide quick assessment of the nature of the alarm, whether it is a serious problem or a nuisance alarm. If the alarm represents a serious threat, the appropriate response will be initiated more quickly. This assessment system will also reduce the number of times that security staff must investigate nuisance alarms.

3.8.2 Alarm Assessment System for Inner Areas

Only two licensees are authorized to store sensitive nuclear material in a high security installation known as an inner area. When the alarm for these areas is triggered, a security guard is dispatched to investigate the cause. The introduction of a mandatory assessment system in the inner area will facilitate the immediate assessment of the cause of the alarm.

(*a*) Alternatives to Alarm Assessment System for Inner Areas

The alternatives are identical to those set out for protected areas described in section 3.8.1(*a*) above. The material under protection by the security system is usable in nuclear weapons and must be protected to the highest degree.

(*b*) Costs

According to the cost estimates provided by the industry, installation costs will total $2,000 and annual operating costs will total $190,000 per year.

(*c*) Benefits

As noted above, the immediate assessment of an alarm from the inner area will allow instantaneous initiation of response to unlawful activities in the case of a real alarm, and will save resources in the investigation of nuisance alarms.

pourraient également être entraînés par la nécessité d'améliorer la qualité des systèmes pour éviter les fausses alertes.

Dans les grandes installations, il est inacceptable d'envisager de dépêcher un garde sur le lieu de l'alerte chaque fois que l'alarme se déclenche étant donné le temps considérable exigé pour arriver sur les lieux. Ce délai pourrait affaiblir considérablement le système de sécurité puisqu'on ne fait pas habituellement appel à l'équipe d'intervention à moins que l'alerte soit confirmée.

***b*) Coûts**

Parce qu'un système d'évaluation des alertes est déjà en place chez les titulaires de permis touchés, et que des systèmes d'entretien de l'équipement sont déjà établis, les coûts initiaux se limiteront à l'achat et à l'installation de l'équipement additionnel. Au total, ces coûts se chiffrent à 6 000 $ pour les cinq titulaires de permis touchés. En se basant sur les chiffres fournis par l'industrie, les coûts d'exploitation pour le maintien du système et les gardes de sécurité sont estimés à 600 000 $ par année pour tous les titulaires de permis touchés.

***c*) Avantages**

Il est essentiel de maintenir une bonne sécurité dans les installations nucléaires du Canada pour les protéger des actes de terrorisme et de sabotage. Les mesures de sécurité au Canada doivent offrir une qualité de protection comparable à celle d'autres pays ayant des niveaux de risque semblables. Un système d'évaluation des alertes fournira un moyen d'évaluer, à distance, la nature et la cause de l'alerte dans une aire protégée, qu'il s'agisse d'un problème grave ou d'une fausse alerte. En cas d'alerte réelle, il permettra de déclencher plus rapidement l'intervention voulue. En cas de fausse alerte, le personnel de sécurité n'aura pas à consacrer inutilement ses ressources à faire enquête.

3.8.2 Système d'évaluation des alertes dans les aires intérieures

Seuls deux titulaires de permis sont autorisés à stocker des matières nucléaires sensibles dans une installation de haute sécurité appelée aire intérieure. Lorsqu'une alarme se déclenche dans une aire intérieure, un garde de sécurité est dépêché sur le lieu de l'alerte pour faire enquête. L'introduction d'un système de surveillance de l'aire intérieure permettrait d'évaluer sans délai la cause de l'alerte.

***a*) Solutions de rechange au système d'évaluation des alertes dans les aires intérieures**

Les solutions de rechange sont identiques à celles qui ont été indiquées à la section 3.8.1*a*) ci-dessus pour les aires protégées. Les matières que le système de sécurité doit protéger peuvent être utilisées dans des armes nucléaires et doivent donc être protégées selon les normes les plus élevées.

***b*) Coûts**

Selon l'estimation des coûts présentée par l'industrie, les coûts d'installation s'élèveraient au total à 2 000 $, et les coûts annuels d'exploitation s'élèveraient au total à 190 000 $ par année.

***c*) Avantages**

Comme on l'a noté ci-dessus, l'évaluation immédiate d'une alerte dans une aire intérieure permettra de déclencher une intervention et de contrer des activités illicites, s'il s'agit

3.8.3 Searches at the Perimeter of a Protected Area

Nuclear facilities in Canada are protected by security perimeters that limit access to protected areas. A new provision has been included in the regulations which will require licensees to search, or otherwise monitor, persons without a security clearance and their possessions when entering and leaving the protected area. Licensees also have the right to search, on reasonable suspicion, anyone entering or leaving a protected area. The searches can be carried out by technical means and are similar to the standard of security provided at Canadian airports.

The draft regulations published in the *Canada Gazette*, Part I required that everyone entering and leaving the protected area be searched. Licensees pointed out that including staff in the requirement would be expensive to implement and would delay shift changes, with little increase in security. The regulations now limit mandatory searches as described above pending completion of the project to review the overall threat to security at Canadian nuclear facilities.

The search procedure will deter terrorists and others from carrying weapons or explosives into protected areas or removing Category I, II or III nuclear material. The regulation allows the operator to use non-intrusive technical means such as metal detectors and X-ray machines in carrying out searches.

(*a*) Alternatives to Searches at the Perimeter of Protected Areas

There is no alternative to searches to prevent explosives and weapons from reaching the protected areas of Canadian nuclear facilities. The alternative of not upgrading the controls over the protected areas would leave the security measures at Canadian nuclear facilities below that found in similar facilities around the world.

(*b*) Costs

The affected licensees have estimated that the new provisions will cost a total of $2.7 million to implement, and that operating costs will be approximately $1.7 million per year.

(*c*) Benefits

There is a continuing worldwide movement to upgrade the security measures at major nuclear facilities. This new initiative is part of the Canadian response to ensure that Canadian nuclear security measures are keeping pace with those of the rest of the world.

3.8.3 Fouilles au périmètre d'une aire protégée

Au Canada, les installations nucléaires sont protégées par un périmètre de sécurité qui restreint l'accès aux aires protégées. Une nouvelle disposition, qui fait maintenant partie du règlement, exigera que les titulaires de permis fouillent ou surveillent les personnes et les choses qui entrent ou sortent d'une aire protégée sans autorisation de sécurité. Les titulaires de permis ont aussi le droit de fouiller, s'ils ont des motifs raisonnables de le faire, quiconque entre dans une aire protégée ou en sort. Les fouilles se feront par des moyens techniques semblables à ceux utilisés dans les aéroports canadiens pour répondre aux normes de sécurité.

Le projet de règlement publié dans la *Gazette du Canada* Partie I exige la fouille de quiconque entre dans une aire protégée ou en sort. Les titulaires de permis ont fait remarquer que le fait d'inclure les employés dans ces exigences serait coûteux à mettre en place et retarderait la relève des équipes, sans pour autant améliorer vraiment la sécurité. Le règlement limite maintenant les fouilles obligatoires, décrites ci-dessous, en attendant l'achèvement du projet de révision de la menace globale à la sécurité dans les installations nucléaires canadiennes.

Les fouilles empêcheraient les terroristes ou d'autres personnes d'apporter des armes ou des explosifs dans une aire protégée ou d'en retirer des substances nucléaires de catégorie I, II ou III. Le règlement permet à l'exploitant d'effectuer des fouilles en utilisant des moyens techniques non intrusifs comme des détecteurs de métal ou de l'équipement radiographique.

***a*) Solutions de rechange aux fouilles au périmètre des aires protégées**

Il n'existe pas de solution de rechange pour éviter que des explosifs ou des armes ne soient introduits dans une aire protégée d'une installation nucléaire canadienne. La solution de rechange consistant à ne pas améliorer les mesures de sécurité pour les aires protégées ferait que les systèmes de sécurité des installations nucléaires canadiennes seraient inférieurs à ceux dont sont munies des installations similaires de par le monde.

***b*) Coûts**

Les titulaires de permis touchés ont estimé que les nouvelles dispositions coûteraient au total 2,7 millions de dollars à mettre en oeuvre et que les coûts d'exploitation seraient d'environ 1,7 million de dollars par année.

***c*) Avantages**

La tendance mondiale actuelle est de rehausser les mesures de sécurité aux grandes installations nucléaires. La nouvelle initiative visant les fouilles est un élément de la réponse canadienne visant à assurer que les mesures de sécurité protégeant les installations nucléaires sont comparables à celles adoptées ailleurs dans le monde.

3.9 ***Nuclear Non-Proliferation Import and Export Control Regulations***

The new regulations increase the number of items for which import licences are required so that Canada will be in a better position to implement its international obligations with respect to the control of nuclear equipment. Canada imports little of this

3.9 ***Règlement sur le contrôle de l'importation et de l'exportation à des fins de non-prolifération***

Le nouveau règlement augmente le nombre d'articles pour lesquels un permis d'importation est exigé; le Canada sera ainsi mieux placé pour respecter ses obligations internationales en matière de contrôle de l'équipement nucléaire. Le Canada importe

equipment, and most companies who would import these items currently have import licences for other reasons, so the overall effect of adding items to the list is not considered to be significant.

As a result of consultations, the list of items requiring import licences has been significantly shortened from that published in the *Canada Gazette*, Part I. Initially, importing any component of a nuclear facility required a licence, but following discussions with the industry, it was concluded that import licences should only be required for major components as identified in Part A.2 of the schedule to the regulations.

3.10 *Canadian Nuclear Safety Commission Rules of Procedure*

The *Canadian Nuclear Safety Commission Rules of Procedure* provide a legal framework for the conduct of public hearings held by the Commission and for opportunities to be heard by the Commission or a designated officer. In the past, under the Atomic Energy Control Board (AECB), the framework for conducting hearings and meetings was contained in "policy" type documents which were approved by the Board, but were not regulations. These rules, while they can be varied or supplemented in order to ensure that a proceeding is dealt with as informally and expeditiously as possible, will streamline the Commission's decision-making procedures for the benefit of all participants.

The AECB has held public meetings for approximately 10 years. The rules represent the accumulated experience the Board has gained during this period. The Board has received numerous comments on Regulatory Policy P-76 since its publication in August 1997. These comments have been considered in the development of the rules.

On February 13, 1999, the draft *Canadian Nuclear Safety Commission Rules of Procedure* were published in the *Canada Gazette*, Part I for comments. The comments from 21 interested parties were reviewed, and appropriate changes were made to the rules. In general, the changes enhance the opportunity for intervenor participation by providing additional time for intervenors to prepare and send information and submissions to the Commission. The main changes, found in sections 2, 17, 18, 19 and 21, relate to notice of hearings, filing and participation requirements, filing supplementary material, and inclusion of officers and employees of the Commission as participants.

Since the question of alternatives, costs and benefits apply to the rules in their entirety, they will be discussed at the end of the section, rather than following each topic.

3.10.1 Confidentiality

Over half of the 21 submissions received on the proposed rules following their February 13, 1999, publication in the *Canada Gazette*, Part I concerned section 12 which deals with confidentiality of information. Some suggested the Commission should not treat any information confidentially, while others thought any information which a person requests to be kept confidential should be so kept. Section 12 recognizes that confidentiality of

peu d'équipement de ce genre, et la plupart des entreprises qui importent de tels articles possèdent actuellement des permis d'importation pour d'autres raisons; ainsi, l'effet général de l'ajout d'articles à cette liste n'est pas considéré comme important.

À la suite de consultations, la liste des articles nécessitant un permis d'importation a été réduite de façon significative par rapport à celle publiée dans la *Gazette du Canada* Partie I. Au départ, un permis était nécessaire pour importer toute composante d'une installation nucléaire, mais, à la suite de discussions avec l'industrie, on est arrivé à la conclusion qu'il faudrait des permis d'importation seulement pour les composantes importantes, comme celles identifié à la partie A.2 de l'annexe du règlement.

3.10 *Règles de procédure de la Commission canadienne de sûreté nucléaire*

Les *Règles de procédure de la Commission canadienne de sûreté nucléaire* prévoit un cadre juridique pour la tenue d'audiences publiques de la CCSN et pour les possibilités d'être entendu par la CCSN ou par un fonctionnaire désigné. Auparavant, sous la gouverne de la CCSN de contrôle de l'énergie atomique (CCEA), le cadre de travail pour la tenue d'audiences et de réunions faisait partie de documents dans lesquels des politiques approuvées par la CCSN étaient énoncées, mais il ne s'agissait pas de règlements. Ces règles, qui pourront être modifiées ou enrichies afin de garantir qu'une procédure se déroule de façon informelle et rapide, simplifieront les procédures de prise de décision de la CCSN à l'avantage de tous les participants.

La CCEA tient des réunions publiques depuis environ 10 ans. Les règles représentent l'expérience accumulée par la CCSN au cours de cette période. Depuis la publication de la politique d'application de la réglementation P-76 en août 1997, la CCSN a reçu de nombreux commentaires à son sujet. Ces commentaires ont été pris en considération dans l'élaboration des règles.

Le 13 février 1999, le projet de *Règles de procédure de la Commission canadienne de la sûreté nucléaire* ont été publiées dans la *Gazette du Canada* Partie I, aux fins de commentaires. Les commentaires de 21 parties intéressées ont été analysés et des changements appropriés ont été apportés aux règles. En général, les changements améliorent les occasions de participation des intervenants en leur offrant du temps supplémentaire pour la préparation et l'envoi de renseignements et de mémoires à la CCSN. Les principaux changements, qu'on trouvera aux articles 2, 17, 18, 19 et 21, se rapportent à l'avis d'audience, aux exigences de dépôt et d'intervention, au dépôt de documents supplémentaires, et à la participation des agents et des employés de la CCSN dans les procédures.

Puisque la question des solutions de rechange, des coûts et des avantages s'applique aux règles dans leur intégralité, elle sera discutée à la fin de la présente section plutôt qu'à la suite de chaque sujet.

3.10.1 Confidentialité

Après la publication des règles proposées le 13 février 1999 dans la *Gazette du Canada* Partie I, plus de la moitié des 21 mémoires reçus concernaient l'article 12, qui traite de la confidentialité des renseignements. Certains ont suggéré que la CCSN ne devrait pas traiter les renseignements reçus de manière confidentielle, tandis que d'autres considéraient que, si une personne exigeait la confidentialité de certains renseignements, la CCSN

some information may be needed but that the Commission should not compromise the public interest by unduly limiting disclosure to affected participants. As a result of comments received during consultation, section 12 was amended to clarify the need to establish a balance between the public interest and the need to protect certain security and confidential information.

3.10.2 Process and Notice Provisions

Comments were received on the notice provisions proposed in section 17 of the rules indicating that the process would be longer, and therefore costlier than at present. Other comments were to the effect that the process should be longer to allow intervenors more time to prepare. It is not anticipated that the new process will inherently be any longer than the process under the AEC Act.

The process set out in Part 2 respecting public hearings was revised to increase the ability of intervenors to adequately review and respond to the material submitted by applicants and Commission staff. Where hearings are scheduled to take place over two days, major facilities, licence applicants and Commission staff will be required to submit their information within set time frames prior to the hearing (Rule 18), as has been the practice under the AECB. The first day of the hearing will concentrate on this information. Intervenors will not be required to submit their information until a set period prior to the second hearing day (Rule 19). This will provide them with an increased ability to review the information submitted by licence applicants and Commission staff, and focus on the issues which may have been identified at the first day of the hearing. Intervenors will then be able to submit their information at the second hearing day and to pose questions concerning the information submitted by licence applicants and Commission staff. Commission staff, as well as witnesses appearing for licence applicants during the first day of hearings, will be required, unless the Commission directs otherwise, to attend during the second day (Rule 18), to give intervenors an adequate opportunity to ask questions.

3.10.3 Quorum and Role of Commission Staff in Proceedings

Two subsections have been added to the rules as a result of consultations, one dealing with Commission staff and the other pertaining to the quorum of the Commission and panels.

The rules, as they originally appeared, omitted reference to Commission staff and their reports, which are submitted to the Commission for consideration. Some contributors noted that staff are important participants in the process and that their participation should be formally included; this has therefore been added. A subsection on a quorum has also been included.

devait respecter ce choix. L'article 12 reconnaît que certains renseignements doivent être tenus confidentiels, mais que la CCSN ne doit pas compromettre l'intérêt du public en limitant indûment leur divulgation aux participants concernés. À la suite des commentaires présentés pendant les consultations, l'article 12 a été modifié pour clarifier la nécessité de trouver un juste équilibre entre l'intérêt du public et la protection de certains renseignements à caractère confidentiel et en matière de sécurité.

3.10.2 Dispositions relatives au processus et à la convocation

Des commentaires sur les dispositions relatives à la convocation proposées à l'article 17 des règles indiquaient que le processus serait plus long et, par conséquent, plus coûteux qu'il ne l'est actuellement. D'autres commentaires proposaient de prolonger le processus afin que les intervenants aient plus de temps pour se préparer. Il n'est pas prévu que le processus soit plus long en soi que celui suivi en vertu de la LCEA.

Le processus établi dans la partie 2 concernant les audiences publiques a été révisé pour améliorer la capacité des intervenants d'analyser adéquatement les documents soumis par les demandeurs et les employés de la CCSN et d'y répondre. Dans les cas d'audiences d'une durée de plus de deux jours, les grandes installations, les demandeurs de permis et les employés de la CCSN devront présenter leurs renseignements dans le délai précisé avant l'audience (Règle 18), comme c'était la pratique sous la gouverne de la CCEA. La première journée de l'audience sera consacrée à ces renseignements. Les intervenants ne seront pas obligés de déposer leurs renseignements avant le délai précisé avant la deuxième journée de l'audience (Règle 19). Cela leur donnera plus de temps pour analyser les renseignements présentés par les demandeurs de permis et les employés de la CCSN et de se concentrer sur les questions relevées au cours de la première journée d'audience. Les intervenants seront alors en mesure de présenter leurs renseignements au cours de la deuxième journée d'audience et de poser des questions concernant les renseignements présentés par les demandeurs de permis et les employés de la CCSN. Les employés de la CCSN ainsi que les témoins des demandeurs de permis qui se présentent lors de la première journée d'audience seront obligés, à moins que la CCSN en décide autrement, de participer à la deuxième journée d'audience (Règle 18) afin de donner aux intervenants la possibilité de poser des questions.

3.10.3 Quorum et rôle des employés de la CCSN durant les procédures

Deux paragraphes ont été ajoutés aux règles à la suite des consultations. L'un traite des employés de la CCSN, et l'autre se rapporte au quorum de la CCSN et des formations.

À l'origine, les règles ne mentionnaient pas les employés de la CCSN et leurs rapports, qui sont soumis à la CCSN aux fins d'examen. Certains contributeurs ayant fait remarquer que les employés sont des participants importants du processus et que leur participation doit être reconnue de façon officielle, ce qui a donc été ajouté, ainsi qu'un paragraphe relatif au quorum.

The addition of these two subsections will not affect the rights or obligations of participants and are therefore seen as minor changes.

3.10.4 Other Changes

A number of other changes were made to the rules to provide clarification, correct errors and ensure that the English and French versions were the same. None of these changes is major.

(*a*) Alternatives

The NSC Act requires the Commission to hold public hearings in certain specified situations and to give a reasonable opportunity for affected parties to be heard. The NSC Act also requires that rules of procedure must be established by regulation so that there are no alternatives. In many respects, the proposed rules reflect the AECB's practice as described in its Regulatory Policy P-76, *Policy and Procedures for Making Submissions and Appearances Before the Atomic Energy Control Board*.

(*b*) Consistency with Regulatory Policy and the Citizens' Code

The rules provide interested parties with a fair opportunity to participate in the Commission's public hearings process and affected parties with an opportunity to be heard, while ensuring that the statutory rights of applicants and licensees are recognized.

(*c*) Benefits

These Rules will constitute a published standard set of procedures for all participants to follow in proceedings before the Commission. The rules establish the Commission's procedures in accordance with its mandate to resolve matters before it as informally and expeditiously as the circumstances and the considerations of fairness permit. They will benefit licensees, applicants and interested parties by describing the process. As well, the rules will assist the Commission in conducting its proceedings in accordance with the requirements of administrative law and the NSC Act.

Since the NSC Act also provides the authority for decision making by inspectors and designated officers, the rules address these functions and the opportunity for affected parties to be heard.

(*d*) Costs

The rules are consistent with the Board's practice and therefore cause no significant additional cost to industry, the public or government.

L'ajout de ces deux paragraphes n'affecte en rien les droits et les obligations des participants et est, par conséquent, considéré comme une modification mineure.

3.10.4 Autres modifications

Un certain nombre d'autres modifications ont été apportées aux règles dans le but de clarifier des choses, de corriger des erreurs et de s'assurer que les versions anglaise et françaises étaient identiques. Aucune de ces modifications n'est capitale.

***a*) Solutions de rechange**

La *Loi sur la sûreté et la réglementation nucléaires* exige que la CCSN tienne des audiences publiques dans certaines situations précises et donne une possibilité raisonnable aux parties touchées de se faire entendre. Elle stipule également que les règles de procédure doivent être établies par règlement; il n'y a donc pas de solutions de rechange. À bien des égards, les règles proposées reflètent la pratique de la CCEA telle qu'elle est décrite dans sa politique d'application de la réglementation P-76, *Politique et règles de procédure sur les mémoires et les interventions à l'adresse de la Commission de contrôle de l'énergie atomique*.

***b*) Uniformité avec la politique de réglementation et le code du citoyen**

Les règles fournissent aux parties intéressées une possibilité juste de participer aux audiences publiques de la CCSN et aux parties touchées une chance de se faire entendre, tout en garantissant la reconnaissance des droits statutaires des demandeurs et des titulaires de permis.

***c*) Avantages**

Ces règles constitueront un ensemble standard de procédures à suivre par tous les participants qui se présentent devant la CCSN. Elles établissent les procédures de la CCSN conformément à son mandat, qui est de résoudre les questions qui lui sont soumises de la façon la plus informelle et rapide que les circonstances et les questions d'équité le permettent. En donnant une description du processus, les règles sont à l'avantage des demandeurs et titulaires de permis ainsi que des parties intéressées. En outre, elles aideront la CCSN à mener les procédures conformément aux exigences du droit administratif et de la LSRN.

Étant donné que la LSRN donne aussi le droit aux inspecteurs et aux fonctionnaires désignés de prendre des décisions, les règles portent sur ces fonctions et sur la possibilité pour les parties touchées de se faire entendre.

***d*) Coûts**

Les règles correspondent aux pratiques de la CCSN et, par conséquent, n'occasionnent pas de coûts additionnels importants à l'industrie, au public ou au gouvernement.

4. *Environmental Impact*

There are no adverse environmental effects anticipated from the passage of these Regulations. The major positive environmental impacts of these Regulations are the requirements to consider the environment in any licensing action and the regulatory scheme to require financial guarantees for decommissioning and waste management. The AEC Act and Regulations make no mention of the environment, but the AECB has been including appropriate requirements via licence conditions. The NSC Act, on

4. *Incidences environnementales*

L'adoption des nouveaux règlements n'entraînera vraisemblablement pas d'effets négatifs sur l'environnement. Les règlements ont pour principales retombées positives d'obliger à tenir compte de l'environnement dans toute mesure d'autorisation, ainsi qu'à fournir des garanties financières pour le déclassement et la gestion des déchets. La *Loi sur le contrôle de l'énergie atomique* et ses règlements ne font pas mention de l'environnement, mais la CCEA assortit les permis des conditions appropriées. D'autre

the other hand, states that one of the objects of the Commission is to "prevent unreasonable risk to the environment". Protecting the environment is therefore mentioned extensively throughout the new regulations.

5. ***Consultation***

The AECB maintains close contact with its licensees and the public by a variety of means, including open Board meetings, public meetings and sessions with Board members and staff. Regular visits by staff to licensed premises and staff working at the nuclear power sites allow for a continuous exchange of information. In addition to this regular dialogue with licensees and stakeholders, the AECB undertook general consultations on the new regulations and specific consultations on the new dose limits, transportation requirements and enhanced security requirements.

Although it is not required by the government's regulatory process, the AECB made draft regulations available soon after the Act was passed. This provided the public and the nuclear industry with an indication of the AECB's intentions and the AECB with comments at an early stage in the process. The draft regulations were published on the AECB Web site and paper copies were made available to any person who requested them. Notices were placed in the AECB Reporter and a notice was sent out to approximately 5,000 licensees and persons who have expressed interest in nuclear issues. The AECB received 1,588 comments from 42 individuals or organizations. These comments were analyzed, and where appropriate, changes were made to the regulations. A document describing each comment and the AECB's response to the comment is available on the AECB's Web site (www.aecb-ccea.gc.ca), and paper copies can be obtained by contacting the AECB.

On October 10, 1998, the AECB published a draft version of the nine technical regulations in the *Canada Gazette*, Part I for the official comment period required in the federal government's regulatory approval process. During the comment period, eight public meetings were held in major centres across the country to allow stakeholders an opportunity to obtain more information about the regulations. In addition, meetings were held with the reactor licensees. When the comment period closed on December 1, 1998, the AECB had received approximately 800 individual comments from 78 contributors. Again, these comments were reviewed, and where appropriate, changes were made to the draft regulations. As with the earlier round of consultations, a document describing the comments and how they were addressed has been published by the AECB.

Beginning in January 1999, a series of meetings were held with some major licensees and other stakeholders concerning some of the significant issues associated with implementing the new regulations. These included the Canadian Nuclear Association and its members, the Saskatchewan Mining Association and its members, the Canadian Radiation Protection Association, Transport Canada and the Government of Saskatchewan.

6. ***Compliance and Enforcement***

These Regulations will be proclaimed under the NSC Act and will be subject to the Compliance Policy of the CNSC. With the

part, aux termes de la LSRN, la CCSN a pour mission de maintenir à un niveau acceptable le risque pour l'environnement. La protection de l'environnement est donc mentionnée abondamment dans les nouveaux règlements.

5. ***Consultations***

La CCEA maintient un contact étroit avec ses titulaires de permis et le public par divers moyens, notamment les réunions de la CCSN, les rencontres publiques et les séances avec les commissaires et le personnel de la CCSN. Les visites régulières des employés aux installations autorisées et leur interaction avec le personnel des centrales favorisent l'échange continu d'information. Outre ce dialogue constant avec les titulaires de permis et les parties intéressées, la CCEA a mené des consultations générales sur les nouveaux règlements et des consultations particulières sur les nouvelles limites de dose ainsi que sur les exigences en matière de transport et d'amélioration de la sécurité.

Bien que le processus de réglementation gouvernemental ne l'exige pas, la CCEA a produit des projets de règlement, qui sont devenus disponibles peu après l'adoption de la LSRN. Cela lui a permis de faire connaître au public et à l'industrie nucléaire ses intentions et d'obtenir des commentaires tôt au cours du processus. Les projets de règlements ont été publiés sur le site Web de la CCEA, et toutes les personnes intéressées ont pu s'en procurer une copie sur support papier. Des avis ont été placés dans son périodique, le Reporter, et un avis a été envoyé à environ 5 000 titulaires de permis et personnes ayant manifesté de l'intérêt pour les questions nucléaires. La CCEA a reçu 1 588 commentaires de 42 particuliers et organisations. Elle a analysé ces commentaires et, le cas échéant, modifié les règlements en conséquence. Un document décrivant les commentaires individuels et les réponses fournies par la CCEA est disponible sur le site Web de la CCEA (www.aecb-ccea.gc.ca), et une copie sur support papier peut être obtenue en communiquant avec la CCEA.

Le 10 octobre 1998, la CCEA a publié une version provisoire des neuf règlements techniques dans la *Gazette du Canada* Partie I pour respecter les exigences du processus d'approbation du gouvernement fédéral en matière de période de commentaires officielle. Durant la période de commentaires, huit rencontres publiques ont eu lieu dans les grands centres du pays afin de permettre aux partenaires d'obtenir davantage de renseignements sur les règlements. En outre, des rencontres ont eu lieu avec les titulaires de permis de centrales nucléaires. À la fin de la période de commentaires, le 1er décembre 1998, la CCEA avait reçu environ 800 commentaires individuels provenant de 78 participants. Une fois de plus, elle a analysé ces commentaires et, le cas échéant, modifié les projets de règlement en conséquence. Tout comme pour les consultations précédentes, la CCEA a publié un document décrivant les commentaires et les réponses qu'elle a fournies.

À compter de janvier 1999, une série de rencontres a eu lieu avec les titulaires de permis importants et d'autres parties intéressées concernant certaines questions importantes associées à la mise en oeuvre des nouveaux règlements. L'Association nucléaire canadienne et ses membres, la Saskatchewan Mining Association et ses membres, l'Association canadienne de radioprotection, Transports Canada et le gouvernement de la Saskatchewan ont participé à ces rencontres.

6. ***Respect et exécution***

Les règlements seront proclamés aux termes de la LSRN et assujettis à la politique de conformité de la CCSN. Avec l'adoption

introduction of the new initiatives noted above, and the new range of penalties and enforcement powers established in the NSC Act, the new regulatory regime will put greater emphasis on safe operation in the interests of health, safety, security and the environment. In particular, options under the NSC Act that allow the courts to order redress of contamination and other penalties as part of the sanction system, are expected to yield valuable new compliance tools.

The Commission will also continue the policy of the AECB to promote compliance through notices, explanatory material, public meetings and seminars. Priority will be placed on the new initiatives noted above.

Compliance verification will continue to be carried out by trained inspectors who will monitor all nuclear activities on the basis of risk and the historical performance of the licensees. Nuclear power plant licensees will continue to have resident inspectors from the Commission working full time on site at their facilities. The NSC Act will give wider and more explicit powers to inspectors, subject to review by the Commission.

Violations can result in an escalating range of actions, including warnings, orders by inspectors or designated officers, licence suspension and prosecution. Inspectors will also be able to issue orders to address problems where risks to the safety of persons or the environment are discovered.

6.1 *Canadian Nuclear Safety Commission Rules of Procedure*

Since the rules are procedural, compliance with them is supported by the procedural powers given to the Commission by the NSC Act. In addition to its power to control its proceedings, the Commission will be a court of record. It has, with respect to the appearance, summoning and examination of witnesses, the production and inspection of records, the enforcement of its orders and other matters necessary or proper for the due exercise of its jurisdiction, all powers that are necessary to carry out its duties.

7. *Overall Cost*

The total cost to implement the new requirements in the regulations is estimated to be $5.9 million, 46% of which results from new requirements relating to security.

The annual incremental cost associated with the new requirements in the regulations is estimated to be $4.5 million per year, 56% of which results from additional security requirements and 22% of which results from the new dose limits.

To implement the new Act and regulations, the Commission received no additional resources so training has and will continue to be accomplished by a reallocation of existing resources. The cost to train Commission staff on the new Act and regulations consists of direct costs for items such as contractors, materials and facilities plus the time spent by Commission staff away from their regular duties. The training program will be spread over the three fiscal years beginning on April 1, 1998 and ending on March 31, 2001. The direct costs are estimated to be $370,000 per year for each of the three fiscal years. This represents approximately 1% of the Commission's annual budget.

des nouvelles initiatives susmentionnées, et compte tenu des amendes et des pouvoirs d'application prévus dans la LSRN, le nouveau régime de réglementation mettra davantage l'accent sur l'exploitation sûre dans l'intérêt de la santé, de la sécurité, de la sûreté et de l'environnement. Les options qui, aux termes de la LSRN, autorisent les tribunaux à ordonner des réparations lors d'une contamination ou d'autres dommages dans le cadre d'un régime de sanctions devraient s'avérer de précieux outils pour assurer la conformité.

La CCSN maintiendra la politique de la CCEA de promouvoir la conformité grâce à des avis, des documents explicatifs, des rencontres publiques et des séminaires. La priorité sera donnée aux nouvelles initiatives susmentionnées.

Des inspecteurs qualifiés continueront d'effectuer la vérification de la conformité en surveillant toutes les activités nucléaires d'après le risque et en tenant compte des antécédents des titulaires de permis. Le titulaire d'un permis de centrale nucléaire continuera d'avoir à demeure des inspecteurs de la CCSN à plein temps. La LSRN confère à l'inspecteur des pouvoirs plus vastes et plus explicites, sous réserve de révision par la CCSN.

Les infractions peuvent entraîner des mesures allant d'un simple avertissement à une poursuite, en passant par un ordre donné par un inspecteur ou un fonctionnaire désigné à la suspension du permis. Un inspecteur pourra aussi émettre les ordres qu'il estime nécessaires pour assurer la sécurité des personnes et protéger l'environnement.

6.1 *Règles de procédure de la Commission canadienne de sûreté nucléaire*

Puisque les règles sont de nature procédurale, leur respect est soutenu par les pouvoirs procéduraux consentis à la CCSN par la LSRN. En plus de pouvoir contrôler ses procédures, la CCSN sera un tribunal d'archives. Elle possède, en matière de participation, d'assignation et d'interrogation des témoins, de production et d'inspection des dossiers, d'application de ses ordonnances et d'autres questions nécessaires ou appropriées à l'exercice régulier de sa compétence, tous les pouvoirs nécessaires à l'exercice de ses fonctions.

7. *Coût d'ensemble*

Le coût total de la mise en oeuvre des nouvelles exigences réglementaires est estimé à 5,9 millions de dollars, dont 46 % découlent des nouvelles exigences en matière de sécurité.

Le coût additionnel des nouvelles exigences est estimé à 4,5 millions de dollars par année, dont 56 % découlent des exigences additionnelles en matière de sécurité, et 22 % des nouvelles limites de dose.

La CCSN n'a reçu aucune ressource additionnelle pour la mise en oeuvre de la nouvelle loi et de ses règlements; la réaffectation des ressources existantes a donc servi, et servira, à assurer la formation. Le coût de la formation sur la nouvelle loi et ses règlements à l'intention du personnel de la CCSN consiste en frais directs pour des éléments comme les entrepreneurs, le matériel et les installations, en plus du temps que les employés de la CCSN passent loin de leurs tâches régulières. Le programme de formation sera réparti sur trois exercices à partir du 1er avril 1998 et se terminera le 31 mars 2001. Les frais directs sont estimés à 370 000 $ par année pour chacun des exercices. Cela représente environ 1 % du budget annuel de la CCSN.

Staff time spent in developing and delivering training, plus the time spent by trainees away from their regular duties, will average 9 FTEs (full time equivalents) during each of the three fiscal years. This reallocation, which represents approximately 2% of the Commission's staff allocation, will be accomplished by reducing the number of inspections and increasing the time period between licence renewals for licensees who have a good compliance history.

The *Canadian Environmental Assessment Act* (CEA Act) requires that environmental assessments be completed for some projects proposed for AECB approval. With the introduction of the NSC Act, subsequent changes to CEA Regulations will be required. The Canadian Environmental Assessment Agency is considering amendments to the CEA Regulations but until its regulatory process has been completed, the effect on licensees is unknown. Questions such as environmental assessments at the time of licence renewal for nuclear facilities will be addressed but until the CEA Regulations are amended, an estimate of any incremental costs is not possible.

8. ***Contact***

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Le temps que les employés passent à élaborer et à assurer la formation, plus le temps que les stagiaires passent loin de leurs tâches régulières représente en moyenne neuf (9) ETP (équivalent temps plein) pendant chacun des exercices. La réaffectation, qui touche environ 2 % du personnel de la CCSN, se fera en réduisant le nombre d'inspections et en prolongeant le délai de renouvellement des permis pour les titulaires dont le dossier de conformité est bon.

La *Loi canadienne sur l'évaluation environnementale* exige qu'une évaluation environnementale soit réalisée pour certains projets ou certaines propositions faisant l'objet d'une approbation de la CCEA. L'entrée en vigueur de la *Loi sur la sûreté et la réglementation nucléaires* signifie que des modifications devront être apportées à la réglementation en matière d'évaluation environnementale. L'Agence canadienne d'évaluation environnementale examine cette question, mais tant que son processus de réglementation ne sera pas achevé, on ne peut déterminer l'incidence de ces mesures sur les titulaires de permis. Des considérations telles que les évaluations environnementales au moment du renouvellement des permis des installations nucléaires seront abordées, mais d'ici à ce que la réglementation en matière d'évaluation environnementale soit effectivement modifiée, on ne peut évaluer les coûts additionnels.

8. ***Personne-ressource***

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Registration
SOR/2000-204 31 May, 2000

NUCLEAR SAFETY AND CONTROL ACT

Class I Nuclear Facilities Regulations

P.C. 2000-784 31 May, 2000

Her Excellency the Governor General in Council, on the recommendation of the Minister of Natural Resources, pursuant to section 44 of the *Nuclear Safety and Control Act*[a], hereby approves the annexed *Class I Nuclear Facilities Regulations* made by the Canadian Nuclear Safety Commission on May 31, 2000.

Enregistrement
DORS/2000-204 31 mai 2000

LOI SUR LA SÛRETÉ ET LA RÉGLEMENTATION NUCLÉAIRES

Règlement sur les installations nucléaires de catégorie I

C.P. 2000-784 31 mai 2000

Sur recommandation du ministre des Ressources naturelles et en vertu de l'article 44 de la *Loi sur la sûreté et la réglementation nucléaires*[a], Son Excellence la Gouverneure générale en conseil agrée le *Règlement sur les installations nucléaires de catégorie I*, ci-après, pris le 31 mai 2000 par la Commission canadienne de sûreté nucléaire.

[a] S.C. 1997, c. 9

[a] L.C. 1997, ch. 9

CANADIAN NUCLEAR SAFETY COMMISSION

CLASS I NUCLEAR FACILITIES REGULATIONS

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COMMISSION CANADIENNE DE SÛRETÉ NUCLÉAIRE

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INTERPRETATION AND APPLICATION

Interpretation

1. The definitions in this section apply in these Regulations.

"Act" means the *Nuclear Safety and Control Act*. (*Loi*)

"certificate" means a document issued by the Commission or by a designated officer authorized under paragraph 37(2)(*b*) of the Act, indicating that a person is certified. (*attestation*)

"certified" means certified by the Commission under paragraph 21(1)(*i*) of the Act or by a designated officer authorized under paragraph 37(2)(*b*) of the Act. (*version anglaise seulement*)

"Class I nuclear facility" means a Class IA nuclear facility and a Class IB nuclear facility. (*installation nucléaire de catégorie I*)

"Class IA nuclear facility" means any of the following nuclear facilities:

(*a*) a nuclear fission or fusion reactor or subcritical nuclear assembly; and

(*b*) a vehicle that is equipped with a nuclear reactor. (*installation nucléaire de catégorie IA*)

"Class IB nuclear facility" means any of the following nuclear facilities:

(*a*) a particle accelerator with a beam energy equal to or greater than 50 MeV;

(*b*) a plant for the processing, reprocessing or separation of an isotope of uranium, thorium or plutonium;

(*c*) a plant for the manufacture of a product from uranium, thorium or plutonium;

(*d*) a plant, other than a Class II nuclear facility as defined in section 1 of the *Class II Nuclear Facilities and Prescribed Equipment Regulations*, for the processing or use, in a quantity greater than 10^{15} Bq per calendar year, of nuclear substances other than uranium, thorium or plutonium;

(*e*) a facility for the disposal of a nuclear substance generated at another nuclear facility; and

(*f*) a facility prescribed by paragraph 19(*a*) or (*b*) of the *General Nuclear Safety and Control Regulations*. (*installation nucléaire de catégorie IB*)

"effective dose" has the same meaning as in subsection 1(1) of the *Radiation Protection Regulations*. (*dose efficace*)

"equivalent dose" has the same meaning as in subsection 1(1) of the *Radiation Protection Regulations*. (*dose équivalente*)

"exclusion zone" means a parcel of land within or surrounding a nuclear facility on which there is no permanent dwelling and over which a licensee has the legal authority to exercise control. (*zone d'exclusion*)

"hazardous substance" or "hazardous waste" means a substance or waste, other than a nuclear substance, that is used or produced in the course of carrying on a licensed activity and that may pose a risk to the environment or the health and safety of persons. (*substance dangereuse ou déchet dangereux*)

"IAEA" means the International Atomic Energy Agency. (*AIEA*)

"*IAEA Agreement*" means the *Agreement between the Government of Canada and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty*

RÈGLEMENT SUR LES INSTALLATIONS NUCLÉAIRES DE CATÉGORIE I

DÉFINITIONS ET CHAMP D'APPLICATION

Définitions

1. Les définitions qui suivent s'appliquent au présent règlement.

« *Accord avec l'AIEA* » L'*Accord entre le Gouvernement du Canada et l'Agence internationale de l'énergie atomique relatif à l'application de garanties dans le cadre du Traité sur la non-prolifération des armes nucléaires*, entré en vigueur le 21 février 1972; INFCIRC/164; UNTS vol. 814, R. n° 11596. (*IAEA Agreement*)

« accord relatif aux garanties »

a) L'*Accord avec l'AIEA*, ainsi que tout arrangement conclu entre le Canada et l'AIEA dans le cadre de cet accord;

b) toute entente à laquelle le Canada est partie et qui concerne la mise en oeuvre au Canada d'un système de vérification des substances nucléaires, de l'équipement réglementé ou des renseignements réglementés, de même que tout arrangement conclu dans le cadre d'une telle entente. (*safeguards agreement*)

« accréditer » Attester la compétence en vertu des alinéas 21(1)*i*) ou 37(2)*b*) de la Loi. (*French version only*)

« activité autorisée » Activité visée à l'alinéa 26*e*) de la Loi que le titulaire de permis est autorisé à exercer relativement à une installation nucléaire de catégorie I. (*licensed activity*)

« AIEA » L'Agence internationale de l'énergie atomique. (*IAEA*)

« attestation » Document délivré par la Commission ou par un fonctionnaire désigné autorisé en vertu de l'alinéa 37(2)*b*) de la Loi et qui atteste la compétence d'une personne. (*certificate*)

« dose efficace » S'entend au sens du paragraphe 1(1) du *Règlement sur la radioprotection*. *(effective dose*)

« dose équivalente » S'entend au sens du paragraphe 1(1) du *Règlement sur la radioprotection*. (*equivalent dose*)

« équipement réglementé » Équipement visé à l'article 20 du *Règlement général sur la sûreté et la réglementation nucléaires*. (*prescribed equipment*)

« garanties » Système de vérification établi en vertu d'un accord relatif aux garanties. (*safeguards*)

« installation nucléaire de catégorie I » Installation nucléaire de catégorie IA et installation nucléaire de catégorie IB. (*Class I nuclear facility*)

« installation nucléaire de catégorie IA » L'une des installations suivantes :

a) un réacteur à fission ou à fusion nucléaires ou un assemblage nucléaire non divergent;

b) un véhicule muni d'un réacteur nucléaire. (*Class IA nuclear facility*)

« installation nucléaire de catégorie IB » L'une des installations suivantes :

a) un accélérateur de particules dont l'énergie du faisceau est d'au moins 50 MeV;

b) une usine de traitement, de retraitement ou de séparation d'isotopes d'uranium, de thorium ou de plutonium;

c) une usine de fabrication de produits à partir d'uranium, de thorium ou de plutonium;

on the Non-proliferation of Nuclear Weapons, effective on February 21, 1972; INFCIRC/164; UNTS vol. 814, R. No. 11596. (*Accord avec l'AIEA*)

"licensed activity" means an activity described in paragraph 26(*e*) of the Act that a licence authorizes the licensee to carry on in relation to a Class I nuclear facility. (*activité autorisée*)

"licensee" means a person who is licensed to carry on an activity described in paragraph 26(*e*) of the Act in relation to a Class I nuclear facility. (*titulaire de permis*)

"prescribed equipment" means the equipment prescribed by section 20 of the *General Nuclear Safety and Control Regulations*. (*équipement réglementé*)

"prescribed information" means the information prescribed by section 21 of the *General Nuclear Safety and Control Regulations*. (*renseignements réglementés*)

"safeguards" means a verification system that is established in accordance with a safeguards agreement. (*garanties*)

"safeguards agreement" means

(*a*) the *IAEA Agreement* and any arrangement between Canada and the IAEA made under that agreement; and

(*b*) any agreement to which Canada is a party for the establishment in Canada of a verification system in respect of nuclear substances, prescribed equipment or prescribed information, and any arrangements made under such an agreement. (*accord relatif aux garanties*)

"sealed source" means a radioactive nuclear substance in a sealed capsule or in a cover to which the substance is bonded, where the capsule or cover is strong enough to prevent contact with or the dispersion of the substance under the conditions for which the capsule or cover is designed. (*source scellée*)

"worker" means a person who performs work that is referred to in a licence. (*travailleur*)

d) une usine, autre qu'une installation nucléaire de catégorie II au sens de l'article 1 du *Règlement sur les installations nucléaires et l'équipement réglementé de catégorie II*, qui traite ou utilise, par année civile, plus de 10^{15} Bq de substances nucléaires autres que l'uranium, le thorium et le plutonium;

e) une installation d'évacuation ou de stockage permanent de substances nucléaires provenant d'une autre installation nucléaire;

f) une installation visée aux alinéas 19*a*) ou *b*) du *Règlement général sur la sûreté et la réglementation nucléaires*. (*Class IB nuclear facility*)

« Loi » La *Loi sur la sûreté et la réglementation nucléaires*. (*Act*)

« renseignements réglementés » Renseignements visés à l'article 21 du *Règlement général sur la sûreté et la réglementation nucléaires*. (*prescribed information*)

« source scellée » Substance nucléaire radioactive enfermée dans une enveloppe scellée ou munie d'un revêtement auquel elle est liée, l'enveloppe ou le revêtement présentant une résistance suffisante pour empêcher tout contact avec la substance et la dispersion de celle-ci dans les conditions d'emploi pour lesquelles l'enveloppe ou le revêtement a été conçu. (*sealed source*)

« substance dangereuse » ou « déchet dangereux » Substance ou déchet, autre qu'une substance nucléaire, qui est utilisé ou produit au cours d'une activité autorisée et qui peut présenter un danger pour l'environnement ou pour la santé et la sécurité des personnes. (*hazardous substance or hazardous waste*)

« titulaire de permis » Personne autorisée par permis à exercer toute activité visée à l'alinéa 26*e*) de la Loi relativement à une installation nucléaire de catégorie I. (*licensee*)

« travailleur » Personne qui effectue un travail mentionné dans un permis. (*worker*)

« zone d'exclusion » Parcelle de terrain qui relève de l'autorité légale du titulaire de permis, qui est située à l'intérieur ou autour d'une installation nucléaire et où il ne se trouve aucune habitation permanente. (*exclusion zone*)

Application

2. These Regulations apply in respect of Class I nuclear facilities.

Champ d'application

2. Le présent règlement s'applique aux installations nucléaires de catégorie I.

LICENCE APPLICATIONS

DEMANDES DE PERMIS

General Requirements

3. An application for a licence in respect of a Class I nuclear facility, other than a licence to abandon, shall contain the following information in addition to the information required by section 3 of the *General Nuclear Safety and Control Regulations*:

(*a*) a description of the site of the activity to be licensed, including the location of any exclusion zone and any structures within that zone;

(*b*) plans showing the location, perimeter, areas, structures and systems of the nuclear facility;

(*c*) evidence that the applicant is the owner of the site or has authority from the owner of the site to carry on the activity to be licensed;

(*d*) the proposed quality assurance program for the activity to be licensed;

Dispositions générales

3. La demande de permis visant une installation nucléaire de catégorie I, autre qu'un permis d'abandon, comprend les renseignements suivants, outre ceux exigés à l'article 3 du *Règlement général sur la sûreté et la réglementation nucléaires* :

a) une description de l'emplacement de l'activité visée par la demande, y compris l'emplacement de toute zone d'exclusion et de toute structure s'y trouvant;

b) des plans indiquant l'emplacement, le périmètre, les aires, les ouvrages et les systèmes de l'installation nucléaire;

c) la preuve que le demandeur est le propriétaire de l'emplacement ou qu'il est mandaté par celui-ci pour exercer l'activité visée;

d) le programme proposé d'assurance de la qualité proposé pour l'activité visée;

(*e*) the name, form, characteristics and quantity of any hazardous substances that may be on the site while the activity to be licensed is carried on;

(*f*) the proposed worker health and safety policies and procedures;

(*g*) the proposed environmental protection policies and procedures;

(*h*) the proposed effluent and environmental monitoring programs;

(*i*) if the application is in respect of a nuclear facility referred to in paragraph 2(*b*) of the *Nuclear Security Regulations*, the information required by section 3 of those Regulations;

(*j*) the proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed; and

(*k*) the proposed plan for the decommissioning of the nuclear facility or of the site.

Licence to Prepare Site

4. An application for a licence to prepare a site for a Class I nuclear facility shall contain the following information in addition to the information required by section 3:

(*a*) a description of the site evaluation process and of the investigations and preparatory work that have been and will be done on the site and in the surrounding area;

(*b*) a description of the site's susceptibility to human activity and natural phenomena, including seismic events, tornadoes and floods;

(*c*) the proposed program to determine the environmental baseline characteristics of the site and the surrounding area;

(*d*) the proposed quality assurance program for the design of the nuclear facility; and

(*e*) the effects on the environment and the health and safety of persons that may result from the activity to be licensed, and the measures that will be taken to prevent or mitigate those effects.

Licence to Construct

5. An application for a licence to construct a Class I nuclear facility shall contain the following information in addition to the information required by section 3:

(*a*) a description of the proposed design of the nuclear facility, including the manner in which the physical and environmental characteristics of the site are taken into account in the design;

(*b*) a description of the environmental baseline characteristics of the site and the surrounding area;

(*c*) the proposed construction program, including its schedule;

(*d*) a description of the structures proposed to be built as part of the nuclear facility, including their design and their design characteristics;

(*e*) a description of the systems and equipment proposed to be installed at the nuclear facility, including their design and their design operating conditions;

(*f*) a preliminary safety analysis report demonstrating the adequacy of the design of the nuclear facility;

(*g*) the proposed quality assurance program for the design of the nuclear facility;

e) le nom, la forme, les caractéristiques et la quantité des substances dangereuses qui pourraient se trouver sur l'emplacement pendant le déroulement de l'activité visée;

f) les politiques et procédures proposées relativement à la santé et à la sécurité des travailleurs;

g) les politiques et procédures proposées relativement à la protection de l'environnement;

h) les programmes proposés pour la surveillance de l'environnement et des effluents;

i) lorsque la demande vise une installation nucléaire mentionnée à l'alinéa 2*b*) du *Règlement sur la sécurité nucléaire*, les renseignements exigés à l'article 3 de ce règlement;

j) le programme destiné à informer les personnes qui résident à proximité de l'emplacement de la nature et des caractéristiques générales des effets prévus de l'activité visée sur l'environnement ainsi que sur la santé et la sécurité des personnes;

k) le plan proposé pour le déclassement de l'installation nucléaire ou de l'emplacement.

Permis de préparation de l'emplacement

4. La demande de permis pour préparer l'emplacement d'une installation nucléaire de catégorie I comprend les renseignements suivants, outre ceux exigés à l'article 3 :

a) une description du processus d'évaluation de l'emplacement, ainsi que des analyses et des travaux préalables qui ont été et seront effectués sur l'emplacement et dans les environs;

b) une description de la vulnérabilité de l'emplacement aux activités humaines et aux phénomènes naturels, y compris les secousses sismiques, les tornades et les inondations;

c) le programme devant servir à déterminer les caractéristiques environnementales de base de l'emplacement et des environs;

d) le programme d'assurance de la qualité proposé pour la conception de l'installation nucléaire;

e) les effets sur l'environnement ainsi que sur la santé et la sécurité des personnes que peut avoir l'activité visée par la demande, de même que les mesures qui seront prises pour éviter ou atténuer ces effets.

Permis de construction

5. La demande de permis pour construire une installation nucléaire de catégorie I comprend les renseignements suivants, outre ceux exigés à l'article 3 :

a) une description de la conception proposée pour l'installation nucléaire, y compris la façon dont elle tient compte des caractéristiques physiques et environnementales de l'emplacement;

b) une description des caractéristiques environnementales de base de l'emplacement et des environs;

c) le programme de construction proposé, y compris le calendrier des travaux;

d) une description des ouvrages à construire pour l'installation nucléaire, y compris leur conception et leurs caractéristiques de conception;

e) une description des systèmes et de l'équipement qui seront aménagés à l'installation nucléaire, y compris leur conception et leurs conditions nominales de fonctionnement;

f) un rapport préliminaire d'analyse de la sûreté démontrant que la conception de l'installation nucléaire est adéquate;

g) le programme d'assurance de la qualité proposé pour la conception de l'installation nucléaire;

(*h*) the proposed measures to facilitate Canada's compliance with any applicable safeguards agreement;

(*i*) the effects on the environment and the health and safety of persons that may result from the construction, operation and decommissioning of the nuclear facility, and the measures that will be taken to prevent or mitigate those effects;

(*j*) the proposed location of points of release, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical and radiological characteristics;

(*k*) the proposed measures to control releases of nuclear substances and hazardous substances into the environment;

(*l*) the proposed program and schedule for recruiting, training and qualifying workers in respect of the operation and maintenance of the nuclear facility; and

(*m*) a description of any proposed full-scope training simulator for the nuclear facility.

Licence to Operate

6. An application for a licence to operate a Class I nuclear facility shall contain the following information in addition to the information required by section 3:

(*a*) a description of the structures at the nuclear facility, including their design and their design operating conditions;

(*b*) a description of the systems and equipment at the nuclear facility, including their design and their design operating conditions;

(*c*) a final safety analysis report demonstrating the adequacy of the design of the nuclear facility;

(*d*) the proposed measures, policies, methods and procedures for operating and maintaining the nuclear facility;

(*e*) the proposed procedures for handling, storing, loading and transporting nuclear substances and hazardous substances;

(*f*) the proposed measures to facilitate Canada's compliance with any applicable safeguards agreement;

(*g*) the proposed commissioning program for the systems and equipment that will be used at the nuclear facility;

(*h*) the effects on the environment and the health and safety of persons that may result from the operation and decommissioning of the nuclear facility, and the measures that will be taken to prevent or mitigate those effects;

(*i*) the proposed location of points of release, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical and radiological characteristics;

(*j*) the proposed measures to control releases of nuclear substances and hazardous substances into the environment;

(*k*) the proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment, the health and safety of persons and the maintenance of security, including measures to

(i) assist off-site authorities in planning and preparing to limit the effects of an accidental release,

(ii) notify off-site authorities of an accidental release or the imminence of an accidental release,

h) les mesures proposées pour aider le Canada à respecter tout accord relatif aux garanties qui s'applique;

i) les effets sur l'environnement ainsi que sur la santé et la sécurité des personnes que peuvent avoir la construction, l'exploitation et le déclassement de l'installation nucléaire, de même que les mesures qui seront prises pour éviter ou atténuer ces effets;

j) l'emplacement proposé des points de rejet, les quantités et les concentrations maximales proposées, ainsi que le volume et le débit d'écoulement prévus des rejets de substances nucléaires et de substances dangereuses dans l'environnement, y compris leurs caractéristiques physiques, chimiques et radiologiques;

k) les mesures proposées pour contrôler les rejets de substances nucléaires et de substances dangereuses dans l'environnement;

l) le programme et le calendrier proposés pour le recrutement, la formation et la qualification des travailleurs liés à l'exploitation et à l'entretien de l'installation nucléaire;

m) une description de tout simulateur de formation à portée totale proposé pour l'installation nucléaire.

Permis d'exploitation

6. La demande de permis pour exploiter une installation nucléaire de catégorie I comprend les renseignements suivants, outre ceux exigés à l'article 3 :

a) une description des ouvrages de l'installation nucléaire, y compris leur conception et leurs conditions nominales d'exploitation;

b) une description des systèmes et de l'équipement de l'installation nucléaire, y compris leur conception et leurs conditions nominales de fonctionnement;

c) un rapport final d'analyse de la sûreté démontrant que la conception de l'installation nucléaire est adéquate;

d) les mesures, politiques, méthodes et procédures proposées pour l'exploitation et l'entretien de l'installation nucléaire;

e) les procédures proposées pour la manipulation, le stockage provisoire, le chargement et le transport des substances nucléaires et des substances dangereuses;

f) les mesures proposées pour aider le Canada à respecter tout accord relatif aux garanties qui s'applique;

g) le programme de mise en service proposé pour les systèmes et l'équipement de l'installation nucléaire;

h) les effets sur l'environnement ainsi que sur la santé et la sécurité des personnes que peuvent avoir l'exploitation et le déclassement de l'installation nucléaire, de même que les mesures qui seront prises pour éviter ou atténuer ces effets;

i) l'emplacement proposé des points de rejet, les quantités et les concentrations maximales proposées, ainsi que le volume et le débit d'écoulement prévus des rejets de substances nucléaires et de substances dangereuses dans l'environnement, y compris leurs caractéristiques physiques, chimiques et radiologiques;

j) les mesures proposées pour contrôler les rejets de substances nucléaires et de substances dangereuses dans l'environnement;

k) les mesures proposées pour éviter ou atténuer les effets que les rejets accidentels de substances nucléaires et de substances dangereuses peuvent avoir sur l'environnement, sur la santé et la sécurité des personnes ainsi que sur le maintien de la sécurité, y compris les mesures visant à :

(i) aider les autorités extérieures à effectuer la planification et la préparation en vue de limiter les effets d'un rejet accidentel,

(iii) report information to off-site authorities during and after an accidental release,

(iv) assist off-site authorities in dealing with the effects of an accidental release, and

(v) test the implementation of the measures to prevent or mitigate the effects of an accidental release;

(*l*) the proposed measures to prevent acts of sabotage or attempted sabotage at the nuclear facility, including measures to alert the licensee to such acts;

(*m*) the proposed responsibilities of and qualification requirements and training program for workers, including the procedures for the requalification of workers; and

(*n*) the results that have been achieved in implementing the program for recruiting, training and qualifying workers in respect of the operation and maintenance of the nuclear facility.

Licence to Decommission

7. An application for a licence to decommission a Class I nuclear facility shall contain the following information in addition to the information required by section 3:

(*a*) a description of and the proposed schedule for the decommissioning, including the proposed starting date and the expected completion date of the decommissioning and the rationale for the schedule;

(*b*) the nuclear substances, hazardous substances, land, buildings, structures, systems and equipment that will be affected by the decommissioning;

(*c*) the proposed measures, methods and procedures for carrying on the decommissioning;

(*d*) the proposed measures to facilitate Canada's compliance with any applicable safeguards agreement;

(*e*) the nature and extent of any radioactive contamination at the nuclear facility;

(*f*) the effects on the environment and the health and safety of persons that may result from the decommissioning, and the measures that will be taken to prevent or mitigate those effects;

(*g*) the proposed location of points of release, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical and radiological characteristics;

(*h*) the proposed measures to control releases of nuclear substances and hazardous substances into the environment;

(*i*) the proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment, the health and safety of persons and the maintenance of security, including an emergency response plan;

(*j*) the proposed qualification requirements and training program for workers; and

(*k*) a description of the planned state of the site on completion of the decommissioning.

Licence to Abandon

8. An application for a licence to abandon a Class I nuclear facility shall contain the following information in addition to the

(ii) aviser les autorités extérieures d'un rejet accidentel ou de l'imminence d'un tel rejet,

(iii) tenir les autorités extérieures informées pendant et après un rejet accidentel,

(iv) aider les autorités extérieures à remédier aux effets d'un rejet accidentel,

(v) mettre à l'épreuve l'application des mesures pour éviter ou atténuer les effets d'un rejet accidentel;

l) les mesures proposées pour empêcher tout acte ou tentative de sabotage à l'installation nucléaire, de même que les mesures pour alerter le titulaire de permis;

m) les responsabilités, le programme de formation, les exigences de qualification et les mesures de requalification des travailleurs;

n) les résultats obtenus grâce à l'application du programme de recrutement, de formation et de qualification des travailleurs liés à l'exploitation et à l'entretien de l'installation nucléaire.

Permis de déclassement

7. La demande de permis pour déclasser une installation nucléaire de catégorie I comprend les renseignements suivants, outre ceux exigés à l'article 3 :

a) une description du déclassement et le calendrier proposé de celui-ci, y compris la justification du calendrier et les dates prévues de début et d'achèvement du déclassement;

b) les substances nucléaires, les substances dangereuses, les terrains, les bâtiments, les ouvrages, les systèmes et l'équipement qui seront touchés par le déclassement;

c) les mesures, méthodes et procédures de déclassement proposées;

d) les mesures proposées pour aider le Canada à respecter tout accord relatif aux garanties qui s'applique;

e) la nature et l'étendue de toute contamination radioactive à l'installation nucléaire;

f) les effets que les travaux de déclassement peuvent avoir sur l'environnement ainsi que sur la santé et la sécurité des personnes, de même que les mesures qui seront prises pour éviter ou atténuer ces effets;

g) l'emplacement proposé des points de rejet, les quantités et les concentrations maximales proposées, ainsi que le volume et le débit d'écoulement prévus des rejets de substances nucléaires et de substances dangereuses dans l'environnement, y compris leurs caractéristiques physiques, chimiques et radiologiques;

h) les mesures proposées pour contrôler les rejets de substances nucléaires et de substances dangereuses dans l'environnement;

i) les mesures proposées pour éviter ou atténuer les effets que les rejets accidentels de substances nucléaires et de substances dangereuses peuvent avoir sur l'environnement, sur la santé et la sécurité des personnes ainsi que sur le maintien de la sécurité, y compris un plan d'intervention d'urgence;

j) les exigences de qualification et le programme de formation proposés pour les travailleurs;

k) une description de l'état prévu de l'emplacement après l'achèvement des travaux de déclassement.

Permis d'abandon

8. La demande de permis pour abandonner une installation nucléaire de catégorie I comprend les renseignements suivants, outre

information required by sections 3 and 4 of the *General Nuclear Safety and Control Regulations*:

(*a*) the results of the decommissioning; and

(*b*) the results of the environmental monitoring programs.

CERTIFICATION OF PERSONS

Application for Certification

9. (1) This section and sections 10 to 13 do not apply in respect of Class IB nuclear facilities.

(2) The Commission or a designated officer authorized under paragraph 37(2)(*b*) of the Act may certify a person referred to in paragraph 44(1)(*k*) of the Act for a position referred to in a licence after receiving from the licensee an application stating that the person

(*a*) meets the applicable qualification requirements referred to in the licence;

(*b*) has successfully completed the applicable training program and examination referred to in the licence; and

(*c*) is capable, in the opinion of the licensee, of performing the duties of the position.

(3) The Commission or a designated officer authorized under paragraph 37(2)(*b*) of the Act may renew a certification after receiving from a licensee an application stating that the certified person

(*a*) has safely and competently performed the duties of the position for which the person was certified;

(*b*) continues to receive the applicable training referred to in the licence;

(*c*) has successfully completed the applicable requalification tests referred to in the licence for renewing the certification; and

(*d*) is capable, in the opinion of the licensee, of performing the duties of the position.

(4) A certification expires five years after the date of its issuance or renewal.

Application for Examination

10. (1) If a licence requires a person to successfully complete an examination administered by the Commission in order to be certified, the person may take the examination after the Commission receives from the licensee an application that includes

(*a*) the name of the person;

(*b*) the name of the applicable examination; and

(*c*) a statement that the person has successfully completed the applicable training program referred to in the licence.

(2) The Commission shall notify the licensee and the person of the examination results.

(3) The notice of examination results shall include a description of the licensee's and the person's right to be provided with an opportunity to be heard in accordance with the procedure referred to in section 13.

Refusal to Certify

11. (1) The Commission or a designated officer authorized under paragraph 37(2)(*b*) of the Act shall notify a licensee who has applied for the certification of a person and the person in respect

ceux exigés aux articles 3 et 4 du *Règlement général sur la sûreté et la réglementation nucléaires* :

a) les résultats du déclassement;

b) les résultats des programmes de surveillance environnementale.

ACCRÉDITATION

Demande d'accréditation

9. (1) Le présent article et les articles 10 à 13 ne s'appliquent pas aux installations nucléaires de catégorie IB.

(2) La Commission ou un fonctionnaire désigné autorisé en vertu de l'alinéa 37(2)*b*) de la Loi peut accréditer une personne visée à l'alinéa 44(1)*k*) de la Loi pour occuper un poste mentionné dans le permis, sur réception d'une demande du titulaire de permis précisant que la personne :

a) satisfait aux exigences de qualification prévues dans le permis;

b) a réussi le programme de formation et l'examen applicables prévus dans le permis;

c) est capable, de l'avis du titulaire de permis, d'exercer les fonctions du poste.

(3) La Commission ou un fonctionnaire désigné autorisé en vertu de l'alinéa 37(2)*b*) de la Loi peut renouveler une attestation sur réception d'une demande du titulaire de permis précisant que la personne ayant reçu l'attestation :

a) a exercé de façon compétente et en toute sécurité les fonctions du poste pour lequel l'attestation a été accordée;

b) continue de recevoir la formation applicable prévue dans le permis;

c) a réussi les épreuves de requalification applicables prévues dans le permis;

d) est capable, de l'avis du titulaire de permis, d'exercer les fonctions du poste.

(4) L'attestation est valide durant les cinq ans suivant la date de sa délivrance ou de son renouvellement.

Demande d'examen

10. (1) La personne qui, aux termes du permis, doit réussir l'examen administré par la Commission pour recevoir l'attestation peut se présenter à l'examen après que la Commission a reçu du titulaire de permis une demande comprenant ce qui suit :

a) le nom de la personne;

b) le titre de l'examen applicable;

c) une déclaration précisant que la personne a réussi le programme de formation applicable prévu dans le permis.

(2) La Commission avise le titulaire de permis et la personne des résultats de l'examen.

(3) L'avis mentionne également le droit du titulaire de permis et de la personne de se voir accorder la possibilité d'être entendus conformément à la procédure prévue à l'article 13.

Refus d'accréditer

11. (1) La Commission ou un fonctionnaire désigné autorisé en vertu de l'alinéa 37(2)*b*) de la Loi avise le titulaire de permis qui a demandé l'accréditation et la personne pour laquelle

of whom certification is being sought of a proposed decision not to certify the person, as well as the basis for the proposed decision, at least 30 days before refusing to certify the person.

(2) The notice shall include a description of the licensee's and the person's right to be provided with an opportunity to be heard in accordance with the procedure referred to in section 13.

Decertification

12. (1) The Commission or a designated officer authorized under paragraph 37(2)(*b*) of the Act shall notify a person in respect of whom a certificate has been issued and the licensee concerned of a proposed decision to decertify the person, as well as the basis for the proposed decision, at least 30 days before decertifying the person.

(2) The notice shall include a description of the licensee's and the person's right to be provided with an opportunity to be heard in accordance with the procedure referred to in section 13.

Opportunity to Be Heard

13. (1) If a licensee or a person referred to in section 10, 11 or 12 has received a notice and has requested, within 30 days after the date of receipt of the notice, an opportunity to be heard either orally or in writing, the licensee or the person shall be provided with such an opportunity in accordance with the request.

(2) On completion of a hearing held in accordance with subsection (1), the licensee and the person shall be notified of the decision and the reasons for it.

RECORDS TO BE KEPT AND RETAINED

14. (1) Every licensee shall keep a record of the results of the effluent and environmental monitoring programs referred to in the licence.

(2) Every licensee who operates a Class I nuclear facility shall keep a record of

(*a*) operating and maintenance procedures;

(*b*) the results of the commissioning program referred to in the licence;

(*c*) the results of the inspection and maintenance programs referred to in the licence;

(*d*) the nature and amount of radiation, nuclear substances and hazardous substances within the nuclear facility; and

(*e*) the status of each worker's qualifications, requalification and training, including the results of all tests and examinations completed in accordance with the licence.

(3) Every licensee who decommissions a Class I nuclear facility shall keep a record of

(*a*) the progress achieved in meeting the schedule for the decommissioning;

(*b*) the implementation and results of the decommissioning;

(*c*) the manner in which and the location at which any nuclear or hazardous waste is managed, stored, disposed of or transferred;

(*d*) the name and quantity of any radioactive nuclear substances, hazardous substances and radiation that remain at the nuclear facility after completion of the decommissioning; and

(*e*) the status of each worker's qualifications, requalification and training, including the results of all tests and examinations completed in accordance with the licence.

l'accréditation a été demandée de la décision proposée de ne pas accréditer la personne, ainsi que du fondement de cette décision, au moins trente jours avant de refuser de l'accréditer.

(2) L'avis mentionne également le droit du titulaire de permis et de la personne de se voir accorder la possibilité d'être entendus conformément à la procédure prévue à l'article 13.

Retrait de l'attestation

12. (1) La Commission ou un fonctionnaire désigné autorisé en vertu de l'alinéa 37(2)*b*) de la Loi avise la personne accréditée et le titulaire de permis concerné de la décision proposée de retirer l'attestation, ainsi que du fondement de cette décision, au moins trente jours avant de la retirer.

(2) L'avis mentionne également le droit de la personne et du titulaire de permis de se voir accorder la possibilité d'être entendus conformément à la procédure prévue à l'article 13.

Possibilité d'être entendu

13. (1) Le titulaire de permis ou la personne visé aux articles 10, 11 ou 12 qui a reçu un avis et qui, dans les trente jours suivant la date de réception de l'avis, a demandé d'être entendu de vive voix ou par écrit est entendu conformément à la demande.

(2) Au terme de l'audience tenue conformément au paragraphe (1), le titulaire de permis et la personne sont avisés de la décision et des motifs de celle-ci.

DOCUMENTS À TENIR ET À CONSERVER

14. (1) Le titulaire de permis tient un document sur les résultats des programmes de surveillance de l'environnement et des effluents qui sont prévus dans le permis.

(2) Le titulaire de permis qui exploite une installation nucléaire de catégorie I tient un document sur :

a) les procédures d'exploitation et d'entretien;

b) les résultats du programme de mise en service prévu dans le permis;

c) les résultats des programmes d'inspection et d'entretien prévus dans le permis;

d) la nature et la quantité des rayonnements, des substances nucléaires et des substances dangereuses présents dans l'installation nucléaire;

e) l'état des qualifications, de la formation et de la requalification de chaque travailleur, y compris les résultats de tous les examens et épreuves subis conformément au permis.

(3) Le titulaire de permis qui déclasse une installation nucléaire de catégorie I tient un document sur :

a) les progrès réalisés pour respecter le calendrier des travaux de déclassement;

b) la mise en oeuvre et les résultats du déclassement;

c) la façon dont les déchets nucléaires ou dangereux sont gérés, stockés de façon provisoire ou permanente, évacués, éliminés ou transférés;

d) le nom et la quantité des substances nucléaires radioactives, des substances dangereuses et des rayonnements qui subsistent à l'installation nucléaire après les travaux de déclassement;

e) l'état des qualifications, de la formation et de la requalification de chaque travailleur, y compris les résultats de tous les examens et épreuves subis conformément au permis.

(4) Every person who is required by this section to keep a record referred to in paragraph (2)(*a*) to (*d*) or (3)(*a*) to (*d*) shall retain the record for 10 years after the expiry date of the licence to abandon issued in respect of the Class I nuclear facility.

(5) Every person who is required by this section to keep a record referred to in paragraph (2)(*e*) or (3)(*e*) shall retain the record for the period that the worker is employed by the licensee and for five years after the worker ceases to be so employed.

COMING INTO FORCE

15. These Regulations come into force on the day on which they are approved by the Governor in Council.

N.B. The Regulatory Impact Analysis Statement for these Regulations appears at page 1142, following SOR/2000-202.

(4) La personne qui est tenue de tenir un document visé aux alinéas (2)*a*) à *d*) ou (3)*a*) à *d*) en application du présent article le conserve pendant les dix ans suivant l'expiration du permis d'abandon délivré pour l'installation nucléaire de catégorie I.

(5) La personne qui est tenue de tenir un document visé aux alinéas (2)*e*) ou (3)*e*) en application du présent article le conserve pendant la période où le travailleur est à son service et pendant les cinq ans après qu'il cesse de l'être.

ENTRÉE EN VIGUEUR

15. Le présent règlement entre en vigueur à la date de son agrément par le gouverneur en conseil.

N.B. Le résumé de l'étude d'impact de la réglementation de ce règlement se trouve à la page 1142, suite au DORS/2000-202.

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APPENDIX A2

CORRELATION OF EIS GUIDELINES AND EIS

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Table A2-1: Concordance of EIS Guidelines with the EIS

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
PART I– INTRODUCTION	
1. CONTEXT	
1.1 Purpose of the Guidelines	—
The purpose of this document is to identify for the proponent, Ontario Power Generation (OPG), the nature, scope and extent of the information that must be addressed in the preparation of the Environmental Impact Statement (EIS) for its proposed Deep Geologic Repository (DGR) to store low- and intermediate-level radioactive waste. The proponent will prepare and submit an EIS that examines the potential environmental effects, including cumulative effects, of the site preparation, construction, operation, decommissioning and abandonment of the project and evaluates their significance. In addition, the proponent will address all requirements for a site preparation and construction licence, detailed in Appendix 2 of this document. This information will be used by a joint review panel established pursuant to the Canadian Environmental Assessment Act and the Nuclear Safety and Control Act as the basis for a public review.	—
While the EIS guidelines provide a framework for preparing a complete and accessible EIS, it is the responsibility of the proponent to provide sufficient data and analysis on any potential environmental effects to permit proper evaluation by a joint review panel, the public, and technical and regulatory agencies. The EIS guidelines outline the minimum information requirements while providing the proponent with flexibility in selecting methods to compile data for the EIS.	—
Exchanges between the proponent and other government organizations, Aboriginal people and stakeholders, where appropriate, are encouraged to ensure that the EIS responds adequately to these guidelines.	Section 2
1.2 Environmental Assessment and Regulatory Process	—
On December 2, 2005, OPG wrote to the Canadian Nuclear Safety Commission (CNSC) indicating its intent to initiate the regulatory process to prepare a site, construct and operate a DGR on the existing Bruce Nuclear Site within the Municipality of Kincardine, Ontario. The proposed DGR would receive low and intermediate level radioactive waste currently stored on the Bruce Site in an interim facility, as well as waste produced from the continued operation of OPG-owned generating stations at Bruce, Pickering and Darlington, in Ontario.	—

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
OPG's proposal includes the site preparation, construction, operation, decommissioning and abandonment of above-ground and below-ground facilities. The surface facilities would consist of components such as the underground access and ventilation buildings, associated temporary or permanent buildings and related infrastructure. The underground facilities would comprise components such as shafts, ramps and tunnels, emplacement rooms, and various service areas and installations. Surface and underground facilities are expected to be located within the boundaries of the Bruce Nuclear Site.	Section 1.2.3; Section 4
DGR operations would involve those activities required to operate and maintain the DGR facility, including the transfer of waste from the existing interim storage facility and the receipt of waste at the repository, the emplacement of the waste in rooms within the repository and the closure of these rooms.	Section 4.8
The project triggers the Canadian Environmental Assessment Act given that the proponent requires authorizations under subsection 24(2) of the Nuclear Safety and Control Act in order for the project to proceed. A comprehensive study for this proposed project was initiated January 30, 2006.	Section 1.4.1
The CNSC held a public consultation and a public hearing on the scope of the environmental assessment. As a result of the public hearing the CNSC reported to the federal Minister of the Environment on the scope of the environmental assessment, public concerns, the possibility of adverse environmental effects and concerns regarding the comprehensive study's ability to address all of the questions raised by the project and provided a recommendation to the Minister of Environment to refer the environmental assessment to a review panel. On June 29, 2007, the Minister of the Environment announced that the DGR project would be referred to a joint review panel.	Section 1.4.1
A joint review panel under the Canadian Environmental Assessment Act and the Nuclear Safety and Control Act is being established to undertake an environmental assessment and regulatory review of this project. The joint review panel process will examine environmental assessment issues that relate to the full life cycle of the project, from site preparation through to operations, as well as an examination of decommissioning, and abandonment activities. The joint review panel process will also consider OPG's application for a site preparation and construction licence. Separate licence applications and regulatory reviews would be required for OPG to operate the DGR, decommission, and to abandon the facility.	Section 1.4.1
CNSC staff has confirmed with the Ontario Ministry of the Environment that there are no provincial EA requirements under the Ontario Environmental Assessment Act that are applicable to this proposal.	Section 1.4.2

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
1.3 Preparation and Review of the EIS	—
The EIS guidelines were prepared by the Canadian Environmental Assessment Agency (CEAA) and the CNSC, and in consultation with other expert federal departments including Health Canada, Natural Resources Canada and Environment Canada. The draft EIS guidelines were subject to a public comment period from April 4, 2008 to June 18, 2008. After consideration of the comments received from Aboriginal groups and the public during the consultation period, the guidelines were revised and finalized, and submitted to the federal Minister of the Environment for approval. The guidelines were subsequently issued to the Proponent.	Section 1.4.1; Section 1.4.2
An EIS is a document prepared by the proponent that allows a joint review panel, regulators, Aboriginal groups and members of the public to understand the project, the existing environment, and the potential environmental effects of the project. The proponent must also provide all information required to support the application for a site preparation and construction licence for the joint review panel, as a panel of the Commission, to consider and render a licensing decision under the Nuclear Safety and Control Act and the regulations made under the Act (See Appendix 2).	EIS and Technical Support Documents Preliminary Safety Report
The proponent will prepare an EIS that addresses the requirements of these guidelines for submission to the joint review panel that will be established for this project. The EIS will then be made available to the public and stakeholders for a comment period on whether the EIS is in conformity with these guidelines. The joint review panel will determine whether additional information must be provided before convening public hearings.	—
The EIS that is made available for public and stakeholder comment should not contain:	Security Document to be submitted
▪ Information that could cause specific, direct and substantial harm to the proponent, to a witness, or specific harm to the environment by the disclosure of;	
▪ Information that involves national or nuclear security;	
▪ information that is confidential (i.e., financial, commercial, scientific, technical, personal or other nature), that is treated consistently as confidential, and the person affected has not consented to the disclosure; or	
▪ Information that is likely to endanger the life, liberty or security of a person through its disclosure.	
The proponent must inform the joint review panel in writing for a determination as to whether specific information required by these guidelines should be submitted to, and retained by the joint review panel, as confidential.	

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
Following public hearings, the joint review panel will prepare a report that includes, but is not limited to, the rationale, conclusions and recommendations of the joint review panel relating to the environmental assessment of the project, including any mitigation measures and follow-up program, and a summary of any comments received from the public and Aboriginal groups.	—
This joint review panel report will be submitted to the Minister of the Environment. The report will be made available to the public at that time. The government will then respond to the joint review panel's report. The Government of Canada's response to the joint review panel report will be made available by the Canadian Environmental Assessment Agency.	—
Subsequent to the Government of Canada's response, the joint review panel will render a licensing decision for a licence to Prepare Site and Construct under the Nuclear Safety and Control Act.	—
2. GUIDING PRINCIPLES	
2.1 Environmental Assessment as a Planning Tool	Section 1.6.1
Environmental assessment is a planning tool used to ensure that projects are considered in a careful and precautionary manner in order to avoid or mitigate the possible adverse effects of development on the environment and to encourage decision makers to take actions that promote sustainable development and thereby achieve or maintain a healthy environment and a healthy economy.	Section 1.6.1
The environmental assessment of this project must, in a manner consistent with those purposes, identify possible environmental effects; propose measures to mitigate adverse effects and predict whether there will be likely significant adverse environmental effects after mitigation measures are implemented.	Section 1.6.1

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
2.2 Public Participation and Aboriginal Engagement	Section 2
Public participation[1] is a central objective of the overall review process. Meaningful public participation requires the proponent to address concerns of the general public regarding the anticipated or potential environmental effects of the project. In preparing the EIS, the proponent is required to engage residents and organizations in all affected communities, other interested organizations, and relevant government agencies. The proponent must provide in the EIS the highlights of this engagement, including the methods used, the results, and the ways in which the proponent intends to address the concerns identified, including a summary of issues raised during such engagement. [1] As described in CEAA's Public Participation Guide (May 2008), terms such as "participation," "consultation," "involvement," and "engagement" are often used interchangeably, although they may mean different things to different people. These guidelines endeavour to use these terms in a manner that is consistent with the 'Public Participation Terminology' described in this CEA Agency Guidance.	Section 1.6.2; Section 2
Another objective of the overall review process is to involve potentially affected Aboriginal people in order that the environmental assessment can identify and address concerns regarding any changes that the project may cause in the environment and the resulting effects of any such changes on the use of lands and resources for traditional purposes by Aboriginal persons. The proponent must ensure that it engages with Aboriginal people that have asserted or have established Aboriginal rights, Aboriginal title or treaty rights that may be affected by the project. In preparing the EIS, the proponent must ensure that Aboriginal people have the information that they require in respect of the project and of how the project may impact them. The proponent is required to describe in the EIS how the concerns respecting Aboriginal people will be addressed. That description should include a summary of discussions, the issues or concerns raised, and should consider and describe any asserted or established Aboriginal rights, Aboriginal title and treaty rights. The EIS must document the potential impact of the project on any asserted or established Aboriginal rights, Aboriginal title and treaty rights, and the measures to prevent or mitigate those potential impacts.	Section 1.6.3; Section 2.3; Section 6.9, Section 7.9
Meaningful involvement in the environmental assessment can only take place when all parties have a clear understanding of the proposed project as early as possible in the review process. Therefore, the proponent is required to:	—
▪ Continue to provide up-to-date information describing the project to the public and especially to the communities likely to be most affected by the project;	Section 2
▪ Involve Aboriginal people in determining how best to deliver that information, e.g., the types of information required, translation needs, different formats, the possible need for community meetings; and	Section 2

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
▪ Explain the results of the EIS in a clear and direct manner to make the issues comprehensible to as wide an audience as possible.	Section 2
2.3 Traditional Knowledge	Section 1.6.4; Section 7.16
Traditional knowledge, which is rooted in the traditional life of Aboriginal people, has an important contribution to make to an environmental assessment. Traditional knowledge refers to the broad base of knowledge held by individuals and collectively by communities that may be based on spiritual teachings, personal observation and experience or passed on from one generation to another through oral and/or written traditions. This tradition is dynamic, substantive, and distinct living knowledge.	Section 1.6.4; Section 6.9, Section 7.16
Traditional knowledge, in combination with other information sources is valuable in achieving a better understanding of potential impacts of projects. Traditional knowledge may, for example, contribute to the description of the existing physical, biological and human environments, natural cycles, resource distribution and abundance, long and short-term trends, and the use of lands, and land and water resources. It may also contribute to project siting and design, identification of issues, the evaluation of potential effects, and their significance, the effectiveness of proposed mitigation, cumulative impacts, and the consideration of follow-up and monitoring programs.	Section 1.6.4; Section 6.9; Section 7.16
Certain issues relevant to the review process are firmly grounded in traditional knowledge, such as harvesting, cultural well-being, land use, heritage resources, and others. Although the basis for traditional knowledge and science-based knowledge can differ, they may on their own or together, contribute to the understanding of these issues.	Section 1.6.4; Section 7.16
The joint review panel will promote and facilitate the contribution of traditional knowledge to the review process. It is recognized that approaches to traditional knowledge, customs and protocols may differ among Aboriginal communities and persons with respect to the use, management and protection of this knowledge. The joint review panel can consider the views of communities and traditional knowledge holders during the joint review process and determine which information should be kept confidential. The proponent must incorporate into the EIS the local knowledge to which it has access or that it may reasonably be expected to acquire through appropriate due diligence, in keeping with appropriate ethical standards and without breaching obligations of confidentiality.	Section 1.6.4; Section 6.9; Section 7.16

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
Alternatively, the proponent may facilitate the presentation of such knowledge by persons and parties having access to this information to the joint review panel during the course of the review. If requested by an Aboriginal people, the proponent should cooperate to develop a mutually agreed-upon arrangement for the Aboriginal people themselves to provide traditional knowledge throughout the joint review process, either by themselves or in collaboration with the proponent.	Section 2.3
2.4 Sustainable Development	**Section 1.6.5**
Sustainable development seeks to meet the needs of present generations without compromising the ability of future generations to meet their own needs.	Section 1.6.5
Environmental assessment provides a systematic approach for identifying, predicting and evaluating the potential environmental effects of projects before decisions are made. In addition, environmental assessment provides the means to identify mitigation measures for adverse effects. Environmental assessment promotes sustainable development and contributes to decision making that can ultimately provide net ecological, economic and social benefits to society.	Section 1.6.5
A project that is supportive of sustainable development must strive to integrate the objective of net ecological, economic and social benefits to society in the planning and decision-making process and must incorporate citizen participation. The project, including its alternative means, must take into account the relations and interactions among the various components of the ecosystems and meeting the needs of the population. The proponent must include in the EIS consideration of the extent to which the Project contributes to sustainable development. In doing so, the proponent should consider, in particular:	Section 2; Section 3
(a) The extent to which biological diversity may be affected by the Project; and	Section 7.4.2.3; Section 7.5.2.5
(b) The capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of present and future generations.	Section 11
2.5 Precautionary Approach	**Section 1.6.6; Section 7.15**
One of the purposes of environmental assessment is to ensure that projects are considered in a careful and precautionary manner before authorities take action in connection with them, in order to ensure that such projects do not cause significant adverse environmental effects. The Precautionary Principle informs the decision-maker to take a cautionary approach, or to err on the side of caution, especially where there is a large degree of uncertainty or high risk.	Section 1.6.6; Section 7.15

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
The document A Framework for the Application of Precaution in Science-based Decision Making About Risk [Reference 1] sets out guiding principles for the application of precaution to science-based decision making in areas of federal regulatory activity for the protection of health and safety and the environment, and the conservation of natural resources.	Section 1.6.6; Section 7.15
The proponent must indicate how the precautionary principle was considered in the design of the project in at least the following ways:	Section 3; Section 7.15
▪ Demonstrate that all aspects of the project have been examined and planned in a careful and precautionary manner in order to ensure that they do not cause serious or irreversible damage to the environment and/or the human health of current or future generations;	Section 7.15
▪ Outline and justify the assumptions made about the effects of all aspects of the project and the approaches to minimize these effects;	Section 7
▪ Alternative means of carrying out the Project are evaluated and compared in light of risk avoidance, adaptive management capacity and preparation for surprise;	Section 3
▪ That in designing and operating the project, priority has been and will be given to strategies that avoid the creation of adverse impacts;	Section 3; Section 4; Section 7
▪ That contingency plans explicitly address accidents, malfunctions and malevolent acts and include risk assessments and evaluations of the degree of uncertainty;	Section 4.13; Section 8; Post Closure Safety Assessment Report; Preliminary Safety Report
▪ Identify any proposed follow-up and monitoring activities, particularly in areas where scientific uncertainty exists in the prediction of effects; and	Section 12
▪ Present public views on the acceptability of all of the above.	Section 2.6; Appendix D4
In doing so, the proponent shall consider the guiding principles set out in the Framework for the Application of Precaution in Science-based Decision Making About Risk.	—

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
2.6 Study Strategy and Methodology	—
The proponent is expected to observe the intent of the EIS guidelines and to identify all environmental effects that are likely to arise from the project (including situations not explicitly identified in these guidelines), the mitigation measures that will be applied, and the significance of any residual effects. It is possible that these guidelines include matters that, in the judgment of the proponent, are not relevant or significant to the project. If such matters are omitted from the EIS, they must be clearly indicated with appropriate justification so that the public and other interested parties have an opportunity to comment on this judgment. Where the joint review panel disagrees with the proponent's decision, it may require the proponent to provide additional information.	Section 7
The proponent must explain and justify methods used to predict impacts of the project on each valued environmental component (VEC), which includes biophysical and socioeconomic components, the interactions among these components and the relations of these components within the environment. The information presented must be substantiated. In particular, the proponent must describe how the VECs were identified and what methods were used to predict and assess the adverse environmental effects of the project on these components. The value of a component not only relates to its role in the ecosystem, but also to the value placed on it by humans. The culture and way of life of the people using the area affected by the project may themselves be considered VECs.	Section 2.9.2; Section 5.3; Section 7
In describing methods, the proponent must document how it used scientific, engineering, traditional and other knowledge to reach its conclusions. Assumptions made must be clearly identified and justified. All data, models and studies must be documented so that the analyses are transparent and reproducible. All data collection methods must be specified. The uncertainty, reliability and sensitivity of models used to reach conclusions must be indicated. The sections in the EIS regarding the existing environment and the potential adverse environmental effects predictions and assessment must be prepared, using best available information and methods, to the highest standards in the relevant subject area. All conclusions must be substantiated.	Section 6; Section 7
The EIS must identify all significant gaps in knowledge and understanding where they are relevant to key conclusions presented in the EIS. The steps to be taken by the proponent to address these gaps must also be identified. Where the conclusions drawn from scientific and technical knowledge are inconsistent with the conclusions drawn from traditional knowledge, the EIS must contain a balanced presentation of the issues and a statement of the proponent's conclusions.	Section 6; Section 7

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
2.7 Use of Existing Information	Section 6
In preparing the EIS, the proponent is encouraged to make use of existing information relevant to the project. When relying on existing information to meet the requirements of various sections of the EIS guidelines, the proponent must either include the information directly in the EIS or clearly direct (e.g., through cross-referencing) the joint review panel to where it may obtain the information. When relying on existing information, the proponent must also comment on how representative the data are, clearly separate factual lines of evidence from inference, and state any limitations on the inferences or conclusions that can be drawn from them, according to the criteria for information quality set out in section 2.6 of the EIS Guidelines. For instance:	Section 6
▪ Assumptions should be clearly identified and justified;	Section 6
▪ All data, models and studies must be documented such that the analyses are transparent and reproducible;	Section 6, Section 7
▪ The uncertainty, reliability and sensitivity of models used to reach conclusions must be indicated;	Section 6, Section 7
▪ Conclusions should be substantiated; and	Section 6, Section 7
▪ The studies should be prepared using best available information and methods, to the highest standards in the relevant subject area.	Section 6, Section 7
3. PRESENTATION OF THE EIS	**—**
For clarity and ease of reference, the EIS should be presented in the same order as the EIS guidelines. However, in certain sections of the EIS, the proponent may decide that the information is better presented following a different sequence. The EIS must include a guide that cross-references the EIS guidelines with the EIS so that points raised in the EIS guidelines are easily located in the EIS.	Appendix A2
In the interest of brevity, the EIS should make reference to, rather than repeat, information that has already been presented in other sections of the document.	All Sections
A key subject index would also be useful and should reference locations in the text by volume, section and sub-section.	Table of Contents, Section 16
The names of the proponent's key personnel and/or contractors and sub-contractors responsible for preparing the EIS must be listed.	Appendix B

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
Supporting documentation can be provided in separate volumes, and should be referenced by volume, section and page in the text of the EIS. The proponent must submit the EIS and all supporting documents in both an electronic format to facilitate internet access and in hard copy for record keeping and review.	All Sections
The proponent should present the EIS in the clearest language possible. However, where the complexity of the issues addressed requires the use of technical language, a glossary defining technical words and acronyms must be included.	Section 15
The proponent should provide charts, diagrams and maps wherever useful to clarify the text, including perspective drawings that clearly convey what the developed project site would look like.	Section 1.1.1; Section 4 Figures
Information required to support the application for the Licence to Prepare Site and Construct must clearly cross-reference the EIS where appropriate.	Preliminary Safety Report
3.1 Environmental Impact Statement Summary	**—**
The proponent must prepare a plain language summary of the EIS that provides the reader with a concise but complete overview of the EIS.	Executive Summary; EIS Summary
4. SCOPE	**—**
The following section outlines the scope of the project and the factors to be assessed. The scope of the project was based on the project description submitted in December 2005. While the details of the project are expected to change and develop through the environmental assessment process, the scope is sufficient to ensure the EIS will capture the project as it is planned to proceed.	–
4.1 Scope of the Project	**Section 4.2**
Pursuant to paragraphs 15(1) (b) and 15(3) (b) of the Canadian Environmental Assessment Act, the Minister of the Environment is proposing that the scope of the project include the site preparation, construction, operation, decommissioning, and abandonment of the project components and activities proposed by OPG as described in *Deep Geologic Repository for Low and Intermediate Level Radioactive Waste – Project Description* [Reference 2]. The long-term management of used nuclear fuel under the mandate of the Nuclear Waste Management Organization is not within the scope of this project.	—
The physical works for this project include both surface facilities and underground facilities. Surface facilities could include two permanent buildings, plus any buildings required for ancillary facilities. The principal structures of the surface facilities expected are comprised of:	Section 4.4.1; Section 4.4.2

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
▪ Receipt/Access Building: this building could contain facilities for underground access by ramp or shaft. If access is by shaft, this building is expected to have a hoist/headframe/cage. If access is by ramp, this building would include ramp access. This building is likely to have facilities for staff, as well as the heating ventilation and air conditioning (HVAC) equipment. Low- and intermediate-level waste could be received at this building and may be staged for transfer to the DGR. This building may also be used for transfer and removal of excavated rock during construction activities; and	Section 4.4.1.1
▪ Ventilation Shaft Headframe Building: this building may provide cover for the ventilation shaft, exhaust fans, sampling/monitoring devices, a hoist and mechanical/electrical systems.	Section 4.4.1.2
Underground facilities would likely include the following:	Section 4.4.2
▪ Ramp or Main Shaft: the main shaft would be excavated using drill and blast or other methods. The ramp would be tunnelled into the rock. Either the ramp or the shaft would be used to bring materials and waste into the DGR	Section 4.4.2.1
▪ Ventilation Shaft: the ventilation shaft would be used to route air and provide emergency egress. This shaft would be excavated by drill and blast, raise bore, or other methods.	Section 4.4.2.1
▪ Underground Tunnels: these tunnels would provide access from the underground receipt area to the operational level.	Section 4.4.2.2; Section 4.4.2.3
▪ Emplacement Rooms: these rooms would provide the storage space needed for the low- and intermediate-level waste, a volume estimated as 160,000 m^3.	Section 4.4.2.4
▪ Operational Level Office, Amenities and Maintenance Areas: these may be constructed adjacent to the main shaft/ramp and possibly used for servicing underground equipment, or serve as a distribution point for services.	Section 4.4.2.2
The physical works also consist of the site infrastructure, and would include such things as power, a sanitary sewer system, a potable water system, a storm water system, a subsurface drainage system, a construction laydown area, access roadways, fencing**,** waste rock storage and associated roads, security and roadways for linking the DGR to the existing Western Waste Management Facility.	Section 4.4; Section 4.7; Section 4.8
The undertakings in relation to the physical works comprise those that are proposed in the project description (Section 8). This includes activities such as:	—

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
Site Preparation: clearing a portion of the proposed site (approximately 15 hectares are wooded) and development of roads to provide site access.	Section 4.7.1
Construction: construction of surface facilities, the shaft or ramp, the ventilation shaft, and the underground excavation of tunnels and an initial set of emplacement rooms. Construction would also result in storage of rock on the Bruce site.	Section 4.7.3; Section 4.7.4
Operation: operational activities include transfer of low- and intermediate-level radioactive waste from the Western Waste Management Facility and waste emplacement in the DGR and any sealing of emplacement rooms during the operating period. The operational phase may also include construction campaigns for additional emplacement rooms.	Section 4.8; Section 4.10.2
Decommissioning: decommissioning activities includes activities such as dismantling the equipment, sealing the repository and access ways and decontamination and demolishing the surface facilities.	Section 4.11
Abandonment: although there are no activities associated with abandonment, the long term performance of the facility must conform to CNSC Regulatory Policy P-290, Managing Radioactive Waste [Reference 3].	Section 4.12
4.2 Factors to be considered in the EIS	**—**
The Minister of the Environment is proposing that the following factors be considered in the EIS in order to adequately understand and assess the potential adverse effects of the project:	—
a The environmental effects of the project, including the environmental effects of malfunctions, accidents or malevolent acts that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;	Section 7; Section 8 (Malfunctions, Accidents and Malevolent Acts); Section 10 (Cumulative Effects)
b The significance of the effects referred to in (a);	Section 7; Section 8 (Malfunctions, Accidents and Malevolent Acts); Section 10 (Cumulative Effects)
c Comments from the public that are received during the environmental assessment;	Section 2.6; Appendix D4
d Measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;	Section 7 (within each environmental component section)
e Purpose of the project;	Section 3.1

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
f Need for the project;	Section 3.2
g Alternatives to the project;	Section 3.3
h Alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;	Section 3.4
i Measures to enhance any beneficial environmental effects;	Section 7 (within each environmental component section)
j The requirements for a follow-up program in respect of the project;	Section 12
k The capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future; and	Section 11
l The consideration of community knowledge and Aboriginal traditional knowledge.	Section 1.6.4; Section 2.9; Section 7.16
PART II– CONTENT OF THE EIS	
Part II of the EIS guidelines provides specific instructions for the content of each section in the EIS. The EIS as a whole must reflect the Guiding Principles in section 2 of the guidelines.	—
5. CONTEXT	
This section must orient the reader to the EIS by briefly introducing the geographic setting, the project, the underlying rationale for the project, the proponent, the federal joint review panel process and the content and format of the EIS.	Section 1

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
5.1 Setting	**—**
This section must provide a concise description of the geographic setting in which the DGR is proposed to be constructed, demonstrating its proximity to Lake Huron, any National Parks or ecologically significant areas, the Municipality of Kincardine and the Town of Saugeen Shores, the Saugeen Ojibway Nation's two residential communities of Saugeen and Cape Crocker. This section must also outline current use of lands, waters (both ground and surface waters) and resources, including those used for traditional purposes by Aboriginal persons that may be affected by the project and those lands, waters and resources related to established or asserted Aboriginal rights, Aboriginal title or treaty rights. Maps at appropriate scales to illustrate the regional setting should be included. The description must be focused on those aspects of the environment important for understanding the potential environmental effects of the project. A brief description of current regional land uses is required to integrate the natural and human elements of the environment in order to explain the interrelationships between the physical and biological aspects and the people and their communities.	Section 1.1; Section 6.4; Section 6.9; Section 6.10
5.2 Project Overview and Purpose	**—**
The proponent will briefly summarize the project, its purpose, location, scale, components, activities, scheduling and costs. A more detailed description of the project is provided for in Section 8 in these guidelines.	Section 1.2
5.3 Proponent	**—**
This section should introduce readers to the proponent with summary information on the nature of the current management structure and any reasonably foreseeable changes in management structure and organizational accountability for the:	Section 1.3
▪ Design, construction, operation and modification of the project;	Section 1.3
▪ Implementation of environmental mitigation measures and environmental monitoring; and	Section 1.3
▪ Management of potential adverse environmental effects.	Section 1.3
5.4 Environmental Assessment and Regulatory Process and Approvals	**Section 1.4**
For the purpose of the environmental assessment, the proponent must:	—
▪ Identify the planning context for the environmental assessment of the project;	Section 1.4.1

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
▪ Discuss government policies, regulations, and land use plans that have a bearing on the project;	Section 1.4; Section 1.5
▪ Identify the requirements for the environmental assessment under the Canadian Environmental Assessment Act and the Nuclear Safety and Controls Act;	Section 1.4
▪ Summarize and discuss the approach, including the role of regulatory bodies, to ensure compliance with existing federal and provincial environmental legislation such as the Nuclear Safety and Control Act, Migratory Birds Convention Act, the Fisheries Act, Species at Risk Act, the Canadian Environmental Protection Act 1999, Ontario Environmental Protection Act, Ontario Water Resources Act, Lakes and Rivers Improvement Act and Ontario's Endangered Species Act;	Section 1.4.1; Section 1.4.2; Section 1.5.1; Section 1.5.2; Section 6
▪ Summarize the main steps in the environmental assessment process and the main approvals required to undertake the project; and	Section 1.4; Section 1.6.7; Section 12.3
▪ Describe the role of the EIS in the overall environmental assessment and regulatory process.	Section 1.7
The joint review panel will also be considering information and evidence in support of OPG's application for a licence to prepare a site and construct a DGR for low- and intermediate- level waste in accordance with the Nuclear Safety and Control Act and its regulations. These requirements are outlined in section 8.1 and Appendix 2 of these guidelines.	Preliminary Safety Report
5.5 International Agreements	**—**
The proponent must summarize and discuss in the EIS applicable international agreements, designations, or action plans, their implications and relationship to the planning and regulatory process described in section 5.4 and how they may influence the project or its environmental effects.	Section 1.5
The location of the facility on the shores of a trans-boundary watershed requires specific attention be paid to the Canada-U.S. Air Quality Agreement, the Great Lakes Water Quality Agreement and other such bi-national treaties and agreements.	Section 1.5
6. PUBLIC PARTICIPATION	**Section 2, Appendix D**
Involvement of Aboriginal people, government agencies, non-governmental organizations, and other interested parties is a central objective of the overall review process. In preparing the EIS, the proponent will demonstrate how it has engaged (i.e., shared information with, and gathered input from) interested parties that may be affected or have an interest in the project, in keeping with the Guiding Principles in section 2 of the guidelines. The key issues identified must be summarized in the EIS:	Section 2; Appendix D

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
▪ The types of support provided to communities, organizations and individuals involved in the public participation process.	Section 2.6
▪ The role of public engagement in identifying VECs, issues, effect prediction and mitigation.	Section 2.9
▪ An explanation of how the results of that engagement influenced the design of the project; and	Section 2.9; Section 3.2.6; Section 3.3.6
▪ A description of the principles and methods will be employed to provide information to, obtain input from or otherwise engage communities and groups regarding the project activities over the lifespan of the project.	Section 2.10; Section 4.10.4
6.1 Aboriginal Peoples	**—**
The EIS must describe the proponent's involvement of the Chippewas of Saugeen First Nation, the Chippewas of Nawash Unceded First Nation and engagement of any other Aboriginal people, including Métis, that may be affected by the project, especially those Aboriginal people claiming Aboriginal rights, title or established treaty rights at the location or in the vicinity of the project.	Section 2.3
This description will include a summary of the history of the proponent's relationship with Aboriginal people with respect to the Bruce Nuclear Site in general and the proposed project in specific. The EIS will describe the objectives of and the methods used for Aboriginal group engagement, issues or concerns raised through such engagement and any details not otherwise subject to confidentiality agreements, including a summary of the discussions, paper and electronic correspondence and meetings held. Details may include date and time, agenda, summary of discussions and a description of how the proponent has addressed the issues or concerns raised by Aboriginal people.	Section 2.3; Section 6.9.2; Section 7.9
6.2 Government Agencies	**—**
The EIS must describe the proponent's involvement of provincial and federal government ministries, departments or agencies and local governments which should include the municipalities of Kincardine, Saugeen Shores, Arran-Elderslie, Brockton and HuronKinloss. This may also include the Ontario Ministry of Energy and Infrastructure, the Ontario Ministry of the Environment and the Ontario Ministry of Natural Resources Park Superintendents for McGregor Point and Inverhuron Provincial Parks. The EIS must describe the objectives of such engagement, the methods used, issues raised during such engagement and the ways in which the proponent has addressed these issues.	Section 2.4

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
6.3 Stakeholders	**—**
The EIS must describe the proponent's involvement of stakeholders (e.g., local businesses, neighbouring residences, cottagers, outdoor recreational interests, and environmental non-government organizations). The EIS must describe the objectives of such engagement, the methods used, the issues raised and the ways in which the proponent has addressed these issues.	Section 2.5; Section 2.6; Section 2.8
6.4 Other Public Participation	**—**
The EIS must describe any other public engagement undertaken by the proponent prior to submitting the EIS. The Canadian Environmental Assessment Act does not exclude the public outside of Canada, thus the EIS should describe any public participation opportunities for non-Canadians. This description must identify the objectives of such engagement, outline the methods used, and summarize the issues raised by the public and the ways in which the proponent has addressed these issues.	Section 2.7
7. PROJECT JUSTIFICATION	**Section 3**
7.1 Purpose and Need for the Project	Section 3.1; Section 3.2
The proponent must clearly describe the need for the proposed DGR. This description should define the problem or opportunity the project is intending to solve or satisfy and should establish the fundamental rationale for the project.	Section 3.2
The proponent must describe the purpose of the project by defining what is to be achieved by carrying out the project.	Section 1.1; Section 3
The "need for" and "purpose of" the project should be established from the perspective of the project proponent and provide the context for the consideration of alternatives in sections 7.2 and 7.3 below.	Section 3.1; Section 3.2
7.2 Alternatives to the Project	Section 3.3
An analysis of alternatives to the project must describe functionally different ways to meet the project's need and achieve the project's purpose from the perspective of the proponent. The analysis of alternatives to a project must be established in relation to the project need and purpose. The analysis of "alternatives to" a project may serve to validate that the preferred alternative is a reasonable approach to meeting need and purpose and is consistent with the aims of the Canadian Environmental Assessment Act.	Section 3.3

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
This section of the EIS must: identify any alternatives to the DGR that are within the control and/or interests of the proponent; explain how the proponent developed the criteria to identify the major environmental, economic and technical costs and benefits of those alternatives; provide reasons for rejection of these alternatives; and identify the preferred alternative to the project based on the relative consideration of the environmental, economic and technical benefits and costs. This must be done to a level of detail which is sufficient to allow the joint review panel and the public to compare the project and its alternatives.	Section 3.3.5; Section 3.3.7
Alternatives to the project described in the EIS may include, but are not limited to:	—
▪ The *status quo* (i.e., the Western Waste Management Facility); and	Section 3.3.4
▪ Surface and near-surface storage.	Section 3.3.2
7.3 Alternative Means of Carrying out the Project	Section 3.4
The EIS must identify and describe the alternative means to carry out the project that are, from the perspective of the proponent, technically and economically feasible. The EIS must also describe the environmental effects of each alternative means. In describing the preferred means, the EIS should identify the relative consideration of environmental effects, and technical and economic feasibility. The criteria used to identify alternative means as unacceptable, and how these criteria were applied, must be described, as must the criteria used to examine the environmental effects of each remaining alternative means to identify a preferred alternative.	Section 3.4
To the extent that these alternative means are feasible for the proponent, this may include, but are not limited to, the following:	—
▪ Alternatives to "natural" containment (i.e., engineered barrier);	Section 3.4.10
▪ Alternative storage systems;	Section 3.4.10
▪ Timing options for various components and phases of the project;	Section 3.4.8
▪ Construction methods;	Section 3.4.7
▪ Layout and design of the DGR;	Section 3.4.4; Section 3.4.5; Section 3.4.6
▪ Siting of the DGR in a different location within the existing site;	Section 3.4.3
▪ Siting of the DGR in a location outside the existing site; and	Section 3.4.2

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
▪ Reduction at source.	Section 3.4.1
The alternative "reduction at source" represents the ways in which OPG could reduce the waste generated during the operation of the existing nuclear power generating stations but does not represent consideration of abandoning nuclear power. Consideration of provincial energy policy is not within the terms of reference of this joint review.	—
The Need for and Purpose of the project should include a description of how the site location was selected. If other potential sites were considered, they should be assessed under the context of alternative means.	Section 3.2; Section 3.4.2
8. DESCRIPTION OF THE PROJECT	**Section 4**
The project description must address all phases of the project, within the scope outlined in section 4, in sufficient detail to allow the joint review panel to assess potential adverse environmental effects and take into account public concerns about the project. The proponent must describe the project as it is planned to proceed through the site preparation and construction, operation (including any potential modifications or refurbishments that may be required during operations), decommissioning, and abandonment of the facility. The description must include a timeline for all phases of the project. Where specific codes of practice, guidelines and policies apply to items to be addressed, those documents must be cited and may be included as appendices to the EIS.	Section 4
The following information must be provided in summary form. Where applicable, reference may be made to more detailed information.	—
8.1 General Information and Design Description	**—**
Information to be provided in the EIS must include:	—
▪ The location of the project;	Section 4.3
▪ A description of the site of the activity to be licensed, including the location of any exclusion zone and any structures within that zone;	Section 4.4
▪ The DGR concept, its components and supporting infrastructure (including the basic configuration, layout, shape, size, and key design features);	Section 4.4
▪ Plans showing the location, perimeter, areas, structures and systems of the nuclear facility;	Section 4.4
▪ Plans showing the existing and planned structures, excavations and underground development;	Section 4.4

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
▪ The design of the waste containers/packages, their performance and longevity with respect to their containment function, including reference to international experience if available and applicable;	Section 3.10.4; Section 4.5; Section 4.8.2.1
▪ A description of the design of and the maintenance program for every eating area;	Section 4.4.1.1; Section 4.15.1.1
▪ A description of the proposed emergency power systems and their capacities;	Section 4.4.3.2
▪ The proposed ventilation and dust control methods and equipment for controlling air quality;	Section 4.4.3.1; Preliminary Safety Report
▪ The proposed level of effectiveness of, and inspection schedule for the ventilation and dust control systems;	Section 4.4.3.1, Preliminary Safety Report
▪ A description of the anticipated liquid and solid waste streams within the facility, including the ingress of water and any diversion or control of the flow of uncontaminated surface and groundwater;	Section 4.7.4.3; Section 4.4.1.5; Section 4.7.5.4; Section 4.8.5
▪ The type of waste streams to be emplaced in the DGR including the inventories and characteristics of nuclear substances and other hazardous materials to be stored at the facility;	Section 4.5
▪ The description and characteristics of the waste containment system; identifying what components, both natural and man-made, comprise the system; and how these components will function to contain and isolate the waste from humans and the environment in the long-term;	Section 4.5; Section 4.8.2
▪ The description of the waste characteristics including source, chemical hazard, radiological hazard, and the non-fissile nature of the material, including the half-life of each isotope, and how the properties, chemical and radiological hazards will change with time;	Section 4.5
▪ The transfer of waste packages, waste package handling, and final waste package emplacement processes;	Section 4.8.2; Section 4.8.3
▪ The sources, types, and quantities of radioactive, hazardous and non-hazardous waste predicted to be generated by the project;	Section 4.7.5; Section 4.8.5; Section 4.11.5
▪ The processes for the collection, handling, transport, storage and disposal of radioactive, hazardous and non-hazardous waste to be generated by the project;	Section 4.7.5; Section 4.8.5; Section 4.11.5
▪ The sources and characteristics of any fire hazards;	Section 4.13
▪ The sources and characteristics of any noise, odour, dust and other likely nuisance effects from the project;	Section 7.7; Section 7.8

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
▪ The sources and characteristics of any potential risks (including radiological risks) to workers, the public and the environment from the project;	Section 4.9; Section 4.13
▪ The predicted doses to workers involved with the associated operations and activities that are within the scope of this project;	Section 7.6
▪ The key operational procedures relevant to protection of workers, the public and the environment that are within the scope of this project;	Section 4.7.8.7; Section 4.8.7; Section 4.15; Section 4.16; Section 4.17
▪ The key components of the facility and its physical security systems (excluding prescribed information) that are relevant to management of malfunctions and accidents that may occur during the site preparation and construction activities, and during the subsequent operations;	Section 4.13; Section 8
▪ The predicted sources, quantities and points of release from the project of emissions and effluents containing nuclear substances and hazardous materials;	Section 4.7.6; Section 4.8.6; Section 7.2; Section 7.3; Section 7.6; Section 7.7; Section 7.8
▪ The proposed program for selecting, using and maintaining personal protective equipment;	Section 4.8.7.5; Section 4.14.1
▪ The proposed measures to control the spread of any radioactive contamination;	Section 4.8.7.1; Section 4.15.1.1; Section 4.16
▪ The proposed quality assurance program for the activity to be licensed;	Section 4.7.8.7
▪ The proposed worker health and safety policies, programs and procedures;	Section 4.7.8.7; Section 4.8.7; Section 4.15; Section 4.16; Section 4.17; Section 8.2.3; Section 8.3.3
▪ The proposed environmental protection policies and procedures, and	Section 4.7.8.7; Section 4.8.7.6; Section 4.8.7.7; Section 4.15
▪ The proposed effluent and environmental monitoring programs.	Section 4.15; Section 12
Because the joint review panel will be considering the proponent's application for a licence under the Nuclear Safety and Control Act to prepare the site and construct the DGR facility, there is a need for the proponent to provide additional and more detailed information as described in section 8.2.	—

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
8.2 Site Preparation and Construction	
The EIS will describe any relevant site clearing and preparation activities required for this project and will provide a description of the permanent or temporary structures that will be constructed, including construction practices, hours of operation and proposed construction schedules. This section should also include a description and schedule of activities relating to the construction of any additional emplacement rooms in the DGR after operation of the DGR has commenced.	Section 4.7
To facilitate consideration of an application to prepare the site and construct the facility, the proponent must provide the information required by the Nuclear Safety and Control Act and its regulations for a Class 1B nuclear facility. The information requirements are described in the General Nuclear Safety and Control Regulations (http://laws.justice.gc.ca/en/n-28.3/sor-2000-202/1_53798.html) and the Class I Nuclear Facilities Regulations (http://laws.justice.gc.ca/en/n-28.3/sor-2000-204/1_53_624.html) of the Nuclear Safety and Control Act (Appendix 2).	Preliminary Safety Report
The following information requirements are required for the EIS and do not replace the requirements referred to in the Nuclear Safety and Control Act and its regulations noted above.	—
For site preparation, the EIS must describe, but should not be limited to, the following:	—
▪ Drilling, stripping of vegetation, clearing and grubbing;	Section 4.7.1.1
▪ Blasting (handling procedures, frequency and size, pre-blast surveys, weather condition considerations);	Section 4.7.4
▪ Topsoil and overburden storage (location and dimensions);	Section 4.4.1.3; Section 4.7.1; Section 4.7.5.3
▪ Rock stockpile (location and dimensions);	Section 4.4.1.3; Section 4.7.5.3
▪ Site access roads;	Section 4.4.1.4; Section 4.7.3.3
▪ Sewage treatment and waste management systems;	Section 4.4.3.7: Section 4.8.5.1
▪ Storage areas for the management of site preparation and construction waste;	Section 4.7.5
▪ Dangerous goods storage areas;	Section 4.4.3.5; Section 4.7.4.1; Section 4.7.5.2; Preliminary Safety Report
▪ Dams, watercourse crossings and diversions, including wetland alteration;	Section 4.7.3.3; Section 4.7.1.3; Section 7.3; Section 7.5

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
▪ Surface facilities and utilities;	Section 4.4.1; Section 4.4.3; Section 4.7.3
▪ Groundwater seepage and surface runoff management;	Section 4.4.1.5; Section 4.7.1.3; Section 4.7.4.3; Section 4.7.5.4
▪ Erosion and sedimentation control measures; and	Section 4.7.1.3; Section 4.7.5.3; Section 7.5.2.1
▪ Risk management (e.g., contingency plans for uncontrolled release of substances, emergency response plans).	Section 4.9; Section 4.17; Section 8.2.3; Section 8.3.3
For construction of the facility, the EIS must provide, but should not be limited to, the following information:	—
▪ The proposed construction program, including its schedule and capital costs;	Section 1.2.4; Section 1.2.5; Section 4.2; Section 4.7; Section 4.7.2.3
▪ A description of the components, systems and equipment proposed to be installed, including their design operating conditions;	Section 4.4; Section 4.7
▪ The proposed quality assurance program for the design of the facility;	Section 4.7.8.7; Section 4.14.1
▪ The results of a process-hazard analysis and a description of how those results have been taken into account;	Section 4.13; Section 8; Preliminary Safety Report
▪ A description of the proposed design, construction and operation of any waste management system, including the measures to monitor its construction and operation, the construction schedule, the contingency plans for construction and the measures to control the movement of water in existing waterways;	Section 4
▪ The anticipated quantities and quality of waste rock that will be removed, their proposed storage location, and the proposed method for managing the waste rock in the near and long term;	Section 4.4.1.3; Section 4.7.5.3; Section 4.11.3
▪ The proposed excavation methods and programs; and	Section 4.7.4
▪ The preliminary commissioning plan for the components, systems and equipment to be installed at the facility.	Section 4.7.7; Section 4.7.8.8
The proponent is also required to provide, or reference, the policies, programs and procedures that would be followed for site preparation and construction of the facility in order to provide some assurance that the facility could be constructed safely and in accordance with the Nuclear Safety and Control Act and its regulations.	Section 4.7.8; Section 4.14.1

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
8.3 Operation	—
For the operations of the facility, the EIS must describe, but not be limited to, the following information:	—
▪ For each project phase, the proponent must describe the number of workers required by occupation and/or skill;	Section 4.7.2; Section 4.8.1; Section 4.11
▪ A description of the material handling, treatment, and disposal plans.	Section 4.8.4; Section 4.8.5
▪ A description of the provisions for onsite transfer of waste and other materials, including proposed modes and routes of transfer, the volumes and quantities to be transferred and how they will be placed into storage in the DGR;	Section 4.8.2; Section 4.8.3
▪ Any construction campaigns to add additional emplacement rooms to the DGR and how this will affect normal operations of the DGR; and	Section 4.10.2
▪ Information on how emplacement rooms will be sealed off, once full, should be included.	Section 4.4.2; Section 4.8.3.1
The proponent is also required to provide, or reference, the policies, programs and procedures that would be followed for the operation of the facility in order to provide some assurance that the facility could be operated safely and in accordance with the Nuclear Safety and Control Act and its regulations following construction.	Section 4.8.7; Section 4.15; Section 4.16; Section 4.17
8.4 Modifications	—
The proponent must describe the management approach to, and conceptual plans for, potential modifications, including expansion or discontinuation, to the proposed project. The proponent must specify the conditions or potential risks which would necessitate modifications to the project. The proposed process to follow when proposing modifications to the project should be described and include a description of plans for informing the public.	Section 4.10
8.5 Decommissioning	Section 4.11
A decommissioning plan for the facility must be included in the EIS. The proponent should refer to CNSC Guide G-219, Decommissioning Planning for Licensed Activities [Reference 4] for more details.	Section 4.11 Preliminary Decommissioning Plan will be submitted to CNSC
The preliminary plan will document the preferred decommissioning strategy, including a justification of why this is the preferred strategy. The preliminary decommissioning plan will also include:	Section 4.11.2

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
▪ End-state objectives;	Section 4.11.1
▪ The major decontamination, disassembly and remediation of surface and underground facilities;	Section 4.11.3
▪ The closure activities associated with sealing the shafts to the underground facilities;	Section 4.11.4
▪ The nature and approximate quantities and types of waste generated during decommissioning; and	Section 4.11.5
▪ An overview of the principal hazards and protection strategies envisioned for decommissioning.	Section 4.11.6
8.6 Abandonment	—
An abandonment plan is required to determine the safety of the facility and its potential impact on human health and the environment. Section 13 of these guidelines provides more details regarding the long-term safety of the DGR. Refer also to CNSC Regulatory Guide G-320 Assessing the Long-Term Safety of Radioactive Waste Management [Reference 5] and CNSC Regulatory Policy P-290 "Managing Radioactive Waste" for the standards and practices for the management and control of radioactive waste.	Section 4.12
8.7 Malfunctions, Accidents and Malevolent Acts	—
Information on malfunctions and accidents, including intentional malevolent acts, are necessary to permit consideration of relevant environmental effects in the environmental assessment. A summary of information on malfunctions and accidents should be presented in this section of the EIS. A separate section of the EIS should provide more details regarding the information requirements relating to malfunctions and accidents as per section 12.0 of these guidelines.	Section 4.13; Section 8

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
8.8 Environmental Protection Policies and Procedures	—
Paragraph 3(g) of the Class I Nuclear Facilities Regulations stipulates that application for a Licence to Prepare Site and Construct shall contain the proposed environmental protection policies and procedures. CNSC Regulatory Standard S-296, Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills (March 2006) [Reference 6] and Regulatory Guide G-296, Developing Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills (March 2006) [Reference 7] provide more information regarding these requirements. The fundamental direction of these regulatory documents is towards the establishment, implementation and maintenance of an Environmental Management System (EMS) by the proponent that meets the requirements of IS 14001-2004 "Environmental Management Systems – Requirements with Guidance for Use" in the context of Canadian environmental protection policy and regulation and the specific environmental protection requirements of the Nuclear Safety and Control Act and its Regulations.	Section 4.7.8.7; Section 4.8.7.6; Section 4.14; Section 4.15
The proponent must therefore submit its proposed environmental protection policies and procedures (i.e., EMS documentation) and demonstrate that the EMS will carry forward the results of the environmental assessment so that it covers the Site Preparation, Construction and Operational phases of the project. The EIS should describe how the mitigation measures described through sections 11 through 14 and the Follow-up Program, as outlined in section 16 of these guidelines, would be integrated into the EMS.	Section 4.15; Section 7 (mitigation measures discussed for each environmental component); Section 12 (follow-up)
9. ENVIRONMENTAL ASSESSMENT BOUNDARIES	**Section 5**
Scoping establishes the boundaries of the environmental assessment and focuses the assessment on relevant issues and concerns. By defining the spatial and temporal boundaries, a frame of reference for identifying and assessing the environmental effects associated with the DGR will be established. Different boundaries may be appropriate for each Valued Ecosystem Component (VEC).	—
A description of the boundaries of the proposed project in a regional context showing existing and planned future land use, current infrastructure and proposed improvements to these infrastructure, including transportation (all modes), power distribution corridors and lines, urban areas and water supplies (individual and community), must be provided. A description of any traditional land use, any established or asserted Aboriginal rights, Aboriginal title or treaty rights from Aboriginal people within the wider regional context should be provided. Sensitive areas including wetlands, critical habitats as defined under the Species at Risk Act and archaeological sites found within the regional context must also be described.	Boundary definitions are located in Section 5.1; for more details on features located in the study areas for the DGR Project, please see Section 6

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
9.1 Spatial Boundaries and Scale	—
In determining the spatial boundaries to be used in assessing the potential adverse environmental effects, the proponent must consider, but not be limited to, the following criteria:	—
a The physical extent of the proposed project, including any offsite facilities or activities;	Section 5.1
b The extent of aquatic and terrestrial ecosystems potentially affected by the project;	Section 6.3 (Hydrology and Water Quality); Section 6.4 (Terrestrial Environment); Section 6.5 (Aquatic Environment)
c The extent of potential effects arising from noise, light and atmospheric emissions;	Section 6.7 (Climate, Weather Conditions and Air Quality; Section 6.8 (Noise)
d The extent to which traditional land use, asserted or established Aboriginal rights, Aboriginal title or treaty rights could potentially be affected by the project;	Section 6.9 (Aboriginal Interests)
e Land use for residential, commercial, industrial, recreational, cultural and aesthetic purposes by communities whose areas include the physical extent of the project; and	Section 6.9 (Aboriginal Interests); Section 6.10 (Socio-economic Environment)
f The size, nature and location of past, present and reasonably foreseeable projects and activities which could interact with items (b), (c), (d) and (e).	Section 10
These boundaries also indicate the range of appropriate scales at which particular baseline descriptions and the assessment of environmental effects must be presented. The proponent is not required to provide a comprehensive baseline description of the environment at each scale, but must provide sufficient detail to address the relevant environmental effects of the project and the alternative means. The EIS must contain a justification and rationale for all boundaries and scales chosen.	Section 6
The geographic study areas for the EIS must encompass the areas of the environment that can reasonably be expected to be affected by the project, or which may be relevant to the assessment of cumulative environmental effects. Study areas must encompass all relevant components of the environment, including the people, non-human biota, land, surface water, groundwater, air and other aspects of the natural and human environment, notably, traditional land use. Study boundaries will be defined taking into account traditional knowledge, ecological, technical, social and political considerations.	Section 6; Section 10

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
The following geographic study areas should serve as the basis for developing project-specific and effect-specific study areas:	—
▪ *Site Study Area:* the Site Study Area includes the facilities, buildings and infrastructure at the Bruce Nuclear Site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the DGR is proposed.	Section 5.1.3
▪ *Local Study Area:* the Local Study Area is defined as that area existing outside the Site Study Area boundary, where there is a reasonable potential for direct effects on the environment from any phase of the project, either through normal activities, or from possible accidents or malfunctions. The Local Study Area should include all of the Bruce Nuclear Site and the lands within the Municipality of Kincardine closest to it, as well as the area of Lake Huron adjacent to the facility. The boundaries must change if appropriate following an assessment of the spatial extent of potential effects.	Section 5.1.2
▪ *Regional Study Area:* the Regional Study Area is defined as the area within which there is the potential for cumulative biophysical and socio-economic effects. This area includes lands, communities and portions of Lake Huron around the Bruce Nuclear Site that may be relevant to the assessment of any wider-spread direct and indirect effects of the project.	Section 5.1.1
Within the aforementioned study areas, the boundary of concern will extend to a depth that will include the full extent of the surface water and groundwater.	Section 6.2 (groundwater): Section 6.3 (surface water)
9.2 Temporal Boundaries	—
In characterizing the environmental effects of the project, the proponent must consider the current baseline environment and environmental trends within the study areas. The description of the existing baseline and the environmental trends should include a consideration of past projects and activities carried out by the proponent and/or others within the regional study area.	Section 6
In describing and predicting the environmental effects of the project, the proponent must cover the period from the start of any site preparation activity associated with the project through construction, operation, including maintenance and repairs, and any modifications through the proposed life of the project, leading to the eventual decommissioning, abandonment, and the long-term performance of the DGR.	Section 5.2; Section 7; Section 9
In assessing cumulative environmental effects within the study area, the proponent must consider the effects of the project in combination with other past, present and future projects that are either "certain" or "reasonably foreseeable" as defined in CEAA's Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act [Reference 8].	Section 10

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
As is the case for the determination of spatial boundaries, the temporal boundaries must indicate the range of appropriate scales at which particular baseline descriptions and the assessment of environmental effects are presented.	Section 5.2
At a minimum, the assessment is expected to include the period of time during which the maximum impact is predicted to occur. The approach taken to determine the temporal boundary of assessment should take into account the following elements:	—
▪ Hazardous lifetime of the contaminants associated with waste or with releases to the environment during both normal operation and postulated accidents and malfunctions;	Section 4.5; Section 5.2; Section 7; Section 8; Section 9
▪ Duration of the operational period (before the facility reaches its end state);	Section 5.2; Section 7
▪ Design life of engineered barriers;	Section 5.2; Section 7; Section 9
▪ Duration of both active and passive institutional controls; and	Section 4.12; Section 5.2; Section 7; Section 8; Section 9
▪ Frequency and duration of natural events and human-induced environmental changes (e.g., seismic occurrence, flood, drought, glaciation, climate change, etc).	Section 5.2; Section 6.2.10; Section 7; Section 8; Section 9
9.3 Valued Ecosystem Components	—
The EIS must describe the general criteria used to identify VECs that may be affected by the project. The EIS must identify the methods used to predict and assess the effects of the project on VECs, and will explain the criteria used to assign significance ratings to any predicted adverse effects. The spatial and temporal boundaries used in the assessment may vary as appropriate, depending on the VEC.	Section 5.3; Section 4 of the TSDs
Table 1 presents a preliminary list of VECs for each environmental component of the assessment. This list of VECs should be modified as appropriate by the proponent in the EIS, following consultations with the public, Aboriginal people, federal and provincial government departments and relevant stakeholders, including those comments received by the Canadian Environmental Assessment Agency and the Canadian Nuclear Safety Commission during the April 4 to June 18, 2008 comment period.	—
Table 1: Preliminary List of Valued Ecosystem Components	Section 5.3

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT			EIS SECTION
Environmental Component	**VEC**	**VEC Category**	—
Physical Environment	Air Quality	Physical	Section 5.3; Section 6.7.2; Section 6.8.2; Section 6.3.2; Section 6.2.2; Groundwater Quantity and Flow renamed to Groundwater and Solute Transport
	Noise Levels	Physical	
	Surface Water Quality	Physical	
	Surface Water Quantity and Flow	Physical	
	Soil Quality	Physical	
	Groundwater Quality	Physical	
	Groundwater Quantity and Flow	Physical	
Plants	Eastern White Cedar	Biological	Section 5.3; Section 6.4.2; Section 6.5.2
	Heal-all	Biological	
	Common Cattail	Biological	
	Variable Leaf Pondweed	Biological	
Mamals	Muskrat	Biological	Section 5.3; Section 6.4.2 (The meadow vole was identified as a VEC in the EIS Guidelines. However, small mammal trapping surveys conducted in 2009 did not confirm the presence of meadow voles in the Project Area. Therefore, northern short-tailed shrew has been adopted as a small mammal VEC for this assessment.)
	White-tailed Deer	Biological	
	Meadow Vole	Biological	
Amphibians and Reptiles	Midland Painted Turtle	Biological	Section 5.3; Section 6.4.2
	Northern Leopard Frog	Biological	
Birds	Mallard	Biological	Section 5.3; Section 6.4.2

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT			EIS SECTION
	Red-eyed Vireo	Biological	
	Wild Turkey	Biological	
	Yellow Warbler	Biological	
	Bald Eagle	Biological	
Benthic Fish	Redbelly Dace	Biological	Section 5.3; Section 6.5.2
	Creek Chub	Biological	
	Lake Whitefish	Biological	
Invertebrates	Benthic Invertebrates	Biological	Section 5.3; Section 6.5.2
	Burrowing Crayfish	Biological	
Pelagic Fish	Smallmouth Bass	Biological	Section 5.3; Section 6.5.2
	Brook Trout	Biological	
	Benthic Invertebrates	Biological	
Human and Social	Human Health	Human/Socio	Section 5.3; Section 6.10.2; Section 6.11.2
	Population	Human/Socio	
	Employment	Human/Socio	
	Business Activity	Human/Socio	
	Tourism	Human/Socio	
	Inverhuron Provincial Park	Human/Socio	
	Housing and Property Values	Human/Socio	
	Municipal Finance, Infrastructure, Services and Facilities/Resources	Human/Socio	
Aboriginal Factors	First Nation Communities	Human/Socio	Section 5.3; Section 6.9.2

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT			EIS SECTION
	Native Heritage and Cultural Resources	Human/Socio	
	Traditional Use of Lands and Resources	Human/Socio	
Ecological Features	Lake Huron	Physical	Section 5.3
	Stream C	Physical	
	Railway Ditch	Physical	
	Wetland	Physical	
10. EXISTING ENVIRONMENT			**Section 6**
The EIS must provide a baseline description of the environment, including the components of the existing environment and environmental processes, their interrelations and interactions as well as the variability in these components, processes and interactions over time scales appropriate to this EIS. The proponent's description of the existing environment must be in sufficient detail to permit the identification, assessment and determination of the significance of potentially adverse environmental effects that may be caused by the project, to adequately identify and characterize the beneficial effects of the project, and provide the data necessary to enable effective testing of predictions during the follow-up program and support the conclusions on the long-term safety assessment (Guidelines Section 13).			Section 6
The baseline description should include results from studies done prior to any physical disruption of the environment due to initial site clearing activities planned as part of the site preparation phase. The baseline description must include characterization of environmental conditions resulting from historical and present activities in the local and regional study areas (see Guidelines Section 14 - Cumulative Effects). The EIS must compare baseline data with applicable federal, provincial, municipal or other legislative requirements, standards, guidelines or objectives.			Section 6

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
This description must include, but not necessarily be limited to those VECs, processes, and interactions that either were identified to be of concern during any workshops or meetings held by the proponent, or that the proponent considers likely to be affected by the project. In doing so, the proponent must indicate to whom these concerns are important and the reasons why, including social, economic, recreational, and aesthetic considerations. The proponent must describe the nature and sensitivity of the area within and surrounding the project and any planned or existing land and water use in the area. The proponent must also indicate the specific geographical areas or ecosystems that are of particular concern, and their relation to the broader regional environment and economy. This includes, but is not limited to, a detailed description of those areas of Lake Huron potentially affected by the project, the Baie du Doré Provincially Significant Wetland, Huron Fringe Woodland, Douglas Point Swamp Environmentally Significant Area, Stream C, the Scott Point Provincially Significant Life Science Area of Natural and Scientific Interest, and Inverhuron Provincial Park. Relevant information about the VECs is to be presented graphically to document physical and biological (e.g., home range) characteristics.	Section 6 (more specifically 6.4 – Terrestrial Environment and 6.5 – Aquatic Environment)
The subsurface environment will play a dominant role in containing and isolating the waste from humans and the environment in the long term. It is therefore expected that the information on subsurface site characterization will be sufficient to allow the development of site specific assessment models that will predict with reasonable confidence the long-term performance of the proposed DGR.	Section 6.2
In describing the physical and biological environment, the proponent must take an ecosystem approach that considers both scientific and traditional knowledge and perspectives regarding ecosystem health and integrity. The proponent must identify and justify the indicators and measures of ecosystem health and social health. These must be related to project monitoring and follow-up measures.	Section 6 (indicators are integrated in the description of the VECs for each environmental component); Section 7 (criteria for measurable changes for each environmental component presented in the screening to focus the assessment)

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
For the biological environment, baseline data in the form of inventories alone is not sufficient for the joint review panel to assess effects. The proponent must consider the resilience of species, communities, and their habitats. The proponent must summarize all pertinent historical information on the size and geographic extent of animal populations as well as density. Habitat at regional and local scales should be defined in ecological mapping of aquatic and terrestrial vegetation types and species (e.g., ecological land classification mapping). Habitat use should be characterized by type of use (e.g., spawning, breeding, migration, feeding, nursery, rearing, wintering), frequency and duration. Emphasis must be on those species, communities and processes identified as VECs. However, the interrelations of these components and their relation to the entire ecosystem and communities of which they are a part must be indicated. The proponent must address issues such as habitat, nutrient and chemical cycles, food chains, productivity, as these may be appropriate to understanding the effect of the project on ecosystem health and integrity. Range and probability of natural variation over time must also be considered.	Section 6.4; Section 6.5
In describing the socio-economic environment, the proponent must provide information on the functioning and health of the socio-economic environment, encompassing a broad range of matters that affect the people and communities in the study areas in a way that recognizes interrelationships, system functions and vulnerabilities. A description of the rural and urban settings likely to be affected by the project should be provided.	Section 6.10; Section 6.11
Information on existing and projected population densities and distributions in the region, including resident populations and transient populations, must be provided by project phase, and for the entire life of the project. Information such as present and future use of land and resources, including transportation infrastructure, public health infrastructure and services (municipal water treatment for domestic use or human consumption, wastewater treatment, landfill), housing and housing values, commercial fisheries in the area, recreation and tourism should also be provided as this information would be required to assess potential adverse effects of the project on human health and socioeconomic conditions in the area, and to assess the effects of the environment on the project. The proponent must also describe any agreements with the surrounding municipalities or other jurisdictions regarding emergency plans or protective actions.	Section 4.17; Section 6.10; Section 6.11; Section 7.10; Section 7.11
Traditional activities carried out by Aboriginal people must be described by the proponent. The proponent should provide information that would include a description of traditional dietary habits and dependence on country foods and harvesting for other purposes, including harvesting of plants for medicinal purposes. The analysis should focus on the identification of potential adverse effects of the project on the ability of future generations of Aboriginal people (up to seven generations) to pursue traditional activities or lifestyle.	Section 6.9; Section 7.9

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
If the background data have been extrapolated or otherwise manipulated to depict environmental conditions in the project area, modeling methods and equations must be described and must include calculations of margins of error and other relevant statistical information, such as confidence intervals and possible sources of error.	Section 6, where necessary
10.1 Biophysical Environment	—
10.1.1 Geology and Geomorphology	—
The EIS must describe the bedrock and quaternary/surficial geology, geomorphology, topography, petrology, geochemistry, hydrogeology and geomechanics for the region and the area that will be disturbed by the project. The EIS must describe the geology and structural geology, such as fractures and faults, at the site and within the local and regional study areas from the bedrock surface through and into the top of the basement rock, the Precambrian formation. Geotechnical properties of the overburden must also be provided, including shear strength and liquefaction potential, to allow the assessment of slope stability and bearing capacity of foundations under both static and dynamic conditions.	Section 6.2
The EIS must describe and assess any geotechnical and geophysical hazards within the study areas, including consideration of subsidence, uplift, seismicity and faulting, as well as consideration of the possibility of movements of the ground surface (including co-seismic rupture) and earthquake ground motions. Where appropriate, the narrative descriptions should be supplemented by illustrations such as maps, figures, cross sections and borehole logs.	Section 6.2
10.1.2 Surface Water	—
The EIS must describe surface water quality, hydrology and sediment quality at the site, local and regional study areas. The description must include delineation of drainage basins at the appropriate scales and include a description of hydrological data such as water levels and flow rates collected over the years. The proponent must describe hydrological regimes, including seasonal fluctuations and year-to-year variability of all surface waters and assess normal flow, flooding, and drought properties of water bodies as well as the interactions between surface water and groundwater flow systems.	Section 6.3

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
The EIS must identify watersheds within the project area and identify recharge and discharge areas, streams, ponds and lakes. The proponent must describe the flow regimes, seasonal flow patterns, quantity and quality of all surface waters. The description must include a discussion of existing surface runoff water management regimes within the project area. The proponent must describe all surface water sources used for drinking water in the area, including source water intakes for drinking water treatment facilities. The proponent must provide information on whether any bodies of water within the study areas are used for recreational purposes.	Section 6.3; Section 6.10
The EIS must provide a description of sampling protocols and analytical methods, and provide maps and figures where appropriate.	Section 6.3
10.1.3 Groundwater	**—**
The EIS must describe the hydrogeology at the site, local and regional study areas, from the ground surface through and into the top of the basement rock, the Precambrian formation. This should include a discussion of both groundwater quality and quantity.	Section 6.2
The EIS must characterize the hydraulic conductivities, effective porosities, longitudinal and transverse dispersivities, diffusivities, pore-space tortuosities and mass transfer coefficients/retardation factors, for the various geological units. The proponent should also describe the characteristics of groundwater interactions under different climatic and seasonal conditions.	Section 6.2
The EIS must provide a conceptual hydrogeologic model that demonstrates the groundwater flow systems and patterns. The hydrogeologic model should describe the changes to groundwater characteristics with depth and identify groundwater discharge and recharge areas. Further information describing the importance of modeling and characterization to the long-term safety of the DGR is provided in section 13 of these guidelines.	Section 6.2
The EIS must identify any hydrogeologic features such as aquitards. Describe any groundwater use in the area, including both current and potential future uses.	Section 6.2
The proponent must describe all groundwater sources used for drinking water in the area, including sources that are consumed directly (i.e. wells).	Section 6.2

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
10.1.4 Terrestrial Environment	—
The EIS must describe the terrestrial species at the site and within the local and regional study areas, including flora, fauna and their habitat. The EIS must describe any wildlife corridors and physical barriers to movement that exist within the project area. Any biological species of natural conservation status (e.g., rare, vulnerable, endangered, threatened and uncommon) at a federal, provincial, regional or local level and their critical habitats must be identified.	Section 6.4
All protected and conservation areas established by federal, provincial, and municipal jurisdictions (e.g., wilderness areas, parks, sites of historical or ecological significance, and nature reserves, federal migratory bird sanctuaries and wildlife management areas, municipal protected water supply areas) must be identified.	Section 6.4
Sites within the local or regional study area subject to contamination from previous nuclear or non-nuclear industrial activities may require baseline characterization of radionuclide and hazardous substance levels within soil, vegetation and non-human biota.	Section 6.2; Section 6.6
Field surveys must be described in terms of representativeness of the target populations, the design for allocation of samples in space and time, measurement methods and results.	Section 6.1; Section 6.4
10.1.5 Aquatic Environment	—
The EIS must describe the aquatic and wetland species at the site and within the local and regional study areas, including a description of the flora, fauna and their habitat. The proponent should seek from relevant authorities, such as the Department of Fisheries and Oceans and the Ontario Ministry of Natural Resources, any available information on aquatic and wetland species and habitat for the local and regional study areas.	Section 6.4.3; Section 6.5
The EIS must provide detailed habitat mapping in order to understand habitat usage by fish within the study area. This information must include depth profiles, substrate mapping, water temperature profiles, and a description of potential and known habitat usage (i.e., nursery, rearing, feeding and migratory) by fish that occur in the study areas.	Appendix D of the Aquatic Environment TSD
The EIS must identify any biological species of natural conservation status (e.g., rare, vulnerable, endangered, threatened, and uncommon) at a federal, provincial, regional or local level and their critical habitats.	Section 6.4; Section 6.5

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
10.1.6 Ambient Radioactivity	**—**
The EIS must describe the ambient radiological conditions at the site and within the local and regional study areas. The EIS must provide information on the existing conditions in this regard, including an inventory of sources, their activity levels, and their origin (natural or anthropogenic), for all environmental media including air, soil, food, water, aquatic sediments, plant and animal tissue in the appropriate subsections of the EIS.	Section 6.6
Humans and non-human biota exposed to ambient radioactivity must be assessed for all relevant routes of exposure (both internal and external exposure scenarios). Information on radiation levels to which workers and members of the public are exposed to must be provided. This must also include consideration of consumers of country food whose exposure pathways may differ due to cultural norms, including any dietary characteristics of Aboriginal peoples.	Section 6.6; Section 7.6
A description of the current radiological monitoring and management programs must be provided.	Section 4.15; Section 4.16; Section 6.6
10.1.7 Climate, Weather Conditions and Air Quality	**Section 6.7**
The EIS must describe the climatic conditions at the site, local and regional study areas. The EIS must also provide a description of seasonal variations in weather conditions within the above-noted study areas, to allow the assessment of effects on the project. Meteorological information provided should include air temperature, relative humidity, precipitation, wind speed and direction, atmospheric pressure, solar radiation, and describe the occurrence of weather phenomena including events such as tornadoes, lightning, temperature inversions and fog. Special consideration must be given in the analysis of extreme and rare meteorological phenomena. Uncertainties should be described and taken into account when discussing the reliability of the information presented.	Section 6.7.3; Section 7.13
The influence of regional topography or other features that could affect weather conditions in the study areas must be described.	Section 6.7.3.1; Appendix C of the Atmospheric Environment TSD
A description of the ambient air quality in the study areas must be provided, with emphasis on those parameters for which there will be radiological and non-radiological emissions resulting from the project.	Section 6.7.5

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
10.1.8 Noise	—
The EIS must describe current ambient noise levels at the site and in the local study areas, and include information on its source(s), geographic extent and temporal variations. The description must also provide ambient noise levels for other areas which could be affected by the project, such as increased traffic along transportation corridors to and from the site during construction. The EIS must describe the anticipated noise levels during all phases of the project. The EIS must provide information on all potential receptors within the local and site study areas, especially residences and sensitive sites such as hospitals, schools, daycares, seniors' residences and places of worship. Baseline sound measurements at representative receptors should be taken and information on both daytime and night time noise levels be provided.	Section 6.8
10.2 Socio-economic Conditions	—
In describing the socio-economic environment, the proponent must provide information on the functioning and health of the socio-economic environment, encompassing a broad range of matters that affect the people and communities, including Aboriginal communities, in the study area.	Section 6.10
10.2.1 Economy	—
The EIS must describe the general socio-economic conditions at the local and regional study areas. The proponent must describe population and community distribution and density in the regional study area. The description must include the proximity of the project to affected communities, fluctuations in population and population attributes (e.g., age groups, employment).	Section 6.10.3
A description of the local and regional economies must also be provided, including workforce and employment. Information must be provided on the available labour supply and rates of employment in the surrounding communities and region.	Section 6.10.3.2; Section 6.10.4.1
10.2.2 Land Use and Value	—
This EIS must describe land use in the local and regional study areas. The proponent must identify the past, current and planned land use(s) of the study areas. This must include a description of the current and planned operations on the Bruce Nuclear Site and a discussion of existing land-based infrastructure that is likely to be affected by the project, such as sewer and water treatment and distribution systems, wells and waste management areas.	Section 6.10.5.2; Section 6.10.5.3
A description of any commercial fisheries that could be affected by the project must be provided.	Section 6.10.4.6

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
Estimates of the current and projected value of the recreational and tourist industry (e.g., hunting, fishing, hiking, parks, kayaking, and cottages along the shores of Lake Huron) for the study areas must be provided.	Section 6.10.4.3
A description of current or of proposed future local, regional or provincial land use or urban development policies, programs and plans must also be provided.	Section 6.10.5.3
10.2.3 Aboriginal Land, Aquatic Areas and Resource Use	**—**
In keeping with the Guiding Principles in Section 2.3 of these Guidelines, the EIS must describe land use at the site and within the local and regional study areas. The proponent should identify the lands, waters and resources of specific social, economic, archaeological, cultural or spiritual value to the Chippewas of Saugeen First Nation, the Chippewas of Nawash Unceded First Nations and any other Aboriginal people, including Métis, that assert Aboriginal rights or title or treaty rights or in relation to which Aboriginal rights or title or treaty rights have been established and that may be affected by the project. The EIS must identify traditional activities, including activities for food, social, ceremonial and other cultural purposes, in relation to such lands, waters and resources with a focus on the current use of lands, waters and resources for traditional purposes. Traditional land use may include areas where traditional activities such as camping, travel on traditional routes, gathering of country foods (hunting, fishing, trapping, planting and harvesting) activities were carried out. Spiritual sites must also be considered as a traditional use activity of significance to Aboriginal people.	Section 6.9
10.2.4 Land Based Transportation	**—**
This section of the EIS must describe the existing conditions of the proposed modes and routes of transportation (e.g., provincial highways, arterial highways, on-site access roads) that will be used throughout the development. The EIS must provide information on the existing types and volumes of traffic and a description of the areas through which trucks will travel, in particular residential or school areas.	Section 6.10.5.4
10.2.5 Navigable Waters	**—**
This EIS must identify any navigational use or issues along Lake Huron, or any other waterbodies that may be affected by the project. Information on location (latitude and longitude), width, and depth must be provided, where appropriate.	Section 6.3

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
10.2.6 Human Health	**—**
The EIS must describe the current health profiles of the communities likely to be affected by the project. The proponent should examine the aspects of human health that are defined by the World Health Organization, and include consideration of physical health and well-being, and associated emotional, social, cultural, and economic aspects.	Section 6.11
The EIS must provide information on population health of the communities in the regional study area. A description of community and public health services available to the residents of communities and to Aboriginal people in the regional study area must also be included.	Section 6.9.5; Section 6.10; Section 6.11
In keeping with the Guiding Principles in section 2.3 of these guidelines, a discussion on Aboriginal people's health-related traditional activities, including the accessibility to spiritual sites within the regional study area, should be included. Health-related traditional activities could include gathering of country foods for consumption (hunting, fishing, trapping, planting and harvesting of plants for medicinal purposes), and activities of spiritual significance. Information on current consumption of country foods and its quality by food type, amounts consumed, parts consumed (whole body as opposed to a specific organ) by Aboriginal people must be provided where available.	Section 6.6; Section 6.11; Section 9.4.5; Appendix C; Section C.2.3.7
10.2.7 Physical and Cultural Heritage Resources	**—**
The EIS must identify any terrestrial and aquatic areas containing features of historical, archaeological, paleontological, architectural or cultural importance. A description of the nature of the features located in those areas must be provided. Particular attention must be given to Aboriginal cultural, archaeological and historical resources since there is documented evidence of the presence of such resources in the study area.	Section 6.9; Section 6.10.6.2
11. EFFECTS PREDICTION, MITIGATION MEASURES AND SIGNIFICANCE OF RESIDUAL EFFECTS	**Section 7**
11.1 Effects Prediction	**—**
This section must contain a description of any changes in the environment caused by the project, including the effects of these environmental changes on health and socio-economic conditions, physical and cultural heritage, current use of lands and resources for traditional purposes by Aboriginal persons, and any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. Specific attention must be given to interactions between the project and the identified VECs. This section must also include changes to the project caused by the environment. Each environmental change must be described in terms of whether it is direct or indirect and positive or adverse.	Section 7

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
The EIS must describe comprehensive analyses of both the short and long term effects of the project on the environment. The proponent must indicate the degree of uncertainty in predicting the environmental effects identified. When numerical models are used (e.g., a hydrogeological model) scientific defensibility must be demonstrated by performing model verification (e.g., peer review of model theory), calibration (e.g., adjusting key parameters to site-specific data), validation (e.g., comparison of predicted to observed), sensitivity and uncertainty analysis.	Section 7; Section 9.3; Preliminary Safety Report; Sections 5 and 8 of the Atmospheric Environment TSD
The proponent is expected to employ standard ecological risk assessment frameworks that categorize the levels of detail and quality of the data required for the assessment. These tiers are as follows:	Section 7.6; Section 8
▪ Tier 1: Qualitative (Expert opinion, literature review, and existing site information);	Section 7.4; Section 7.5; Section 7.6
▪ Tier 2: Semi-quantitative (Measured site-specific data and existing site information); and	Section 7.4; Section 7.5; Section 7.6
▪ Tier 3: Quantitative (Recent field surveys and detailed quantitative methods).	Section 7.6
Thus, if the Tier 2 assessment still indicates a potential for effects for valued receptors then a Tier 3 assessment would need to be conducted to reduce the level of uncertainty. If the risk characterization component is uncertain this may necessitate the probabilistic modeling of the population level consequences of the proposed project.	Section 7.4; Section 7.5; Section 7.6
An accepted approach to population-level ecological risk assessment and it use in environmental decision-making has been developed through recent scientific work. This approach includes a determination of when a population-level risk assessment is warranted (Tier 1 and Tier 2 assessments), the consideration of exit criteria, and a determination of the value of the assessment [Reference 9].	Section 7.6; Section 8
The consideration of views from the public and Aboriginal groups, including any perceived changes attributed to the project, should be recognized and addressed in the assessment method.	Section 2.9; Section 7.16
11.2 Mitigation Measures	**—**
Mitigation is the elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means. The proponent must describe general and specific measures intended to mitigate the potentially adverse environmental effects of the project. The proponent must indicate which measures respond directly to statutory or regulatory requirements.	Section 7 (for each environmental component); Table 13.1-1

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
All proposed mitigation must be described by phase, timing and duration. Information must be provided on methods, equipment, procedures and policies associated with the proposed mitigation. The proponent must discuss and evaluate the effectiveness of the proposed measures and assess the risk of mitigation failure and the potential severity of the consequences of such failures. Information must be provided on similar mitigation methods used with similar Projects and the degree of success achieved.	Section 7 (for each environmental component); Table 13.1-1
The proponent must indicate what other mitigation measures were considered (including the various components of mitigation) and explain why they were rejected. Trade-offs between cost savings and effectiveness of the various forms of mitigation must be justified. The proponent must identify who is responsible for the implementation of these measures and the system of accountability.	Section 1.3; Section 4.14; Section 7 (for each environmental component); Table 13.1-1
For species at risk defined by the federal Species at Risk Act, pursuant to subsection 79(1) of that Act, the Responsible Authority under the Canadian Environmental Assessment Act must notify the appropriate federal Minister of any listed wildlife species, its critical habitat or the residences of individuals of that species that may be adversely impacted by the project. Pursuant to subsection 79(2) of the Species at Risk Act, if the project is carried out, the Responsible Authority must also ensure that measures are taken to avoid or lessen those effects and to monitor them; these measures must be taken in a way that is consistent with any applicable recovery strategy and action plans. Therefore, the proponent must include information in the EIS that will allow the Responsible Authority to meet this requirement.	Section 6.4; Section 6.5; Section 7.4; Section 7.5
Compliance monitoring verifies whether required mitigation measures were implemented. Compliance monitoring on its own does not satisfy the requirements for a follow-up program described in section 16, but serves to track conditions or issues during the project lifespan or at certain times. For each environmental component potentially affected by the project, the EIS must describe any proposed monitoring programs.	Section 4.15.2; Section 12
11.3 Significance of Residual Effects	**—**
The proponent is expected to take all reasonable precautions to protect the environment. Hence, all reasonable means (e.g., best available technologies, industry best practices) are expected to be used to eliminate or mitigate adverse environmental effects. Any residual effects that persist, despite all mitigative activities, are to be assessed as to their significance.	Section 7 (for each environmental component); Section 13 (Conclusions)
The EIS must identify the criteria used to assign significance ratings to any predicted adverse effects. The EIS must contain a detailed analysis of the significance of the potential residual adverse environmental effects it predicts. It must contain clear and sufficient information to enable the joint review panel and the public to understand and review the proponent's judgment of the significance of effects. The proponent must define the terms used to describe the level of significance.	Section 7.1 (Criteria identified and defined); Section 7 (for each environmental component)

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
The proponent must assess the significance of predicted effects according to the following categories:	—
▪ Magnitude of the effect;	Section 7 (for each environmental component)
▪ Geographic extent of the effect;	Section 7 (for each environmental component)
▪ Timing, duration and frequency of the effect;	Section 7 (for each environmental component)
▪ Degree to which effects are reversible or mitigable;	Section 7 (for each environmental component)
▪ Ecological and social/cultural context; and	Section 7 (for each environmental component)
▪ Probability of occurrence.	Section 7 (for each environmental component)
In assessing significance against these criteria, the EIS must, where possible, employ relevant existing regulatory documents, environmental standards, guidelines, or objectives such as prescribed maximum levels of emissions or discharges of specific hazardous agents into the environment or maximum acceptable levels of specific hazardous agents in the environment. If the level of an adverse environmental effect is less than the standard, guideline, or objective, it may be not significant.	Section 7 (for each environmental component)
The EIS must avoid repetition by identifying the potential adverse environmental effects, the proposed mitigation measures and the significance of the effects after mitigation measures have been taken into account, on each VEC, both biophysical and socio-economic, in the same discussion. A summary of the effects, mitigation and significance associated with each VEC should be provided in tabular format to provide clarity and ease of reference.	Section 13.1 (Table 13.1-1)
The EIS must clearly explain the method and definitions used to describe the level of the adverse effect (e.g., low, medium, high) for each of the above categories and how these levels were combined to produce an overall conclusion on the significance of adverse effects for each VEC. This method must be transparent and reproducible.	Section 7.1; Effects levels for criteria defined for each environmental component presented in Section 7

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
11.4 Biophysical Environment	**—**
11.4.1 Geology and Geomorphology	**—**
The EIS must describe the predicted effects on any geological formations and how those effects will be avoided or minimized. Potential effects to be considered must include, but not be limited to, effects on physical stability conditions (including physical strength characteristics), geochemical conditions and thermal regime.	Section 7.2
The proponent will discuss how these effects will be monitored, if required.	Table 12.2-1
The EIS must identify potential effects of the project on the environment when bedrock, unconsolidated deposits, soils or sediments are disturbed, and stockpiled, or used for construction purposes. Where the proponent has identified alternative sites for the disposal of waste rock, the EIS must provide sufficient information about the effects of each technically and economically feasible alternative to explain the preferred option.	Section 7.2; Section 3.4.6
11.4.2 Surface Water	**—**
The EIS must identify and quantify the predicted effects on existing surface waterbodies and wetlands.	Section 7.3
11.4.3 Groundwater	**—**
The proponent will discuss how the DGR development may affect surrounding groundwater quantity or quality and provide detail on how the effects to groundwater will be avoided or mitigated. Modelling work may be required to predict these effects. All parameter estimates (e.g. precipitation, evaporation, groundwater flows, soil permeability, hydraulic roughness, water balance, etc.) reported by the proponent must include the source of information (either estimates or empirical) and make reference to measurement standards or collection protocols used, assumptions built into the data, and data reporting that includes ranges and confidence estimates for the parameters.	Section 7.2
The proponent should justify all parameter choices (base-case values, ranges, statistical distributions) for groundwater flow and solute transport modeling and sensitivity analyses. Describe any monitoring programs, including sampling protocol and monitoring station locations that will be designed to provide information on effects on groundwater quality and quantity.	Section 7.2; Table 12.2-1

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
11.4.4 Terrestrial Environment	—
For all phases of the project, the EIS must describe the effects of the project on terrestrial fauna and flora and include a full accounting of effects on species of natural conservation status and their habitat. This effects evaluation should be based on results of field monitoring studies and predictions from an ecological risk assessment model. It must be clear how predicted effects to the biota exposed to the project stressor compare to the expected "reference condition" for unexposed biota on a biological population basis taking into account natural variation. Potential effects may include but are not limited to:	Section 7.4
▪ Effect of loss of terrestrial habitat and the quality of lost habitat for relevant species;	Section 7.4
▪ Disturbance of feeding, nesting or breeding habitats;	Section 7.4
▪ Physical barriers to wildlife;	Section 7.4
▪ Disruption, blockage, impediment and sensory disturbance (e.g., noise and light effects) of daily or seasonal wildlife movements (e.g., migration, home ranges, etc.);	Section 7.4
▪ Direct and indirect wildlife mortality;	Section 7.4
▪ Reduction in wildlife productivity; and	Section 7.4; Section 7.6.2.2
▪ Contaminant concentration of the food chain.	Section 7.6.2.2
The proponent must describe any proposed monitoring programs that will be designed to provide information on the effects of the project on the terrestrial environment and biota.	Table 12.2-1
11.4.5 Aquatic Environment	—
The proponent will describe the effects of the project on aquatic fauna and flora, and include a full accounting of effects on species of natural conservation status and their habitat. Potential effects may include but are not limited to:	Section 7.5
▪ Effects on habitat, including aquatic vegetation and sensitive areas such as spawning grounds, nursery areas, winter refuges and migrations corridors;	Section 7.5
▪ Effects on aquatic species, including rare and/or sensitive species;	Section 7.5
▪ Effects of blasting on fish and fish habitat on local aquatic systems; and	Section 7.5

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
▪ Contaminant concentration of the food chain.	Section 7.5; Section 7.6.2.2
Descriptions of potential effects must include changes to food chain and food web dynamics as a habitat component as this relates to fish populations. Particular attention must be placed on the effects to the existing sport fishing and Aboriginal commercial fishing industry.	Section 7.5; Section 7.9; Section 7.10.2.8
The proponent must describe any proposed monitoring programs that will be designed to provide information on the effects of the project on the aquatic environment and biota.	Table 12.2-1
11.4.6 Radiological Conditions	—
For all phases of the project, the EIS must describe in the appropriate sections any changes to radiation and radioactivity present in the terrestrial and aquatic environments, the atmosphere, and to workers and members of nearby communities as a result of the project. Any mitigation to reduce negative effects and any monitoring programs to monitor effects must also be described.	Section 4.16; Section 7.6; Section 8; Section 9; Table 12.2-1
11.4.7 Atmosphere	—
The EIS must identify all air emissions including maximum emissions from point source and fugitive releases, including greenhouse gases, expected to be generated during all phases of the project. The proponent must describe how these emissions will affect the environment and indicate what will be done to avoid or mitigate adverse effects. The EIS must include a comparison of the project's marginal contribution to total national and provincial emissions on an annual basis. The proponent must describe any monitoring programs that will be designed to provide information regarding effects on air quality and the success of mitigation measures employed.	Section 7.7; Table 12.2-1
11.4.8 Noise and Vibration	—
For all phases of the project, the EIS must describe the predicted effects (with rationale) of any change in noise or vibration levels on terrestrial and aquatic species and on workers and nearby residents and communities, The methods to be used to monitor noise and vibration levels must also be described. The proponent must model sound levels during both construction and operation and predicted sound levels must be compared against existing levels. This should include both daytime and night time noise levels and tonal noise.	Section 7.8; Section 7.4 (Terrestrial Environment); Section 7.5 (Aquatic Environment); Section 7.11.5 (Workers)

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
11.4.9 Effects of the Environment on the Project	**—**
The EIS must describe the potential effects that the environment may have on the project. The assessment must take into account how local lake conditions and natural hazards, such as severe weather conditions and external events (e.g. flooding, tornado, fire and seismic events), could adversely affect the project. Longer-term effects of climate change must also be discussed in relation to the long-term performance of the project. Information regarding applicable climate elements must include, but not be limited to:	Section 7.13
▪ An estimate of its importance to the project;	Section 7.13
▪ An estimate of how sensitive the project is to variations of this element;	Section 7.13
▪ A discussion of climate data used; and	Section 7.14
▪ Change in lake level.	Section 7.13.2; Section 7.14.2.3
The sensitivity of the project to long-term variability and effects must be identified and discussed. The Canadian Environmental Assessment Agency document *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners* [Reference 10] provides guidance for incorporating climate change considerations into an environmental assessment.	Section 7.14; Appendix D of the Atmospheric Environment TSD
11.5 Socio-economic Effects	**—**
This section of the EIS must describe the predicted changes to health and socio-economic conditions, physical and cultural heritage, and current use of lands and resources, including those used for traditional purposes by Aboriginal people that result from any changes the project may cause in the environment.	Section 7.9; Section 7.10; Section 7.11
11.5.1 Economy	**—**
For all phases of the project, the EIS must describe the expected effects on the regional study area's economy, including effects on employment and economic sectors such as commercial, retail and recreational sectors. It must also describe what measures are within the proponent's control to avoid or mitigate adverse economic effects.	Section 7.10

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
11.5.2 Land Use and Value	—
The EIS must describe the predicted effects (with rationale) that the proposed DGR development will have on the existing and planned operation on the Bruce Nuclear Site as well as on other land and water uses, including changes in tourism, aesthetics, education, and recreational opportunities caused by the construction, operation and modification of the project in terms of increased noise levels, lowered air and water quality, alteration or visual and topographic characteristics of the area. Discuss the potential effects on existing structures (e.g., building foundations, wells, etc.) caused by blasting, etc. Discuss plans to conduct a pre-blast survey prior to any blasting activities. Also discuss temporary and permanent restrictions on land use during construction and operation.	Section 7.10; Appendix I (Atmospheric Environment TSD)
For all phases of the project, the EIS must describe the expected effects or pressures on, but not limited to, land use, the housing market (including local and regional residential rental market), property taxes, and property values.	Section 7.10
11.5.3 Aboriginal Traditional Land Use	—
The EIS must identify any change that the project is likely to cause in the environment, and any effect of any such change on the use of lands and resources for traditional purposes by the Chippewas of Saugeen First Nation, the Chippewas of Nawash Unceded First Nations and any other Aboriginal group including, but not limited to, effects to hunting, trapping, fishing and gathering. For each effect, the EIS must specify where possible the particular area that may be affected. The EIS must identify any concerns raised by such Aboriginal people about the project or other past or present means of storing or disposing of nuclear waste, and regarding the cumulative effects of the project in combination with any other over these areas.	Section 2.3; Section 6.9.2; Section 7.9
11.5.4 Land-based Transportation	—
For all phases of the project, the EIS must describe the expected effects on transportation infrastructure in the regional study area. The discussion on the predicted effects, (with rationale) to local and regional traffic volumes and road conditions, including provincial highways, arterial highways and on-site access roads, must be provided. Information on the potential effects on the areas, through which trucks will travel, such as residential or school areas, must also be included. The proposed methods for avoiding effects on the existing transportation infrastructure must be described.	Section 7.10
11.5.5 Navigable Waters	—
The EIS will identify potential effects on navigability on Lake Huron and other water bodies that may be affected by the project.	Section 7.10.2.13

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
11.5.6 Human Health	—
The EIS must provide a discussion on the potential effects on the physical, mental, and social well-being of workers, the public and communities.	Section 7.11
The information must include, but not be limited to, the following:	—
▪ An analysis of the effects of the project on the health and safety of all workers, including the possible effects of any malfunctions or accidents;	Section 7.11; Section 8
▪ The predicted doses to workers, including doses to contract workers, and to members of the project resulting from activities within the scope of this project;	Section 7.6; Section 8
▪ A description of quantitative risk assessment modeling conducted, where necessary, for any malfunctions and accidents;	Section 8; Preliminary Safety Report
▪ An assessment of the project's potential effects on human health through sources of contaminants from the project and potential exposure pathways into air and potable water;	Section 7.2; Section 7.3; Section 7.6; Section 7.11
▪ Any potential effects of air emissions associated with the project on human receptors within the project study area, such as health effects of nitrogen oxides, sulphur oxides, VOCs, carbon monoxide, dioxins/furans, metals, hydrogen chloride, and any other emissions from fossil fuel combustion, and explosives use; and	Section 7.11; Section 8.3
▪ Any potential effects of project-generated noise on human receptors within the study area.	Section 7.8; Section 7.11
The effects of the project on local and regional health services and public health infrastructure (water supplies for domestic use and sewage treatment) must also be described.	Section 7.10; Section 7.11
11.5.7 Physical and Cultural Heritage Resources	—
If it has been determined that sites of historical, archaeological, paleontological or architectural importance exist, the potential effects of the project on these sites and on any physical and cultural heritage resources that are likely to be affected by the project must be identified and discussed. The proposed measures to preserve, protect or recover these resources must be described.	Section 7.9; Section 7.10

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
12. ACCIDENTS, MALFUNCTIONS AND MALEVOLENT ACTS	**Section 8**
The proponent must identify and describe the probability of possible malfunctions or accidents associated with the project, and the potential adverse environmental effects of these events. Sufficient quantitative information must be provided on all radioactive and hazardous substances that could be released to the environment in significant quantities.	Section 8
The description must include the safeguards that have been established by the proponent to protect against such occurrences and the contingency procedures in place. Accident management typically relies heavily on the evacuation of personnel and of the population, as required. The proponent must demonstrate that the requirements for adequate infrastructure external to the DGR site are met. The need for any necessary administrative measures must also be identified together with the responsibilities of organizations other than the proponent.	Section 8; Preliminary Safety Assessment
The proponent must provide a description of any contingency, clean-up or restoration work in the surrounding environment that would be required during, or immediately following, the postulated malfunctions and accidents.	Section 8.3.3
Early in the conduct of the environmental assessment, the accidents and malfunction scenarios to be considered in the environmental assessment will be subject to review and acceptance by the joint review panel or its technical support staff. Expected scenarios include, but are not limited to, container collapse/failure, and various degrees of barrier loss including total loss of barrier.	Section 4.13; Section 8.2
The proponent must describe:	—
▪ Specific malfunction and accident events that have a reasonable probability of occurring during the life of the project, including an explanation of how these events were identified for the purpose of this environmental assessment;	Section 4.13; Section 8.1
▪ Source, quantity, mechanism, rate, form and characteristics of contaminants and other materials (physical, chemical and radiological) likely to be released to the surrounding environment during the postulated malfunctions and accidents and the effect this will have on the environment and health and safety of the nuclear energy worker and the general public; and	Section 8
▪ Any contingency, clean-up or restoration work in the surrounding environment that would be required during, immediately following, or in the longer term following the postulated malfunction and accident scenarios.	Section 8.3.3

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
The EIS must address potential environmental effects that could result from intentional malevolent acts. While intentional malevolent acts are not accidents, the proponent must compare the environmental effects resulting from malevolent acts with the effects identified for accidents and malfunctions involving the DGR.	Section 4.13.3; Section 8.4
13 LONG-TERM SAFETY OF THE DGR	**Section 9**
13.1 Demonstrating the Long term Safety of the DGR	**—**
Demonstrating long-term safety consists of providing reasonable assurance that the proposed DGR will perform in a manner that protects human health and the environment. This demonstration is achieved through the development of a safety case. The safety case includes a safety assessment complemented by additional arguments and evidence in order to provide confidence in the long-term safety of the facility.	Section 9.1
The safety assessment is central to the safety case. It involves an analysis to evaluate the performance of the overall waste disposal facility and its impact on human health and the environment. A long-term safety assessment is generally based on a pathways analysis of contaminant releases, contaminant transport, receptor exposure and potential effects based on a scenario of expected evolution of the disposal facility and the site. Additional information and explanation can be found in CNSC Regulatory Guide G-320, Assessment the Long Term Safety of Radioactive Waste Management, CNSC Regulatory Policy P290, Managing Radioactive Waste, and the International Atomic Energy Agency (IAEA) document WS-R-4, IAEA Safety Standards Geological Disposal of Radioactive Waste, Safety Requirements [Reference 11].	Section 9.1
13.2 Selection of Assessment Scenarios	**—**
The first step in conducting a safety assessment is the development of scenarios. A scenario is a postulated or assumed set of future conditions or events to be modeled in an assessment. Long-term assessment scenarios should be sufficiently comprehensive to account for all of the potential future states of the site and the environment. It is common for a safety assessment to include a central scenario of the normal (or expected) evolution of the site and facility with time, and additional scenarios that examine the impacts of disruptive events or modes of containment failure.	Section 9.2
A normal evolution scenario should be based on reasonable extrapolation of present-day site features and receptors lifestyles. It should include expected evolution of the site and degradation of the waste disposal system (gradual or total loss of barrier function) as it ages. Disruptive event scenarios postulate the occurrence of low- probability events leading to the possible abnormal degradation and loss of containment. Scenarios should be developed in a systematic, transparent and traceable manner based on current and future conditions of site characteristics, waste properties and receptor characteristics and their lifestyles.	Section 9.2

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
The safety assessment should demonstrate that the set of scenarios developed is credible and comprehensive. Some scenarios may be excluded from the assessment because there is an extremely low likelihood that they would occur or because they would have trivial consequences. The approach and screening criteria used to exclude or include scenarios should be justified and well-documented.	Section 9.2
The anticipated evolution of the repository under different scenarios has to be supported by a combination of expert judgment, field data on the past evolution of the site, and also mathematical models that might need to couple chemical, thermal, hydrologic, hydrogeologic and mechanical processes that play key roles in the repository evolution.	Section 9.2
13.3 Additional Arguments in the Safety Case	**—**
Due to increasing uncertainty as predictions are made far into the future, the long-term safety assessment should also be supported by additional arguments and multiple lines of reasoning such as:	–
▪ Use of different safety assessment strategies: for example by using a combination of assessment approaches such as scoping and bounding calculations, deterministic and probabilistic approaches;	Section 9.4
▪ Demonstration of the robustness of the waste disposal system: this entails demonstrating that the waste disposal system will maintain its safety function under extreme conditions, disruptive events or unexpected containment failure. The safety case should illustrate and explain the relative role of the different components of the disposal system that contribute to its overall robustness; and	Section 9.4
▪ Use of complementary safety indicators to doses and environmental concentrations that are usually calculated for comparison with regulatory limits. Other parameters that are illustrative of safety include: waste dissolution rates; groundwater age and travel time; fluxes of contaminants; concentrations of contaminants in specific environmental media (e.g., concentration of radium in groundwater); or changes in toxicity of the waste.	Section 9.4
13.4 Confidence in Mathematical Models	**—**
The proponent should provide adequate confidence in the mathematical models used to support the safety case. The equations of the mathematical models are usually solved numerically with computer codes. Proper verification of these codes has to be demonstrated, to ensure that the codes adequately solve the equations of the mathematical models. In addition, confidence in the mathematical models can be provided by performing any or all of the following activities:	Section 9.3
▪ Performing independent predictions using entirely different assessment strategies and computer tools;	Section 9.3

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
▪ Demonstrating consistency amongst the results of the long-term assessment model and complementary scoping and bounding assessments;	Section 9.3
▪ Applying the assessment model to an analog of the waste management system to build confidence through a post-audit of the real data available from an analog; and	Section 9.3
▪ Performing model intercomparison studies of benchmark problems.	Section 9.3
In particular, the proponent should justify the choice of solute transport modeling codes to be used and provide supporting information on code verification and validation.	Section 9.3
In addition, scientific peer review by publication in open literature and widespread use by the scientific and technical community will add to the confidence in the assessment model.	Section 9.3
13.5 Interpretation of Assessment Results and Comparison with Acceptance Criteria	**—**
Compliance with the acceptance criteria and with regulatory guidance must be evaluated, and the uncertainties associated with the assessment should be analyzed. Acceptance criteria are the numerical values (regulatory limits) used to judge the results of assessment model calculations. These acceptance criteria ensure compliance with the Nuclear Safety and Control Act and its associated regulations, and by other applicable legislation, including CNSC Regulatory Guide G—320, "Assessing the Long Terms Safety of Radioactive Waste Management" and Regulatory Policy P-290, "Managing Radioactive Waste". The principal regulatory limits are the radiological dose and environmental concentrations of hazardous substances, and it is expected that these parameters are calculated in long-term assessments as primary indicators of safety.	Section 9.4
Acceptance criteria for a long-term assessment are current regulatory limits, standards, objectives and benchmarks. Adopting a fraction of these acceptance criteria (such as dose constraints or factors of safety) for a long-term assessment provides additional assurance that the uncertainty in the predictions and in future human actions would not result in unreasonable risk in the future. It is expected that the proponent will establish and justify the acceptance criteria adopted for any assessment.	Section 9.4
When interpreting the assessment results, the applicant should demonstrate a thorough understanding of the underlying science and engineering principles which are controlling the assessment results. The results of the assessment should be analyzed to show they are consistent with expectations of system performance and with the complete set of assumptions and simplifications used in developing the model(s) and scenarios. Any unexpected assessment results or discrepancies should be investigated and explained.	Section 9.4; Section 9.5

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
An uncertainty analysis of the predictions should be performed to identify the sources of uncetainty and determine the effects of these uncertainties on safety (e.g., through sensitivity analysis). This analysis should distinguish between uncertainties arising from uncertainties in site characterization data, in the conceptual site description model, in assumptions of the scenario, and in the mathematics of the assessment model. For the uncertainties which have important impacts on long-term safety, follow-up field and laboratory investigation programs in combination with refinement of mathematical models should be proposed.	Section 9.4.6
14. CUMULATIVE EFFECTS	**Section 10**
The proponent must identify and assess the cumulative adverse and beneficial environmental effects of the project in combination with other past, present or reasonably foreseeable projects and/or activities within the study area. The management of decommissioning waste, for example, would be a potential future project that would be included in an assessment of cumulative effects. The approach and methods used to identify and assess cumulative effects must be explained. The Canadian Environmental Assessment Act Operational Policy Statement OPS-EPO/2 – 2007, "*Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act*" provides guidance for assessing cumulative effects.	Section 10
The assessment of cumulative environmental effects of the project must include the following, but may also address other items:	—
▪ Identify the VECs, or their indicators, on which the cumulative effects assessment is focused, including the rationale for their selection. Present spatial and temporal boundaries for the cumulative effect assessment for each VEC selected. Emphasize VECs with special environmental sensitivities or where significant risks are involved.	Section 5; Section 10
▪ Identify the sources of potential cumulative effects. Specify other projects or activities that have been or will be carried out that could produce effects on each selected VEC within the boundaries defined, and whose effects would act in combination with the residual effects of the project.	Section 10.4
▪ Evaluate the likelihood of development by the proponent or others that may appear feasible because of the proximity of the project's infrastructure. Limit assessment to cumulative effects on the physical, biological, and human environments that are likely and for which measurable or detectable residual effects are predicted.	Section 10

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
A reasonable degree of certainty should exist that proposed projects and activities will actually proceed for them to be included. Projects that are conceptual in nature or limited as to available information may be insufficiently developed to contribute to this assessment in a meaningful manner. In either case, provide a rationale for inclusion or exclusion.	Section 10.4
The EIS must describe the analysis of the total cumulative effect on a VEC over the life of the project, which requires knowledge of the incremental contribution of all projects and activities, in addition to that of the project. The EIS must include different forms of effects (e.g., synergistic, additive, induced, spatial or temporal) and identify impact pathways and trends.	Sections 10.5 and 10.6
Potential effects on a VEC are not necessarily the result of one project. While a Project-specific assessment of cumulative effects is not responsible for assessing all external effects; the effect assessment must consider how a project-specific effect, or suite of project-specific effects, would interact with these external factors. The EIS must make clear the contribution of the project to a total potential cumulative effect, and place potential cumulative project effects in an appropriate regional context; consider regional plans, community conservation plans, species recovery plans, management plans, objectives and/or guidelines need in an integrated manner in order to understand the aspirations of people and communities in the region.	Sections 10.5 and 10.6
In assessing the cumulative environmental effects of the project in combination with other projects and/or activities, the proponent must identify any changes in the original environmental effects and significance predictions for the project. The proponent must also discuss the effectiveness of the proposed mitigation measures and the response to such changes, as well as the implications for monitoring and follow-up programs as described in section 16.	Sections 10.5 and 10.6
This section should provide a brief historical overview of the timelines of the construction, commissioning and operating periods of various facilities at the Bruce site, beginning with the first construction in 1960.	Section 10.4; Figure 10.4-2
15. CAPACITY OF RENEWABLE RESOURCES	**Section 11**
The EIS must describe the effects of the project on the capacity of renewable resources to meet the needs of the present and those of the future. The EIS must identify those resources likely to be significantly impacted by the project, and describe how the project could affect their sustainable use. The EIS must also identify and describe any criteria used in considering sustainable use. Sustainable use may be based on ecological considerations such as integrity, productivity, and carrying capacity.	Section 11

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
16. FOLLOW-UP PROGRAM	**Section 12**
The proponent must include a framework upon which effects monitoring and follow-up actions will be based throughout the life of the project, should the project proceed.	Section 12
A follow-up program must be designed to verify the accuracy of the environmental assessment and to determine the effectiveness of the measures implemented to mitigate the adverse environmental effects of the project. The follow-up program must be designed to incorporate pre-project information which would provide the baseline data, compliance data such as established benchmarks, regulatory documents, standards or guidelines, and real time data which would consist of observed data gathered in the field. As part of the follow-up program, the proponent must describe the compliance reporting methods to be used, including reporting frequency, methods and format.	Section 12; EA Follow-up Monitoring Program
Environmental assessment effects predictions, assumptions and mitigation actions that are to be tested in the follow-up monitoring program must be converted into field-testable monitoring objectives. The monitoring design must include a statistical evaluation of the adequacy of existing baseline data to provide a benchmark against which to test for project effects, and the need for any additional pre-construction or pre-operational monitoring to establish a firmer project baseline.	Section 12; Mitigation measures are described for each environmental component in Section 7; EA Follow-up Monitoring Program
The proponent must propose a schedule for the follow-up program. The schedule should indicate the frequency and duration of effects monitoring. This schedule would be developed after statistical evaluation of the length of time needed to detect effects given estimated baseline variability, likely environmental effect size and desired level of statistical confidence in the results (Type 1 and Type 2 errors).	Section 12; EA Follow-up Monitoring Program
The description of the follow-up program must include any contingency procedures/plans or other adaptive management provisions as a means of addressing unforeseen effects or for correcting exceedances, as required, so as to comply/conform to benchmarks, regulatory standards or guidelines.	Section 12; EA Follow-up Monitoring Program
The follow-up program must describe roles and responsibilities for the program and its review process, by both peers and the public.	Section 12.1
The EIS should provide discussion on the need for, and requirements of, a follow-up program, and include:	—
▪ The need for such a program and its objectives;	Section 12

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
▪ Tabular summary and explanatory text of the main components of the program including a description of each monitoring activity under that component, which of the three generic program objectives the activity is relevant to (e.g., confirm mitigation or assumptions, verify effect) and the specific statement from environmental assessment that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no adverse effects at the population level for white-tailed deer because of vehicle strikes due to increased traffic within the site study area), as well as the specific monitoring objective for that activity (e.g.. record occurrence of vehicular collisions with deer on-site to verify predicted effects);	Table 12.2-1
▪ How it would be structured;	Table 12.2-1
▪ Roles to be played by the proponent, regulatory agencies, Aboriginal people and others in such a program;	Section 2.10; Section 12
▪ Possible involvement of independent researchers;	EA Follow-up Monitoring Program
▪ The sources of funding for the program; and	Section 12
▪ Information management and reporting.	Section 12
The follow-up program plan should be described in the EIS in sufficient detail to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them), confirm environmental assessment assumptions and confirm the effectiveness of mitigation.	Section 12; EA Follow-up Monitoring Program
17. ASSESSMENT SUMMARY AND CONCLUSION	**Section 13**
This section of the report must summarize the overall findings with emphasis on the main environmental issues identified.	Section 13
18. REFERENCES	**Section 14**
1. Canadian Privy Council Office. A Framework for the Application of Precaution in Science-based Decision Making about Risk. ISBN 0-662-67486-3 Cat. no. CP22- 70/2003.	—
2. Ontario Power Generation, Deep Geologic Repository for Low and Intermediate Level Radioactive Wastes – Project Description, OPG, November 2005.	—
3. CNSC Regulatory Policy P-290, Managing Radioactive Waste, Canadian Nuclear Safety Commission, Ottawa, July 2004.	—

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
4. CNSC Regulatory Guide G-2 19, Decommissioning Planning for Licensed Activities, Canadian Nuclear Safety Commission, Ottawa, June 2000.	—
5. CNSC Regulatory Guide G-320, Assessing the Long Term Safety of Radioactive Waste Management, Canadian Nuclear Safety Commission, Ottawa, December 2006.	—
6. CNSC Regulatory Standard S-296, Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills, Canadian Nuclear Safety Commission, Ottawa, March 2006.	—
7. CNSC Regulatory Guide G-296, Developing Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills, Canadian Nuclear Safety Commission, Ottawa, March 2006.	—
8. CEAA Operational Policy Statement OPS-EPO/3- 2007, Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, Ottawa, November 2007.	—
9. Barnthouse, L.W., W. R. Munns Jr. and M. T. Sorensen. 2008. "Population	—
10. CEAA Procedural Guide, *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners,* prepared by: The Federal	—
11. International Atomic Energy Agency, *IAEA Safety Standards Geological Disposal of Radioactive Waste, Safety Requirements No. WS*	—
GLOSSARY	**Section 15**
Aboriginal Rights mean those rights of Aboriginal peoples which are not found in treaties or land claims agreements.	—
Aboriginal Title means the form of land ownership belonging to Aboriginal people and the rights coming from the aboriginal relationship with land.	—

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
Aboriginal Traditional Knowledge (ATK) means knowledge that is held by, and unique to Aboriginal peoples. It is a living body of knowledge that is cumulative and dynamic and adapted over time to reflect changes in the social, economic, environmental, spiritual and political spheres of the Aboriginal knowledge holders. It often includes knowledge about the land and its resources, spiritual beliefs, language, mythology, culture, laws, customs and medicines. It may be considered in the environmental assessment of a proposed project. The term traditional ecological knowledge (TEK) is often used interchangeably with the term Aboriginal traditional knowledge (see, ATK). However, TEK is generally considered to be a subset of ATK that is primarily concerned with knowledge about the environment.	—
Aquatic Environment means the components related to, living in, or located in or on water or the beds or shores of a water body, including but not limited to all organic and inorganic matter, and living organisms and their habitat, including fish habitat, and their interacting natural systems.	—
Bounding Assessment means an assessment designed to provide limiting or worst-case predictions, based on simplification of the processes being simulated or the use of data limits (such as maximum possible precipitation, or thermodynamic solubility limits).	—
CEAA means the Canadian Environmental Assessment Agency.	—
CNSC means Canadian Nuclear Safety Commission.	—
Country Food means a diet of local meat and fish and wild plants gained through subsistence harvest.	—
DGR means deep geologic repository.	—
Ecological Risk Assessment means the process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors. This definition recognizes that a risk does not exist unless: (1) the stressor has an inherent ability to cause adverse effects, and (2) it is coincident with or in contact with the ecological component long enough and at sufficient intensity to elicit the identified adverse effect(s).	—
EIS means environmental impact statement.	—
Environmental Assessment means a process for identifying project and environment interactions, predicting environmental effects, identifying mitigation measures, evaluating significance, reporting and following-up to verify accuracy and effectiveness. Environmental assessment is used as a planning tool to help guide decision making, as well as project design and implementation.	—

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
Environmental Effect means as defined in the Canadian Environmental Assessment Act.	—
Hazardous Substance means a substance, other than a nuclear substance, that is used or produced in the course of carrying on a licensed activity and that may pose a risk to the environment or the health and safety of persons.	—
Institutional Control means the control of residual risks at a site after it has been decommissioned. Institutional controls can include active measures (requiring activities on the site such as water treatment, monitoring, surveillance and maintenance) and passive measures (that do not require activities on the site, such as land use restrictions, markers, etc.).	—
Joint Review Panel means a review panel appointed pursuant to the Canadian Environmental Assessment Act.	—
Long Term means in radioactive waste disposal, any period of time after active institutional controls can be expected to cease.	—
OPG means Ontario Power Generation.	—
Project means the proposal to construct and operate a deep geologic repository (DGR) to store low and intermediate level radioactive waste.	—
Proponent means Ontario Power Generation.	—
Radioactive Waste means any material (liquid, gaseous, or solid) that contains a radioactive "nuclear substance," as defined in section 2 of the Nuclear Safety and Control Act, and which the owner has declared to be waste.	—
Safety Case means an integrated collection of arguments and evidence to demonstrate the safety of a facility. This will normally include a safety assessment, but could also typically include information (including supporting evidence and reasoning) on the robustness and reliability of the safety assessment and the assumptions made therein.	—
Scenario means a postulated or assumed set of conditions or events. They are most commonly used in analysis or assessment to represent possible future conditions or events to be modeled, such as possible accidents at a nuclear facility, or the possible future evolution of a repository and its surroundings.	—
Species at Risk means as defined in the federal Species at Risk Act.	—

Table A2-1: Concordance of EIS Guidelines with the EIS (continued)

FINAL EIS GUIDELINES: DEEP GEOLOGIC REPOSITORY (DGR) PROJECT	EIS SECTION
Terrestrial Environment means the components related to, living on, or located on the Earth's land areas, including but not limited to all organic and inorganic matter, living organisms and their habitat, and their interacting natural systems.	—
Treaty Rights means rights arising from the terms of a treaty	—
Valued Ecosystem Component (VEC) means the environmental element of an ecosystem that is identified as having scientific, social, cultural, economic, historical, archaeological or aesthetic importance.	—
Western Waste Management Facility means the existing interim facility located on the Bruce Nuclear Site to store low and intermediate level radioactive waste.	—

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APPENDIX B: KEY STAFF INVOLVED IN PREPARATION OF THE EIS

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Table B-1: Key Staff Involved in Preparation of the EIS

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Table B-1: Key Staff Involved in Preparation of the EIS (continued)

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APPENDIX C: HUMAN HEALTH ASSESSMENT

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C1. INTRODUCTION

Ontario Power Generation (OPG) is undertaking a multi-year planning and regulatory approvals process for the DGR Project for the long-term management of low and intermediate level waste. This appendix presents the human health assessment completed to support the EA for the DGR Project. This assessment addresses health effects from normal operations only. Effects of accidents, or upset conditions, are assessed in Section 8 of the EIS.

C1.1 TEMPORAL AND SPATIAL BOUNDARIES

The assessment of the DGR Project on human health is conducted within the framework of temporal and spatial boundaries described in Section 5.1 and 5.2 of the EIS. The study areas were used without modification. The human health assessment focuses on the effects of the site preparation and construction, operations and decommissioning of the DGR Project. The abandonment and long-term performance phase is considered in Section 9 of the EIS.

C1.2 VALUED ECOSYSTEM COMPONENTS

While all components of the environment are important, it is neither practicable nor necessary to assess every potential effect of a project on every component of the environment. The EA focuses on the components that have the greatest relevance in terms of value and sensitivity, and which are likely to be affected by the project. To achieve this focus, specific Valued Ecosystem Components (VECs) are identified. The Canadian Environmental Assessment Agency states that VECs are "*Any part of the environment that is considered important by the proponent, public, scientists and government involved in the assessment process"* [C1]. Importance may be determined on the basis of cultural values or scientific concerns. VECs can be an individually valued component of the environment or a collection of components that represent one aspect of the environment (e.g., physical environment health).

According to the World Health Organization (WHO), "health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" [C2]. The WHO defines determinants of health as factors that affect the health of individuals and communities; specifically, the social and economic environment, the physical environment, as well as a person's individual characteristics and behaviours [C3]. To evaluate human health in accordance with the WHO definition, physical determinants, socio-economic determinants, cultural determinants and emotional determinants were all characterized, and used as indicators. These individual indicators were combined to produce a description of "overall health" that encompass a more holistic approach for considering the potential project-related effects on human health. Table C1.2-1 lists the VECs selected for the human health assessment.

Table C1.2-1: VECs Selected for Human Health

VEC	Rationale for Selection	Indicators	Measures [a]
Overall Health of Local Residents	• Local residents will have different characteristics (e.g., occupancy, use and consumption), which may result in different health effects than other groups	• Physical environment determinants • Socio-economic determinants • Cultural determinants • Emotional determinants	• Changes in physical environment determinants • Changes in socio-economic determinants • Changes in cultural determinants • Changes in emotional determinants
Overall Health of Members of Aboriginal Communities	• Members of Aboriginal communities will have different characteristics (e.g., occupancy, use and consumption), which may result in different health effects than other groups	• Physical environment determinants • Socio-economic determinants • Cultural determinants • Emotional determinants	• Changes in physical environment determinants • Changes in socio-economic determinants • Changes in cultural determinants • Changes in emotional determinants
Overall Health of Seasonal Users	• Seasonal users will have different characteristics (e.g., occupancy, use and consumption), which may result in different health effects than other groups	• Physical environment determinants • Socio-economic determinants • Cultural determinants • Emotional determinants	• Changes in physical environment determinants • Changes in socio-economic determinants • Changes in cultural determinants • Changes in emotional determinants
Health of Workers	• Workers at the DGR Project would experience different exposures during their work day, which may result in different health effects than other groups	• Radiological exposures • Non-radiological hazards	• Magnitude of radiological exposures • Potential health and safety consequence(s) as a result of exposure to non-radiological hazards

Note:
a Changes in the measures of VECs are DGR Project-related changes.

C1.2.1 Rationale for Selection of VECs for Human Health

C1.2.1.1 Overall Health

Changes in health determinants may vary from one subset of the population to the next. Therefore, VECs were identified for the overall health of local residents, the overall health of members of the Aboriginal communities, and the overall health of seasonal users. Local residents include individuals that permanently reside in the Local Study Area; members of the Aboriginal communities are considered to be a member of the Saugeen Ojibway Nation (SON), and seasonal users may be park users or cottagers who would live or vacation in the Local Study Area for part of the year. In assessing these three VECs, we have looked at individual receptors considered to be representative of the group as a whole.

C1.2.1.2 Health of Workers

The DGR Project will require an on-site labour force during its first three phases: as high as 200 workers during the site preparation and construction phase; on average 40 workers during the operations phase; and on average 115 workers during the decommissioning phase. Workers will have different exposures than the off-site receptor groups and are thus considered separately. They are present on the DGR Project site on a routine basis and consequently, have the greatest potential for exposures to radionuclides, conventional chemicals and other hazards associated with activities at the DGR Project.

C1.2.2 Indicators

The factors identified by WHO [C3] as contributing to human health have been selected as indicators for the human health VECs. These indicators are described below.

C1.2.2.1 Physical Environment Determinants

Concentrations of Target Compounds in Environmental Media

Exposure to chemicals can potentially result in a range of health effects, from no effect to death, depending on the chemical, the route of exposure, and the duration of exposure. DGR Project activities can cause the production and release of chemicals in different environmental media and people living near the DGR Project can potentially be exposed to these chemicals. Thus, exposure to chemical concentrations has been assessed.

The EIS Guidelines require a discussion of the potential health effects associated with the emissions from the DGR Project, including both criteria compounds (common air pollutants affecting human health and environment and are highly regulated) and compounds emitted from activities such as fossil fuel combustion and explosives use. A review of the DGR Project works and activities was used to identify compounds that could be emitted from the DGR Project that may have an effect on human health. This target compound list includes the following:

- carbon monoxide (CO);

- nitrogen dioxide (NO_2);
- sulphur dioxide (SO_2);
- fine particulates (i.e., PM_{10} and $PM_{2.5}$);
- volatile organic compounds including:
    - acetaldehyde;
    - acetone;
    - acrolein;
    - benzene;
    - ethylbenzene;
    - formaldehyde;
    - toluene; and
    - xylenes.
- carcinogenic polycyclic aromatic hydrocarbons (PAHs);
- non-carcinogenic PAHs;
- naphthalene; and
- selected metals (including aluminum, cadmium, chromium, lead, and zinc).

Noise Exposure Levels

Noise exposure levels have been selected as an indicator to assess potential health effects of noise generated by the DGR Project. Specifically, the health assessment will use the percent highly annoyed (%HA) and the specific critical noise level (HCII) put forward by Health Canada [C4].

Radiation Exposure Levels

As the DGR Project involves the transfer within the DGR Project Area and storage of L&ILW, the human health assessment considers potential changes in human exposure to radiation.

C1.2.2.2 Socio-economic Determinants

Income

Income was selected as an indicator for the socio-economic determinants VEC because higher income and social status are linked to better health. A greater income division between the richest and poorest people is associated with greater differences in health status [C3].

Education

Education was also selected as an indicator for the socio-economic determinants VEC because low education levels are associated with poor health, more stress and lower self-confidence [C3].

Access to Health Care and Social Services

Access and use of services can prevent and treat diseases. Human health may be affected if the current level of medical services is not sufficient to meet the additional needs created as a result of the DGR Project, or if the required services are no longer available [C3].

Health Behaviours

A healthy lifestyle including a healthy diet, rich in fruits and vegetables, regular exercise, low stress and no smoking, are behaviours that can affect human health and well-being.

Employment

Employment is considered a socio-economic health indicator. The WHO identifies that employed people, particularly those who have more control in their working conditions, have better overall health [C3].

C1.2.2.3 Cultural Determinants

Customs, traditions and the beliefs of the family and community may all affect health according to the WHO [C3]. This is particularly true for Aboriginal people, where access to cultural sites and traditional foods is an integral part of the community lifestyle.

C1.2.2.4 Emotional Determinants

Perception of Health and Safety

Feelings of health, safety and security are considered to provide an indication of psychological health and well-being. The presence of the DGR Project may result in a reduction of feelings of safety and security among local populations and can affect satisfaction with living in the community, contributing to stress levels and overall health.

Community Cohesion

Community cohesion refers to people's sense of belonging to a self-defined community, shared norms and values. A cohesive community maintains and generates relationships and community pride, defining a common vision among residents that serves to maintain and enhance well-being. The WHO emphasizes the importance of community cohesion to overall health and well-being, where strong social support networks, including greater ties to family, friends and community and linked to better overall health [C3].

C1.2.2.5 Health of Workers

The health of workers is influenced by radiological exposures and non-radiological hazards. It is anticipated that the construction workforce will largely be sourced from outside the Local and Regional Study Area since the labour force associated with primary industry across the Local

and Regional Study Areas is largely in the agricultural sector. Workers at the DGR Project during the operations and decommissioning phase will be local residents or members of the Aboriginal community and these aspects of overall health would be captured in the assessment of these VECs.

C1.2.3 Measures

Changes in the physical, socio-economic, cultural and emotional determinants resulting from project-related changes will be used as the measures to evaluate the effects of the DGR Project on the overall health VECs.

The magnitude of radiological exposures as a result of the DGR Project and potential health and safety consequence(s), as a result of exposure to non-radiological hazards from the DGR Project, are used to measure effects on the health of workers.

C2. DESCRIPTION OF THE EXISTING ENVIRONMENT

This section provides a description of the existing environmental conditions in the proposed DGR Project study areas for the human health components of the EIS. The characterization of the existing environment serves as the baseline condition for which the environmental effects of the DGR Project are predicted and assessed.

C2.1 EXISTING ENVIRONMENT METHODS

The description of the existing environment focuses on the VECs identified in Section C1. Information is presented for the study areas with emphasis placed on the areal extents most likely to be affected by the DGR Project. The description of the existing environment for human health presents a compilation and review of existing information.

The following sources of information were used in the characterization of the existing environment:

- Atmospheric Environment TSD;
- Geology TSD;
- Hydrology and Surface Water Quality TSD;
- Radiation and Radioactivity TSD;
- Socio-economic Environment TSD;
- Aboriginal Interests TSD;
- Statistics Canada CANSIM Database [C5; C6] by subject:
    - Well-being: perceived health, very good or excellent and perceived mental health, very good or excellent.
    - Health Conditions: overweight males and females, obesity, arthritis, diabetes, asthma, high blood pressure and injury-hospitalization
    - Human Function: participation and activity limitation and disability-free life expectancy.
    - Life Expectancy: life expectancy and infant mortality
    - Health Behaviours: dietary practices, leisure-time physical activity, active or moderately active, smoking and consumption of alcohol.
    - Cancer Incidence: all invasive primary cancer sites, colon, rectum and rectosigmoid junction cancer, bronchus and lung cancer, female breast cancer, and prostate cancer.
- Canadian Institute for Health Information (CIHI) Health Indicator Reports (2007 to 2008) [C7]; and
- Cancer Care Ontario [C8].

For the purposes of the health assessment, information is reported for the geographic area representing either the Local or Regional Study Area. The health status statistics are based on data for the Grey Bruce Health Unit and South West Local Health Integration Network (LHIN). There is no reason to assume that health status statistics in the Regional Study Area would be different than those for the Grey-Bruce Health Unit or South West LHIN as a whole.

A public health unit (PHU) is an official health agency established by a group of urban and rural municipalities to provide a more efficient community health program, carried out by full-time specially qualified staff. There are 36 PHUs in Ontario that administer health promotion and disease prevention programs to inform the public about healthy lifestyles, communicable disease control including education in STIs/AIDS, immunization, food premises inspection, health growth and development including parenting education for all age groups and selected screening services. Each PHU is governed by a board of health, which is an autonomous corporation under the Health Protection and Promotion Act, and is administered by the medical officer of health who reports to the local board of health. The board is largely made up of elected representatives from the local municipal councils. The Ministry of Health and Long-Term Care shares the costs of the Health Units with the municipalities.

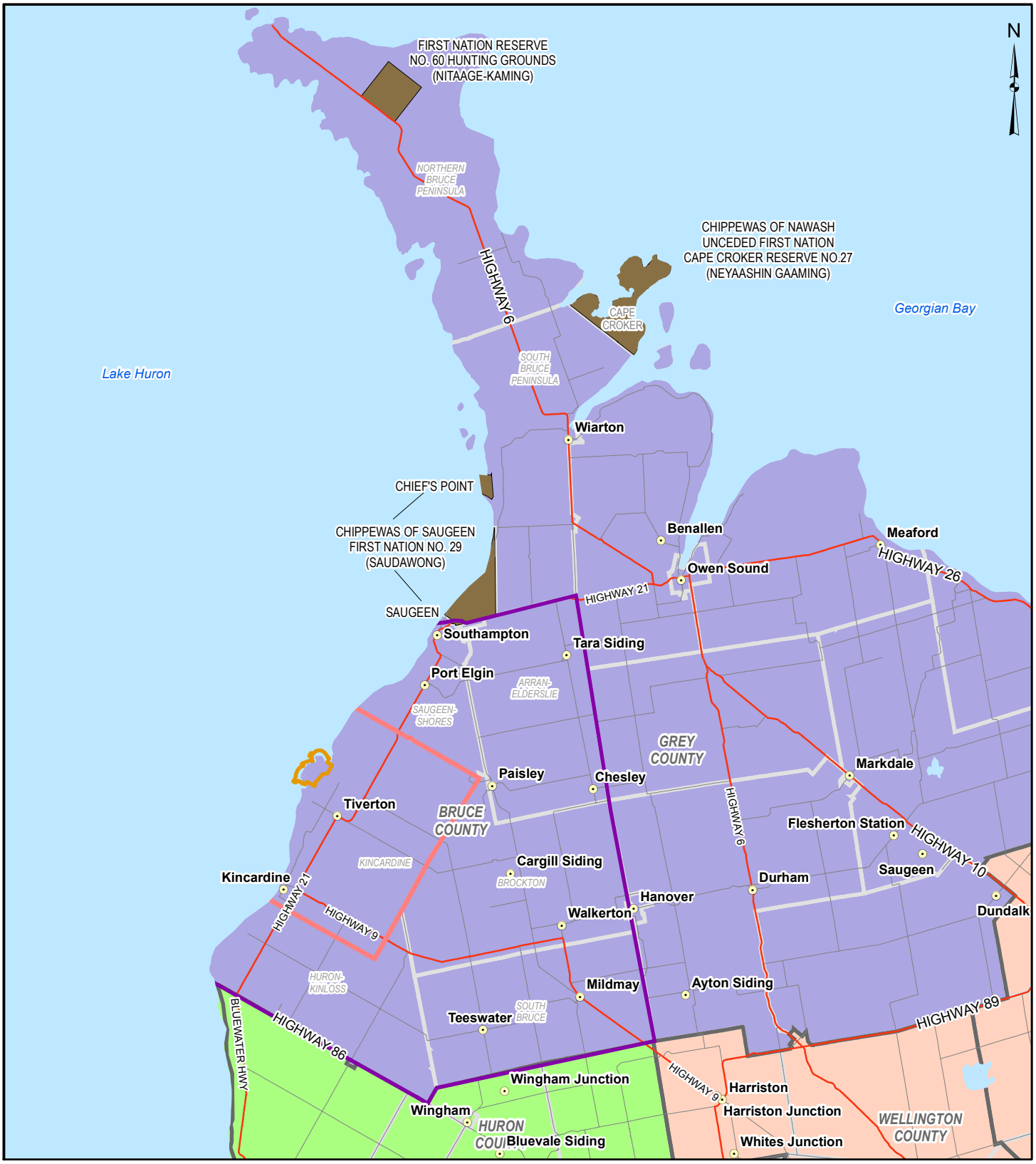
Education and cancer incidence statistics are based on data for the South-West LHIN, Ontario. The LHINs were created by the province of Ontario to provide efficient and effective health care services to Ontario on a regional basis. Residents in the Regional and Local Study Area are served by the South West LHIN, which includes 227 service providers. There is no reason to assume that education statistics in the Regional Study Area would be different than those for the South West LHIN as a whole.

Figures C2.1-1 and C2.1-2 identify the geographic coverage of the Grey Bruce Health Unit and the Southwest LHIN, respectively.

The human health assessment relies on information already documented in the other TSDs and in the summaries provided in the EIS. Brief summaries are presented within appropriate sections below along with references to the relevant sections of the TSDs. Where new or additional information beyond that provided in the TSDs was required to characterize the existing environment, it has been provided.

The existing environment human health assessment pays particular attention to current health profiles of the communities likely to be affected by the DGR Project, including those living in the Regional Study Area and the SON community members. The overview of the existing environment and health of the Aboriginal communities focuses on aspects relevant to the human health assessment and is presented in the sections that follow.

To provide context, each of the WHO determinants are described first, followed by an overall discussion of the VECs.



LEGEND

- Site Study Area [1]
- Local Study Area
- Regional Study Area
- County Boundary
- First Nations' Lands
- Grey Bruce Health Unit
- Huron County Health Unit
- Wellington-Dufferin-Guelph Health Unit

NOTE

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.

REFERENCE

Base Data Provided by 4DM, November 2007.
Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

PROJECT

DGR PROJECT
ENVIRONMENTAL IMPACT STATEMENT

TITLE

PUBLIC HEALTH UNITS IN GREY AND BRUCE COUNTIES

Golder Associates
Mississauga, Ontario

PROJECT NO. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct. 2007		
GIS	BC	22 Jun. 2010		
CHECK	RS	22 Jun. 2010		
REVIEW	MAR	22 Jun. 2010		

FIGURE C2.1-1

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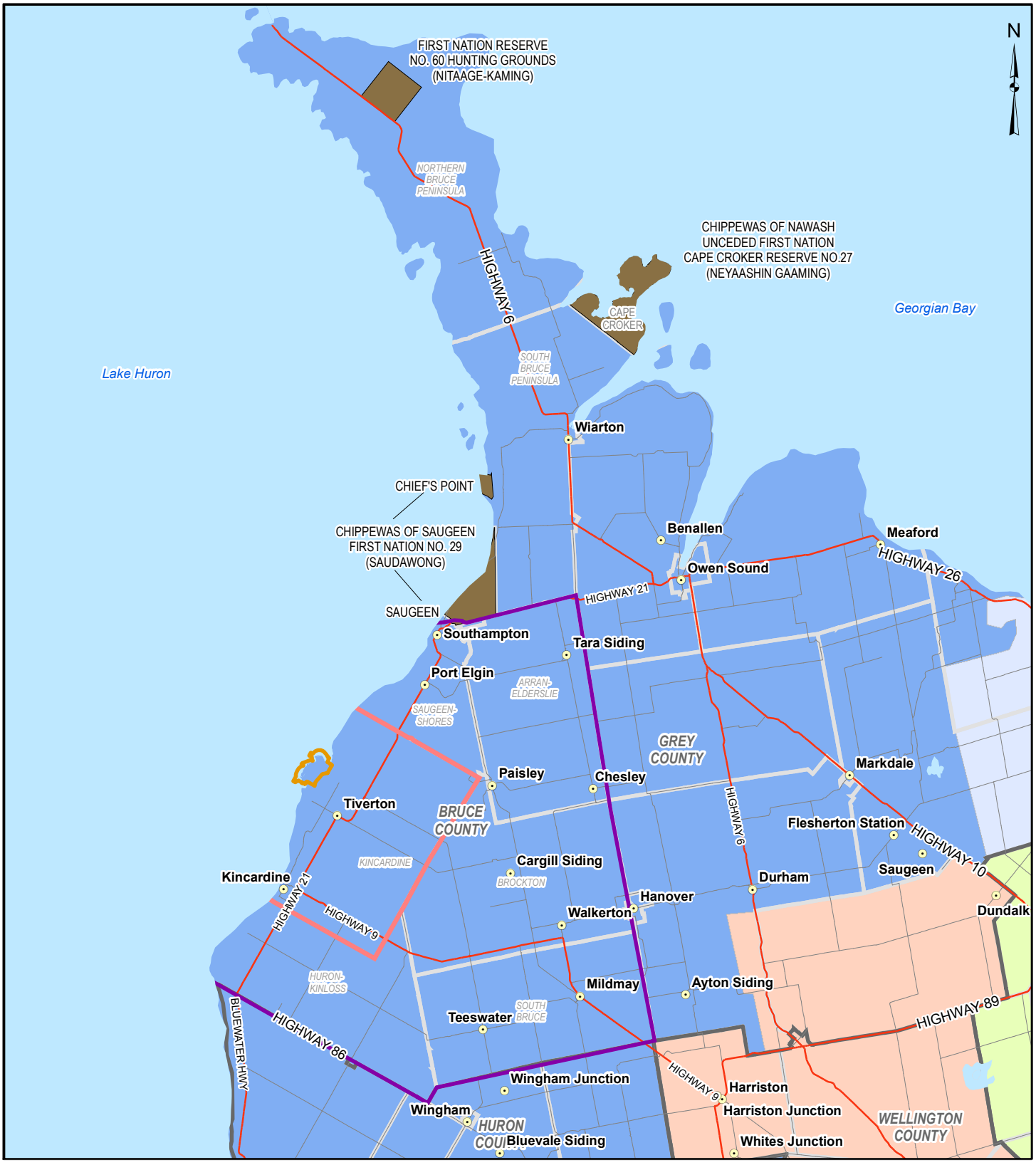

LEGEND

- Site Study Area [1]
- Local Study Area
- Regional Study Area
- County Boundary
- First Nations' Lands
- Central West
- North Simcoe Muskoka
- South West
- Waterloo Wellington

NOTE

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.

REFERENCE

Base Data Provided by 4DM, November 2007.
Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

0 5 10 20 30 40 50
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PROJECT
DGR PROJECT
ENVIRONMENTAL IMPACT STATEMENT

TITLE
LOCAL HEALTH INTEGRATION NETWORKS IN GREY AND BRUCE COUNTIES

Golder Associates
Mississauga, Ontario

PROJECT NO. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct. 2007		
GIS	BC	22 Jun. 2010		
CHECK	RS	22 Jun. 2010		
REVIEW	MAR	22 Jun. 2010		

FIGURE C2.1-2

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C2.2 TRADITIONAL KNOWLEDGE AND ABORIGINAL SHARING

As described in the Aboriginal Interests TSD, concerns with regards to human health historically raised by local Aboriginal communities include:

- radiological impacts on health, animals and plants;
- potential health and safety implications for the natural environment, and their future generations caused by the potential for damage to traditional lands and their way of life;
- level of contaminants in fish;
- effects on the food chain and on all parts of the environment; and
- safety of Aboriginal communities.

The description of the existing human health includes a discussion of health of the two communities that comprise the SON.

C2.3 PHYSICAL ENVIRONMENT DETERMINANTS

C2.3.1 Air Quality

The existing air quality in the Local Study Area is described using a combination of background air quality measurements and the modelled air quality resulting from the existing emission sources at the Bruce nuclear site. An air dispersion model was run to predict maximum concentrations at selected human receptor locations, resulting from existing sources at the Bruce nuclear site. The background air quality for the region was then added to these predictions (for compounds where it was available) to yield existing air quality in the Local Study Area. Details on air dispersion modelling that supports the human health assessment are provided in the Atmospheric Environment TSD.

Potential human receptors were identified as people who live in or use areas in the vicinity of the DGR Project. Based on the considered phases of the DGR Project (site preparation and construction, operations, and decommissioning), the following receptors were identified and are considered to be present at the locations indicated on Figure C2.3.1-1 as follows:

- local residents (AR1, AR2, AR3);members of the nearest Aboriginal communities (AR5, AR6); and
- seasonal users (AR2, AR4).

These receptors correspond to human health receptors R1, R2, R3, R4, R5 and R6 in the Atmospheric Environment TSD. Local residents include individuals that permanently reside in the Local Study Area. Residential communities were identified at AR1, AR2 and AR3. Local residents were assumed to include infants, toddlers, children, adolescents and adults.

Members of the nearest Aboriginal communities are considered to be members of the Saugeen Ojibway Nation (Chippewas of Saugeen First Nation Reserve No. 29, Chippewas of Nawash Unceded First Nation Cape Crocker Reserve No. 27). Members of the SON were conservatively considered to be present at AR5, which is located at the limits of the air

modelling domain, aligned between the DGR Project and the closest SON reserve. However, the actual reserve is approximately 17 km further from the DGR Project site than this location. Because AR5 is closer to the DGR Project than the community, the actual exposures and risks to members of the SON would be less than is estimated in this human health assessment. The second Aboriginal receptor, AR6, was placed at the burial ground (Jiibegmegoong) on the Bruce nuclear site. This receptor was identified as a location where members of the Aboriginal community may periodically spend time (assumed to be once per month in the assessment).

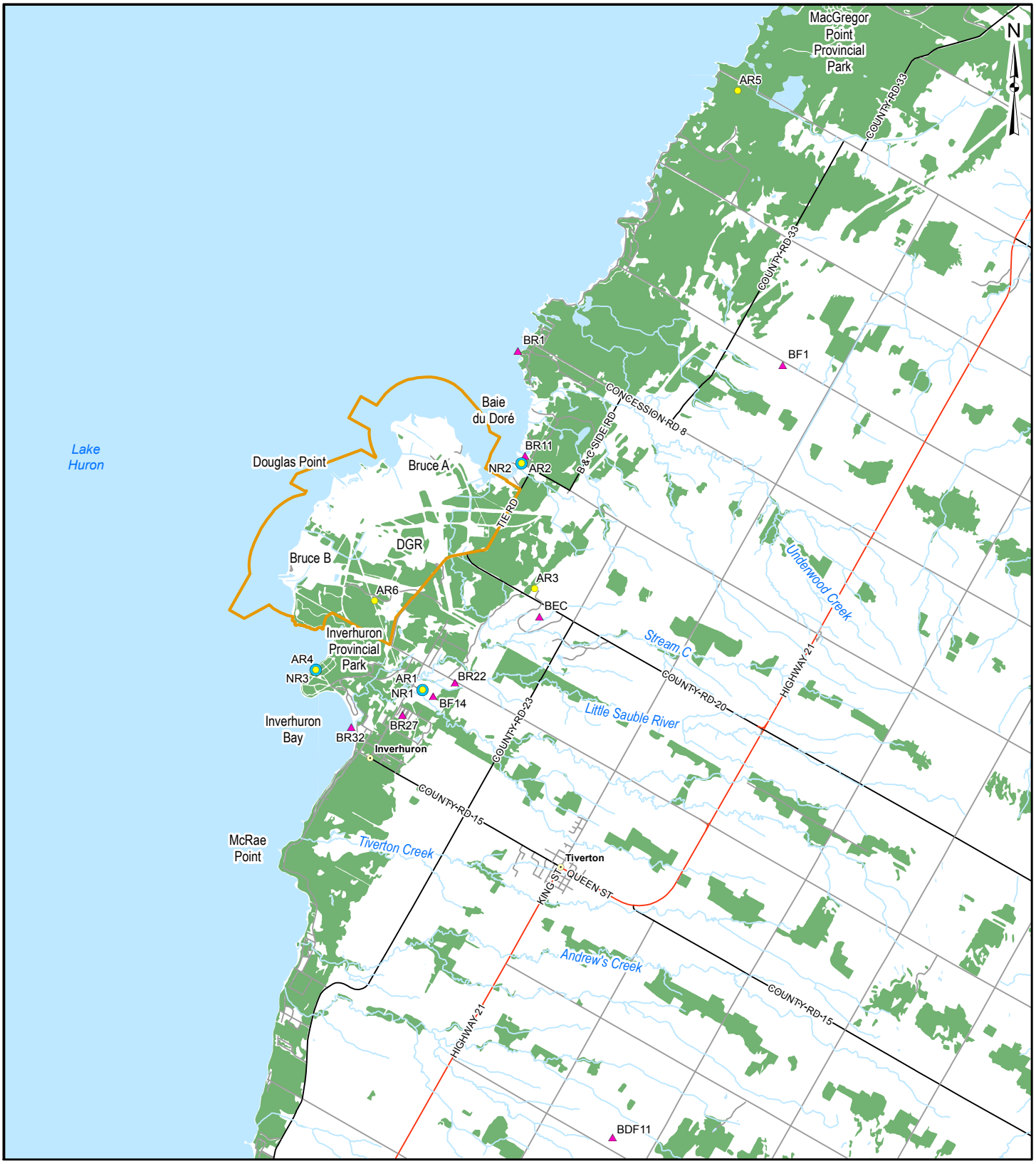
Seasonal users may be park users or cottagers who would live or vacation in the Local Study Area for part of the year. Seasonal users may use the recreational areas around AR2 and AR4 (Inverhuron Provincial Park and Baie du Doré, respectively) and were considered to be present at these locations for approximately two months of the year.

In the health assessment, air modelling results presented in the Atmospheric Environment TSD were used to calculate the incremental lifetime cancer risk (ILCR) for each of the target compounds (Table C2.3.1-1). Details on the human health risk assessment (HHRA) calculations are presented in Attachment 1. The resulting ILCR values are compared to a target risk value of one in a million (an ILCR of 1×10^{-6}). None of the existing concentrations of carcinogenic compounds result in ILCR values that exceed the target.

Table C2.3.1-1: ILCR Values for Existing Conditions

Receptor Location	Target Compounds			
	Cancer PAHs	Acetaldehyde	Benzene	Formaldehyde
Local Residents				
AR1	1.7×10^{-8}	1.1×10^{-8}	9.5×10^{-9}	1.6×10^{-8}
AR2	1.7×10^{-8}	1.3×10^{-8}	1.1×10^{-8}	1.9×10^{-8}
AR3	1.7×10^{-8}	8.4×10^{-9}	7.1×10^{-9}	1.2×10^{-8}
Members of Aboriginal Communities				
AR5	1.7×10^{-8}	5.6×10^{-9}	4.7×10^{-9}	8.1×10^{-9}
AR6	—	—	—	—
Seasonal Users				
AR2	5×10^{-10}	5.7×10^{-9}	4.8×10^{-9}	8.2×10^{-9}
AR4	5×10^{-10}	4.7×10^{-9}	4.0×10^{-9}	6.8×10^{-9}

Note:
— Not applicable. AR6 is located at the Jiibegmegoong burial ground. Aboriginal visitors at this location would be exposed to compounds for short, intermittent durations. Thus, a carcinogenic evaluation that is based on chronic exposure is not relevant to this receptor location.



LEGEND

- Radiological Potential Critical Group Location
- Noise Receptor
- Air Receptor
- Site Study Area [1]

NOTE

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.

REFERENCE

Base Data Provided by 4DM, November 2007.
Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

PROJECT

DGR PROJECT
ENVIRONMENTAL IMPACT STATEMENT

TITLE

HUMAN HEALTH RECEPTOR LOCATIONS

Golder Associates
Mississauga, Ontario

PROJECT NO. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct 2007		
GIS	BC	22 Jun. 2010		
CHECK	RS	22 Jun. 2010		
REVIEW	SM	22 Jun. 2010		

FIGURE C2.3.1-1

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In the HHRA, air modelling results were also used to calculate a hazard quotient (HQ) for each of the receptors above for non-cancer causing substances (see Table C2.3.1-2). The HQ is derived as the ratio of the estimated exposure (for each critical receptor) to the tolerable daily intake (TDI) or tolerable concentration based on chemical-specific health based benchmarks (or toxicity reference values). The dose of the chemical depends on the calculated concentration in various media (e.g., air, water, soil and foods), the amount of time the person is in contact with these media and the biological characteristics of the person (e.g., ingestion rates and body weight). The resulting HQ values are compared to a health-based acceptable limit (an HQ of 1.0 is acceptable when all pathways are considered). A typical target value of 0.2 would be considered to represent a negligible risk when looking at an individual exposure pathway. However, the majority of the target compounds in this assessment would only need to consider the inhalation pathway. Therefore, for volatile and inert compounds (e.g., acrolein, NO_2, PM_{10}, $PM_{2.5}$), an acceptable HQ value of 1.0 is appropriate.

The existing concentrations of the target compounds have HQ values that are considerably lower than the relevant targets of either 1.0 for volatile and inert compounds with the exception of acrolein, or 0.2 for semi-volatile compounds and metals. Emissions from existing sources at the Bruce nuclear site result in off-site HQ values for acrolein that range from 0.48 and 0.49 for seasonal users (AR2 and AR4); 2.4, 2.5 and 2.6 for local residents (AR1, AR2 and AR3); and 0.021 and 2.1 for Aboriginal community members (AR6 and AR5).

Acrolein is generated by combustion sources including vehicles, forest fires, and wood stoves. Acrolein's high vapour pressure indicates that it will occur primarily in the vapour phase, with an estimated atmospheric half-life ranging from 15 to 20 hours [C9]. Therefore, acrolein will dissipate from the atmosphere in a short timeframe and it is not likely to be transported over long distances (i.e., effect is limited to Local Study Area). Short-term exposures to low levels of acrolein can cause irritation of the eyes, throat and respiratory tract, tearing of the eyes, and coughing. These symptoms are reversible and will dissipate when exposure stops.

Although HQ values for acrolein were calculated to exceed 1.0, the maximum predicted concentrations are low compared to values measured across Canada and in Ontario. The maximum ambient air concentrations of acrolein ranged from 0.56 to 0.71 µg/m³ in Ontario from 1996 to 1998, and ranged from 0.05 to 2.47 µg/m³ in urban sites across Canada [C9]. Canadian exposures to acrolein are 2 to 20 times higher in indoor air as compared to outdoor air [C9] . The maximum 24-hour existing acrolein concentration of 0.33 µg/m³ (predicted at receptor AR6), is lower than the range of maximum ambient acrolein concentrations measured in Ontario and within the Canadian range. It is clear from the ambient air concentrations reported in Ontario and the analytical detection limit for acrolein in air samples of 0.11 µg/m³ that the new Ontario criteria of 0.08 µg/m³ cannot be met.

Table C2.3.1-2: Hazard Quotients for Existing Conditions

Contaminant	Local Residents			Members of Aboriginal Communities		Seasonal Users	
	AR1	AR2	AR3	AR5	AR6	AR2	AR4
Non-Cancer PAHs	1.2×10^{-4}	1.2×10^{-4}	1.3×10^{-4}	1.2×10^{-4}	2.5×10^{-5}	2.0×10^{-5}	2.0×10^{-5}
Acetaldehyde	2.4×10^{-2}	2.6×10^{-2}	2.9×10^{-2}	1.6×10^{-2}	3.8×10^{-4}	5.0×10^{-3}	5.3×10^{-3}
Acetone	9.6×10^{-6}	1.0×10^{-5}	1.1×10^{-5}	6.3×10^{-6}	1.9×10^{-6}	2.0×10^{-6}	2.1×10^{-6}
Acrolein	**2.4×10^{0}**	**2.5×10^{0}**	**2.6×10^{0}**	**2.1×10^{0}**	2.1×10^{-2}	4.8×10^{-1}	4.9×10^{-1}
Benzene	4.8×10^{-4}	5.1×10^{-4}	5.7×10^{-4}	3.1×10^{-4}	5.7×10^{-6}	9.8×10^{-5}	1.0×10^{-4}
Ethyl-benzene	2.5×10^{-6}	2.6×10^{-6}	2.9×10^{-6}	1.6×10^{-6}	4.2×10^{-7}	5.0×10^{-7}	5.3×10^{-7}
Formaldehyde	1.3×10^{-2}	1.4×10^{-2}	1.5×10^{-2}	8.5×10^{-3}	6.7×10^{-3}	2.6×10^{-3}	2.8×10^{-3}
Naphthalene	9.4×10^{-6}	8.0×10^{-6}	1.3×10^{-5}	6.4×10^{-6}	6.1×10^{-6}	1.5×10^{-6}	1.7×10^{-6}
NO_2	5.9×10^{-2}	6.0×10^{-2}	6.2×10^{-2}	5.2×10^{-2}	1.7×10^{-2}	1.2×10^{-2}	1.2×10^{-2}
$PM_{2.5}$	5.9×10^{-2}	5.8×10^{-2}	6.0×10^{-2}	5.8×10^{-2}	1.2×10^{-2}	1.1×10^{-2}	1.1×10^{-2}
PM_{10}	5.9×10^{-2}	6.0×10^{-2}	6.0×10^{-2}	5.8×10^{-2}	1.2×10^{-2}	1.1×10^{-2}	1.1×10^{-2}
SO_2	6.2×10^{-2}	5.6×10^{-2}	7.5×10^{-2}	4.9×10^{-2}	1.2×10^{-2}	1.1×10^{-2}	1.1×10^{-2}
Toluene	4.2×10^{-6}	4.4×10^{-6}	5.0×10^{-6}	2.7×10^{-6}	3.6×10^{-5}	8.5×10^{-7}	9.0×10^{-7}
Xylenes	1.7×10^{-4}	1.8×10^{-4}	2.0×10^{-4}	1.1×10^{-4}	3.3×10^{-6}	3.4×10^{-5}	3.6×10^{-5}
Aluminum	8.4×10^{-7}	8.4×10^{-7}	8.4×10^{-7}	8.4×10^{-7}	1.3×10^{-10}	7.6×10^{-8}	7.6×10^{-8}
Cadmium	1.4×10^{-3}	1.4×10^{-3}	1.4×10^{-3}	1.4×10^{-3}	1.1×10^{-7}	1.2×10^{-4}	1.2×10^{-4}
Chromium	1.3×10^{-5}	1.3×10^{-5}	1.3×10^{-5}	1.3×10^{-5}	2.0×10^{-9}	1.2×10^{-6}	1.2×10^{-6}
Lead	6.0×10^{-5}	6.0×10^{-5}	6.0×10^{-5}	6.0×10^{-5}	1.5×10^{-8}	5.5×10^{-6}	5.5×10^{-6}
Zinc	1.6×10^{-5}	1.6×10^{-5}	1.6×10^{-5}	1.6×10^{-5}	3.8×10^{-10}	1.3×10^{-6}	1.3×10^{-6}

C2.3.2 Noise Exposure Levels

Existing noise levels in the Local Study Areas are discussed in detail in the Atmospheric Environment TSD and summarized in Section 6.8 of the EIS. Noise monitoring was carried out at three points of reception, namely NR1, NR2 and NR3 (see Figure C2.3.1-1). These receptors correspond to R1, R2 and R3 in the Atmospheric Environment TSD.

The predicted noise levels at health receptors can be compared to the existing conditions and Health Canada criteria. Health Canada has published a draft national guideline for evaluating health impacts of noise [C4]. This guideline considers the following:

- characteristics of the noise level;
- construction noise impacts based on increased levels of annoyance in the population;
- operational noise impacts based on increased levels of annoyance in the population;
- impact on special land uses such as schools, hospitals and seniors' residences; and
- sleep disturbance impacts.

The Health Canada approach deals with increases in predicted noise levels over the existing conditions for the daytime and nighttime equivalent noise levels, as well as a whole day equivalent noise level descriptor (L_{eq24}). In addition, impulsive and tonal characteristics of source noise are accounted for because they can increase potential effects. The following two measures are included in the Health Canada document:

- the percentage of the exposed population that could be "highly annoyed" by increased noise levels caused by projects (%HA); and
- the specific impact, or impulse noise, indicator (HCII).

The methods for calculating %HA and HCII are described in Appendix J of the Atmospheric Environment TSD. Table C2.3.2-1 provides a summary of the predictions for the human health receptor locations for the existing %HA measure. Health Canada considers a change in %HA of 6.5% to have the potential for adverse effects on human health. Health effects for %HA relate exclusively to changes from the existing conditions.

Table C2.3.2-1: Existing Noise Levels at Human Health Receptors (%HA)

Receptor	Existing %HA
NR1 – Albert Road	1.5
NR2 – Baie du Doré	2.1
NR3 – Inverhuron Provincial Park	2.1

Table C2.3.2-2 provides a summary of the predictions for human receptors for the existing HCII measure. An HCII value in excess of 75 dBA is considered by Health Canada to have the potential for adverse effects on human health. Since none of the existing HCII values are greater than 75 dBA, they do not represent a health concern.

Table C2.3.2-2: Noise Level Predictions at Human Health Receptors (HCII)

Receptor	Existing HCII (dBA)
NR1 – Albert Road	47
NR2 – Baie du Doré	50
NR3 – Inverhuron Provincial Park	50

C2.3.3 Radiation Exposure Levels

Existing radiation levels in the Regional and Local Study Areas and doses to members of the public and workers are discussed in detail in the Radiation and Radioactivity TSD, summarized in Section 6.6 of the EIS and in the following sections below.

C2.3.3.1 Members of the Public

For the purpose of the radiological assessment, critical groups are used to estimate the maximum realistic impacts of emissions, where a critical group is "*a fairly homogeneous group of people whose location, habits, diet, etc., cause them to receive doses higher than the average received by typical people in all other groups in the exposed population.*" [C10]. Three types of potential critical groups were identified and their characteristics were defined [C11]. The three types of potential critical groups are: 1) non-farm resident, 2) farm resident, and 3) dairy farm resident. Eight candidate groups representing these types were defined for the purpose of estimating radiation doses to determine which group is the most highly exposed group (the critical group)[1]. A worker employed at the Bruce Eco-Industrial Park (formerly Bruce Energy Centre) was also identified representing another potential critical group. The characteristics of these groups are defined in Table C2.3.3-1 and the locations of these groups are shown on Figure C2.3.1-1. These candidate groups were defined on the basis of proximity to the sources of emissions at the Bruce nuclear site, and on the basis of lifestyle characteristics in order to ensure that the homogeneity criterion could be satisfied.

The doses for each candidate critical group are calculated for the radionuclides shown in Table C2.3.3-2, and for each of the following pathways shown in the same table [C12]. The highest dose among the nine potentially critical groups representing members of the public was Group BF14 (located to the southeast of the Bruce nuclear site), with the critical group individual dose during 2009 as 4 μSv/a to the adult. The estimated doses are considerably less than 1% of the regulatory limit of 1,000 μSv/a for members of the public. The values are also quite small compared to the variation in background radiation from natural sources. Also, it is noteworthy that the baseline dose is less than the *de minimis* dose level of 10 μSv/a recommended by the ACRP and the Advisory Committee on Nuclear Safety (ACNS) [C13] for the 18th consecutive

[1] Aboriginals are not identified as a specific candidate group in Bruce Power's REMP program. Their locations, traditional activities/lifestyle or traditional dietary habits mean they will not be exposed to a higher dose than those candidate groups identified here. This is supported by the results of the diet survey of Chippewas of Nawash First Nation (at Neyaashiinigmiing, ON, on Georgian Bay, approximately 80 km to the northeast of the Bruce nuclear site) as discussed in Section 5.7.3 of the Radiation and Radioactivity TSD.

year. The *de minimis* dose rate is based on a risk level that would generally be regarded as negligible in comparison to other, non-nuclear risks.

Table C2.3.3-1: General Characteristics of Potential Critical Groups

Group Name	General Characteristics and Location of Group
BR1	Non-farm resident, Lakeshore Scott Point, located north of the Bruce nuclear site
BR11	Non-farm resident, Inland Baie du Doré, located to the northeast of the Bruce nuclear site
BR32	Non-farm resident, Lakeshore Inverhuron Bay, south-southeast of Bruce B
BR22	Non-farm resident, Inland Northeast of Inverhuron, located to the south of the Bruce nuclear site
BR27	Non-farm resident, Trailer Park Northeast of Inverhuron, located to the south of the Bruce nuclear site
BF1	Agricultural, Non-dairy farm resident located to the northeast of the Bruce nuclear site
BF14	Agricultural, Non-dairy farm resident located to the southeast of the Bruce nuclear site
BDF11	Agricultural, Dairy farm resident located to the southeast of the Bruce nuclear site near Tiverton.
BEC	Worker in Bruce Energy Centre located to the east of the Bruce nuclear site

Source: [C14]

Table C2.3.3-2: Radionuclides and Pathways to Critical Groups

Parameter	Details
Radionuclides	• Tritiated water • Noble gases • Iodine • Particulates [a] • Carbon-14 • Organically bound tritium
Pathways	• Air inhalation/skin absorption • Air immersion (external exposure) • Water ingestion • Water immersion (via swimming or bathing) • Soil external exposure (soil ground shine) • Terrestrial plant ingestion • Terrestrial animal ingestion

Table C2.3.3-2: Radionuclides and Pathways to Critical Groups (continued)

Parameter	Details
Pathways (continued)	• Aquatic plant ingestion • Aquatic animal ingestion • Sediment external exposure (beach ground shine)

Note:
a Refers to the remaining group of particulates not otherwise identified in this table.
Source: [C12]

C2.3.3.2 Workers

The occupational doses received by Nuclear Energy Workers (NEWs) at the WWMF and other nuclear facilities on Bruce nuclear site are closely monitored by comprehensive personal dosimetry programs. Radiation doses to workers at the WWMF are monitored by OPG. Radiation doses to workers at Bruce A, Bruce B and the Central Maintenance and Laundry Facility (CMLF) are monitored by Bruce Power, which operates the facilities. Doses to workers at Douglas Point generating station are monitored by Atomic Energy of Canada Limited (AECL).

Under these programs, radiation doses from external gamma radiation, neutron radiation and from internal radioactivity (inhaled and transferred across the skin) are measured, recorded and reported.

For NEWs, at the WWMF the collective annual whole body doses were 6.52 person-mSv, and collective dose of 2.7 and 4.3 person-Sv at Bruce A and Bruce B, respectively during 2009. For non-NEWs, the current doses do not exceed 100 μSv/a, which represents 10% of the annual dose limit to general public.

C2.3.4 Surface Water Quality

Existing surface water quality in the Regional and Local Study Areas is discussed in the Hydrology and Surface Water Quality TSD and summarized in Section 6.3 of the EIS. Lake Huron is a source of drinking water for a number of the local communities. The communities of Kincardine and Southampton are supplied by two Water Supply Plants (WSPs) which obtain their water from Lake Huron. Water supply for the Bruce nuclear site is from the Domestic Water System operated by Bruce Power, which takes water from Lake Huron. In addition, there may be other residents that obtain their water supply directly from the lake (e.g., seasonal residences). There are no existing concerns with respect to surface water quality.

C2.3.5 Soil Quality

Local residents, recreational users and members of the Aboriginal communities would not have direct contact with soils on the DGR Project site, as site access would be restricted to workers and supervised visitors. Thus, the soil conditions within study areas are considered relevant to human health because of the potential for interactions via groundwater contamination and off-site migration. Workers at the DGR Project site during the site preparation and construction, and decommissioning phases of the DGR Project may be exposed to soils in the Project Area.

Therefore, the presence of contaminated soils within the Project Area is relevant to worker health. Soil quality within the former Bruce Heavy Water Plant (BHWP) area was evaluated through Phase I and Phase II Environmental Site Assessments (ESAs), which were conducted in 1998 [C15]. Several areas of metals, PHC, and PAH contamination in the vicinity of the Project Area (former BHWP) were identified. However, there are no locations of potential contamination identified in the DGR Project site. Existing soil quality is discussed further in the Geology TSD and summarized in Section 6.2 of the EIS.

C2.3.6 Groundwater Quality

Groundwater conditions beyond the Site Study Area, but within the Regional Study Area are considered relevant to human health because of the potential contact to local residents, seasonal users and members of the Aboriginal communities via drinking water, recreational usage, discharges to surface water and agricultural usage. There are a number of private drinking water wells in the Local Study Area. No existing concerns with groundwater quality in the Local Study Area have been identified.

Groundwater quality within and upgradient of the Project Area may be considered relevant to the health of workers because workers may be exposed to groundwater during excavation activities during the site preparation and construction and decommissioning phases of the DGR Project. Existing groundwater quality is discussed in detail in the Geology TSD and summarized in Section 6.2. The groundwater in the Project Area is typical of the overburden soils and carbonate mineralogy of the region [C16]. Some localized exceedances of drinking water criteria have been identified in the areas of potential contamination described in Section 5 of the Geology TSD. As noted, none of these areas are within the DGR Project site. Drinking water at the Bruce nuclear site is not obtained from groundwater.

C2.3.7 Foods

The calculated HQs/ILCRs presented in Section 2.3.1 are totals from all pathways (i.e., they consider ingestion of chemicals emitted by the DGR Project via home-grown vegetables). The ingestion rates considered in calculations are provided in Section 4.3 of the HHRA (Attachment 1). Exposure from consumption of fish and wild game is not included because changes in concentrations target compounds in fish and game from the DGR Project would not be measurable (as discussed in the Aquatic Environment and Terrestrial Environment TSDs).

In 2002, a Nawash FISHES Study [C17] was completed to determine the risk due to eating fish caught in Lake Huron that may have come into contact with the Bruce nuclear site. As part of this study, a dietary survey was completed for members of the Chippewas of Nawash First Nation. Of the 174 people interviewed, many reported eating fish, especially in the summer months when about 9 out of 10 people eat Lake Huron or Georgian Bay fish at least once. A few people eat fish two or three times per week, but most people eat fish once or twice a month. Lake whitefish is the most popular species and lake trout and rainbow trout are also widely eaten. Very low amounts of some radioactive chemicals, such as tritium, carbon-14, strontium-90 and cesium-137 were found in the fish sampled for this study. The levels were similar to those in fish caught far away from the Bruce nuclear site. The study concluded that there is no health risk from radioactive chemicals due to eating fish [C17].

C2.4 SOCIO-ECONOMIC DETERMINANTS

C2.4.1 Income

Income statistics in the Regional and Local Study Areas are discussed in detail in the Socio-economic Environment TSD and are summarized in Section 6.10 of the EIS.

In the most recent Census (2006), the average household income across the Local and Regional Study Areas was approximately $73,200, ranging from approximately $56,550 in Arran-Elderslie to approximately $89,900 in Saugeen Shores. The average household income in Kincardine was the second highest in the Local and Regional Study Areas at approximately $80,400.

Between 2001 and 2006, average household income increased in each municipality. Across the Local and Regional Study Area, this increase was 27%, or an average 5.4% per year. The strongest growth in average household income was found in Saugeen Shores (39%), while the lowest increase occurred in South Bruce (11%). Over the five-year period, the average household income in Kincardine increased by 33%, or 6.6% annually.

C2.4.2 Education

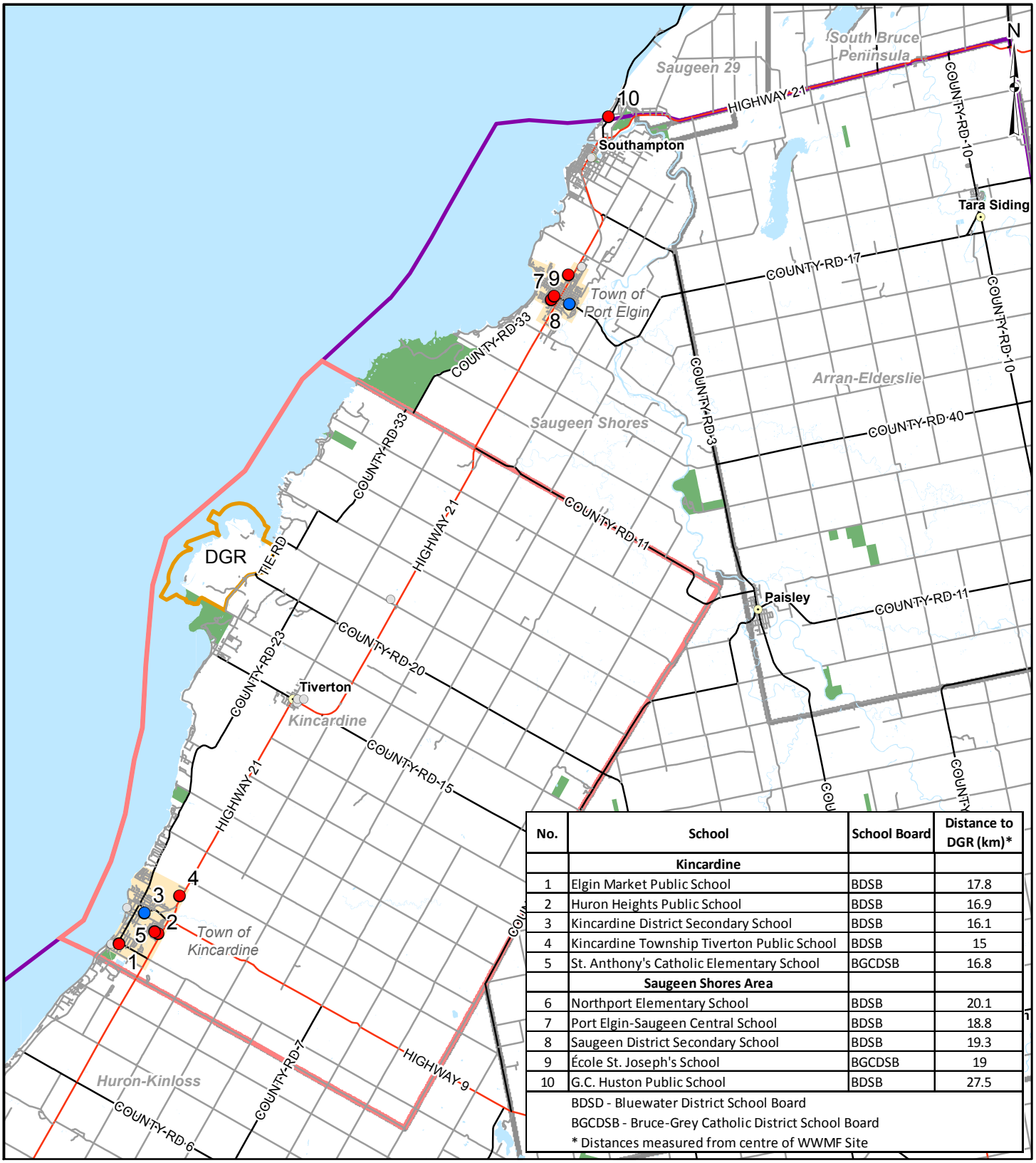
C2.4.2.1 Local Residents

Existing education services and facilities in the Regional and Local Study Areas are discussed in the Socio-economic Environment TSD and summarized in Section 6.10 of the EIS. The following paragraphs summarize existing education infrastructure and provide education levels within the South West LHIN based on 2006 Census data [C18].

The Local and Regional Study Areas are served by two school boards who provide services across Bruce and Grey Counties. The boards provide both elementary and secondary school services. Area schools in closest proximity to the Bruce nuclear site are located in Kincardine and Port Elgin (see Figure C2.4.2-1) with Kincardine Township Tiverton Public School in closest proximity to the Bruce nuclear site, at 15 km. Interviews with officials from the Grey-Bruce Catholic and Bluewater District School Boards indicate that there is adequate school capacity in the Local Study Area to accommodate population growth in the community.

Interviews with individual schools in the Local Study Area indicate that local schools play an important role in the community. School facilities (e.g., pools, sports fields, gyms) are used for co-curricular and extra-curricular activities including, outdoor education and first aid classes, night school, driver's education, blood donor clinics and community group meetings such as sports clubs and cadets.

As shown in Table C2.4.2-1, the 2006 census survey shows that approximately 85.5% of the population aged 25 to 29 within South West LHIN were high school graduates and 57.4% of the population aged 25 to 54 were post-secondary school graduates.



No.	School	School Board	Distance to DGR (km)*
	Kincardine		
1	Elgin Market Public School	BDSB	17.8
2	Huron Heights Public School	BDSB	16.9
3	Kincardine District Secondary School	BDSB	16.1
4	Kincardine Township Tiverton Public School	BDSB	15
5	St. Anthony's Catholic Elementary School	BGCDSB	16.8
	Saugeen Shores Area		
6	Northport Elementary School	BDSB	20.1
7	Port Elgin-Saugeen Central School	BDSB	18.8
8	Saugeen District Secondary School	BDSB	19.3
9	École St. Joseph's School	BGCDSB	19
10	G.C. Huston Public School	BDSB	27.5

BDSD - Bluewater District School Board
BGCDSB - Bruce-Grey Catholic District School Board
* Distances measured from centre of WWMF Site

LEGEND

- Site Study Area [1]
- Local Study Area
- Regional Study Area
- Municipal Boundary
- Park
- Community Centres and Arenas

Local Schools

- Elementary
- Secondary

NOTE

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.

REFERENCE

Base Data Provided by 4DM, November 2007.
Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

0 5 10
Kilometres

PROJECT
DGR PROJECT
ENVIRONMENTAL IMPACT STATEMENT

TITLE
COMMUNITY FACILITIES

Golder Associates
Mississauga, Ontario

PROJECT NO. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct 2007		
GIS	BC	22 Jun. 2010		
CHECK	RS	22 Jun. 2010		
REVIEW	MAR	22 Jun. 2010		

FIGURE C2.4.2-1

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Table C2.4.2-1: Level of Education

Metric	Value
High school graduates aged 25 to 29, proportion of population aged 25 to 29	85.5%
Post-secondary graduates aged 25 to 54, proportion of population aged 25 to 54	57.4%

Source: South West LHIN, Ontario [C18]

C2.4.2.2 Aboriginal Communities

The following paragraphs summarize the existing education services and available education level statistics for members of the Aboriginal communities, as discussed in Section 6.9 of the EIS and in the Aboriginal Interests TSD.

Chippewas of the Saugeen First Nation - Reserve No. 29

Elementary school-aged children are bussed to public school in Southampton and secondary school students are bussed to Port Elgin, both of which are part of the Bluewater District School Board. The School Board hired an Aboriginal Advisor in January of 2006. The Aboriginal Advisor supports the development of learning environments that engage Aboriginal learners; improves communication with students, parents and staff; helps parents support their children's learning; contributes to creating a welcoming and inclusive environment for parents; and supports the development of learning circles and alternative support programs [C19].

The Saugeen First Nation Education Department provides access to education opportunities and self-development for Saugeen First Nation members. The Education Department is located on the Saugeen Reserve [C20].

Of the total population 15 years and over, 40% do not hold a certificate, diploma, or degree from an educational institution. Eighteen percent (18%) have a high-school certificate or equivalent as the highest level of education completed, 12% have an apprenticeship or trades certificate or diploma, 24% have a college or other non-university certification, 4% have a university certificate or diploma below the bachelor level, and 2% have a university certificate, diploma or degree [C21].

First Nations Communities – Chippewas of Nawash Unceded First Nation – Cape Croker Reserve No. 27

Elementary school-aged children attend the Cape Croker Elementary School. High-school aged students are bussed to Wiarton and Lion's Head. In March 2009, the Government of Canada announced funding towards the building of a new school in the community, with support from Canada's Economic Action Plan. It is envisaged that the new school, which will replace the existing school, will include a new 2,350 m² facility, complete with play areas, soccer field, track, and basketball court. Once constructed, the new school will replace the current Cape Croker Elementary School, which provides Junior Kindergarten to Grade 8 education. The existing

school is located near MacGregors' Harbour and consists of the main building and two portables [C22].

Of the total population 15 years or older, 36% do not have a certificate, diploma or degree from an educational institution. Approximately 19% hold a high-school or equivalent diploma, 11% have an apprenticeship, trades certificate or diploma, 23% have a college or other non-university diploma, 2% hold a university certificate or diploma below the bachelor level, and 9% have a university certificate, diploma or degree [C21].

C2.4.3 Healthcare and Social Services

C2.4.3.1 Local Residents

The following paragraphs provide an overview of the healthcare and other social services in the Regional and Local Study Areas. These services are discussed in the Socio-economic Environment TSD.

Health Services

Residents in the Regional and Local Study Area are served by the Southwest LHIN, which includes 227 service providers. Services include Community Care Access Centres, community support services, hospitals, long term care homes, mental health services and addiction services.

Within the Southwest LHIN, the Regional and Local Study Area are served by two health bodies: Grey Bruce Health Services (GBHS) and South Bruce Grey Health Centre (SBGHC). Within the Regional Study Area, the SBGHC operates three hospitals, located in Walkerton, Chesley, and Kincardine. The GBHS network has one rural hospital located in Southampton (Regional Study Area).

Bruce County Emergency Medical Services (EMS) delivers emergency and pre-hospital care to the citizens of the Regional and Local Study Areas. The Bruce County EMS manages six stations with four stations situated in the Local and Regional Study Areas: one at Walkerton, one at Chesley, one at Kincardine and one at Port Elgin. The Bruce County EMS operates with a staff of 100 paramedics, a fleet of 12 ambulances and a supervisor unit.

Social Services

Social services are designed to assist families and individuals in the community to address social/family or individual needs such as unemployment, housing assistance and child care. These services play an important role in the community by helping to maintain personal well-being. Within the Local and Regional Study Areas private, not-for-profit and government providers supply many accessible social services. Social services available in Bruce County include long-term care facilities, social housing, affordable housing, child care services and the Ontario Works program.

C2.4.3.2 Aboriginal Communities

Existing health and social services in the Aboriginal communities are summarized below and in the Aboriginal Interests TSD.

Chippewas of Saugeen First Nation

Table C2.4.3-1 lists the services available to community members and their locations.

Table C2.4.3-1: List of Services On and Off-Reserve for the Chippewas of Saugeen First Nation

Service	Location
Band Administration	On-Reserve
Health Centre	On-Reserve
Police Department and Fire Centre	On-Reserve
School	Off-Reserve
Recreation Centre	On-Reserve
Heat/Hydro/Water Utility	On-Reserve
Garbage/Sewer Facility	Off-Reserve

Source: [C20]

Several community service centres can be found on the Saugeen Reserve. These include the G'Shawdagawin day care, the Kabaeashawim women's shelter, and an elder's facility [C23].

Chippewas of Nawash Unceded First Nation

Table C2.4.3-2 lists the services available to community members and their locations.

Table C2.4.3-2: List of Services On and Off-Reserve for the Chippewas of Nawash Unceded First Nation

Service	Location
Band Administration	On-Reserve
Health Centre	On-Reserve
Police Department and Fire Centre	On-Reserve
School	On-Reserve
Recreation Centre	On-Reserve
Heat/Hydro/Water Utility	On-Reserve
Garbage/Sewer Facility	On-Reserve

Source: [C20]

M'Wikwedong Native Cultural Resource Centre (Friendship Centre) – Owen Sound, Ontario

Supplementing programs and services provided within the Chippewas of Nawash and Chippewas of Saugeen communities is the M'Wikwedong Native Cultural Resource Centre (Friendship Centre) located in Owen Sound, Ontario. Some of the off-reserve programs and services operated by the Centre include:

- The Community Action Program for Children (CAP-C);
- Canada Prenatal Nutrition Program;
- AKWE:GO;
- Aboriginal Healing and Wellness Strategy;
- Life Long Care;
- UMAYC Youth FX Project; and
- Community access to high-speed Internet.

C2.4.4 Health Behaviours

Certain behaviours are considered to be detrimental to overall health and well-being. Poor dietary practices, lack of physical activity, smoking and frequent alcohol consumption are among these behaviours and are surveyed and reported on by Statistics Canada [C5]. Table C2.4.4-1 summarizes the health behaviour statistics for the Grey Bruce PHU and Ontario in general for 2008 and 2009 and for Aboriginal communities in Ontario in 2000/2001 and 2003. The statistical significance of the differences between the Grey Bruce PHU estimates and those from the province are also reported by Statistics Canada ($p<0.05$) [C5]. Statistics on the significance of the differences between the Aboriginal Population and provincial data and Grey Bruce PHU were not available.

The differences between dietary practices (5 or more servings daily of fruits/vegetables) and activity level (leisure-time physical activity and active or moderately active) in Grey Bruce PHU compared to the province as a whole were not statistically significant. The physical activity level in the Ontario Aboriginal population is comparable to that in Grey Bruce PHU and Ontario. Consumption of alcohol was greater in Grey Bruce PHU compared to Ontario. The estimates on alcohol consumption in the Aboriginal population could not be compared as they are measured differently than they are in Grey Bruce and Ontario.

Though the statistical significance of these results has not been determined, generally smaller percentage of the Aboriginal population in Ontario consume five or more servings of fruits/vegetables daily and larger percentage smoke daily or occasionally.

C2.4.5 Employment

Employment statistics for the Regional and Local Study Areas are discussed in the Socio-economic Environment and Aboriginal Interests TSDs and are summarized below.

C2.4.5.1 Local Residents

The Bruce nuclear site is the largest single employment centre in the Local Study Area. From 2001 to 2006, employment in Kincardine increased by 4.9%. Across the combined Local and Regional Study Areas, the increase in employment was 3.4% over this period. The highest increase in employment was in the Township of Huron-Kinloss, at 9.5%. In 2009, employment at the Bruce nuclear site included approximately 4,000 Bruce Power employees, 400 refurbishment contractors (Units 1 and 2), 183 OPG employees at the WWMF and 123 AECL employees.

It is expected that the place of residence for these employees will be similar to that of Bruce Power employees. Based on information from a 2005 analysis of worker residence locations, it is expected that most of the Bruce Power workforce (90%) resides within Bruce County. Within Bruce County, more than 75% of Bruce Power employees reside either in the Municipality of Kincardine or Saugeen Shores. The Municipality of Kincardine accounts for 40% of all Bruce Power employees and Saugeen Shores for 35% [C24].

C2.4.5.2 Members of Aboriginal Communities

The reported employment statistics relate to the market sectors in which SON members are employed. In the Saugeen First Nation Community, 25% of the working population is employed in sales and service occupations; 23% in trades or in the transport and equipment operator occupations; and 14% in social science, education, government service, or religious occupations [C21]. In the Nawash First Nation Community, a total of 16% of the workforce is employed in health care and social services, 14% in business services, 12% in agriculture and other resource-based industries, 8% in construction, 7% in education, 5% in retail, and the remaining 38% in other services [C21]. The SON lake whitefish fishery represents a source of livelihood for many community members. The traditional fishing waters of the SON represent approximately 10,600 km² in surface area and cover the eastern main basin of Lake Huron extending to the Canada-United States border and the western half of Georgian Bay [C25].

Table C2.4.4-1: Health Behaviour Statistics

	Ontario		Grey Bruce PHU		Difference[a]	Ontario Aboriginal Population	
	2008	2009	2008	2009		2000/2001	2003
Dietary Practices (5 or more servings daily of fruits/vegetables) (%)	40.5	44.1	43.6	43.5	↔	36	36.4
Leisure-time physical activity Active or moderately active (%)	49.5	50.7	55.3	52.6	↔	48.9	52.5
Smoke daily or occasionally (age 12+ years) (%)	19.8	18.6	18.8	18.1	↔	55.3	39.5
Heavy drinking (%)	15.5	15.6	21.2	18.4	↑	n/a	n/a
Heavy drinking (5 or more drinks on one occasion, less than 12 times a year) (%)	n/a	n/a	n/a	n/a	n/a	28.7	33.4
Heavy drinking (5 or more drinks on one occasion, 12 or more times a year) (%)	n/a	n/a	n/a	n/a	n/a	30.6	22.1

Notes:
a Difference is indicated using symbols as follows: ↑ statistically significant increase, ↓ statistically significant decrease, ↔ change not statistically significant, does not compare Aboriginal population results.
n/a Data not available
Source: [C5; C26]

C2.5 CULTURAL DETERMINANTS

Cultural determinants relevant to the overall health and well-being of local residents, members of the Aboriginal communities and seasonal users are discussed as follows. The Socio-economic Environment TSD and the Aboriginal Interests TSD provide detailed descriptions of the cultural and heritage resources of importance to Euro-Canadian and Aboriginal people.

C2.5.1 Euro-Canadian Cultural Resources

Four culturally-sensitive areas (A, B, C and D, shown on Figure C2.5.1-1) are identified within the Bruce nuclear site. For the purposes of this assessment, a culturally-sensitive area is one that is known to contain a Euro-Canadian archaeological site or within which there is potential for one to be encountered as a result of ground disturbance.

C2.5.2 Aboriginal Heritage Resources

C2.5.2.1 Aboriginal Heritage Sites

There are sixteen registered archaeological sites either on or within 7.5 km of the Bruce nuclear site, most of which are located on or in the immediate vicinity of the Inverhuron Provincial Park [C27]. The scarcity of identified archaeological sites within the Bruce nuclear site is in contrast to the high density of registered and unregistered sites of Aboriginal people's habitation, resource-procurement, ritual and burial below the Lake Algonquin shoreline and along the shore of Inverhuron Bay and Little Sauble River. There are two registered archaeological sites within the confines of the Bruce nuclear site: Upper Mackenzie and Dickie Lake [C28].

The Upper Mackenzie site is located just inside the south entrance to the Bruce nuclear site on the north side of the South Access Road (within area A on Figure C2.5.1-1). In 1961, the site was damaged during the construction of the South Access Road into the Bruce nuclear site. Bulldozing had disturbed an area of about one acre on the north side of the road, exposing at least two cultural features.

The Dickie Lake site, which dates from the Late Archaic (1000 to 800 BC) or Early Woodland (800 to 300 BC) [C27], is located along the Nipissing Great Lakes shore complex (within area A on Figure C2.5.1-1). Investigations at the site in the 1950s and 1960s found two wind-exposed human burials and an abundance of crude cobble tools, but found little evidence of habitation or related activities. The Dickie Lake site is now referred to as Jiibegmegoong (Spirit Place). The Jiibegmegoong site is located approximately 3 km from Bruce A and 1 km from Bruce B, the WWMF and the road leading to the main gate. The human remains removed from Jiibegmegoong were reinterred in 1998 [C27]. Both Chippewas of Nawash and Chippewas of Saugeen have requested and have received approval to access the Bruce nuclear site to conduct ceremonies or monitoring at the Jiibegmegoong burial ground. The condition of the Jiibegmegoong site was examined in 2007. The on-going erosion at the site did not appear to be appreciable from the last observation [C27].

C2.5.2.2 Traditional Use of Land and Resources

The information available regarding the traditional use of land and resources by individual First Nation in the study areas is limited. The Chippewas of Saugeen First Nation assert their jurisdiction over the waters around the Saugeen/Bruce Peninsula in their entirety, which includes the fisheries, lands and minerals, above and below the waters, including the lake bed, as per the 1995 Duluth Declaration [C29]. The Chippewas of Nawash Unceded First Nation describes its traditional territory as the waters and fisheries that surround their traditional lands [C30]. The Chippewas of Nawash Unceded First Nation have stated that during the fur trade, hunting and trapping was an important resource-based activity. It continues to be an essential part of their identity and culture. Animals traditionally hunted were deer, beaver, rabbit, groundhog, porcupine, raccoon, muskrat, partridges and wild turkey, and furs were sold in Owen Sound [C31].

The traditional fishing waters of the SON represent approximately 10,600 km² in surface area and cover the eastern main basin of Lake Huron extending to the Canada-United States border and the western half of Georgian Bay [C25]. The SON lake whitefish fishery represents a source of livelihood for many community members. Representatives of the Chippewas of Nawash First Nation have previously expressed concern about the monitoring of lake whitefish in Lake Huron as part of the overall Bruce Nuclear environmental monitoring program because of the importance of this species to the First Nations lifestyle and economy.

C2.6 EMOTIONAL DETERMINANTS

The emotional determinants were based on the perception of health and safety in the Local and Regional Study Areas.

The Socio-economic Environment TSD provides a description of the perception of health and safety in the Local and Regional Study Areas. Section 6.10 of the EIS provides a brief overview of the findings. These perceptions were derived from community attitude surveys described in the Socio-economic Environment TSD under the general heading of community cohesion.

Community cohesion refers to a person's sense of belonging to a self-defined community. A cohesive community maintains and generates relationships and community pride, it also helps in defining a common vision among its residents that serves to maintain and enhance overall community health and well-being. The main factor contributing to the cohesiveness of a community relevant to the human health assessment is overall satisfaction with living in the community. The Socio-economic Environment TSD, and Section 6.10 of the EIS provide a summary of the results of the public attitude research, community leader, stakeholder and neighbouring property owner surveys conducted for the DGR Project. These results indicate that overall, residents of the Local and Regional Study Areas are satisfied with living in their communities.

To date, no specific surveys are available characterizing the perception of health and safety for the members of Aboriginal communities within the Regional Study Area.

LEGEND

- Culturally Sensitive Area
- Project Area (OPG-retained lands that encompass the DGR Project)
- Site Study Area [1]

NOTE

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.

REFERENCE

Base Data Provided by 4DM, November 2007.
Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

0 0.5 1 2
Kilometres

PROJECT
DGR PROJECT
ENVIRONMENTAL IMPACT STATEMENT

TITLE
CULTURALLY SENSITIVE AREAS IN THE SITE STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT NO. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct. 2007		
GIS	BC	23 Jun. 2010		
CHECK	RS	23 Jun. 2010		
REVIEW	MAR	23 Jun. 2010		

FIGURE C2.5.1-1

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C2.7 OVERALL HEALTH

As previously discussed, the linkage between general well-being and human health is evident from the WHO definition of health, advocated by Health Canada. Health is defined as "a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity". Health encompasses social, economic, cultural and psychological well-being and includes the ability to adapt to daily stresses and change [C2;C3].

The discussion of general well-being and human health incorporates health indicators consistent with those established by the CIHI for the Health Indicator Framework. For the purpose of describing health and well-being, the following factors are considered:

- well-being;
- health conditions;
- human function; and
- life expectancy.

The overall health of local residents and members of Aboriginal communities are described in the next four sections, where data are available. There is no evidence to suggest that existing health conditions would be different for Aboriginal communities than the Region as a whole, in those cases when specific data are unavailable.

A seasonal user may reside in the Regional or Local Study Area for only part of the year. Thus, his or her overall health would also be dependent of the physical, socio-economic, cultural and emotional factors of the other community in which they spend the remainder of the year. For the purpose of this assessment, it is assumed that the existing overall health of seasonal users is consistent with that of the local resident.

C2.7.1 Well-being

Sense of well-being can be indicated by self-rated (physical) health and self-rated mental health. Self-reported health is an indicator of overall health status. It can reflect aspects of health not captured in other measures, including incipient disease, disease severity, aspects of positive health status, physiological and psychological reserves and social and mental function. Self-reported mental health provides a general indication of the population suffering from some form of mental disorder, mental of emotional problems, or distress, not necessarily reflected in self-reported (physical) health. Table C2.7.1-1 below provides a summary of the indicators chosen to reflect the self-rated health and well-being of individuals in the community.

Table C2.7.1-1: Well-being

	Ontario		Grey Bruce PHU		Difference[a]	Ontario Aboriginal Population	
	2008	2009	2008	2009		2000/ 2001	2003
Perceived health, very good or excellent (%)	59.3	61.2	61.8	61.7	↔	48.7	43.8
Perceived mental health, very good or excellent (%)	74.7	74	72.2	74.4	↔	n/a	n/a

Notes:
a Difference is indicated using symbols as follows: ↑ statistically significant increase, ↓ statistically significant decrease, ↔ change not statistically significant, does not compare Aboriginal population results
n/a Data not available
Source: [C5;C26]

The statistical significance of the differences between the Grey Bruce PHU estimates and those from the province are also reported by Statistics Canada ($p<0.05$) [C5]. Statistics on the significance of the differences between the Aboriginal Population and provincial data and Grey Bruce PHU were not available.

There was no statistical difference ($p>0.05$) between the Grey Bruce PHU and the Ontario population. In general, a lower percentage of the Ontario Aboriginal population perceived their health as very good or excellent compared to individuals in the Grey Bruce PHU and Ontario.

C2.7.2 Health Conditions

Health conditions can be indicated by body mass index (BMI), occurrence of arthritis/rheumatism, diabetes, asthma, high blood pressure, and injury hospitalization. BMI is a method of classifying body weight according to health risk. Occurrence of diseases and conditions give an overview of the general health of the community. The injury hospitalization indicator contributes to an understanding of the adequacy and effectiveness of injury prevention efforts, including public education, product development and use, community and road design, and prevention and treatment resources. The Statistics Canada data for the Southwest LHIN for 2007 and 2008 is presented in Table C2.7.2-1.

Table C2.7.2-1: Health Conditions

	Ontario		Grey Bruce PHU		Difference[a]	Ontario Aboriginal Population	
	2008	2009	2008	2009		2000/ 2001	2003
Overweight - males 18 years and over (%)	40.8	40.1	44.1	34.4	↔	37.2	47.5
Obese - males 18 years and over (%)	18.5	18.6	23.2	26.9	↔	22.1	25.8
Overweight - females 18 years and over (%)	28.2	27.8	34.7	31.7	↔	26.9	37
Obese - females 18 years and over (%)	15.6	16.3	24.1	20.5	↑	30.8	27
Arthritis (%)	16.9	16.8	25.3	21	↑	21.6	23.2
Diabetes (%)	6.2	6.4	5.3	9.2	↔	7.1	5.4
Asthma - males 12 years and over (%)	7.2	6.8	7.9	8.8	↔	11.6	13.4
Asthma - females 12 years and over (%)	9.4	9.6	11	8.1	↔	20.5	21
High blood pressure (%)	16.6	17.2	20.7	19	↑	11	13.2
Injury hospitalization (age-standardized rate/100,000)[b]	431	420	611	697	↑	n/a	n/a

Notes:
a Difference is indicated using symbols as follows: ↑ statistically significant increase, ↓ statistically significant decrease, ↔ change not statistically significant, does not compare Aboriginal population results.
b Years 2007 and 2008
n/a Data not available
Source: [C5;C7;C26]

Data were obtained from Statistics Canada [C5] with the exception of those on injury hospitalization, which were obtained from Canadian Institute for Health Information [C7]. The statistical significance of the differences between the Grey Bruce PHU estimates and those from the province are also reported by Statistics Canada ($p<0.05$) and have been presented here where available [C5]. Statistics on the significance of the differences between the Aboriginal Population and provincial data and Grey Bruce PHU were not available.

C2.7.3 Human Function

Human function can be characterized through participation and activity limitation, and disability free expectancy (see Table C2.7.3-1). Participation and activity limitation is indicative of chronic health problems or decline in physical or mental condition that limits participation in home, school, work and other activities. Disability-free expectancy is a more comprehensive indicator

than that of life expectancy because it introduces the concept of quality of life. It is used to distinguish between years of life free from any activity limitation and years experienced with at least one activity limitation. The emphasis is not exclusively on the length of life, as is the case for life expectancy, but also on the quality of life.

Table C2.7.3-1: Human Function

	Ontario		Grey Bruce PHU		Difference[a]	Ontario Aboriginal Population	
	2007	2008	2007	2008		2000/ 2001	2003
Participation and activity limitation (%)	33.2	29.6	37	28.5	↔	44.1	46
Disability-free life expectancy (years)[b]	68	n/a	67.2	n/a	↔	n/a	n/a

Notes:
a Difference is indicated using symbols as follows: ↑ statistically significant increase, ↓ statistically significant decrease, ↔ change not statistically significant, does not compare Aboriginal population results
b Based on the 1996 Census
n/a Data not available
Source: [C5;C32;C26]

The statistical significance of the differences between the Grey Bruce PHU estimates and those from the province are also reported by Statistics Canada ($p<0.05$) [C5]. Statistics on the significance of the differences between the Aboriginal Population and provincial data and Grey Bruce PHU were not available. Disability-free life expectancy was not available for the Ontario Aboriginal population.

There was no statistical difference ($p>0.05$) between the Grey Bruce PHU and the Ontario population. In general, the Ontario Aboriginal population had a higher percentage of individuals who had participation and activity limitation when compared to individuals in the Grey Bruce PHU and in Ontario.

C2.7.4 Life Expectancy

Health status through death can be indicated through infant mortality rates and life expectancy. Infant mortality is a long-established measure, not only of child health, but also of societal well-being (see Table C2.7.4-1). It reflects the level of mortality, health status and health care of a population and the effectiveness of preventative care and the attention paid to maternal and child health. Life expectancy measures the quantity of life rather than the quality of life.

Table C2.7.4-1: Life Expectancy

	Ontario		Grey Bruce PHU		Difference[a]	Ontario Aboriginal Population	
	1997	2001	1997	2001		2000/ 2001	2003
Infant mortality (rate per 1,000 total births)	5.3[b]	5.1[c]	6.8[b]	5.3[c]	↔	n/a	n/a
Life expectancy - males (years)	76.2	77.4	75.6	76.2	↓	n/a	n/a
Life expectancy - female (years)	81.4	82	81.2	81	↓	n/a	n/a

Notes:
a Difference is indicated using symbols as follows: ↑ statistically significant increase, ↓ statistically significant decrease, ↔ change not statistically significant, does not compare Aboriginal population results
b The infant mortality data is not based on data from 1997 and 2001. It is based on a three year average of data from 2000 to 2002
c The infant mortality data is not based on data from 1997 and 2001. It is based on a three year average of data from 2005 to 2007
n/a Data not available
Source: [C26;C33;C34]

The statistical significance of the differences between the Grey Bruce PHU estimates and those from the province are also reported by Statistics Canada ($p<0.05$) [C5]. Information regarding Ontario Aboriginal population infant mortality rates or life expectancy was unavailable from Statistics Canada.

The infant mortality rates are the three year average from 2000 to 2002 and 2005 to 2007. There was no statistical difference ($p>0.05$) between the Grey Bruce PHU and the Ontario infant mortality rates. The life expectancy for individuals in the Grey Bruce PHU was significantly lower ($p<0.05$) than those in Ontario.

C2.7.5 Cancer Incidence

When there are problems with the genetic material of a normal healthy cell, they become cancer cells. Cancer cells keep dividing and growing without any control, losing the normal function of the tissue or organ. After these cancer calls invade other tissues and spread to other locations in the body causing problems with normal bodily function. Cancer incidence rates can be an indicator of the overall health in a community, as cancers are associated with lifestyle and environmental exposures as well as hereditary factors. Given the radiological nature of the DGR Project and the association of certain cancers with radiological exposures, existing cancer incidence statistics warrant consideration in this assessment.

C2.7.5.1 Non – Aboriginal Population

Cancer incidence rates specific to the Regional Study Area were not available. However, data was available for Ontario, the South West LHIN and Grey Bruce PHU and have been presented below in Table C2.7.5-1.

Table C2.7.5-1: Cancer Incidence Rates in the General Population

	Ontario			South West LHIN			Grey Bruce PHU		
	2001	2002	2003	2001	2002	2003	2001	2002	2003
All invasive primary cancer sites (including in situ bladder), both sexes	398	393	391.5	419.7	415.2	409.7	403.6	395.5	385.6
Colon, rectum and rectosigmoid junction cancer, both sexes	50.9	49.2	48.3	55.6	53.6	51.8	52.7	50.0	50.0
Bronchus and lung cancer, both sexes	52.7	50.4	48.9	53	50.6	49	49.9	48.8	46.0
Female breast cancer, females	100.5	99.1	98.6	102.2	103	102.4	94.2	96.1	—
Prostate cancer, males	134.2	131.2	128.4	149.3	148.3	141.8	158.3	150.9	—

Notes:
Rates are based on a three-year average. The 2001 and 2002 data are based on the July 2005 Canadian Cancer Registry (CCR) file, whereas the 2003 data are based on the June 2007 CCR file.
Data presented as age-standardized rate per 100,000 population.
Source: [C35;C5]

The statistical significance of the differences between the South West LHIN and Ontario was not available. With exception of prostate cancer, cancer incidence rates in the South West LHIN and Grey Bruce are within 10% of Ontario incidence rates for the same type of cancer. As such, the South West LHIN and Grey Bruce PHU cancer incidence rates are considered to be comparable to Ontario rates due to many confounding factors that require consideration including lifestyle (smoking, alcohol consumption, obesity, etc.), genetic predisposition, access to medical care, and education. Also, while incidence rates appear to fluctuate, there are no apparent increasing trends for all types of cancers including prostate cancers.

C2.7.5.2 Aboriginal Population

Cancer incidence rates for First Nations and the statistical significance of differences between these rates and those of Ontario in general are presented below in Table C2.7.5-2 [C8]. In general, cancer incidence rates are lower in First Nations communities compared to the general population; however, colorectal and lung cancer rates are reportedly increasing.

Table C2.7.5-2: Cancer Incidence Rates in First Nations in Canada

Cancer	Ontario	First Nations	Difference[a]
Males			
Colorectum cancer	55	65	↔
Prostate cancer	119	61	↓
Lung cancer	63	57	↔
Kidney cancer	15	20	↔
Lymphoma	22	15	↔
Females			
Breast cancer	114	65	↓
Lung cancer	41	36	↔
Colorectum	37	35	↔
Lymphoma	19	10	↔
Cervical cancer	9	11	↔

Notes:
a Statistical significance of the differences are indicated using symbols as follows: ↑ statistically significant increase, ↓ statistically significant decrease, ↔ change not statistically significant.
Age-standardized rate/100,000 based on the 1991 Canadian population ages 15-74.
Based on data from 1997-2001.
Source: [C8]

C2.8 HEALTH OF WORKERS

Planned construction techniques for the DGR Project will require standard engineering trades, management and support as well as specialized labour. It is anticipated that the construction workforce will largely be sourced from outside the Local and Regional Study Area. This expectation seems justified as the skills and expertise, particularly when it comes to underground work, do not likely exist in the Local or Regional Study Areas where mining is not a major industrial activity. It is anticipated that during the construction and decommissioning phases of the DGR Project, the workforce will be predominately sourced from the Local and Regional Study Areas. Thus, the reported health statistics presented in Section C2.7 would be representative of the workers at the DGR Project site.

Rates of injury or illness related to workplace exposures or accidents are also relevant to the health of workers. Historical safety performance for the WWMF is reported by the Maximum Reasonable Potential for Harm (MRPH) rating, the number of injuries and type, the All Injury Rate (AIR) and the Accident Severity Rate (ASR).

Table C2.8-1 shows the number of incidents by MRPH rating. A high MRPH rating incident is one where death or permanent or temporary disability occurs or has the potential to occur. Table C2.8-2 shows the number of type of injuries at the WWMF by year.

Table C2.8-1: Incidents at the WWMF by MRPH Rating

	2003	2004	2005	2006	2007	2008	2009	2010 Q2	Total
High	1	—	—	—	1	1	2	1	5
Medium	4	—	3	3	3	6	2	0	21
Low	14	16	21	20	19	34	28	8	160
Total	19	16	24	23	23	41	32	8	186

Note: — Data not available.

Table C2.8-2: Incidents at WWMF by Number of Injuries and the Type of Injury

	2003	2004	2005	2006	2007	2008	2009	2010 Q2	Total
First Aid	4	5	6	5	3	3	10	3	39
Lost Time Injury	—	—	—	1	—	—	1	0	2
Medical Treatment	2	2	4	1	—	2	6	0	17
No Attention	1	1	4	7	11	18	7	1	50
No Injury	12	8	10	9	9	18	8	4	78
Total	19	16	24	23	23	41	32	8	186

Note:
— Data not available.

The AIR measures the number of injuries involving OPG employees that resulted in lost time or required medical treatment.

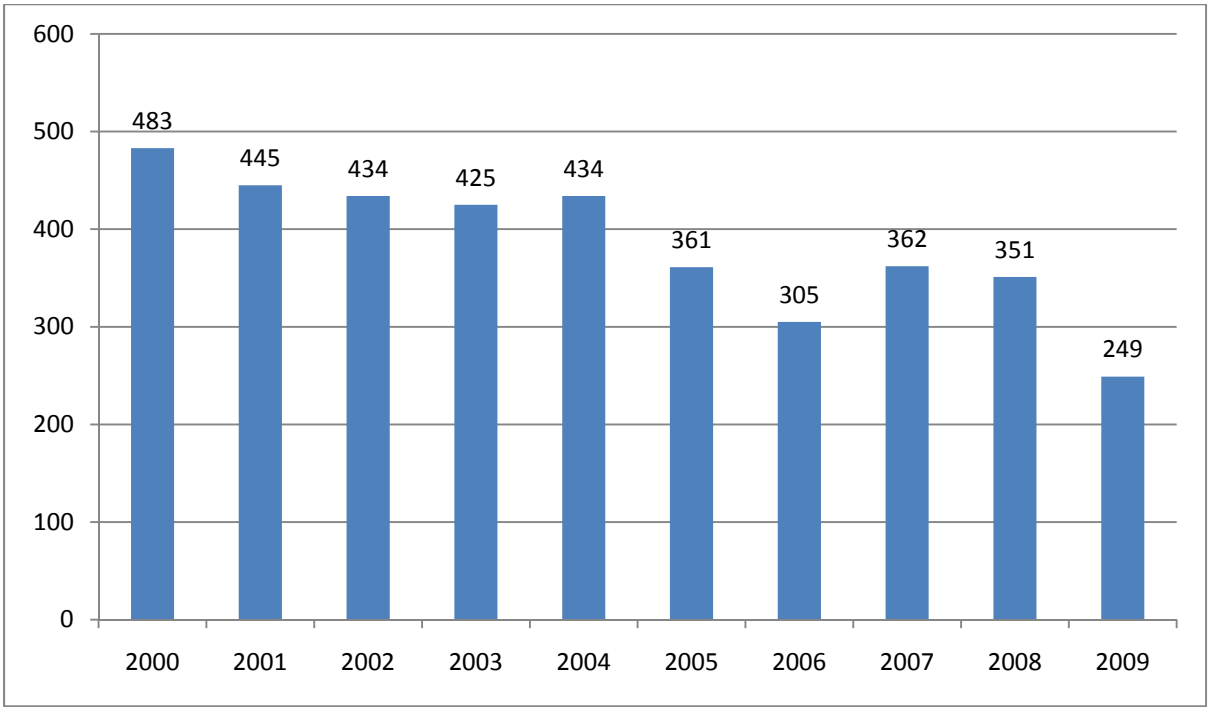
$$AIR = \#\frac{Lost\ Time\ Incidents + \#\ Incident\ Requiring\ Medical\ Treatment\ \times 200{,}000\ employees}{Exposure\ Hours}$$

The ASR is a measure of the number of days lost as a result of injuries to OPG employees (i.e., number of calendar days lost per 200,000 hours worked). Table C2.8-3 presents the annual AIRs and ASRs from 2005 to the second quarter of 2010.

Activities during the site preparation and construction phase of the DGR Project can be represented by those common in the mining sector. Accordingly, as a reference, Figure C2.8-1 presents the lost time injury or illness claims for the mining sector for the years from 2000 to 2009.

Table C2.8-3: Annual AIRs and ASRs

	2005		2006		2007		2008		2009		Q2 2010	
	Target	**Actual**	**Target**	**Actual**	**Target**	**Actual**	**Target**	**Actual**	**Target**	**Actual**	**Target**	**Actual**
AIR	1.5	1.38	1.5	0.9	≤1.5	0.0	≤1.5	0.7	≤1.3	2.85	1.28	0
ASR	≤2.3	0.0	≤2.3	18.97	≤2.2	0.0	≤2.2	0.0	≤2.2	4.47	≤4.5	0



Source: [C36]]

Figure C2.8-1: Number of Lost Time Claims for Mining Sector (2000 to 2009)

C3. IDENTIFICATION AND ASSESSMENT OF ENVIRONMENTAL EFFECTS

The assessment of effects predicts and describes the likely environmental effects, mitigation measures and residual adverse effects on the human health VECs that could reasonably be expected as a result of the DGR Project.

C3.1 ASSESSMENT METHODS

Effects on the overall health VECs are predicted by considering potential effects of the DGR Project on each of the determinants. Therefore, predictions for each of the determinants are presented first, followed by the VECS. Consistent with accepted EA practice, quantitative and qualitative methods, including professional expertise and judgement, are used to predict and describe the DGR Project-specific effects to allow for a detailed assessment.

If a likely environmental effect is identified, the effect is assessed as either beneficial or adverse. Any adverse effects on VECs attributable to the DGR Project are advanced for consideration of possible mitigation measures. Beneficial effects, if any, are also identified during this step but are not considered further in this assessment.

If the assessment indicates that an adverse effect on one of the human health VECs is likely as a result of the DGR Project, technically and economically feasible mitigation measures are proposed to control, reduce, or eliminate the identified effect.

For non-radiological hazards, control measures to avoid the potential hazards or mitigate the impact from these hazards are developed and recommendations for implementing the controls are made, where required. Many of the hazards and control measures identified apply to more than one activity. Therefore, to ensure that these hazards and controls are considered collectively and not in isolation or without context, the approach is to group the common hazards for the activities being considered and then identify the essential control elements that ought to be included in an overall hazard control program for the major DGR Project phase. The Conventional Safety Assessment Report provides additional information on how appropriate mitigation measures were identified for each hazard.

Once mitigation measures are considered, the likely adverse effect is re-evaluated with the mitigation measures in place to identify any residual adverse effects. Any identified residual adverse effects are advanced to Section C4 for an assessment of significance.

C3.2 EFFECTS ON PHYSICAL ENVIRONMENT DETERMINANTS

C3.2.1 Changes in Air Quality

The effects of changes in concentrations in environmental media on human health as a result of the DGR Project are evaluated using human exposure modelling described in detail in Attachment 1. Adverse effects are considered to be likely if the estimated hazard quotients (HQs) or incremental lifetime cancer risks (ILCRs) of the target compounds are higher for the DGR Project phases than for the existing conditions.

Air modelling results were used to calculate a hazard quotient (HQ), which is a measure of the dose a person may take into his or her body relative to a chemical-specific health-based benchmark (or toxicity reference value) for each of the receptors. The resulting HQ values are compared to a health-based acceptable limit (an HQ of 1 is acceptable when all pathways are considered). A typical target value of 0.2 would be considered acceptable when looking at an individual exposure pathway. However, for the majority of the target compounds, where exposure would only be by air, only the inhalation pathway would need to be considered. Therefore, for volatile and inert compounds (e.g., acrolein, NO_2, PM_{10}, $PM_{2.5}$), an acceptable HQ value of 1.0 is appropriate.

In addition, the incremental lifetime cancer risk (ILCR) is calculated for each of the target compounds. The resulting ILCR values are compared to a target incremental occurrence of one in a million (an ILCR of 1×10^{-6}).

The effects of changes in air quality on human health were evaluated based on quantitative exposure modelling at six receptor locations, discussed in Section C2.3.1 and shown on Figure C2.3.1-1.

The incremental lifetime cancer risk (ILCR) during the site preparation and construction phase was calculated using dispersion model predictions from the Atmospheric Environment TSD and HHRA methods presented in Attachment 1. The resulting ILCR values (see Table C3.2.1-1) are well below (i.e., several orders of magnitude) the target risk value of one in a million (an ILCR of 1×10^{-6}) for all of the receptor groups.

Table C3.2.1-1: ILCR Values During Site Preparation and Construction Phase

Receptor	Cancer PAHs	Acetaldehyde	Benzene	Formaldehyde
Local Resident				
AR1	3.6×10^{-8}	1.3×10^{-8}	1.1×10^{-8}	1.9×10^{-8}
AR2	3.6×10^{-8}	1.6×10^{-8}	1.3×10^{-8}	2.3×10^{-8}
AR3	3.6×10^{-8}	8.3×10^{-9}	7.1×10^{-9}	1.2×10^{-8}
Members of Aboriginal Communities				
AR5	3.6×10^{-8}	6.1×10^{-9}	5.2×10^{-9}	8.9×10^{-9}
AR6	—	—	—	—
Seasonal User				
AR2	7.9×10^{-10}	1.7×10^{-9}	1.5×10^{-9}	2.5×10^{-9}
AR4	7.9×10^{-10}	1.8×10^{-9}	1.5×10^{-9}	2.5×10^{-9}

Note:
— Not applicable. AR6 is located at the Jiibegmegoong burial ground. Aboriginal visitors at this location would be exposed to compounds for short, intermittent durations. Thus, a carcinogenic evaluation that is based on chronic exposure is not relevant to this receptor location.

In a similar manner, the incremental lifetime cancer risk (ILCR) during the operations phase was calculated. The resulting ILCR values (see Table C3.2.1-2) are also well below the target risk value of one in a million (an ILCR of 1×10^{-6}) for all of the receptor groups.

Table C3.2.1-2: ILCR Values During Operations Phase

Receptor	Cancer PAHs	Acetaldehyde	Benzene	Formaldehyde
Local Residents				
AR1	1.7×10^{-8}	1.2×10^{-8}	1.0×10^{-8}	1.7×10^{-8}
AR2	1.7×10^{-8}	1.4×10^{-8}	1.2×10^{-8}	2.0×10^{-8}
AR3	1.7×10^{-8}	8.5×10^{-9}	7.2×10^{-9}	1.2×10^{-8}
Members of Aboriginal Communities				
AR5	1.7×10^{-8}	5.7×10^{-9}	4.8×10^{-9}	8.3×10^{-9}
AR6	—	—	—	—
Seasonal Users				
AR2	5.0×10^{-10}	5.9×10^{-9}	5.1×10^{-9}	8.6×10^{-9}
AR4	5.0×10^{-10}	5.1×10^{-9}	4.4×10^{-9}	7.5×10^{-9}

Note:
— Not applicable. AR6 is located at the Jiibegmegoong burial ground. Aboriginal visitors at this location would be exposed to compounds for short, intermittent durations. Thus, a carcinogenic evaluation that is based on chronic exposure is not relevant to this receptor location.

The HQ values were calculated for both the site preparation and construction (see Table C3.2.1-3) and operations phase (see Table C3.2.1-4) using dispersion modelling results from the Atmospheric TSD and HHRA methods presented in Attachment 1. Only one of the target compounds (acrolein) had an HQ value in excess of the desired target (i.e., 1.0) for the local residents and members of the Aboriginal community. All of the remaining target compounds had HQ values that were considerably lower than the relevant targets of either 1.0 for volatile and inert compounds, or 0.2 for semi-volatile compounds and metals, at identified receptor locations.

Acrolein exposures are driven by existing concentrations (see Table C2.3.1-2). During the site preparation and construction phase, HQ values increased for all three of the local resident receptors and one of the Aboriginal community receptors (AR-5). The increases in HQ values at these receptors are minimal. During the operations phase, none of the HQ values increased; however, the values for local resident receptors and the Aboriginal community receptor AR5 remain above 1. The increased acrolein exposure attributable to the DGR Project is identified as an adverse effect during site preparation and construction phase (i.e., a non-trivial change from the existing conditions).

Table C3.2.1-3: Hazard Quotients – Site Preparation and Construction Phase

Contaminant	Local Residents			Members of Aboriginal Communities		Seasonal Users	
	AR1	AR2	AR3	AR5	AR6	AR2	AR4
Non-Cancer PAHs	1.8×10^{-4}	1.8×10^{-4}	1.6×10^{-4}	1.5×10^{-4}	5.2×10^{-5}	2.9×10^{-5}	3.4×10^{-5}
Acetaldehyde	3.6×10^{-2}	3.7×10^{-2}	3.1×10^{-2}	1.7×10^{-2}	7.6×10^{-4}	7.1×10^{-3}	9.6×10^{-3}
Acetone	1.4×10^{-5}	1.5×10^{-5}	1.2×10^{-5}	6.6×10^{-6}	3.9×10^{-6}	2.8×10^{-6}	3.8×10^{-6}
Acrolein	**2.9×10^{0}**	**2.9×10^{0}**	**2.7×10^{0}**	**2.2×10^{0}**	3.4×10^{-2}	5.6×10^{-1}	6.5×10^{-1}
Benzene	7.2×10^{-4}	7.3×10^{-4}	6.0×10^{-4}	3.3×10^{-4}	1.1×10^{-5}	1.4×10^{-4}	1.9×10^{-4}
Ethyl-benzene	3.7×10^{-6}	3.7×10^{-6}	3.1×10^{-6}	1.7×10^{-6}	8.4×10^{-7}	7.2×10^{-7}	9.7×10^{-7}
Formaldehyde	1.9×10^{-2}	2.0×10^{-2}	1.6×10^{-2}	8.9×10^{-3}	1.4×10^{-2}	3.8×10^{-3}	5.1×10^{-3}
Naphthalene	2.1×10^{-5}	2.3×10^{-5}	1.4×10^{-5}	8.6×10^{-6}	1.9×10^{-5}	4.5×10^{-6}	7.0×10^{-6}
NO_2	2.0×10^{-1}	1.6×10^{-1}	7.7×10^{-2}	1.0×10^{-1}	7.2×10^{-2}	3.0×10^{-2}	5.1×10^{-2}
$PM_{2.5}$	8.6×10^{-2}	7.9×10^{-2}	6.4×10^{-2}	7.1×10^{-2}	3.6×10^{-2}	1.5×10^{-2}	2.3×10^{-2}
PM_{10}	8.4×10^{-2}	7.8×10^{-2}	6.4×10^{-2}	7.1×10^{-2}	3.5×10^{-2}	1.5×10^{-2}	2.2×10^{-2}
SO_2	6.2×10^{-2}	5.6×10^{-2}	7.5×10^{-2}	4.9×10^{-2}	1.2×10^{-2}	1.1×10^{-2}	1.1×10^{-2}
Toluene	6.2×10^{-6}	6.3×10^{-6}	5.3×10^{-6}	2.8×10^{-6}	7.3×10^{-5}	1.2×10^{-6}	1.6×10^{-6}
Xylenes	2.5×10^{-4}	2.5×10^{-4}	2.1×10^{-4}	1.1×10^{-4}	6.6×10^{-6}	4.8×10^{-5}	6.5×10^{-5}
Aluminum	1.8×10^{-6}	1.8×10^{-6}	1.8×10^{-6}	1.8×10^{-6}	1.9×10^{-10}	1.6×10^{-7}	1.6×10^{-7}
Cadmium	2.6×10^{-3}	2.6×10^{-3}	2.6×10^{-3}	2.6×10^{-3}	1.6×10^{-9}	2.3×10^{-4}	2.3×10^{-4}
Chromium	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}	2.7×10^{-5}	2.5×10^{-10}	2.5×10^{-6}	2.5×10^{-6}
Lead	1.3×10^{-4}	1.3×10^{-4}	1.3×10^{-4}	1.3×10^{-4}	1.0×10^{-8}	1.2×10^{-5}	1.2×10^{-5}
Zinc	2.5×10^{-5}	2.5×10^{-5}	2.5×10^{-5}	2.5×10^{-5}	2.0×10^{-10}	2.1×10^{-6}	2.1×10^{-6}

Table C3.2.1-4: Hazard Quotients – Operations Phase

Contaminant	Local Residents			Members of Aboriginal Communities		Seasonal Users	
	AR1	AR2	AR3	AR5	AR6	AR2	AR4
Non-Cancer PAHs	1.2×10^{-4}	1.2×10^{-4}	1.3×10^{-4}	1.2×10^{-4}	2.5×10^{-5}	2.0×10^{-5}	2.1×10^{-5}
Acetaldehyde	2.4×10^{-2}	2.7×10^{-2}	2.9×10^{-2}	1.6×10^{-2}	3.8×10^{-4}	5.2×10^{-3}	5.3×10^{-3}
Acetone	9.6×10^{-6}	1.1×10^{-5}	1.2×10^{-5}	6.3×10^{-6}	1.9×10^{-6}	2.1×10^{-6}	2.1×10^{-6}
Acrolein	**2.4×10^{0}**	**2.5×10^{0}**	**2.6×10^{0}**	**2.1×10^{0}**	2.1×10^{-2}	4.9×10^{-1}	4.9×10^{-1}
Benzene	4.8×10^{-4}	5.4×10^{-4}	5.7×10^{-4}	3.1×10^{-4}	5.7×10^{-6}	1.0×10^{-4}	1.0×10^{-4}
Ethyl-benzene	2.5×10^{-6}	2.8×10^{-6}	3.0×10^{-6}	1.6×10^{-6}	4.2×10^{-7}	5.3×10^{-7}	5.4×10^{-7}
Formaldehyde	1.3×10^{-2}	1.5×10^{-2}	1.6×10^{-2}	8.5×10^{-3}	6.7×10^{-3}	2.8×10^{-3}	2.8×10^{-3}
Naphthalene	1.0×10^{-5}	9.0×10^{-6}	1.3×10^{-5}	6.5×10^{-6}	6.1×10^{-6}	1.7×10^{-6}	1.9×10^{-6}
NO_2	9.7×10^{-2}	7.8×10^{-2}	6.4×10^{-2}	5.4×10^{-2}	4.3×10^{-2}	1.5×10^{-2}	2.0×10^{-2}
$PM_{2.5}$	6.0×10^{-2}	5.9×10^{-2}	6.0×10^{-2}	5.8×10^{-2}	1.2×10^{-2}	1.1×10^{-2}	1.1×10^{-2}
PM_{10}	5.9×10^{-2}	6.0×10^{-2}	6.0×10^{-2}	5.8×10^{-2}	1.2×10^{-2}	1.2×10^{-2}	1.1×10^{-2}
SO_2	6.2×10^{-2}	5.6×10^{-2}	7.5×10^{-2}	4.9×10^{-2}	1.2×10^{-2}	1.1×10^{-2}	1.1×10^{-2}
Toluene	4.2×10^{-6}	4.7×10^{-6}	5.0×10^{-6}	2.7×10^{-6}	3.6×10^{-5}	9.0×10^{-7}	9.1×10^{-7}
Xylenes	1.7×10^{-4}	1.9×10^{-4}	2.0×10^{-4}	1.1×10^{-4}	3.3×10^{-6}	3.6×10^{-5}	3.6×10^{-5}
Aluminum	9.6×10^{-7}	9.6×10^{-7}	9.6×10^{-7}	9.6×10^{-7}	5.8×10^{-10}	8.6×10^{-8}	8.6×10^{-8}
Cadmium	3.6×10^{-3}	3.6×10^{-3}	3.6×10^{-3}	3.6×10^{-3}	5.1×10^{-7}	3.1×10^{-4}	3.1×10^{-4}
Chromium	1.5×10^{-5}	1.5×10^{-5}	1.5×10^{-5}	1.5×10^{-5}	8.8×10^{-9}	1.3×10^{-6}	1.3×10^{-6}
Lead	8.2×10^{-5}	8.2×10^{-5}	8.2×10^{-5}	8.2×10^{-5}	6.8×10^{-8}	7.4×10^{-6}	7.4×10^{-6}
Zinc	6.3×10^{-5}	6.3×10^{-5}	6.3×10^{-5}	6.3×10^{-5}	1.7×10^{-9}	5.1×10^{-6}	5.1×10^{-6}

The in-design air quality mitigation measures were incorporated as an integral component of the DGR Project design and implementation for the purposes of assessing the health effects of changes in air concentrations of target compounds. There are no health-specific mitigation measures related to air quality beyond those identified in the Atmospheric Environment TSD.

C3.2.2 Changes in Noise Levels

The effects of changes in noise levels on human health as a result of the DGR Project are evaluated by predicting noise levels at selected health receptors and comparing them to Health Canada criteria. Noise effects on health are estimated by two measures: %HA and HCII. Health Canada considers an increase of 6.5%HA as the threshold above which there is potential for adverse effects on human health. HCII is the specific impact, or impulse noise, indicator. An HCII value in excess of 75 dBA is considered by Health Canada to have the potential for adverse effects on human health. Adverse effects are considered to be likely if the predicted %HA or HCII exceed the Health Canada thresholds.

As described above, the effects of noise on human health were evaluated based on %HA and HCII estimates at three receptor locations as shown on Figure C2.3.1-1:

- NR1 – located on Albert Road adjacent to Inverhuron Provincial Park;
- NR2 – located across Baie du Doré from Bruce A; and
- NR3 – located within Inverhuron Park at an existing camp site.

The percentage of the exposed population that could be "highly annoyed" by increased noise levels caused by the DGR Project is calculated as the %HA. Table C3.2.2-1 presents the %HA for the site preparation and construction, and operations phases relative to existing conditions.

Table C3.2.2-1: Noise Level Predictions at Human Health Receptors (%HA)

Receptor	Ambient %HA	Existing %HA	Project-related Change Relative to Existing (%)	%HA Threshold [a]	Likely Adverse Effect?
Site Preparation and Construction Phase					
NR1 – Albert Road	1.6	1.5	0.1	6.5	no adverse effect
NR2 – Baie du Doré	2.6	2.1	0.5	6.5	no adverse effect
NR3 – Inverhuron Provincial Park	2.2	2.1	0.1	6.5	no adverse effect
Operations Phase					
NR1 – Albert Road	6.0	1.5	4.5	6.5	no adverse effect
NR2 – Baie du Doré	8.3	2.1	6.2	6.5	no adverse effect

Table C3.2.2-1: Noise Level Predictions at Human Health Receptors (%HA) (continued)

Receptor	Ambient %HA	Existing %HA	Project-related Change Relative to Existing (%)	%HA Threshold [a]	Likely Adverse Effect?
NR3 – Inverhuron Provincial Park	7.7	2.1	5.6	6.5	no adverse effect

Note:
a The %HA threshold is applied to the DGR Project-related change relative to existing conditions.

Health Canada also recommends a consideration of impulse noises using the specific impact (HCII), or impulse noise indicator. Table C3.2.2-2 summarizes the predicted HCII levels from the DGR Project. As shown the predicted HCII levels are all expected to be less than 75 dBA (i.e., no adverse effects).

Table C3.2.2-2: Noise Level Predictions at Human Health Receptors (HCII)

Receptor	Ambient HCII (dBA)	Existing HCII (dBA)	HCII Threshold (dBA)	Likely Adverse Effect?
Site Preparation and Construction Phase				
NR1 – Albert Road	48	47	75	no adverse effect
NR2 – Baie du Doré	51	50	75	no adverse effect
NR3 – Inverhuron Provincial Park	50	50	75	no adverse effect
Operations Phase				
NR1 – Albert Road	58	47	75	no adverse effect
NR2 – Baie du Doré	61	50	75	no adverse effect
NR3 – Inverhuron Provincial Park	60	50	75	no adverse effect

Note:
The numbers in this table are different from the Atmospheric Environment TSD, which presents background noise levels, not impulse noise levels.

Noise levels during the decommissioning phase will be equal or less than those during the site preparation and construction phase. Therefore, adverse effects to human health from changes in noise levels are not likely during any of the phase of the DGR Project.

Since no adverse effects on human health are anticipated as a result of DGR Project-related noise, no mitigation measures beyond those considered to be integral to the design and implementation of the DGR Project are considered.

C3.2.3 Changes in Surface Water

As described in the Hydrology and Surface Water Quality TSD, there will be no adverse effects on surface water quality during the site preparation and construction, operation, or

decommissioning phases. In addition, any changes in surface water quality will not be measurable outside of the Site Study Area. Therefore, further consideration is not warranted. However, the surface water pathway is included in the risk assessment modelling presented in Section C3.2.1-1.

Changes in surface water quantity and flow may affect waterbodies that people use for recreational purposes or for their source of drinking water. These potential changes are considered in the Socio-economic Environment TSD, when evaluating effects on use and enjoyment of property. These conclusions are used in the determination of potential effects on emotional determinants (see Section C.3.5). There are no other mechanisms through which changes in flow could affect human health. Therefore, no further consideration is warranted.

C3.2.4 Changes in Soil Quality

As described in the Geology TSD, there are no likely adverse effects on soil quality. In addition, any changes in soil quality will not be measurable outside of the Site Study Area. Accordingly, further consideration of interactions between soil quality and human health is not warranted. However, the soil quality pathway is included in the risk assessment modelling presented in Section C3.2.1-1.

C3.2.5 Changes in Groundwater

As described in the Geology TSD, there are no likely adverse effects on groundwater quality. Accordingly, further consideration of interactions between groundwater quality and human health is not warranted. However, the groundwater pathway is included in the risk assessment modelling presented in Section C3.2.1-1.

Changes in groundwater flow may affect drinking water supplies. These potential changes are considered in the Socio-economic Environment TSD, when evaluating effects on use and enjoyment of property. These conclusions are used in the determination of potential effects on emotional determinants (see Section C.3.5). There are no other mechanisms through which changes in flow could affect human health. Therefore, no further consideration is warranted.

C3.2.6 Changes in Human Exposure to Radiation

The effects of changes in human exposure to radiation are evaluated by estimating the total dose (μSv/a) from the DGR Project. Radiological effects are considered collectively regardless of the physical media. Adverse effects are considered to be likely if the predicted total dose exceeds the *de minimis* dose level of 10 μSv/a recommended by the ACRP and the Advisory Committee on Nuclear Safety (ACNS). The *de minimis* dose rate is based on a risk level that would generally be regarded as negligible in comparison to other, non-nuclear risks.

Because radiological compounds will not be handled as part of the site preparation and construction phase, there will be no human exposures to radiation during this phase that are attributed to airborne and waterborne releases from the DGR Project.

The dose impact on the public of any airborne and waterborne releases from the DGR during the operations phase was estimated using two methods, discussed in detail in the Radiation and Radioactivity TSD:

- derivation of dose based on the DGR estimated releases in comparison to the Bruce nuclear site releases and dose estimates, which are in turn based on measurements from the Bruce nuclear site Radiological Environmental Monitoring Program (REMP); and
- derivation of dose based on the WWMF pathways model and Annual Reports scaled to DGR release rate estimates.

As described in the Radiation and Radioactivity TSD, there are no likely adverse effects from the DGR Project on human health attributable to DGR Project-related exposure to radiation. The total dose to the public is well below the 1 mSv/a regulatory limit and below the OPG dose target of 0.01 mSv/a set for the facility. The dose to the public will further decrease after the above ground radioactive waste inventories are disposed of in the emplacement rooms, which will then be progressively closed during operations and ultimately sealed during decommissioning. Long-term performance of the DGR Project is described in Section 9 of the EIS. No adverse effects on human health are likely. Therefore, adverse effects to human health from exposure to radiation are not likely.

C3.3 EFFECTS ON SOCIO-ECONOMIC DETERMINANTS

The effects of the DGR Project on socio-economic determinants are evaluated through estimation of changes in income, education, healthcare and social services, health behaviours and employment as predicted by modelling in the Socio-economic Environment TSD. An adverse effect on the socio-economic determinant is considered to be likely only if it is evident when compared to the existing environment.

C3.3.1 Income

The increase in employment opportunities as a result of the DGR Project may, in turn, increase household income and spending. Health status may improve as a result of change in income, where there may be better access to better quality foods, organized sports and fitness centres, decreased stress levels, and higher self-confidence. The socio-economic environment assessment indicates that the DGR Project would create an appreciable amount of income in the Local and Regional Study Areas, and would likely translate into greater household income. This interaction is considered to be positive and in favour of health and well-being.

C3.3.2 Education

As discussed in the Socio-economic Environment TSD, the DGR Project could generate additional students in Kincardine and Saugeen Shores. Based on the information provided in stakeholder interviews, the schools in Kincardine have the capacity to receive approximately 350 more students and the school in Saugeen Shores has the capacity to receive approximately 700 more students. The projected additional student numbers are only a small fraction of the

surplus capacity that exists in the local school board facilities. Therefore, no adverse effects would occur as a result of overcrowding or competition for available space.

Increased educational opportunities for students have also been identified as a positive effect in the Socio-economic Environment TSD. As a leading, new technology for the long-term management of nuclear waste in Canada, the DGR Project will be the first of its kind in North America and will provide unique learning opportunities for both students in the Local and Regional Study Areas, as well as Ontarians and out of province visitors. Therefore, these educational opportunities will have an overall positive effect on education.

C3.3.3 Healthcare and Social Services

C3.3.3.1 Health and Safety Services

As described in the Socio-economic Environment TSD, additional demands on health care, emergency medical services (EMS), fire and police protection may result from population growth because of greater employment opportunities and workers in the Local and Regional Study Areas. The socio-economic assessment used economic modelling to assess the effects of the DGR Project. The effect of the DGR Project on health and safety services was estimated to be very small. The results indicate that the additional demand on health and safety services is barely measurable and would not be noticeable in terms of level of service to members of the community. Therefore, no adverse effects are anticipated.

C3.3.3.2 Social Services

The associated population increase because of the DGR Project is anticipated to be minor in the context of current and foreseeable population levels. In addition, no change in the demographic characteristics of the population is anticipated as a result of the DGR Project. Therefore, no adverse effects to social services are anticipated as a result of the DGR Project.

C3.3.4 Health Behaviours

Nuisance effects during the DGR Project, such as noise and dust, have the potential to disrupt fitness activities conducted at community and recreational facilities near the Bruce nuclear site, or at outdoor sites such as Inverhuron and MacGregor Point Provincial Parks and Brucedale Conservation Area. As described in the Socio-economic Environment TSD, it is not expected that any community or recreational facility will experience nuisance disruption. In addition, as part of the public attitude research, the majority of park users and outdoor recreationalists stated that the DGR Project would not affect their behaviours. There is no potential for the DGR Project to affect Aboriginal health behaviours. Therefore, no adverse effects to health behaviours attributed to changes in recreational facility access are anticipated because of the DGR Project.

Mitigation measures that will serve to minimize changes to recreational facilities and programs are presented in the other TSDs. Furthermore, no adverse effects are expected because of changes in these other environments.

OPG will continue to work with various stakeholders to deliver its community and recreational initiatives through existing community liaison measures. In addition, OPG will continue to keep its neighbours, Aboriginal communities and the broader public informed concerning the activities at the Bruce nuclear site as appropriate to each phase of the DGR Project, and will maintain its contribution to the community through its Community Partnership Program.

C3.3.5 Employment

As described in the Socio-economic Environment TSD, 65% of Local Study Area resident and 64% of Regional Study Area residents anticipate that the new job and employment opportunities created by the DGR Project will contribute positively to their community. Employment projects for the municipalities in the Local and Regional Study Areas show modest employment growth over the long term, as a result of the DGR Project, relative to the existing labour force at the Bruce nuclear site. Positive effects were predicted for employment.

In addition, the presence of the DGR Project is also seen by some in the community as an indication of the long-term viability that is the continued presence of nuclear related activity and employment opportunities at the Bruce nuclear site. This expectation may contribute to positive attitudes toward future well-being of the community. Therefore, no adverse effects are identified for socio-economic determinants as a result of employment.

C3.4 EFFECTS ON CULTURAL DETERMINANTS

The effects of the DGR Project on cultural determinants are evaluated in consideration of access to cultural and heritage sites and access to traditional foods. The effects are determined by the community surveys and with reference to discussion in the Socio-economic Environment and Aboriginal Interest TSDs. An adverse effect on the cultural determinant is considered to be likely only if it is evident when compared to the existing environment.

C3.4.1 Access to Cultural and Heritage Sites

C3.4.1.1 Local Residents and Seasonal Users

The DGR Project has the potential to disrupt cultural activities conducted at community facilities near the Bruce nuclear site. However, as discussed in the Socio-economic Environment TSD, it is not expected that any cultural site will experience nuisance disruption. Therefore, no adverse effects to the cultural determinants are anticipated because of changes in access to cultural sites as a result of the DGR Project.

Mitigation measures that will serve to control potential effects on cultural facilities and programs are presented in the other TSDs. No additional mitigation measures specific to human health considerations are warranted since no adverse effects are identified.

C3.4.1.2 Members of the Aboriginal Communities

As described in the Aboriginal Interests TSD, culturally sensitive areas are identified in the Site Study Area. The value of activities undertaken by Aboriginal peoples at the Aboriginal burial site located on the Bruce nuclear site may be diminished by nuisance air quality, noise and visual changes. Mitigation measures are presented in the Aboriginal Interests TSD.

C3.5 EFFECTS ON EMOTIONAL DETERMINANTS

The effects of the DGR Project on emotional determinants are evaluated by considering the presence of the DGR Project and its effect on the use and enjoyment of private property, the perception of health and safety, and community cohesion. The effects are determined by the community surveys and as discussed in the Socio-economic Environment TSD. As noted in Section C2.6, no information specific to Aboriginal communities is available. An adverse effect on the emotional determinant is considered to be likely only if it is evident when compared to the existing environment.

C3.5.1 Perception of Health and Safety

People's attitude toward the DGR Project is considered an important indicator of well-being. The assessment of effects on perception of health and safety is based on the public attitude research discussed in detail in the Socio-economic Environment TSD and primarily based on two questions:

- How confident are you in the radioactive waste management technologies used at the Western Waste Management Facility (WWMF)?
- How confident are you in the safety of a deep geologic repository at the Western Waste management facility?

The results indicate that majority of people in the study areas have confidence in the technologies used at the WWMF; 90% of the respondents in the Local Study Area and 84% in the Regional Study Area are at least 'somewhat' confident, and 63% in the Local Study Area are 'very confident'. The results further indicate that the majority of respondents do not expect that the DGR will change their feelings of personal safety and security; 83% in the Local Study Area and 73% in the Regional Study Area. Therefore, adverse effects to perception of health and safety are not anticipated as a result of the DGR Project.

C3.5.2 Community Cohesion

Emotional determinants may be affected by changes in community cohesion. Community cohesion refers to people's sense of belonging to a self-defined community, shared norms and values. Based on the results of public attitude research (described in the Socio-economic Environment TSD), residents in the Local Study Area consider having a small town community with friendly people as a positive influence on community cohesion. The DGR Project is not likely to become a divisive issue among Local Study Area residents. Overall, each individual, neighbourhood or community will experience changes in cohesion in their own way, depending upon the strength of the positive and negative influences encountered. The positive influences

on community cohesion are more likely to be noticeable than the negative ones. On a community wide basis, an adverse effect attributable to the DGR Project is not considered likely.

Although no adverse effects on community cohesion are anticipated as a result of the DGR Project, OPG will continue to keep its neighbours and the broader public informed concerning activities at the Bruce nuclear site as appropriate to each phase of the DGR Project. In addition, OPG will maintain its contributions to the community through its Corporate Citizenship Program and will continue to work with various stakeholders and Aboriginal communities to deliver its community, recreational and education initiatives.

C3.6 EFFECTS ON OVERALL HEALTH OF LOCAL RESIDENTS

The overall health of local residents is evaluated by changes in the physical environment, socio-economic, cultural and emotional determinants of health. An adverse effect on overall health is considered likely only if the effect is evident when compared to the existing environment.

C3.6.1 Effects

The overall health of local residents is determined by combining the physical, socio-economic, cultural and emotional determinants for permanent receptors in the Local Study Area. As discussed in the preceding sections, a potential adverse effect (i.e., a non-trivial change from existing conditions) to the health of a local resident associated with exposure to acrolein in air is identified as a result of the DGR Project. As noted previously, these predictions are driven by the existing conditions. Conservatively, it has been assumed that the adverse effect for this one determinant warrants the identification of an adverse effect on overall health of local residents. No adverse effects are identified for local residents for cultural, socio-economic and emotional health determinants.

C3.6.2 Mitigation Measures

The in-design mitigation measures, maintenance of community and recreational facilities, and continual communication with the community on activities related to the DGR Project are considered important to the overall health and well-being of local residents in the Local and Regional Study Areas.

C3.6.3 Residual Adverse Effects

A residual adverse effect to the overall health of local residents as a result of changes in air quality (i.e., acrolein concentrations) is identified. As discussed in Section C3.2.1, acrolein exposures are driven by existing (pre-project) conditions. This residual adverse effect is advanced for an evaluation of significance.

C3.7 EFFECTS ON OVERALL HEALTH OF MEMBERS OF THE ABORIGINAL COMMUNITIES

The overall health of members of Aboriginal communities is evaluated by changes in the physical environment, socio-economic, cultural and emotional determinants of health. An adverse effect on overall health is considered likely only if the effect is evident when compared to the existing environment.

C3.7.1 Effects

The overall health of members of Aboriginal communities is determined by exposures to target compounds in the physical environment, noise and radiation dose; socio-economic factors, cultural factors and emotional factors. An adverse effect (i.e., non-trivial change from existing conditions) associated with the exposure to acrolein in air is identified as a result of the DGR Project. No adverse effects are identified for Aboriginal residents for cultural, socio-economic and emotional health determinants. As noted previously, these predictions are driven by the existing conditions. Conservatively, it has been assumed that the adverse effect for this one determinant warrants the identification of an adverse effect on overall health of members of Aboriginal communities.

C3.7.2 Mitigation Measures

The in-design mitigation measures, maintenance of community and recreational facilities, and continual communication with the Aboriginal community on activities related to the DGR Project are considered important to the overall health and well-being of Aboriginal community members in the Local and Regional Study Areas.

C3.7.3 Residual Adverse Effects

A residual adverse effect to the overall health of members of Aboriginal communities as a result of changes in air quality (i.e., acrolein concentrations) is identified. The residual adverse effect is advanced for an evaluation of significance.

C3.8 EFFECTS ON OVERALL HEALTH OF SEASONAL USERS

The overall health of the seasonal users is evaluated by changes in the physical environment, socio-economic, cultural and emotional determinants of health. An adverse effect on overall health is considered likely only if the effect is evident when compared to the existing environment.

C3.8.1 Effects

The overall health of seasonal users is determined by exposures to target compounds in the physical environment, socio-economic factors, cultural factors and emotional factors. No adverse effects for any of the determinants are likely at the seasonal receptors. Therefore, no adverse effects on overall health of seasonal users are likely.

C3.8.2 Mitigation Measures

No adverse effects on the overall health of seasonal users are anticipated as a result of the DGR Project. Accordingly, no mitigation is identified.

C3.8.3 Residual Adverse Effects

No residual adverse effects to the overall health of seasonal users are likely as a result of the DGR Project.

C3.9 EFFECTS ON HEALTH OF WORKERS

The health of workers is evaluated by the magnitude of radiological exposures and the potential health and safety consequence(s) caused by exposure to non-radiological hazards. An adverse effect on overall health is considered likely if, in the case of radiological exposures, the dose exceeds the occupational exposure dose target or in the case of non-radiological hazards, the effect (or potential consequence) has a potential adverse health outcome.

C3.9.1 Effects

C3.9.1.1 Radiological Exposures

NEWs could be exposed to radiation via inhalation, skin absorption and immersion of radionuclides dispersed in air above ground and underground. The radionuclides of concern include tritium and carbon-14, which are slowly released from waste packages. Radon, which could be generated from wastes and from surrounding host rock, is not expected to be present in the DGR in significant concentration on the basis of the measured low uranium/radium content of the rock and wastes [C37].

Non-NEWs may be exposed by an external radiation dose. The external radiation dose was estimated as a result of the direct radiation and skyshine from packages during above-ground handling at the DGR [C38].

Radiological exposures are evaluated by comparison of predicted doses to acceptable regulatory limits. The CNSC has set the following regulatory limits on the annual dose to members of the public and to workers to ensure that the probability of occurrence of effects is acceptably low [C39]:

- nuclear energy worker, including a pregnant nuclear energy worker: 50 mSv for one-year dosimetry period and 100 mSv for a five-year dosimetry period;
- pregnant nuclear energy worker: 4 mSv for the balance of the pregnancy; and
- a person who is not a nuclear energy worker (non-NEWs): 1 mSv for one calendar year.

OPG has set a more conservative dose target for its facilities. For NEWs, the OPG occupational dose target is 10 mSv/a.

Radiological doses are calculated as described in Section 8.1.4 of the Radiation and Radioactivity TSD.

NEWs

The results showed that workers can be directly exposed to radiation without exceeding OPG's occupational dose target (10 mSv/a). However, higher dose rate locations were identified where worker occupancy may be limited, for instance, near the face of an array of LLW or ILW packages in emplacement rooms [C38]. Generally, workers would not need to spend much time in these locations, and most packages do not approach the dose rate limits. However, it would be appropriate to monitor the radiation fields in these locations, and if necessary to limit the worker exposure, use shielded forklifts and/or use greater stand-off distances. This is considered further within the context of ALARA [C40].

The assessment determined air concentrations of tritium and carbon-14 are below the Derived Air Concentration for workers, and inhalation and immersion doses to workers are much lower than OPG's occupational dose target of 10 mSv/a for workers [C38].

Non-NEWs

The access and movement of non-NEWs in the Project and Site Study Area are controlled by OPG and Bruce Power. Dose rate measurements at locations around the sites where non-NEWs might be located ensure that the received doses do not exceed the non-NEW criterion value of 1 mSv/a. Based on the dose rate measurements carried out at the WWMF, it is predicted that the dose rate during the operations phase will be less than 0.5 μSv/h at the perimeter of DGR Project, which corresponds to a dose rate of <1 mSv/a for a 2,000 h/a occupancy. This rate represents the bounding value compared with that for the site preparation and construction phase and decommissioning phase. It is not likely that the non-NEWs performing different duties will spend appreciable time in this area, and thus, the doses to non-NEWs are expected to be well below the 1 mSv/a criterion. Furthermore, the radiation doses to non-NEWs from the normal operation of the DGR Project are expected to be negligible as they are not expected to be within the vicinity of any radiation source of concern to the DGR Project.

Section 7.6 of the EIS and the Radiation and Radioactivity TSD provide further detail.

C3.9.1.2 Non-radiological hazards

The assessment was conducted systematically using a Screening Process Hazard Analysis methodology combined with a Job Hazard Analysis approach [C41]. Hazards were identified based on the activities that would normally be expected for the various phases of the DGR Project. The assessment was divided into four areas, namely site preparation, construction, operations and safety management. Under each of these areas the major work packages or elements are listed. Comments are then added, if required, for clarification. Work activities that would normally be expected to occur are listed for each major work package. These work activities, the expected working environment and potential interactions among these elements are then considered to assist in identifying the potential hazards. Possible outcomes that may result from potential hazards are recorded on worksheets and may include personal injury,

death, property damage, or loss of critical safety function for example. These outcomes provide a basis for establishing priorities related to mitigation and control measures and recommendations; they assist in determining the safety significance of the hazards associated with certain activities.

The health of workers is evaluated by the potential health and safety consequence(s) caused by exposure to non-radiological hazards. Table C3.9.1-1 identifies hazardous activities or conditions that may arise during the phases of the DGR Project; potential consequences; and potential health outcomes. Control and mitigation measures have also been identified in the table.

In addition, general safety management can lead to adverse consequences to workers. These are identified in Table C3.9.1-2.

Table C3.9.1-1: Effects on Health of Workers

Hazardous Activity or Condition	DGR Project Phase[a]	Potential Consequences	Potential Outcomes	Control/Mitigation Measures
Confined space entry	• Operations	• Hazardous atmosphere	• Occupational disease • Personal injury or death	• Confined space entry program
Diesel exhaust from equipment operation underground	• Operations	• Worker exposure to toxic, designated or hazardous substance	• Occupational disease • Personal injury	• Ventilation • Underground diesel control code of practice to avoid overloading ventilation capacity to support diesel equipment operations • Working environment monitoring • Worker awareness • Inspection and maintenance program
Dust at the surface	• Site preparation and construction	• Worker exposure • Poor visibility	• Occupational disease • Personal injury	• Vehicular speed control standard • Application of water or other dust allaying substance • Worker awareness • Work permits • Personal Protective Equipment (PPE)

Table C3.9.1-1: Effects on Health of Workers (continued)

Hazardous Activity or Condition	DGR Project Phase[a]	Potential Consequences	Potential Outcomes	Control/Mitigation Measures
Dust underground	• Operations	• Worker exposure	• Occupational disease	• Vehicular speed control standard • Concrete floors underground • Shotcreted walls underground • Housekeeping • Ventilation
Hazardous Materials Handling	• Site preparation and construction • Operations	• Worker exposure to toxic designated or controlled substance	• Occupational disease • Personal injury or death	• PPE • Worker awareness • WHIMS
Noise	• Site preparation and construction • Operations	• Worker exposure - industrial hearing loss • Hampered communication	• Occupational disease • Personal injury • Potential loss of critical safety communication	• Engineered noise abatement - barriers, encapsulation, shielding • Personal Protective Equipment (PPE) • Equipment planned/preventative maintenance • Worker awareness • Signage
Noxious fumes, gases and dust underground	• Site preparation and construction	• Hazardous atmosphere	• Occupational disease • Personal injury or death	• Ventilation flow through the work place

Table C3.9.1-1: Effects on Health of Workers (continued)

Hazardous Activity or Condition	DGR Project Phase[a]	Potential Consequences	Potential Outcomes	Control/Mitigation Measures
Underground blasting	• Site preparation and construction	• Exposure to blasting dust and fumes • Unexpected detonation • Exposure to blast concussion and flying debris	• Occupational disease • Personal injury or death	• Central blasting control • Controlled re-entry • Adequate ventilation • Blasting procedures • Controlled blasting times • Use only qualified workers
Underground diesel equipment exhaust	• Site preparation and construction	• Worker exposure to toxic, designated or hazardous substance	• Occupational disease • Personal injury	• Ventilation • Underground diesel control code of practice to avoid exceeding the ventilation system capacity to safely support diesel equipment operation • Working environment monitoring • Maintenance • Worker awareness

Table C3.9.1-1: Effects on Health of Workers (continued)

Hazardous Activity or Condition	DGR Project Phase[a]	Potential Consequences	Potential Outcomes	Control/Mitigation Measures
Underground ventilation failure	• Operations	• Exposure to noxious fumes, dust and gasses	• Occupational disease • Personal injury	• Install visual and audible alarms on ventilation system • Inspect ventilation system prior to entering the underground workplace • Routine monitoring of ventilation flows • Refuge station • Evacuation procedure • Back-up power
Welding and cutting	• Site preparation and construction • Operations	• Burns • Fire • Worker exposure to welding flash • Worker exposure to toxic or designated substance • Electrocution	• Personal injury or death • Occupational disease	• Worker awareness • PPE • Hot work permit • Maintenance and inspection program

Note:
a The decommissioning phase was not explicitly considered in the Preliminary Conventional Safety Assessment [C41]; however, hazards will likely be similar to those identified in the site preparation and construction phase.
Source: [C41]

Table C3.9.1-2: Effects on Health of Workers related to General Safety Management

Hazardous Activity or Condition	Potential Consequences	Potential Outcomes	Control/Mitigation Measures
Inadequate communications	• Potential hazards not identified • Disruption of important safety related communications • Workers not fully engaged in safety awareness • Perception that management is not committed to safety	• Degradation or lack of safety culture • Missed opportunity to avoid safety incidents • Accumulation of poor safety conditions leading to a major safety incident • Inappropriate work planning • Potentially unsafe conditions/acts go unchecked	• Communication mechanism that fosters and encourages the free flow of constructive safety information and concerns between workers, management and the client • Recognition of the importance of a positive safety culture throughout the workforce, management and client • Active visible participation in the development and improvement of a safety culture that meets the unique needs of the DGR Project
Inadequate risk management	• Unidentified "risk creep" • Risk assessment does not recognize relevant hazards • Inadequate safety factors in the design and engineering • Insufficient detailed design available effective risk assessment of DGR Project design • Design failure • Engineering liability	• Inappropriate acceptance of safety risk • Unrecognized safety risk factors • Unknown exposure of workers to unacceptable safety risk	• Standard level of completion for detailed engineering as input for risk assessments (for example 50% and 80% complete) • Control and manage deviations from the original design that was assessed for safety • Review and periodically update safety assessments as the design and/or construction progresses • Safe work planning for all activities • Appropriate work procedures

Table C3.9.1-2: Effects on Health of Workers related to General Safety Management (continued)

Hazardous Activity or Condition	Potential Consequences	Potential Outcomes	Control/Mitigation Measures
Inadequate leadership	• Lack of clear direction • Culture of blame • Lack of accountability for safety function • Unclear roles, responsibilities and accountabilities related to safety • Reactive leadership based on lagging indicators rather than proactive leadership based on leading indicators	• Ineffective safety systems and services • Inappropriate safety culture • Lack of confidence by the workforce in the DGR Project leadership • Inadequate responsiveness to safety issues for optimal safe DGR Project execution	• Provide clearly documented roles responsibilities • Validate safety program and systems functionality and routinely verify effectiveness of implementation • Visible management and safety personnel in day to day health and safety issues • Publish safety performance data • Set reasonable but challenging safety performance targets • Be seen to be involved – attend safety and toolbox meetings • Regular safety walks on the site to interact with all workers • Set the example and standard through own behaviour
Inadequate quality management	• Errors and omissions going unchecked • Unnoticed degradation of safety performance • Poor quality DGR Project safety management • Inconsistent approach to work	• Inability to accurately assess the adequacy of safety systems/services • Ineffective safety systems and services • No basis for continual improvement	• Use a system of metrics to monitor and record key safety performance (KPIs) • Benchmarking and external review of safety systems and services • Audits • Include auditing in KPIs
Cumbersome DGR Project organizational structure	• Too many reporting layers with a poor interface between DGR Project management and contractor organizations	• Inadequate responsiveness to safety issues for optimal safe DGR Project execution	• Avoid unnecessary management and supervisory levels that may create cumbersome and inflexible bureaucracy within the DGR Project

Table C3.9.1-2: Effects on Health of Workers related to General Safety Management (continued)

Hazardous Activity or Condition	Potential Consequences	Potential Outcomes	Control/Mitigation Measures
Compliance that does not develop beyond the minimum regulatory expectations	• Inability to advance the safety awareness • Wasted resources of dealing with immediate safety issues	• Reactive leadership based on lagging indicators rather than proactive leadership based on leading indicators	• Educate through conversation, clear expression of expectations and passion for the importance of safety
Inadequate training	• Lack of knowledge of health and safety expectations • Inadequate skills inventory	• Persistent unsafe workplace conditions • Acceptance of unsafe conditions in the workplace	• Identify applicable lessons learned and disseminate these between contractors, owners and owners representative organizations • Include applicable lessons learned into DGR Project training and orientation • Adopt Systematic Approach to Training (SAT) • Develop a training matrix
Inappropriate allocation of resources	• Cost overruns • Underfunding of necessary safety efforts	• Insufficient resources allocated to managing safety aspects that have higher negative impact potential than others	• Assign a safety significance index to activities, systems, components or structures to facilitate priority setting
Inadequate chemical physical and biological hazards control	• Unhealthy workplaces	• Occupational disease • Personal injury • Reportable occurrence	• Assign a safety significance index to activities, systems, components or structures • Training • Procedures
Failure of backup systems that may impact health and safety	• Imminent danger to health and safety and property	• Emergency shutdown of activities and operations and evacuation of personnel	• Routine testing and inspection of backup systems • Evacuation procedures • Refuge stations

Source: [C41]

C3.9.2 Mitigation Measures

C3.9.2.1 Radiological Exposures

The Radiation and Radioactivity TSD, describes the mitigation measures that have been developed during the design of the DGR Project and its associated infrastructure (e.g., the WPRB), to minimize the radiological effects on workers. These in-design mitigation measures include the following features:

- shielding (e.g., appropriate design of waste container, WPRB design, underground emplacement rooms, installation of shielding and end and closure walls when appropriate);
- ventilation;
- sump and stormwater collection and management;
- emission control (airborne and waterborne);
- zoning and monitoring to prevent spread of contamination in the DGR;
- fencing and security; and
- operating procedures and training (ALARA).

These in-design mitigation measures are described in greater detail in the Preliminary Safety Report [C38] and the EIS.

C3.9.2.2 Non-radiological Exposures

Hazardous activities or conditions on the DGR Project site have potential consequences and potential outcomes that can adversely affect human health. For each hazardous activity or condition, control/mitigation measures are recommended, as shown in Tables C3.9.1-1 and C3.9.1-2.

C3.9.3 Residual Adverse Effects

No residual adverse effects to the health of workers are expected as a result of the DGR Project. The controls and mitigation measures described above, in addition to the in-design mitigation measures will provide adequate control to protect the health of workers.

C3.10 MALFUNCTIONS, ACCIDENTS AND MALEVOLENT ACTS EFFECTS SUMMARY

The predicted radiological dose and non-radiological species released during any accident or malfunction scenario are less than the applicable criteria for the public and workers. No adverse effects are expected for the members of the public as a result of malfunctions and accidents. Provided that the mitigation and control measures are used, no unacceptable risks to workers resulting from the DGR Project are expected. The effects of the malevolent acts are considered to be bound by those identified for the malfunctions and accidents and are not expected to result in adverse effects to the members of the public and workers. Detailed results can be found in the Malfunctions, Accidents and Malevolent Acts TSD and the Preliminary Safety Report [C38].

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C4. SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS

This section includes an evaluation of the significance of the residual adverse effects identified for the DGR Project on the human health VECs. An assessment of the cumulative effects associated with the DGR Project is addressed in Section 10 of the EIS.

C4.1 ASSESSMENT METHODS

As described in Section C3, residual adverse effects on local residents and members of the Aboriginal communities caused by exposures to acrolein in air during the DGR Project phases were identified. These residual adverse effects are assessed to determine if the residual adverse effect is significant using criteria applicable to human health. The criteria used for judging and describing the significance of effects are shown in Table C4.1-1.

Table C4.1-1: Effects Criteria and Levels for Assigning Significance

Effects Criteria	Effects Level Definition		
Magnitude (of effect)	**Low**	**Medium**	**High**
	The effects level definitions for magnitude are provided in Tables C4.1-2.		
Geographic Extent (of effect)	**Low**	**Medium**	**High**
	Effect is within the Site Study Area.	Effect extends into the Local Study Area.	Effect extends into the Regional Study Area.
Timing and Duration (of conditions causing effect)	**Low**	**Medium**	**High**
	Conditions causing effect are evident during the site preparation and construction phase, or during the decommissioning phase.	Conditions causing effect are evident during the operations phase.	Conditions causing effect extend beyond any one phase.
Frequency (of effect)	**Low**	**Medium**	**High**
	Conditions or phenomena causing the effect occur infrequently (i.e., several times per year).	Conditions or phenomena causing the effect occur at regular, although infrequent intervals (i.e., several times per month).	Conditions or phenomena causing the effect occur at regular and frequent intervals (i.e., daily or continuously).
Degree of Irreversibility (of effect)	**Low**	**Medium**	**High**
	Effect is readily (i.e., immediately) reversible.	Effect is reversible with time.	Effect is not reversible (i.e., permanent).

The criteria used to evaluate magnitude are specific to each of the indicators under consideration. The following sections and Table C4.1-2 summarize the effects level definitions for magnitude for human health VECs with a residual adverse effect.

Table C4.1-2: Effects Magnitude Levels – Physical Environment Determinants

Indicator	Measures	Effects Level Definition		
		Low	Medium	High
Physical Environment Determinants	HQ (non-carcinogenic compounds – single exposure pathway)	>1 and ≤10	>10 and ≤20	>20

A hazard quotient (HQ) is a measure of the dose a person may take into his or her body relative to a chemical-specific health-based benchmark (or toxicity reference value). The dose of the chemical depends on the concentration in various media (e.g., air, water, soil and foods), the amount of time the person is in contact with these media and the biological characteristics of the person (e.g., ingestion rates and body weight).

Probability of occurrence was not explicitly included as a criterion for the assessment of significance of residual adverse effects. The assessment recognizes the widest, reasonable range of likely residual adverse effects without specific regard for their respective probability of occurrence. The focus is on evaluating the possible impact of such effects on human health, and the consideration of feasible mitigation measures that can be incorporated to control, reduce or eliminate the effect.

The level of significance is assigned to residual adverse effects by using professional judgement to combine the magnitude, geographic extent, timing and duration, frequency, and degree of irreversibility. For example, a residual adverse effect may be considered to be significant if it is of high magnitude, high irreversibility and is highly valuable to society or the environment.

The residual adverse effect can be determined to be:

- not significant;
- may not be significant; or
- significant.

An effect that "may not be significant" is one that, in the professional judgement of the specialists, would not be significant; however, follow-up monitoring should be implemented to confirm that significant adverse effects do not occur.

C4.2 ASSESSMENT OF SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS

As described in Section C3, residual adverse effects on the Overall Health of Local Residents, and Member of Aboriginal Communities VECs were identified as a result of changes in air quality (i.e., acrolein concentrations). Residual adverse effects are discussed with reference to the overall health of receptors. The potential exposure to acrolein is not significant for these VECs. The summary of assessment of significance for human health VECs is provided in Table C4.2-1.

Table C4.2-1: Summary of Residual Adverse Effects and Significance Levels

Residual Adverse Effect	Magnitude	Geographic Extent	Timing and Duration	Frequency	Degree of Irreversibility	Overall Assessment
Effect of acrolein exposure on overall health of local residents	Low • HQ >1 and <10 at receptor locations	Medium • Effect is limited to the Local Study Area	Low • Effect occurs during site preparation and construction phase	Medium • Conditions or phenomena causing the effect occur at regular, although infrequent intervals (i.e., several times per month).	Low • Effect is readily (i.e., immediately) reversible when the exposure ceases	**Not significant**
Effect of acrolein exposure on overall health of members of Aboriginal communities	Low • HQ >1 and <10 at receptor locations	Medium • Effect is limited to the Local Study Area	Low • Effect occurs during site preparation and construction phase	Low • Conditions or phenomena causing the effect occur at infrequent intervals (i.e., once per year).	Low • Effect is readily (i.e., immediately) reversible when the exposure ceases	**Not significant**

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C5. PRELIMINARY FOLLOW-UP PROGRAMS

The EIS Guidelines stipulate that the need for, and the requirements of, any follow-up program for the DGR Project be identified. A follow-up program may be required to determine that the environmental and cumulative effects of the DGR Project are consistent with predictions reported in the EIS. It can also be used to verify that mitigation measures are effective once implemented and determine whether there is a need for additional mitigation measures. A preliminary follow-up plan is provided below. The follow-up program is designed to be appropriate to the scale of the DGR Project and the effects identified through the EA process.

The results of the human health assessment for the DGR Project determined that adverse effects to the health of humans living beyond the Bruce nuclear site would not be significant. Nor were there any adverse effects identified for workers. As a result, no additional follow-up monitoring is recommended for the human health indicators.

Not withstanding the results of the health assessment, monitoring of radiological exposures is proposed as part of the follow-up described in the Radiation and Radioactivity TSD. In addition, the Preliminary Safety Report [C38] describes on-site monitoring programs focussed on the exposure and health of workers at the DGR Project.

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C6. CONCLUSIONS

Based on the assessment provided in this report, the following conclusions are provided:

- no residual adverse effects on seasonal users and workers are expected to occur during the DGR Project phases;
- residual adverse effects (not significant) on the overall health of local residents and members of Aboriginal communities are expected to occur during the site preparation and construction operations, and decommissioning phases of the DGR Project lifecycle due to the exposure to acrolein in air; and
- the DGR Project will create employment opportunities and increased income, which may contribute to better health and well-being via reduced stress and greater self-confidence.

The likely adverse effects are not considered to be significant because of the low magnitude and duration of the effect. Acrolein exposures are driven by the existing conditions. In conclusion, no significant adverse effects as a result of the DGR Project are identified on human health VECs.

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APPENDIX C – ATTACHMENT 1:
HUMAN HEALTH RISK ASSESSMENT

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March 2011

CELEBRATING 50 YEARS in 2010

ATTACHMENT 1 OF APPENDIX C

HUMAN HEALTH RISK ASSESSMENT FOR THE DEEP GEOLOGIC REPOSITORY

Submitted to:
Nuclear Waste Management Organization
22 St. Clair Avenue East
Toronto, Ontario M4T 2S3

REPORT

Report Number: 06-1112-0037

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1.0 INTRODUCTION

This attachment provides the detailed methodology and results of the human health risk assessment (HHRA) that forms part of the overall Human Health Assessment (HHA; Appendix C), for the Environmental Impact Statement (EIS) for the Ontario Power Generation (OPG) Deep Geologic Repository (DGR). An EIS is required as part of the environmental assessment (EA) under the provisions of the *Canadian Environmental Assessment Act* (CEAA), because the proponent (OPG) will be required to obtain a license from the Canadian Nuclear Safety Commission (CNSC) to allow the project to proceed.

The primary objective of this HHRA is to quantitatively interpret the potential overall adverse effect of changes in Physical Environmental Determinant valued-ecosystem component (VEC), specifically changes in chemical concentrations in air, surface water, ground water, soil, foods. Other Physical Environment Factors (Noise and Radiological exposures) are addressed in the main body of the HHA. This assessment examines potential off-site effects only. Potential on-site effects to workers are examined in the Radiation and Radioactivity TSD and Malfunctions, Accident and Malevolent Acts TSD.

1.1 Human Health Risk Assessment Approach

The methodology applied in this assessment is technically consistent with established procedures outlined by regulatory agencies such as Health Canada, the Canadian Council of Ministers of the Environment (CCME), the United States Environmental Protection Agency (USEPA) and the Ontario Ministry of the Environment (MOE). The overall risk assessment approach is summarized in the following section.

1.2 Framework

The potential for a health risk to arise from environmental substances is predicated on the co-existence of three elements:

- Chemicals must be present at hazardous levels;
- Receptors (i.e., people) must be present; and
- Exposure pathways must exist between the source of the chemicals and receptors.

In the absence of any one of the three elements, health risks cannot occur. The presence of all three elements indicates a potential for risk to health, but does not necessarily indicate an unacceptable risk. In such situations, a risk assessment is completed to address both the magnitude and uncertainty associated with potential health risks.

The process followed a widely recognized framework for risk assessment, as illustrated in Figure 1.2-1 (Health Canada, 1995). The framework progresses from a qualitative initial phase (Problem Formulation) through exposure and toxicity analysis and culminates in quantitative risk characterization.

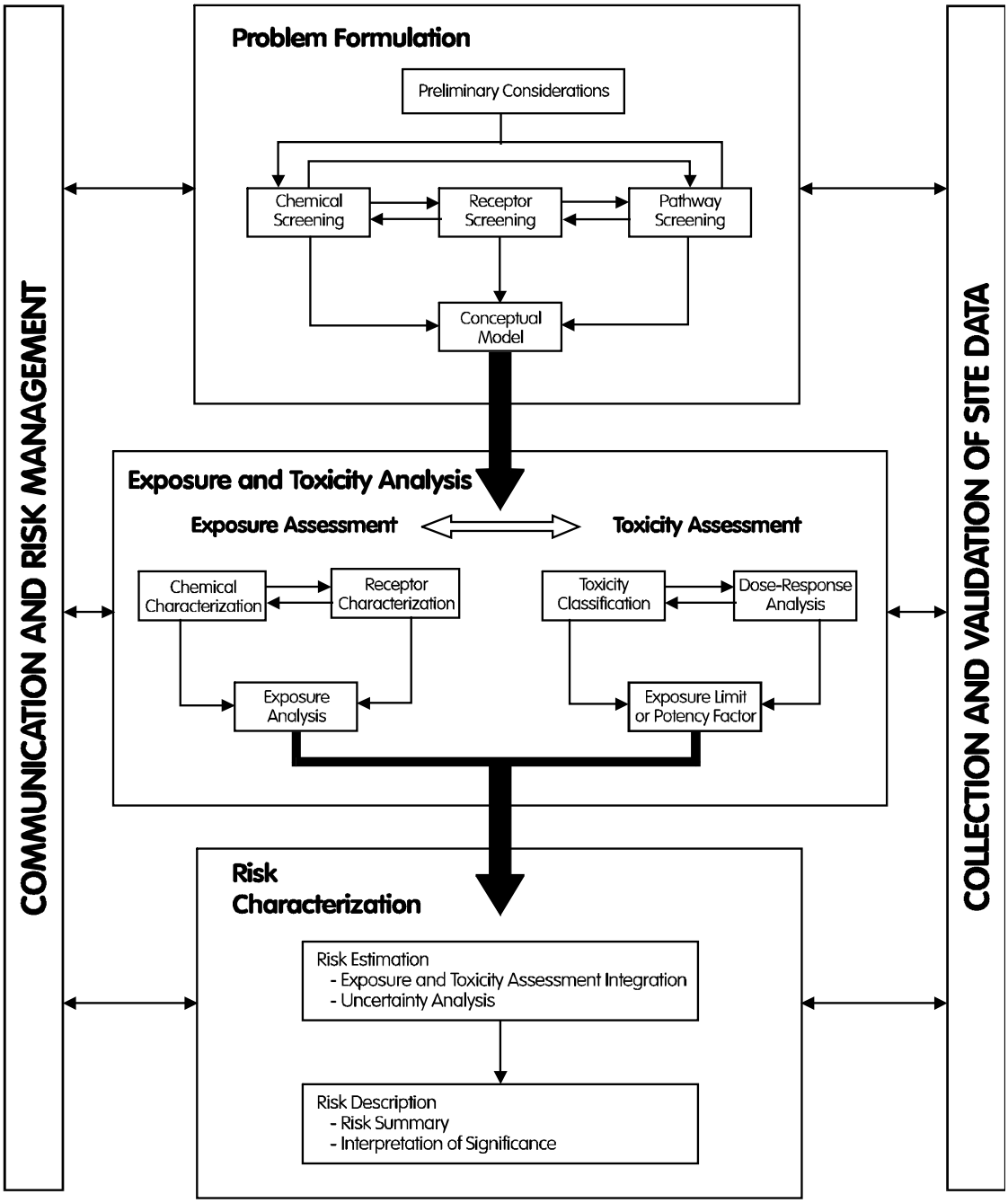

Figure 1.2-1: Risk Assessment Framework

1.2.1 Problem Formulation

The objective of the problem formulation for this assessment was to develop a focussed understanding of how chemicals emitted from the DGR may affect human health within communities and in areas near the DGR Project site. In addition, the assessment was focussed on the human activity that is expected to occur within the study areas, the chemicals that may cause harm and the plausible exposure pathways between chemicals and receptors.

The problem formulation helps to focus the HHRA on the chemicals, receptors and exposure pathways of greatest concern. If no unacceptable health risks are predicted for these, it is highly likely that unacceptable health risks would not be present for other chemicals, receptors or exposure pathways. Specific components of the problem formulation are described in Section 1.2.1.1.

1.2.1.1 Components of Problem Formulation

The three components of problem formulation are:

(i) Receptor screening: The objective of the receptor screening process is to select representative receptors who may be exposed to chemicals emitted by the DGR. Representative receptors include those who would be at greatest risk and would have sufficient characterization data to facilitate calculations of exposure and health risks. Wildlife are also considered where they are highly valued by local people and are a food source for people.

(ii) Chemical screening: The objective of the chemical screening step is to focus on the chemicals of greatest concern emitted by the DGR. Chemicals that do not increase in concentration as a result of the DGR Project, that do not exceed applicable guidelines/criteria and/or that are essential nutrients with very low toxicity potential are typically removed from further consideration. The remaining chemicals, which have the potential to contribute to increased health risks, are evaluated in the HHRA.

(iii) Exposure pathway screening: The objective of the exposure pathway screening is to determine all of the potential routes by which identified receptors could be exposed to potential chemical emissions from the DGR Project. A list of plausible exposure pathways is developed. The list is then evaluated to determine whether each pathway would be operable for each receptor.

The results of the problem formulation are presented as a conceptual exposure model. The conceptual exposure model is usually presented as a flowchart or pictorial illustration of the exposure pathways linking chemicals in various environmental media with the receptors of concern. The conceptual model for this assessment is presented in Section 3.4 of this attachment.

1.2.2 Exposure Assessment

Exposure assessment is the process of estimating the amount of a chemical that a receptor may take into its body (referred to as a dose or concentration) through all applicable exposure pathways. The dose of a chemical depends on the concentration in various media (e.g., air, water, soil and food), the amount of time a receptor is in contact with these media and the biological characteristics of the receptor (e.g., ingestion rates, body weights and dietary preferences).

Exposure assessment requires the use of predictive models. The models incorporate key parameters such as chemical concentrations in environmental media; release rates from the media (e.g., air deposition rates); uptake coefficients describing uptake from air, soil or water; transfer factors between different trophic levels; and receptor characteristics, such as body weight, food ingestion rates and time spent in the study area.

Chemical concentrations used in the exposure assessment models for the current assessment were predicted based on existing sources and the proposed activities associated with the DGR Project. Descriptions of the data used in the HHRA are presented in Section 3.5 of this attachment.

1.2.3 Toxicity Assessment

Toxicity assessment is the process of determining the amount of a chemical that a receptor may take into its body (referred to as a dose) through all applicable exposure pathways without risk of adverse health effects. This parameter is typically referred to as a toxicity reference value.

For this HHRA, toxicity reference values (TRVs) used to evaluate non-carcinogens are called reference doses (RfDs). For carcinogenic chemicals, they are called slope factors (SFs). The RfD and SF are defined as the amount of chemical per unit body weight that can be taken into the body each day with minimal risk of adverse health effects. Toxicity reference values used in this assessment are based on dose-response toxicity evaluations available through agencies and toxicological databases, such as Health Canada and the Integrated Risk Information System (IRIS), a U.S. Environmental Protection Agency (U.S. EPA) on-line database. In addition, the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) has developed a toxicological database for petroleum hydrocarbon mixtures.

1.2.4 Risk Characterization

The final step of this HHRA involves comparison of the exposure estimate to the TRV.

For non-carcinogens, the value is called a hazard quotient (HQ). The HQ is calculated using the following equation:

$$Hazard\ Quotient\ (HQ) = \frac{Estimated\ Exposure\ Dose}{Toxicity\ Reference\ Value}$$

For non-carcinogens, 20% of the TRV for each exposure medium is considered an acceptable risk based on provincial guidance (MOE, 2005a). For example, risk due to exposure to soil through the combined pathways of soil ingestion, dermal contact and inhalation of dust should not exceed 0.2.

For carcinogens, the risk value is characterized by the Incremental Lifetime Cancer Risk (ILCR) and is calculated by the following equation:

$$Incremental\ Lifetime\ Cancer\ Risk\ (ILCR) = Estimated\ Exposure\ Dose\ \times Slope\ Factor$$

The MOE considers an acceptable cancer risk to be one in one million (1×10^{-6}) for each environmental medium. For example, risk due to exposure to soil through the combined pathways of soil ingestion, dermal contact and inhalation of dust should not exceed 1×10^{-6} (MOE, 2005a).

1.2.5 Uncertainty

There is always uncertainty associated with risk assessment predictions, depending on the quality, quantity and variability associated with available information. When information is uncertain, it is standard practice in a risk assessment to make assumptions that are biased towards safety. The uncertainties inherent in modelling exposures are compensated for by the conservative input parameters used. Collectively, these conservative assumptions weigh heavily towards HQs and ILCRs that overestimate the true risk that is likely to be manifested by human and wildlife receptors due to the DGR Project. Thus, there is a high degree of confidence that health risks have not been underestimated in this HHRA.

2.0 SITE CHARACTERIZATION

2.1 Site Description

The site is described in detail in Section 1.1 of the EIS with key points summarized herein. The DGR Project site is a 127 hectare (ha) area located within the fenced portion of the 932 ha Bruce Nuclear site, located about mid-way between Kincardine and Port Elgin. Although OPG is the owner of the Bruce site, the majority of the site is controlled under a leasing agreement with the current operator, Bruce Power. Bruce Power also controls all access to the site. As a result of the leasing agreement between OPG and Bruce Power, OPG has retained control of the portion of the Bruce site encompassing the WWMF and surrounding lands.

The DGR project would be located on the OPG-retained lands at the centre of the Bruce site. The operating Bruce A nuclear generating station is north of the WWMF and the operating Bruce B nuclear generating station is located to the southwest. The WWMF consists of the buildings and structures in the centre of the Bruce nuclear site lands, approximately one kilometre from the Lake Huron shoreline. Former Construction Landfills Nos. 1 and 3 are located within the southeast portion of the DGR Project Area. The central and northern portions of the DGR Project site are a combination of vacant lands, and lands that have been cleared that were historically used as a former metal storage yard and a former construction pipe storage yard. The northwestern corner of the DGR Project site is adjacent (separated by road) to the northeastern corner of the former Bruce Heavy Water Plant (BHWP).

The DGR project is expected to be constructed in the area immediately north of the WWMF. The estimated size of the surface facilities for the DGR project is approximately 13 ha, including the construction laydown area and rock pile. The extent of the underground facilities is approximately 30 ha.

2.2 Existing Conditions

A summary of the existing environmental conditions are discussed in Section 4.0 of the main body of Appendix C and are discussed in detail in the Atmospheric, Geology, and Hydrology and Surface Water Quality TSDs.

2.3 Project Activities

The individual works and activities are the physical structures, buildings, systems, components, activities and events comprising the DGR Project (collectively referred to herein as the "project works and activities"). The specific works and activities required for the DGR Project are summarized in the Basis for EIS in Section 4 of the EIS. Further details on the DGR Project design can be found in Section 4 of the EIS and in the Preliminary Design Report.

3.0 PROBLEM FORMULATION

The problem formulation stage distinguishes between issues for which further quantitative analysis is warranted from those that can be eliminated from further consideration. Once this process is completed, the information from the problem formulation stage is summarized in a Conceptual Site Model (CSM), which illustrates the pathways of the target compounds from their sources, through the relevant environmental media to the receptors of interest. The problem formulation was derived from information provided in the Atmospheric, Geology, Hydrology and Surface Water Quality, Radiation and Radioactivity and Aboriginal Interests TSDs.

3.1 Selection of Target Compounds

The EIS guidelines require assessment of the potential health effects associated with the emissions from the DGR Project, including both criteria compounds and compounds emitted from activities such as fossil fuel combustion and explosives use. A review of the project works and activities was used to identify compounds that could be emitted from the DGR Project that may have an effect on human health. This list includes the following target compounds:

- carbon monoxide (CO);
- nitrogen dioxide (NO_2);
- sulphur dioxide (SO_2);
- particulates (i.e., PM_{10} and $PM_{2.5}$);
- volatile organic compounds including:
  - acetaldehyde;
  - acetone;
  - acrolein;
  - benzene;
  - ethylbenzene;
  - formaldehyde;

  - toluene; and
  - xylenes.
- polycyclic aromatic hydrocarbons (PAHs); and
- selected metals (including aluminum, cadmium, chromium, lead, and zinc).

3.1.1 Air

Concentrations of target compounds were compared to ambient air quality criteria to provide a first tier assessment of the air concentrations in the existing environment and those resulting from emissions from the DGR Project, as shown in Tables A-1 to A-21 in Appendix A. Available ambient air screening criteria are presented in Table A-22. The screening indicates exceedances of the 1-hour and 24-hour standards for acrolein at almost all receptor locations for all Project phases; exceedances of the 1-hour standard for NO_2 during the site preparation and construction phase at maximum modelled concentrations and exceedances of the annual standard for carcinogenic PAHs.

The subsequent sections of this HHRA evaluate the risk to human health associated with acrolein and carcinogenic PAHs exceedances.

Maximum modelled 1-hour NO_2 concentrations exceed the ambient air target (400 µg/m³) during the construction phase and are the consequence of predicted peak events that would occur infrequently during this phase and would be of short-duration. Therefore, no potential risk to human health is identified due to exceedance of the NO_2 ambient air quality criteria and as such, acute exposures to NO_2 are not evaluated further.

With the exception of CO, all target compounds have also been retained for further consideration in the HHRA, with the purpose of providing additional detail on potential health risks associated with chronic exposures to the target compounds. CO was not evaluated further in the HHRA as it acts acutely, whereby it binds to hemoglobin and reduces the oxygen carrying capacity of blood. Maximum CO concentrations do not exceed the acute ambient air quality criteria at all receptor locations, during all phases of the project. Therefore, CO concentrations in air, as a result of emissions from the DGR Project are not considered to pose a risk to human health and have not been evaluated further.

As discussed in the Atmospheric Environment TSD, ozone was not identified as a key indicator for the assessment as the DGR Project does not directly emit ozone, nor does it emit precursor compounds in sufficient volumes to result in enhanced ozone formation.

3.1.2 Soil

No direct releases to soil are expected as a result of the DGR Project works and activities. However, certain airborne compounds released during the DGR Project (e.g. semi-volatile PAHs and metals) can deposit in soils. Once deposition occurs, these contaminants can enter the food chain and result in potential exposures through the consumption of local foods. Target compounds in soil thus include non-carcinogenic and carcinogenic PAHs as well as metals that are released during diesel combustion processes (i.e., aluminum, cadmium, chromium, lead and zinc) during the DGR project. Though metals are initially released in air, they are not evaluated in air

because they will settle to soils quickly and inhalation exposures to metals will be negligible. Once deposited in soils, these metals will tend to be immobile. Thus deposition over the duration of the DGR Project can potentially represent a valid pathway via ingestion of foods grown in these soils.

3.1.3 Groundwater

No releases to groundwater are expected as a result of the DGR Project works and activities. As such, no target compounds in groundwater have been identified.

3.1.4 Surface Water

No releases to surface water are expected as a result of the DGR Project works and activities. As such, no target compounds in surface water have been identified.

3.2 Selection of Receptors

Potential human receptors were identified as people who live in or use areas in the vicinity of the DGR Project. Based on the temporal phases of the project (site preparation and construction, operations, etc.), the following receptors were identified and are considered to be present at the locations indicated on Figure C2.3.1-1 (Appendix C) as follows:

- Local Residents (AR1, AR2 AR3);
- Members of the nearest aboriginal communities (Chippewas of Saugeen First Nation Reserve No. 29, Chippewas of Nawash Unceded First Nation Cape Crocker Reserve No. 27 (AR5), Aboriginal Burial Ground visitors (AR6); and
- Seasonal Users (AR2, AR4).

Members of the Chippewas of Saugeen First Nation were conservatively considered to be present at AR5, even though the reserve is further away from this location. This location was considered because it is the nearest point within the bounds of the air model capabilities. Actual exposures and risks to members of the Chippewas of Saugeen First Nation and other nearby aboriginal communities would be less than is estimated in this HHRA. The Aboriginal Burial Ground, AR6, was identified as a location where members of the aboriginal community may periodically visit and conduct ceremonies. As a result, AR6 has also been considered an exposure point. Seasonal users may be park users or cottagers who would live or vacation in the Local Study Area for part of the year. Seasonal users may use the recreational areas around AR2 and AR4 (Inverhuron Park and Baie du Doré, respectively) and were considered to be present at these locations for approximately two months of the year.

Workers were not quantitatively assessed and accordingly have not been included as a receptor in this assessment. Workers may include construction workers in the site preparation and construction phase or DGR facility personnel during the operations phase. Construction workers could be exposed to chemicals in groundwater, surface water or soil during earthmoving activities. However, as discussed in Appendix C, there are neither existing nor predicted concerns with groundwater, surface water or soil. Thus, a quantitative

assessment was not warranted. DGR Facility personnel could be exposed to physical, chemical and radiological hazards. Radiological hazards are assessed quantitatively and are discussed in detail in Appendix C. Predicted hazards and appropriate pre-emptive mitigation measures are discussed in detail in Appendix C.

3.3 Selection of Exposure Pathways of Concern

The objective of the exposure pathway screening process is to identify potential routes by which people could be exposed to chemicals and the relative significance of these pathways to total exposure. A chemical represents a potential health risk only if it can reach receptors through an exposure pathway at a concentration that could potentially lead to adverse effects. If there is no pathway for a chemical to reach a receptor, then there cannot be a risk, regardless of the chemical concentration. All potential pathways between chemicals and people were considered. Pathways that were quantitatively evaluated included air inhalation, incidental ingestion and dermal contact with soil and ingestion of below-ground and above-ground vegetables. Identified target compounds are not expected to be released to soil, groundwater or surface water during the DGR Project works and activities. Further, local residents would not have direct contact with soils as they do not have access to the DGR site. Groundwater users are upgradient of the DGR site and would not be affected by DGR Project works and activities. Therefore, these pathways were not evaluated for local or regional communities. Further discussion is provided as follows.

3.3.1 Inhalation of Airborne Chemicals

During the site preparation and construction phases, people in the local community may be exposed to volatile and semi-volatile chemicals released in air from the DGR Project. Therefore, inhalation of chemicals in air is evaluated as an exposure pathway in the HHRA for all three receptor groups, at all receptor locations.

3.3.2 Deposition from Air

Although the inhalation of airborne contaminants is the primary mechanism for exposure with respect to changes in air quality, certain airborne compounds can deposit on the ground. Once deposition occurs, these contaminants can enter the food chain which can also result in potential exposures through the consumption of local foods. Thus, during the DGR Project phases, people may be exposed to chemicals deposited to soil by incidental ingestion or dermal contact; by consumption of garden vegetables; or by consumption of locally raised animals. Concentrations in wild game or locally raised animals were not quantitatively evaluated, as this was not considered a valid pathway in the Local Study Area.

3.3.3 Incidental Ingestion and Direct Contact with Soil

Target compounds are not expected to be released directly to soil during the project works and activities of the DGR Project. However, as previously discussed certain airborne compounds can deposit on the ground. Once deposition occurs, these contaminants can enter the food chain which can result in potential exposures through the consumption of local foods.

3.3.4 Ingestion and Dermal Contact with Groundwater

Target compounds are not expected to be released to groundwater during the project works and activities of the DGR Project. As such, this pathway was not retained for further consideration in the HHRA.

3.3.5 Ingestion and Dermal Contact with Surface Water

Target compounds are not expected to be released to surface water during the project works and activities of the DGR Project. As such, this pathway was not retained for further consideration in the HHRA.

3.4 Conceptual Site Model

Figure 3.4-1 represents the potential exposure pathways for the HHRA. Each of the potential exposure pathways are evaluated further in Section 4.5.

Some of the selected target compounds exhibit chemical properties that preclude it from consideration for certain exposure pathways. For example, volatile organic compounds and criteria pollutants are highly volatile and would be cleared by air transport and clearance mechanisms before deposition to soil. Therefore, these compounds have been retained for further consideration in the inhalation pathway alone. Exposure via incidental ingestion and dermal contact with soil and consumption of garden vegetables is considered to be negligible. Similarly, metals will tend to settle out from air and be retained in soils. Accordingly, exposure to metals via inhalation of air has been considered negligible. This assumption is supported by the modelled air concentrations for metals presented in Tables A-18 to A-21 in Appendix A. Table 3.4-1 below summarizes the dominant pathways that were considered for each of the target compounds.

Table 3.4-1: Dominant Exposure Pathway for Target Compounds:

Target Compound	Inhalation	Ingestion or dermal contact with soil (Deposition)	Ingestion of garden vegetables	Ingestion or dermal contact with water
Acetaldehyde	✓			
Acetone	✓			
Acrolein	✓			
Aluminum		✓	✓	✓
Benzene	✓			
Cadmium		✓	✓	✓
Chromium		✓	✓	✓
Ethylbenzene	✓			
Formaldehyde	✓			
Lead		✓	✓	✓
Naphthalene	✓			
NO_2	✓			
PM2.5	✓			

Table 3.4-1: Dominant Exposure Pathway for Target Compounds (continued)

Target Compound	Inhalation	Ingestion or dermal contact with soil (Deposition)	Ingestion of garden vegetables	Ingestion or dermal contact with water
PM10	✓			
SO_2	✓			
Toluene	✓			
Non-Carcinogenic PAHs	✓	✓	✓	✓
Carcinogenic PAHs	✓	✓	✓	✓
Xylenes	✓			
Zinc		✓	✓	✓

3.5 Data Sources

3.5.1 Air Concentrations

Air modelling was used to determine maximum hourly, daily and annual exposure point concentrations of target compounds

Background values reported in the Atmospheric Environment TSD or in literature (MOE, 2005b, Golder, 2010) were added to predicted concentrations for each phase of the Project to determine a worst-case exposure-point concentration in the existing conditions during the site preparation and construction, and operations phases. Air dispersion modelling methods are discussed in detail in the Atmospheric Environment TSD. Air emissions during the decommissioning and abandonment phases were assumed to be equal to or less than those during the site preparation and construction phase. Maximum 24-hour concentrations were considered relevant for evaluating potential exposure to non-carcinogenic compounds and maximum annual concentrations were considered relevant for evaluating exposure to carcinogenic compounds. Maximum 1-hour and 8-hour concentrations were considered when evaluating acute exposures to members of Aboriginal communities visiting the on-site Burial Ground (AR6).

3.5.2 Deposition Rates

Soil and vegetable concentrations were calculated using protocols provided in the *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (US EPA, 2005). These protocols provide a multi-media pathway exposure assessment tool based on reasonable, protective assumptions about how substances emitted from combustion sources can be emitted into ambient air, deposited to soil and consequently taken up into plants and livestock. The US EPA (2005) has developed uptake factors and, environmental fate and transport factors. A description of the methods used to predict concentrations in soil and plants are presented in the following sections.

Concentrations in soil and garden vegetables were calculated based on wet and dry deposition rates, at the receptor location with the highest average ambient air concentration of semi- to non-volatile compounds.

Receptor Location AR2 represents a worst-case exposure scenario. Calculation methods for wet and dry deposition rates are described in detail in Appendix B.

3.5.2.1 Soil Concentrations

The parameters used to calculate soil concentrations are presented in Table 3.5.2.1-1. Sample calculations are presented in Appendix C. An incremental soil concentration was calculated for each DGR Project phase. Loss due to weathering and degradation was only assumed for organic chemicals because metals are not degraded by processes such as microbial degradation and photolysis (US EPA, 2005). All chemicals deposited onto soil were assumed to mix within the top 0.2 m for tilled land (vegetables grown in a garden). An incremental soil concentration was determined for each Project phase and was applied in the exposure modelling for each of the project phases. Soil concentrations used in this HHRA are presented in Section 4.5.1 of this HHRA Attachment. Predicted soil concentrations due to deposition during the DGR Project phases are presented below in Table 3.5.2.1-2.

Table 3.5.2.1-1 Parameters for Predicting Incremental Soil Concentrations

Variable		Value	Units	Reference
ISC	Incremental Soil Concentration	Chemical specific	mg/kg dry wt	See Appendix C of this Attachment
Dyd	Dry Deposition rate	Chemical specific	$g/m^2/yr$	See Appendix B of this Attachment
Dyw	Wet Deposition rate	Chemical specific	$g/m^2/yr$	See Appendix B of this Attachment
tD	deposition time (the period of the baseline phase)	10	yr	Assumed
tD	deposition time (the period of the construction phase)	7	yr	EIS
tD	deposition time (the period of the operations phase)	45	yr	EIS
tD	deposition time (the period of the decommissioning phase)	6	yr	EIS
tD	deposition time (the period of the entire project)	58	yr	EIS
Zs	Soil mixing depth	20	cm	Tilled soil U.S. EPA (2005) Appendix B Table B-1-1
BD	Bulk Density	1.5	g/cm^3	U.S. EPA (2005) Appendix B Table B-1-1
Ks (carcinogenic PAHs)	soil loss constant; loss of soil from biotic and abiotic processes and degradation (carcinogenic PAHs)	0.27	(yr-1)	Howard *et al.* (1991) as cited in U.S. EPA 2005; HHRAP Companion Database
Ks (Non-carcinogenic PAHs)	soil loss constant; loss of soil from biotic and abiotic processes and degradation (non-carcinogenic PAHs)	0.55	(yr-1)	Howard *et al.* (1991) as cited in U.S. EPA 2005; HHRAP Companion Database

The following equations are used to calculated incremental soil concentration for inorganic and organic chemicals.

ISC (Inorganic Chemicals) = (100* (Dyd+Dyw)*tD) / (Zs *BD)
ISC (Organic Chemicals) = [(100*(Dyd+Dyw)*[1-exp(-Ks * tD)]/(Zs*BD*Ks)]

Table 3.5.2.1-2: Predicted Incremental Soil Concentrations

Parameter	ISC (mg/kg dry wt)		
	Maximum Receptor Group AR2 (Residential)		
	Baseline	Construction	Operations
Inorganic			
Aluminum	7.51E-04	1.12E-03	3.38E-03
Cadmium	5.63E-04	8.41E-04	2.53E-03
Chromium	9.38E-05	1.40E-04	4.22E-04
Lead	9.38E-05	1.40E-04	4.22E-04
Zinc	6.57E-04	9.82E-04	2.96E-03
Organic			
Carcinogenic PAHs	2.76E-06	5.36E-06	2.96E-06
Non-carcinogenic PAHs	9.06E-05	1.90E-04	9.10E-05

3.5.2.2 Plant Concentrations

Chemical concentrations in garden produce were estimated using the equations below and the parameters presented in Table 3.5.2.2-1. These equations were used to calculate plant tissue concentrations in above-ground vegetables due to air deposition on foliage and uptake from soil; and tissue concentrations in below-ground vegetables. Incremental plant concentrations due to each project phase were calculated and applied in the exposure modelling calculations for each project phase. Tables 3.5.2.2-2 and 3.5.2.2-3 show the predicted concentrations in above and below ground vegetables.

Incremental Plant Concentration:

$$Incremental\ Plant\ Concentration\ (IPC) = Incremental\ Plant\ Concentration\ due\ to\ Air\ Depostion\ (Pd) + Incrementation\ Plant\ Concentration\ due\ to\ vapour\ transfer(Pv) + Incremental\ Plant\ Concentration\ due\ to\ root\ uptake\ (Pr)$$

Above-ground Vegetables:

$$Pd = (1{,}000 * (Dyd + (Fw * Dyw)) * (1 - Fv) * Rp(plant\ material) * (1.0 - exp(-Kp * Tp(plant\ material))/(Yp(plant\ material) * Kp)$$

$$Pv = 0\ for\ target\ chemicals$$

$$Pr = ISC * BCFag$$

Below-ground Vegetables:

$$Pd = 0$$

$$Pv = 0$$

$$Pr = ISC * BCF(soil\ to\ root) * Vg$$

Table 3.5.2.2-1 Parameters for Predicting Vegetable Concentrations

Variable		Value	Units	Reference
Dyd	Dry Deposition rate	Chemical specific	g/m²/yr	See Appendix B of this Attachment
Dyw	Wet Deposition rate	Chemical specific	g/m²/yr	See Appendix B of this Attachment
Fw	fraction of chemical wet deposition that adheres to plant surfaces	0.6	unitless	cations and organics – U.S. EPA Region 6 (2005) Appendix B Table B-2-7
Fv	fraction of chemical in vapour phase	0	unitless	assumed
Rp	interception fraction; represents portion of chemical deposition intercepted by plants	0.39	unitless	default value – U.S. EPA Region 6 (2005) Appendix B Table B-2-7
Tp	length of plant exposure to deposition per year	0.164	yr	default value – U.S. EPA Region 6 (2005) Appendix B Table B-2-7
Yp	crop yield	2.24	(kg dry wt/m²)	default value – U.S. EPA Region 6 (2005) Appendix B Table B-2-7
Kp	chemical removal from the plant surface by weathering	18	yr^{-1}	default value – U.S. EPA Region 6 (2005) Appendix B Table B-2-7
ISC	Incremental Soil Concentration	chemical-specific	mg/kg dry wt	Calculated
BCFag	bioconcentration factor	chemical-specific	mg/kg dry wt	Chemical specific U.S. EPA Region 6 (2005); RAIS
BCF (soil to root)	bioconcentration factor	chemical-specific	unitless	Chemical specific U.S. EPA Region 6 (2005); RAIS
Vg (Kow <4)	correction factor to account for absorption of chemical through root surface	1	(unitless)	for all chemicals with log Kow < 4 – U.S. EPA Region 6 (2005) Appendix B Table B-2-7
Vg (Kow >4)	correction factor to account for absorption of chemical through root surface	0.01	(unitless)	for all chemicals with log Kow > 4 – U.S. EPA Region 6 (2005) Appendix B Table B-2-7

Table 3.5.2.2-2: Concentration in Above-ground Vegetables

Parameter	Total Plant Concentration (mg/kg dry wt)		
	Maximum Receptor Group AR2 (Residential)		
	Baseline	Construction	Operations
Inorganic			
Aluminum	2.00E-04	4.35E-04	2.11E-04
Cadmium	2.15E-04	4.24E-04	4.52E-04
Chromium	2.51E-05	5.45E-05	2.67E-05
Lead	2.60E-05	5.58E-05	3.05E-05
Zinc	2.36E-04	4.72E-04	4.59E-04
Organic			
Carcinogenic PAHs	2.12E-06	4.62E-06	2.12E-06
Non-carcinogenic PAHs	1.40E-04	3.06E-04	1.40E-04

Table 3.5.2.2-3: Concentration in Below-ground Vegetables

Parameter	Plant Concentration due to Root Uptake		
	Maximum Receptor Group AR2 (Residential)		
	Baseline	Construction	Operations
Inorganic			
Aluminum	3.00E-06	4.49E-06	1.35E-05
Cadmium	3.60E-05	5.39E-05	1.62E-04
Chromium	4.22E-07	6.31E-07	1.90E-06
Lead	8.45E-07	1.26E-06	3.80E-06
Zinc	5.91E-04	8.84E-04	2.66E-03
Organic			
Carcinogenic PAHs	1.10E-09	2.14E-09	1.18E-09
Non-carcinogenic PAHs	1.36E-07	2.85E-07	1.37E-07

4.0 EXPOSURE ASSESSMENT

The exposure assessment involves estimating the daily dose of a compound to which receptors are potentially exposed for each complete exposure pathway identified in the problem formulation stage. Both predicted project emission data and cumulative concentration data were considered with conservative exposure assumptions to describe receptor contact with the COCs.

Members of Aboriginal communities were assumed to be present at AR6 (on-site Burial Ground) for visitations and for ceremonies. Their exposures would be infrequent and short in duration (less than eight hours). As a result, an assessment of the acute effects was considered more appropriate for this location. The acute assessment for AR6 consists of two parts. The first part considers the effects of exposures to maximum 1-hour concentrations of classical air pollutants (NO_2, SO_2 and CO) at the Burial Ground and the second part considers the effects of an 8-hour exposure to all target compounds, twelve times per year.

4.1 Temporal Boundaries

The HHRA evaluates the long-term (chronic) effects of chemicals (short-term for relevant chemicals) on human health. The assessment assumes that people live their entire lives within the study area. As discussed in the main report, the effects to human health are predicted and assessed in the context of temporal boundaries. The following temporal exposure scenarios were evaluated in the HHRA:

1) Exposure to chemical emissions from the existing sources (i.e., existing conditions);

2) Exposure to combined chemical emissions from the existing sources and the DGR site preparation and construction activities (i.e., site preparation and construction phase, 5-7 years);

3) Exposure to combined chemical emissions from the existing sources and those emitted during the DGR operation (i.e. operations phase, 40-45 years);

4) Exposure to combined chemical emissions from the existing sources and those emitted during the DGR decommissioning (i.e. decommissioning phase, 6 years); and

5) Exposure to combined chemical emissions from the existing sources and those emitted during the DGR abandonment and long-term performance (i.e. abandonment and long-term performance phase).

Exposures to combined chemical emissions from the existing sources and those emitted during the decommissioning and abandonment phases are assumed to each be less than or equal to those during the site preparation and construction phase. Exposure and risk estimates are presented for the existing conditions, site preparation and construction and operations phases only.

4.2 Spatial Boundaries

The assessment of the DGR Project on human health is conducted within the framework of spatial boundaries described in Section 5.2 of the EIS. The study areas were used without modification.

4.3 Receptor Characteristics

To quantitatively estimate the exposure doses that the receptors identified in the CSM could be exposed to, the characteristics of the receptors (e.g., body weight) and their contact rates with air, soil and vegetation (e.g., inhalation rate, ingestion rate) were determined. Guidance from Health Canada (2004) was used as the primary source of receptor characteristics and contact rates; where there was no Health Canada guidance, guidance from other sources such as the Exposure Factors Handbook (U.S. EPA, 1997) were adopted. The following receptors were evaluated at the locations identified on Figure C2.3.1-1 (Appendix C):

- Local Residents (AR1, AR2 AR3);
- Members of the nearest aboriginal communities (Chippewas of Saugeen First Nation Reserve No. 29, Chippewas of Nawash Unceded First Nation Cape Crocker Reserve No. 27) (AR5), Aboriginal Burial Ground visitors (AR6); and.
- Seasonal Users (AR2, AR4).

The specific receptor characteristics and exposure assumptions are provided in Table 4.3.2-1.

4.3.1 Non-cancer Evaluation

Health Canada (2004) considers that residents spend 1.5 hours outdoors. This exposure time was adopted for local residents, recreational users and Aboriginal residents. Exposure frequencies of 365 days per year for the resident and aboriginal resident, and 70 days per year for the seasonal user were adopted from Health Canada (2004). Exposure durations were adopted from Health Canada and were also limited to the duration of the project phase (i.e. maximum of 7 years for the construction phase). Averaging times were set equal to the exposure duration. Body weights and inhalation rates were also adopted from Health Canada (2004). For the exposure pathways evaluated, members of Aboriginal communities at AR5 have the same exposure parameters as the resident. The receptor characteristics for AR6 are the same as at AR5 except that they are assumed to spend eight hours per day (hours/day), once per month at this location.

4.3.2 Cancer Evaluation

Exposure parameters were consistent with the non-cancer evaluation. Averaging times for carcinogens were adopted from Health Canada (2004).

Table 4.3-1: Receptor Characteristics

Exposure Factor	Infant	Toddler	Child	Adolescent	Adult	Seasonal User	Reference
Age	0-6 months	7 months-4 years	5 -11 years	12-19 years	≥20 years	≥20 years	Health Canada, 2004
Body Weight (kg)	8.2	16.5	32.9	59.7	70.7	70.7	Health Canada, 2004
Inhalation Rate (m^3/day)	2.1	9.3	14.5	15.8	15.8	15.8	Health Canada, 2004
Soil Ingestion Rate (mg/day)	20	80	20	20	20	100	Health Canada, 2004
Surface Area-Hands (cm^2)	320	430	590	800	890	890	Health Canada, 2004
Surface Area-Arms (cm^2)	550	890	1480	2230	2500	2500	Health Canada, 2004
Surface Area-Legs(cm^2)	910	1690	3070	4970	5720	5720	Health Canada, 2004
Rate of Adherence-Hands (g/cm^2)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	Health Canada, 2004

Table 4.3.2-1: Receptor Characteristics - Resident and Seasonal User (continued)

Exposure Factor	Infant	Toddler	Child	Adolescent	Adult	Seasonal User	Reference
Rate of Adherence-Arms&Legs (g/cm^2)	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	Health Canada, 2004
Ingestion of Above-ground vegetables (g/day)	72	67	98	120	137	137	Health Canada, 2004
Ingestion of Below-ground vegetables (g/day)	83	105	161	227	188	188	Health Canada, 2004
Exposure Time (hours/day)	1.5	1.5	1.5	1.5	1.5	1.5	Health Canada, 2004
Exposure Frequency (days/year)	365	365	365	365	365	70	Health Canada, 2004
Exposure duration (years)	0.5	4.5	7	8	10	4.5 (NC) / 30 (C)	Assumed(1)
Averaging Time (non-cancer; years)	0.5	4.5	7	8	10	4.5	Health Canada, 2004
Averaging Time (cancer; years)	75	75	75	75	75	56	Health Canada, 2004

Notes:

For the exposure pathways evaluated, members of Aboriginal communities at AR5 have the same exposure parameters as the resident.
(1) The exposure duration for the non-cancer assessment for the seasonal user is 4.5 years to represent a toddler, for the cancer assessment it is 30 years to represent an adult.

4.4 Pathway Analysis

Based on the identified COCs, the relevant environmental media (soil, groundwater, air, etc.) and the potential human receptors (i.e., residents, seasonal users, etc.), exposure pathways were identified and evaluated for the selected off-site human receptors, as previously discussed and as presented below in Table 4.4-1.

Table 4.4-1: Exposure Pathways of Concern

	Air	Water	Soil (Deposition)	Foods (Garden vegetables)
Inhalation	✓			
Ingestion			✓	✓
Dermal Contact			✓	

4.5 Exposure Estimates

4.5.1 Exposure Point Concentrations

Maximum predicted 24-hour emission concentrations from each phase of the DGR Project (existing environment, site preparation and construction, and operations) were used as exposure point concentrations to calculate exposure for receptors AR1 to AR5 for the non-cancer assessment. Maximum predicted annual emission concentrations from each phase were used as exposure point concentrations at receptor locations AR1 to AR5 to calculate exposures for the cancer assessment. Maximum 1-hour and 8-hour concentrations were used as exposure point concentrations for the acute assessment for AR6. These concentrations are presented below in Tables 4.5.1-1 to 4.5.1-4.

Table 4.5.1-1: Maximum Predicted 1-hour Concentrations (µg/m³)

	Existing Environment	Site Preparation and Construction	Operations
	Receptor Location	Receptor Location	Receptor Location
Contaminant	**AR6**	**AR6**	**AR6**
Acetaldehyde	17	40	17
Acetone	9	21	9
Acrolein	1.6	3.5	1.6
Aluminum	0.011	0.048	0.013
Benzene	1.1	2.6	1.1
Cadmium	0.008	0.036	0.010
Carbon monoxide	351	1274	515
Chromium	0.0013	0.0059	0.0016
Ethylbenzene	0.19	0.45	0.19
Formaldehyde	9	21	9
Lead	0.001	0.006	0.002
Naphthalene	0.003	0.016	0.004
NO_2	73	252	159
$PM_{2.5}$	9	139	16
PM_{10}	13	221	19
SO_2	204	204	204
Toluene	1.6	3.8	1.6
Non-Carc PAHs	0.009	0.034	0.011
Xylenes	1.3	3.0	1.3
Zinc	0.009	0.042	0.011

Table 4.5.1-2: Maximum Predicted 8-hour Concentrations (µg/m³)

	Existing Environment	Site Preparation and Construction	Operations
	Receptor Location	Receptor Location	Receptor Location
Contaminant	**AR6**	**AR6**	**AR6**
Acetaldehyde	5	11	5
Acetone	3	6	3
Acrolein	0.7	1.1	0.7
Aluminum	0.003	0.010	0.003
Benzene	0.3	0.7	0.3
Cadmium	0.002	0.008	0.002
Carbon monoxide	339	523	344
Chromium	0.0004	0.0013	0.0004
Ethylbenzene	0.06	0.12	0.06
Formaldehyde	2.8	5.6	2.8
Lead	0.0004	0.0013	0.0004
Naphthalene	0.0010	0.0033	0.0010
NO_2	30	128	76
$PM_{2.5}$	16	50	17
PM_{10}	27	82	27
SO_2	68	68	68
Toluene	0.5	1.0	0.5
Non-Carc PAHs	0.004	0.009	0.004
Xylenes	0.4	0.8	0.4
Zinc	0.003	0.009	0.003

Table 4.5.1-3: Maximum Predicted 24-hour Concentrations (µg/m³)

	Existing Environment					Site Preparation and Construction					Operations				
	Receptor Location					Receptor Location					Receptor Location				
Contaminant	**AR1**	**AR2**	**AR3**	**AR4**	**AR5**	**AR1**	**AR2**	**AR3**	**AR4**	**AR5**	**AR1**	**AR2**	**AR3**	**AR4**	**AR5**
Acetaldehyde	2	2	2	2	1	3	3	2	4	1	2	2	2	2	1
Acetone	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1
Acrolein	0.4	0.4	0.4	0.4	0.3	0.5	0.5	0.4	0.5	0.3	0.4	0.4	0.4	0.4	0.3
Aluminum	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.001
Benzene	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Cadmium	0.001	0.001	0.001	0.001	0.000	0.001	0.002	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.000
Carbon monoxide (8-hour)	262	285	253	285	258	297	303	261	355	273	269	286	254	292	259
Chromium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0002	0.0004	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Ethylbenzene	0.02	0.02	0.02	0.02	0.01	0.03	0.03	0.03	0.04	0.01	0.02	0.02	0.02	0.02	0.01
Formaldehyde	0.9	1.0	1.1	1.1	0.6	1.4	1.4	1.2	2.0	0.6	1.0	1.1	1.1	1.1	0.6
Lead	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0002	0.0004	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Naphthalene	0.0003	0.0002	0.0004	0.0003	0.0002	0.0006	0.0007	0.0004	0.0011	0.0003	0.0003	0.0003	0.0004	0.0003	0.0002
NO_2	18	19	19	19	16	63	49	24	84	31	30	24	20	32	17
$PM_{2.5}$	14	14	15	14	14	21	19	16	29	17	15	14	15	14	14
PM_{10}	24	24	24	24	23	34	32	26	47	29	24	24	24	24	23
SO_2	25	23	31	24	20	25	23	31	24	20	25	23	31	24	20
Toluene	0.2	0.2	0.2	0.2	0.1	0.3	0.3	0.2	0.3	0.1	0.2	0.2	0.2	0.2	0.1
Non-Carc PAHs	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.003	0.004	0.003	0.003	0.003	0.003	0.003	0.003
Xylenes	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.3	0.1	0.1	0.2	0.2	0.2	0.1
Zinc	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.001

Table 4.5.1-4: Maximum Predicted Annual Concentrations (µg/m³)

	Existing Environment					Site Preparation and Construction					Operations				
	Receptor Location					Receptor Location					Receptor Location				
Contaminant	**AR1**	**AR2**	**AR3**	**AR4**	**AR5**	**AR1**	**AR2**	**AR3**	**AR4**	**AR5**	**AR1**	**AR2**	**AR3**	**AR4**	**AR5**
Acetaldehyde	0.17	0.20	0.13	0.17	0.09	0.23	0.27	0.14	0.27	0.10	0.18	0.21	0.13	0.18	0.09
Benzene	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Cadmium	0.00005	0.00004	0.00004	0.00004	0.00003	0.00009	0.00009	0.00005	0.00013	0.00005	0.00006	0.00005	0.00004	0.00006	0.00003
Chromium	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Formaldehyde	0.09	0.11	0.07	0.09	0.05	0.12	0.14	0.08	0.14	0.06	0.10	0.11	0.07	0.10	0.05
Carcinogenic PAHs	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003

4.5.2 Exposure Factors

Both adults and toddlers were evaluated for non-carcinogenic chemicals. Children are considered to be more sensitive to the effects of chemicals than an adult because they typically have a greater intake rate to body weight ratio and certain behavioural activities that may expose them to larger quantities of chemicals (e.g., playing in soil). In addition, some chemicals (e.g., lead) have been shown to be more toxic to children than adults. Consistent with risk assessment guidance (Health Canada 2004, 1995), the toddler life stage (i.e., 7 months to 4 years) was chosen as the most sensitive child life stage. Accordingly, exposure estimates for the toddler have been presented in the tables in Section 4.5.5.

Development of cancer occurs over a longer period of time and consequently, it is appropriate to evaluate a receptor over their entire lifespan, rather than evaluating only a certain phase of life (e.g., childhood). Therefore, for carcinogenic chemicals, a "composite" receptor was evaluated from birth to 70 years of age.

Details on the body weights, vegetation ingestion rates, soil ingestion rates and air inhalation rates for humans have been presented above in Table 4.3.2-1.

4.5.3 Relative Absorption Factors

The relative absorption factors (RAFs) provided by the MOE (2009) were adopted for use in this HHRA. Inhalation RAFs were assumed equal to unity. The RAFs used in the HHRA are provided in Table 4.5.3-1.

Table4.5.3-1: Relative Absorption Factors

Compound	RAF_{inh}		RAF_{ing}		RAF_{der}	
	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer
Acetaldehyde	1	1	-	-	-	-
Acetone	1	-	-	-	-	-
Acrolein	1	-	-	-	-	-
Aluminum	-	-	1	-	0.1	-
Benzene	1	1	-	-	-	-
Cadmium	-	-	1	-	0.01	-
Chromium	-	-	1	-	0.1	-
Ethylbenzene	1	-	-	-	-	-
Formaldehyde	1	1	-	-	-	-
Lead	-	-	1	-	1	-
Naphthalene	1	-	-	-	-	-
NO_2	1	-	-	-	-	-
$PM_{2.5}$	1	-	-	-	-	-
PM_{10}	1	-	-	-	-	-
SO_2	1	-	-	-	-	-
Toluene	1	-	-	-	-	-
Non-Carc PAHs	1	-	1	-	0.13	-
Carc PAHs	-	1	-	1	-	0.1
Xylenes	1	-	-	-	-	-
Zinc	-	-	1	-	0.1	-

Note:

'-' indicates that this pathway was not evaluated for this compound.

4.5.4 Estimation of Exposure Doses

The equations used to calculate the exposure dose are shown below and have been modified slightly from those provided by Health Canada and US EPA for additional transparency. It should also be noted that the averaging time (AT) in the equations below was considered to be equal to the exposure duration (ED) for non-carcinogens and equal to the total lifespan of the individual for carcinogens. Non-carcinogenic exposure doses are presented in section 4.5.5 in Tables 4.5.5.1-1 to 4.5.5.1-7 for the existing environment; Tables 4.5.5.2-1 to 4.5.5.2-7 for the site preparation and construction phase; and Tables 4.5.5.3-1 to 4.5.5.3-7 for the operations phase. Carcinogenic exposure doses are presented section 4.5.6 in Tables 4.5.6.1-1 to 4.5.6.1-7 for the existing environment; Tables 4.5.6.2-1 to 4.5.6.2-7 for the site preparation and construction phase; and Tables 4.5.6.3-1 to 4.5.6.3-7 for the operations phase. Further details and sample calculations are provided in Appendix D.

Exposure doses for ingestion and dermal contact of soil and ingestion of above- and below-ground vegetables were calculated for receptor location AR2. As previously discussed, exposure point concentrations at this location represent the maximum levels to which any receptor would be exposed. For this reason, they have conservatively been used to estimate metal and PAH exposures from soil and vegetables at all receptor locations. Differences in exposure estimates are thus reflective of receptor characteristics.

In the acute assessment for receptor AR6, 1-hour maximum predicted were adopted unadjusted, as exposures (see Table 4.5.1-1) for the first part of the assessment. In second part of the acute assessment, exposures were estimated by adjusting maximum predicted eight-hour concentrations based on receptor characteristics (e.g. breathing rate, body weight etc.). These acute exposure estimates are presented with the other receptors in the tables below.

4.5.4.1 Incidental Ingestion of Soil

$$Dose\ (mg \cdot kg/day) = \frac{C_s \times IR_s \times RAF_{ing} \times EF \times ED}{BW \times AT \times CF} \qquad \textbf{(1)}$$

Where:

C_S = concentration of chemical in soil (mg/kg)

IR_S = receptor soil ingestion rate (kg/d)

RAF_{ing} = relative absorption factor from the gastrointestinal tract (unitless)

EF = exposure frequency (d/yr)

ED = exposure duration (yr)

BW = body weight (kg)

AT = averaging time (equal to ED for non-carcinogens; equal to 70 years for carcinogens)

CF = unit conversion factor (365 d/yr)

4.5.4.2 Dermal Contact with Soil

$$Dose\ (mg/kg \cdot day) = \frac{C_s \times RAF_{der} \times \sum SA \times R_{adher} \times EV \times EF \times ED}{BW \times AT \times CF} \quad \textbf{(2)}$$

Where:

C_S = concentration of chemical in soil (mg/kg)

RAF_{der} = relative absorption factor for skin (unitless)

SA = exposed skin surface area (cm^2)

R_{adher} = rate of soil adherence to skin (kg/cm^2-event)

EV = events per day (event/d)

EF = exposure frequency (d/yr)

ED = exposure duration (yr)

BW = body weight (kg)

AT = averaging time (equal to ED for non-carcinogens; equal to 70 years for carcinogens)

CF = unit conversion factor (365 d/yr)

4.5.4.3 Inhalation Exposures

$$Dose\ (mg/kg \cdot day) = \frac{C_{air} \times CF_1 \times RAF_{inh} \times IR \times ET \times EF \times ED}{BW \times CF_2 \times AT} \quad \textbf{(3)}$$

Where:

C_{air} = concentration in air (in $\mu g/m^3$);

CF_1 = unit correction factor (0.001mg/µg);

RAF_{inh} = correction factor for absorption by inhalation (unitless);

IR = inhalation rate (m^3/hr);

ET = exposure time (hr/day);

EF = exposure frequency (day/yr);

ED = exposure duration (yr);

BW = body weight (kg);

CF_2 = unit correction factor (365 days/yr); and

AT = averaging time (yr).

4.5.4.4 Ingestion of Garden Vegetables

$$Dose\ (mg/kg \cdot day) = \frac{C_{veg} \times R_{ing} \times RAF_{ing} \times EF \times ED}{BW \times AT \times CF1} \quad \textbf{(4)}$$

Where:

C_{veg} = concentration of compound in vegetables (mg/kg);

R_{ing} = rate of ingestion of backyard vegetables (kg/d);

RAF_{ing} = ingestion relative absorption factor for food (unitless) ;

EF = exposure frequency expressed as days per year (d/yr);

ED = exposure duration expressed as years (yr);

BW = body weight expressed as kilograms (kg);

AT = averaging time; and

CF_1 = unit correction factor of 365 d/yr.

4.5.5 Non-carcinogenic Exposure Doses

4.5.5.1 Existing Environment

Table 4.5.5.1-1: Inhalation Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	6.3E-05	6.6E-05	7.4E-05	4.1E-05	3.2E-05	1.3E-05	1.4E-05
Acetone	3.3E-05	3.5E-05	3.9E-05	2.2E-05	1.7E-05	6.7E-06	7.1E-06
Acrolein	1.4E-05	1.4E-05	1.5E-05	1.2E-05	4.2E-06	2.7E-06	2.8E-06
Aluminum	—	—	—	—	—	—	—
Benzene	4.1E-06	4.4E-06	4.9E-06	2.7E-06	2.1E-06	8.4E-07	8.9E-07
Cadmium	—	—	—	—	—	—	—
Carbon monoxide	—	—	—	—	2.1E-03	—	—
Chromium	—	—	—	—	—	—	—
Ethylbenzene	7.0E-07	7.5E-07	8.4E-07	4.6E-07	3.6E-07	1.4E-07	1.5E-07
Formaldehyde	3.3E-05	3.5E-05	4.0E-05	2.2E-05	1.7E-05	6.8E-06	7.2E-06
Lead	—	—	—	—	—	—	—
Naphthalene	1.0E-08	8.5E-09	1.3E-08	6.8E-09	6.4E-09	1.6E-09	1.8E-09
NO_2	6.4E-04	6.6E-04	6.9E-04	5.7E-04	1.9E-04	1.3E-04	1.3E-04
$PM_{2.5}$	5.0E-04	5.0E-04	5.1E-04	5.0E-04	1.0E-04	9.6E-05	9.7E-05
PM_{10}	8.4E-04	8.6E-04	8.5E-04	8.3E-04	1.6E-04	1.6E-04	1.6E-04
SO_2	8.9E-04	8.0E-04	1.1E-03	7.0E-04	4.2E-04	1.5E-04	1.6E-04
Toluene	6.0E-06	6.3E-06	7.1E-06	3.9E-06	3.1E-06	1.2E-06	1.3E-06
Non-Carcinogenic PAHs	9.8E-08	9.5E-08	1.1E-07	9.2E-08	2.7E-08	1.8E-08	1.9E-08
Xylenes	4.7E-06	5.0E-06	5.6E-06	3.1E-06	2.4E-06	9.6E-07	1.0E-06
Zinc	—	—	—	—	—	—	—

Table 4.5.5.1-2: Incidental Soil Ingestion Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	3.6E-09	3.6E-09	3.6E-09	3.6E-09	1.2E-10	2.0E-10	2.0E-10
Benzene	—	—	—	—	—	—	—
Cadmium	2.7E-09	2.7E-09	2.7E-09	2.7E-09	9.0E-11	1.5E-10	1.5E-10
Carbon monoxide	—	—	—	—	—	—	—
Chromium	4.5E-10	4.5E-10	4.5E-10	4.5E-10	1.5E-11	2.5E-11	2.5E-11
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	4.5E-10	4.5E-10	4.5E-10	4.5E-10	1.5E-11	2.5E-11	2.5E-11
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	4.4E-10	4.4E-10	4.4E-10	4.4E-10	1.4E-11	2.5E-11	2.5E-11
Xylenes	—	—	—	—	—	—	—
Zinc	3.2E-09	3.2E-09	3.2E-09	3.2E-09	1.0E-10	1.8E-10	1.8E-10

Table 4.5.5.1-3: Soil Dermal Contact Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	3.1E-10	3.1E-10	3.1E-10	3.1E-10	1.0E-11	3.5E-11	3.5E-11
Benzene	—	—	—	—	—	—	—
Cadmium	2.3E-11	2.3E-11	2.3E-11	2.3E-11	7.7E-13	2.6E-12	2.6E-12
Carbon monoxide	—	—	—	—	—	—	—
Chromium	3.9E-11	3.9E-11	3.9E-11	3.9E-11	1.3E-12	4.4E-12	4.4E-12

Table 4.5.5.1-3: Soil Dermal Contact Exposure Dose (mg/kg-day) (continued)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	3.9E-10	3.9E-10	3.9E-10	3.9E-10	1.3E-11	4.4E-11	4.4E-11
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	4.9E-11	4.9E-11	4.9E-11	4.9E-11	1.6E-12	4.9E-11	4.9E-11
Xylenes	—	—	—	—	—	—	—
Zinc	2.7E-10	2.7E-10	2.7E-10	2.7E-10	9.0E-12	2.7E-10	2.7E-10

Table 4.5.5.1-4: Soil Direct Contact Total (Ingestion + Dermal Contact) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	4.0E-09	4.0E-09	4.0E-09	4.0E-09	1.3E-10	2.4E-10	2.4E-10
Benzene	—	—	—	—	—	—	—
Cadmium	2.8E-09	2.8E-09	2.8E-09	2.8E-09	9.1E-11	1.6E-10	1.6E-10
Carbon monoxide	—	—	—	—	—	—	—
Chromium	4.9E-10	4.9E-10	4.9E-10	4.9E-10	1.6E-11	3.0E-11	3.0E-11
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	8.5E-10	8.5E-10	8.5E-10	8.5E-10	2.8E-11	6.9E-11	6.9E-11
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—

Table 4.5.5.1-4: Soil Direct Contact Total (Ingestion + Dermal Contact) Exposure Dose (mg/kg-day) (continued)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Non-Carcinogenic PAHs	4.9E-10	4.9E-10	4.9E-10	4.9E-10	1.6E-11	7.4E-11	7.4E-11
Xylenes	—	—	—	—	—	—	—
Zinc	3.5E-09	3.5E-09	3.5E-09	3.5E-09	1.1E-10	4.5E-10	4.5E-10

Table 4.5.5.1-5: Ingestion of Garden Vegetables (Above-ground) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	8.1E-07	8.1E-07	8.1E-07	8.1E-07	—	7.4E-08	7.4E-08
Benzene	—	—	—	—	—	—	—
Cadmium	8.7E-07	8.7E-07	8.7E-07	8.7E-07	—	8.0E-08	8.0E-08
Carbon monoxide	—	—	—	—	—	—	—
Chromium	1.0E-07	1.0E-07	1.0E-07	1.0E-07	—	9.3E-09	9.3E-09
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	1.1E-07	1.1E-07	1.1E-07	1.1E-07	—	9.6E-09	9.6E-09
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	5.7E-07	5.7E-07	5.7E-07	5.7E-07	—	5.2E-08	5.2E-08
Xylenes	—	—	—	—	—	—	—
Zinc	9.6E-07	9.6E-07	9.6E-07	9.6E-07	—	8.8E-08	8.8E-08

Table 4.5.5.1-6: Ingestion of Garden Vegetables (Below-ground) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	1.9E-08	1.9E-08	1.9E-08	1.9E-08	—	1.5E-09	1.5E-09
Benzene	—	—	—	—	—	—	—
Cadmium	2.3E-07	2.3E-07	2.3E-07	2.3E-07	—	1.8E-08	1.8E-08
Carbon monoxide	—	—	—	—	—	—	—
Chromium	2.7E-09	2.7E-09	2.7E-09	2.7E-09	—	2.2E-10	2.2E-10
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	5.4E-09	5.4E-09	5.4E-09	5.4E-09	—	4.3E-10	4.3E-10
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	8.7E-10	8.7E-10	8.7E-10	8.7E-10	—	6.9E-11	6.9E-11
Xylenes	—	—	—	—	—	—	—
Zinc	3.8E-06	3.8E-06	3.8E-06	3.8E-06	—	3.0E-07	3.0E-07

Table 4.5.5.1-7: Ingestion of Garden Vegetables Total Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	8.3E-07	8.3E-07	8.3E-07	8.3E-07	—	7.6E-08	7.6E-08
Benzene	—	—	—	—	—	—	—
Cadmium	1.1E-06	1.1E-06	1.1E-06	1.1E-06	—	9.8E-08	9.8E-08

Table 4.5.5.1-7: Ingestion of Garden Vegetables Total Exposure Dose (mg/kg-day) (continued)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Carbon monoxide	—	—	—	—	—	—	—
Chromium	1.0E-07	1.0E-07	1.0E-07	1.0E-07	—	9.5E-09	9.5E-09
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	1.1E-07	1.1E-07	1.1E-07	1.1E-07	—	1.0E-08	1.0E-08
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	5.7E-07	5.7E-07	5.7E-07	5.7E-07	—	5.2E-08	5.2E-08
Xylenes	—	—	—	—	—	—	—
Zinc	4.7E-06	4.7E-06	4.7E-06	4.7E-06	—	3.9E-07	3.9E-07

4.5.5.2 Site Preparation and Construction Phase

Table 4.5.5.2-1: Inhalation Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	9.4E-05	9.5E-05	7.9E-05	4.3E-05	6.5E-05	1.8E-05	2.5E-05
Acetone	4.9E-05	5.0E-05	4.2E-05	2.2E-05	3.4E-05	9.6E-06	1.3E-05
Acrolein	1.6E-05	1.7E-05	1.5E-05	1.2E-05	6.8E-06	3.2E-06	3.7E-06
Aluminum	—	—	—	—	—	—	—
Benzene	6.1E-06	6.2E-06	5.2E-06	2.8E-06	4.3E-06	1.2E-06	1.6E-06
Cadmium	—	—	—	—	—	—	—
Carbon monoxide	—	—	—	—	3.2E-03	—	—
Chromium	—	—	—	—	—	—	—
Ethylbenzene	1.1E-06	1.1E-06	8.9E-07	4.8E-07	7.3E-07	2.1E-07	2.8E-07
Formaldehyde	5.0E-05	5.1E-05	4.2E-05	2.3E-05	3.5E-05	9.7E-06	1.3E-05
Lead	—	—	—	—	—	—	—

Table 4.5.5.2-1: Inhalation Exposure Dose (mg/kg-day) (continued)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Naphthalene	2.3E-08	2.5E-08	1.5E-08	9.1E-09	2.0E-08	4.7E-09	7.4E-09
NO_2	2.2E-03	1.7E-03	8.5E-04	1.1E-03	7.9E-04	3.3E-04	5.7E-04
$PM_{2.5}$	7.4E-04	6.7E-04	5.5E-04	6.1E-04	3.1E-04	1.3E-04	1.9E-04
PM_{10}	1.2E-03	1.1E-03	9.1E-04	1.0E-03	5.1E-04	2.1E-04	3.2E-04
SO_2	8.9E-04	8.0E-04	1.1E-03	7.0E-04	4.2E-04	1.5E-04	1.6E-04
Toluene	8.9E-06	9.1E-06	7.5E-06	4.1E-06	6.2E-06	1.7E-06	2.4E-06
Non-Carcinogenic PAHs	1.2E-07	1.3E-07	1.1E-07	9.6E-08	5.5E-08	2.5E-08	3.0E-08
Xylenes	7.1E-06	7.2E-06	6.0E-06	3.2E-06	4.9E-06	1.4E-06	1.9E-06
Zinc	—	—	—	—	—	—	—

Table 4.5.5.2-2: Incidental Soil Ingestion Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	5.4E-09	5.4E-09	5.4E-09	5.4E-09	1.8E-10	3.0E-10	3.0E-10
Benzene	—	—	—	—	—	—	—
Cadmium	4.1E-09	4.1E-09	4.1E-09	4.1E-09	1.3E-10	2.3E-10	2.3E-10
Carbon monoxide	—	—	—	—	—	—	—
Chromium	6.8E-10	6.8E-10	6.8E-10	6.8E-10	2.2E-11	3.8E-11	3.8E-11
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	6.8E-10	6.8E-10	6.8E-10	6.8E-10	2.2E-11	3.8E-11	3.8E-11
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	9.2E-10	9.2E-10	9.2E-10	9.2E-10	3.0E-11	5.2E-11	5.2E-11
Xylenes	—	—	—	—	—	—	—
Zinc	4.8E-09	4.8E-09	4.8E-09	4.8E-09	1.6E-10	2.7E-10	2.7E-10

Table 4.5.5.2-3: Soil Dermal Contact Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	4.7E-10	4.7E-10	4.7E-10	4.7E-10	1.5E-11	5.2E-11	5.2E-11
Benzene	—	—	—	—	—	—	—
Cadmium	3.5E-11	3.5E-11	3.5E-11	3.5E-11	1.2E-12	3.9E-12	3.9E-12
Carbon monoxide	—	—	—	—	—	—	—
Chromium	5.8E-11	5.8E-11	5.8E-11	5.8E-11	1.9E-12	6.5E-12	6.5E-12
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	5.8E-10	5.8E-10	5.8E-10	5.8E-10	1.9E-11	6.5E-11	6.5E-11
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	1.0E-10	1.0E-10	1.0E-10	1.0E-10	3.4E-12	1.0E-10	1.0E-10
Xylenes	—	—	—	—	—	—	—
Zinc	4.1E-10	4.1E-10	4.1E-10	4.1E-10	1.3E-11	4.1E-10	4.1E-10

Table 4.5.5.2-4: Soil Direct Contact Total (Ingestion + Dermal Contact) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	5.9E-09	5.9E-09	5.9E-09	5.9E-09	1.9E-10	3.6E-10	3.6E-10
Benzene	—	—	—	—	—	—	—
Cadmium	4.1E-09	4.1E-09	4.1E-09	4.1E-09	1.4E-10	2.3E-10	2.3E-10
Carbon monoxide	—	—	—	—	—	—	—
Chromium	7.4E-10	7.4E-10	7.4E-10	7.4E-10	2.4E-11	4.5E-11	4.5E-11
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	1.3E-09	1.3E-09	1.3E-09	1.3E-09	4.2E-11	1.0E-10	1.0E-10
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	1.0E-09	1.0E-09	1.0E-09	1.0E-09	3.4E-11	1.5E-10	1.5E-10
Xylenes	—	—	—	—	—	—	—
Zinc	5.2E-09	5.2E-09	5.2E-09	5.2E-09	1.7E-10	6.8E-10	6.8E-10

Table 4.5.5.2-5: Ingestion of Garden Vegetables (Above-ground) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	1.8E-06	1.8E-06	1.8E-06	1.8E-06	—	1.6E-07	1.6E-07
Benzene	—	—	—	—	—	—	—
Cadmium	1.7E-06	1.7E-06	1.7E-06	1.7E-06	—	1.6E-07	1.6E-07
Carbon monoxide	—	—	—	—	—	—	—

Table 4.5.5.2-5: Ingestion of Garden Vegetables (Above-ground) Exposure Dose (mg/kg-day) (continued)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Chromium	2.2E-07	2.2E-07	2.2E-07	2.2E-07	—	2.0E-08	2.0E-08
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	2.3E-07	2.3E-07	2.3E-07	2.3E-07	—	2.1E-08	2.1E-08
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	1.2E-06	1.2E-06	1.2E-06	1.2E-06	—	1.1E-07	1.1E-07
Xylenes	—	—	—	—	—	—	—
Zinc	1.9E-06	1.9E-06	1.9E-06	1.9E-06	—	1.8E-07	1.8E-07

Table 4.5.5.2-6: Ingestion of Garden Vegetables (Below-ground) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	2.9E-08	2.9E-08	2.9E-08	2.9E-08	—	2.3E-09	2.3E-09
Benzene	—	—	—	—	—	—	—
Cadmium	3.4E-07	3.4E-07	3.4E-07	3.4E-07	—	2.7E-08	2.7E-08
Carbon monoxide	—	—	—	—	—	—	—
Chromium	4.0E-09	4.0E-09	4.0E-09	4.0E-09	—	3.2E-10	3.2E-10
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	8.0E-09	8.0E-09	8.0E-09	8.0E-09	—	6.4E-10	6.4E-10
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—

Table 4.5.5.2-6: Ingestion of Garden Vegetables (Below-ground) Exposure Dose (mg/kg-day) (continued)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	1.8E-09	1.8E-09	1.8E-09	1.8E-09	—	1.5E-10	1.5E-10
Xylenes	—	—	—	—	—	—	—
Zinc	5.6E-06	5.6E-06	5.6E-06	5.6E-06	—	4.5E-07	4.5E-07

Table 4.5.5.2-7: Ingestion of Garden Vegetables Total Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	1.8E-06	1.8E-06	1.8E-06	1.8E-06	—	1.6E-07	1.6E-07
Benzene	—	—	—	—	—	—	—
Cadmium	2.1E-06	2.1E-06	2.1E-06	2.1E-06	—	1.9E-07	1.9E-07
Carbon monoxide	—	—	—	—	—	—	—
Chromium	2.3E-07	2.3E-07	2.3E-07	2.3E-07	—	2.1E-08	2.1E-08
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	2.3E-07	2.3E-07	2.3E-07	2.3E-07	—	2.1E-08	2.1E-08
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	1.2E-06	1.2E-06	1.2E-06	1.2E-06	—	1.1E-07	1.1E-07
Xylenes	—	—	—	—	—	—	—
Zinc	7.5E-06	7.5E-06	7.5E-06	7.5E-06	—	6.3E-07	6.3E-07

4.5.5.3 Operations Phase

Table 4.5.5.3-1: Inhalation Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	6.3E-05	7.0E-05	7.5E-05	4.1E-05	3.2E-05	1.3E-05	1.4E-05
Acetone	3.3E-05	3.7E-05	3.9E-05	2.2E-05	1.7E-05	7.1E-06	7.2E-06
Acrolein	1.4E-05	1.5E-05	1.5E-05	1.2E-05	4.2E-06	2.8E-06	2.8E-06
Aluminum	—	—	—	—	—	—	—
Benzene	4.1E-06	4.6E-06	4.9E-06	2.7E-06	2.1E-06	8.8E-07	8.9E-07
Cadmium	—	—	—	—	—	—	—
Carbon monoxide	—	—	—	—	2.1E-03	—	—
Chromium	—	—	—	—	—	—	—
Ethylbenzene	7.1E-07	7.9E-07	8.4E-07	4.6E-07	3.6E-07	1.5E-07	1.5E-07
Formaldehyde	3.4E-05	3.8E-05	4.0E-05	2.2E-05	1.7E-05	7.2E-06	7.3E-06
Lead	—	—	—	—	—	—	—
Naphthalene	1.1E-08	9.5E-09	1.4E-08	6.9E-09	6.5E-09	1.8E-09	2.0E-09
NO_2	1.1E-03	8.6E-04	7.1E-04	5.9E-04	4.7E-04	1.6E-04	2.2E-04
$PM_{2.5}$	5.1E-04	5.1E-04	5.1E-04	5.0E-04	1.0E-04	9.7E-05	9.8E-05
PM_{10}	8.5E-04	8.6E-04	8.5E-04	8.3E-04	1.7E-04	1.6E-04	1.6E-04
SO_2	8.9E-04	8.0E-04	1.1E-03	7.0E-04	4.2E-04	1.5E-04	1.6E-04
Toluene	6.0E-06	6.7E-06	7.1E-06	3.9E-06	3.1E-06	1.3E-06	1.3E-06
Non-Carcinogenic PAHs	1.0E-07	9.7E-08	1.1E-07	9.2E-08	2.7E-08	1.9E-08	1.9E-08
Xylenes	4.7E-06	5.3E-06	5.7E-06	3.1E-06	2.4E-06	1.0E-06	1.0E-06
Zinc	—	—	—	—	—	—	—

Table 4.5.5.3-2: Incidental Soil Ingestion Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	1.6E-08	1.6E-08	1.6E-08	1.6E-08	5.4E-10	9.2E-10	9.2E-10

Table 4.5.5.3-2: Incidental Soil Ingestion Exposure Dose (mg/kg-day) (continued)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Benzene	—	—	—	—	—	—	—
Cadmium	1.2E-08	1.2E-08	1.2E-08	1.2E-08	4.0E-10	6.9E-10	6.9E-10
Carbon monoxide	—	—	—	—	—	—	—
Chromium	2.0E-09	2.0E-09	2.0E-09	2.0E-09	6.7E-11	1.1E-10	1.1E-10
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	2.0E-09	2.0E-09	2.0E-09	2.0E-09	6.7E-11	1.1E-10	1.1E-10
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	4.4E-10	4.4E-10	4.4E-10	4.4E-10	1.5E-11	2.5E-11	2.5E-11
Xylenes	—	—	—	—	—	—	—
Zinc	1.4E-08	1.4E-08	1.4E-08	1.4E-08	4.7E-10	8.0E-10	8.0E-10

Table 4.5.5.3-3: Soil Dermal Contact Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	1.4E-09	1.4E-09	1.4E-09	1.4E-09	4.6E-11	1.6E-10	1.6E-10
Benzene	—	—	—	—	—	—	—
Cadmium	1.1E-10	1.1E-10	1.1E-10	1.1E-10	3.5E-12	1.2E-11	1.2E-11
Carbon monoxide	—	—	—	—	—	—	—
Chromium	1.8E-10	1.8E-10	1.8E-10	1.8E-10	5.8E-12	2.0E-11	2.0E-11
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	1.8E-09	1.8E-09	1.8E-09	1.8E-09	5.8E-11	2.0E-10	2.0E-10
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—

Table 4.5.5.3-3: Soil Dermal Contact Exposure Dose (mg/kg-day) (continued)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	4.9E-11	4.9E-11	4.9E-11	4.9E-11	1.6E-12	4.9E-11	4.9E-11
Xylenes	—	—	—	—	—	—	—
Zinc	1.2E-09	1.2E-09	1.2E-09	1.2E-09	4.1E-11	1.2E-09	1.2E-09

Table 3.5.5.3-4: Soil Direct Contact Total (Ingestion + Dermal Contact) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	1.8E-08	1.8E-08	1.8E-08	1.8E-08	5.8E-10	1.1E-09	1.1E-09
Benzene	—	—	—	—	—	—	—
Cadmium	1.2E-08	1.2E-08	1.2E-08	1.2E-08	4.1E-10	7.0E-10	7.0E-10
Carbon monoxide	—	—	—	—	—	—	—
Chromium	2.2E-09	2.2E-09	2.2E-09	2.2E-09	7.3E-11	1.3E-10	1.3E-10
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	3.8E-09	3.8E-09	3.8E-09	3.8E-09	1.3E-10	3.1E-10	3.1E-10
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	4.9E-10	4.9E-10	4.9E-10	4.9E-10	1.6E-11	7.4E-11	7.4E-11
Xylenes	—	—	—	—	—	—	—
Zinc	1.6E-08	1.6E-08	1.6E-08	1.6E-08	5.1E-10	2.0E-09	2.0E-09

Table 3.5.5.3-5: Ingestion of Garden Vegetables (Above-ground) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	8.6E-07	8.6E-07	8.6E-07	8.6E-07	—	7.8E-08	7.8E-08
Benzene	—	—	—	—	—	—	—
Cadmium	1.8E-06	1.8E-06	1.8E-06	1.8E-06	—	1.7E-07	1.7E-07
Carbon monoxide	—	—	—	—	—	—	—
Chromium	1.1E-07	1.1E-07	1.1E-07	1.1E-07	—	9.9E-09	9.9E-09
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	1.2E-07	1.2E-07	1.2E-07	1.2E-07	—	1.1E-08	1.1E-08
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	5.7E-07	5.7E-07	5.7E-07	5.7E-07	—	5.2E-08	5.2E-08
Xylenes	—	—	—	—	—	—	—
Zinc	1.9E-06	1.9E-06	1.9E-06	1.9E-06	—	1.7E-07	1.7E-07

Table 4.5.5.3-6: Ingestion of Garden Vegetables (Below-ground) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	8.6E-08	8.6E-08	8.6E-08	8.6E-08	—	6.9E-09	6.9E-09
Benzene	—	—	—	—	—	—	—
Cadmium	1.0E-06	1.0E-06	1.0E-06	1.0E-06	—	8.3E-08	8.3E-08
Carbon monoxide	—	—	—	—	—	—	—

Table 4.5.5.3-6: Ingestion of Garden Vegetables (Below-ground) Exposure Dose (mg/kg-day) (continued)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Chromium	1.2E-08	1.2E-08	1.2E-08	1.2E-08	—	9.7E-10	9.7E-10
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	2.4E-08	2.4E-08	2.4E-08	2.4E-08	—	1.9E-09	1.9E-09
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	8.7E-10	8.7E-10	8.7E-10	8.7E-10	—	7.0E-11	7.0E-11
Xylenes	—	—	—	—	—	—	—
Zinc	1.7E-05	1.7E-05	1.7E-05	1.7E-05	—	1.4E-06	1.4E-06

Table 3.5.5.3-7: Ingestion of Garden Vegetables Total Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Acetone	—	—	—	—	—	—	—
Acrolein	—	—	—	—	—	—	—
Aluminum	9.4E-07	9.4E-07	9.4E-07	9.4E-07	—	8.5E-08	8.5E-08
Benzene	—	—	—	—	—	—	—
Cadmium	2.9E-06	2.9E-06	2.9E-06	2.9E-06	—	2.5E-07	2.5E-07
Carbon monoxide	—	—	—	—	—	—	—
Chromium	1.2E-07	1.2E-07	1.2E-07	1.2E-07	—	1.1E-08	1.1E-08
Ethylbenzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Lead	1.5E-07	1.5E-07	1.5E-07	1.5E-07	—	1.3E-08	1.3E-08
Naphthalene	—	—	—	—	—	—	—
NO_2	—	—	—	—	—	—	—
$PM_{2.5}$	—	—	—	—	—	—	—
PM_{10}	—	—	—	—	—	—	—
SO_2	—	—	—	—	—	—	—

Table 3.5.5.3-7: Ingestion of Garden Vegetables Total Exposure Dose (mg/kg-day) (continued)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Toluene	—	—	—	—	—	—	—
Non-Carcinogenic PAHs	5.7E-07	5.7E-07	5.7E-07	5.7E-07	—	5.2E-08	5.2E-08
Xylenes	—	—	—	—	—	—	—
Zinc	1.9E-05	1.9E-05	1.9E-05	1.9E-05	—	1.5E-06	1.5E-06

4.5.6 Carcinogenic Exposure Doses

4.5.6.1 Existing Environment

Table 4.5.6.1-1: Inhalation Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	1.5E-06	1.7E-06	1.1E-06	7.2E-07	—	7.4E-07	6.1E-07
Benzene	9.5E-08	1.1E-07	7.1E-08	4.7E-08	—	4.8E-08	4.0E-08
Formaldehyde	7.7E-07	9.1E-07	5.8E-07	3.9E-07	—	3.9E-07	3.2E-07
Carcinogenic PAHs	2.7E-09	2.7E-09	2.7E-09	2.7E-09	—	1.2E-09	1.2E-09

Table 4.5.6.1-2: Incidental Soil Ingestion (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	1.2E-12	1.2E-12	1.2E-12	1.2E-12	—	4.5E-14	4.5E-14

Table 4.5.6.1-3: Soil Dermal Contact Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	3.3E-13	3.3E-13	3.3E-13	3.3E-13	—	7.7E-15	7.7E-15

Table 4.5.6.1-4: Soil Direct Contact Total (Ingestion + Dermal Contact) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	1.5E-12	1.5E-12	1.5E-12	1.5E-12	—	5.3E-14	5.3E-14

Table 4.5.6.1-5: Ingestion of Garden Vegetables (Above-ground) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	2.2E-09	2.2E-09	2.2E-09	2.2E-09	—	4.7E-11	4.7E-11

Table 4.5.6.1-6: Ingestion of Garden Vegetables (Below-ground) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	1.8E-12	1.8E-12	1.8E-12	1.8E-12	—	3.4E-14	3.4E-14

Table 4.5.6.1-7: Ingestion of Garden Vegetables Total Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	2.2E-09	2.2E-09	2.2E-09	2.2E-09	—	4.7E-11	4.7E-11

4.5.6.2 Site Preparation and Construction Phase

Table 4.5.6.2-1: Inhalation Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	1.7E-06	2.0E-06	1.1E-06	7.9E-07	—	2.2E-07	2.3E-07
Benzene	1.1E-07	1.3E-07	7.1E-08	5.2E-08	—	1.5E-08	1.5E-08
Formaldehyde	9.3E-07	1.1E-06	5.7E-07	4.2E-07	—	1.2E-07	1.2E-07
Carcinogenic PAHs	2.5E-09	2.5E-09	2.4E-09	2.4E-09	—	2.7E-10	2.7E-10

Table 4.5.6.2-2: Incidental Soil Ingestion Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	2.3E-12	2.3E-12	2.3E-12	2.3E-12	—	8.7E-14	8.7E-14

Table 4.5.6.2-3: Soil Dermal Contact Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	6.3E-13	6.3E-13	6.3E-13	6.3E-13	—	1.5E-14	1.5E-14

Table 4.5.6.2-4: Soil Direct Contact Total (Ingestion + Dermal Contact) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	3.0E-12	3.0E-12	3.0E-12	3.0E-12	—	1.0E-13	1.0E-13

Table 4.5.6.2-5: Ingestion of Garden Vegetables (Above-ground) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	4.9E-09	4.9E-09	4.9E-09	4.9E-09	—	1.0E-10	1.0E-10

Table 4.5.6.2-6: Ingestion of Garden Vegetables (Below-ground) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	3.6E-12	3.6E-12	3.6E-12	3.6E-12	—	6.6E-14	6.6E-14

Table 4.5.6.2-7: Ingestion of Garden Vegetables Total Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	4.9E-09	4.9E-09	4.9E-09	4.9E-09	—	1.0E-10	1.0E-10

4.5.6.3 Operations Phase

Table 4.5.6.3-1: Inhalation Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	1.5E-06	1.8E-06	1.1E-06	7.4E-07	—	7.7E-07	6.7E-07
Benzene	1.0E-07	1.2E-07	7.2E-08	4.8E-08	—	5.1E-08	4.4E-08
Formaldehyde	8.2E-07	9.6E-07	5.9E-07	3.9E-07	—	4.1E-07	3.6E-07
Carcinogenic PAHs	2.7E-09	2.7E-09	2.7E-09	2.7E-09	—	1.2E-09	1.2E-09

Table 4.5.6.3-2: Incidental Soil Ingestion Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	1.3E-12	1.3E-12	1.3E-12	1.3E-12	—	4.8E-14	4.8E-14

Table 4.5.6.3-3: Soil Dermal Contact Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	3.5E-13	3.5E-13	3.5E-13	3.5E-13	—	8.2E-15	8.2E-15

Table 4.5.6.3-4: Soil Direct Contact Total (Ingestion + Dermal Contact) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	1.6E-12	1.6E-12	1.6E-12	1.6E-12	—	5.6E-14	5.6E-14

Table 4.5.6.3-5: Ingestion of Garden Vegetables (Above-ground) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	2.2E-09	2.2E-09	2.2E-09	2.2E-09	—	4.7E-11	4.7E-11

Table 4.5.6.3-6: Ingestion of Garden Vegetables (Below-ground) Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	2.0E-12	2.0E-12	2.0E-12	2.0E-12	—	3.6E-14	3.6E-14

Table 4.5.6.3-7: Ingestion of Garden Vegetables Total Exposure Dose (mg/kg-day)

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	—	—	—	—	—	—	—
Benzene	—	—	—	—	—	—	—
Formaldehyde	—	—	—	—	—	—	—
Carcinogenic PAHs	2.2E-09	2.2E-09	2.2E-09	2.2E-09	—	4.7E-11	4.7E-11

5.0 TOXICITY ASSESSMENT

The toxicity assessment involves the classification of the potential toxic effects of compounds and the estimation of the concentrations of chemicals to which human receptors could be exposed without experiencing adverse effects on their health. A toxicity assessment is conducted for all compounds and considers possible modes of toxicity associated with different routes and durations of exposure and sensitive receptors.

5.1 Contaminant Classification

Regulatory agencies classify chemicals based on their mode of action (i.e., threshold versus non-threshold substances). For substances exhibiting a threshold for toxicity (non-carcinogens), an acceptable level of exposure at or below which no adverse effects are anticipated is established. For non-threshold substances (carcinogens), any level of exposure is assumed to theoretically pose a potential risk, and a slope factor is used to predict risks from estimated exposures. Genotoxic substances which act through a mechanism involving damage to the genetic material (i.e., DNA) are usually considered to be non-threshold substances. Genotoxic substances include radionuclides.

Several organizations have developed classification systems based on the carcinogenic properties of chemicals. The classification systems for the U.S. EPA Integrated Risk Information System (U.S. EPA; 2010a) and the International Agency for Research on Cancer (IARC, 2007) are presented in the Table 5.1-1.

Table 5.1-1: Chemical Carcinogenic Properties

IARC	US EPA	Description
Group 1	Group A	Human carcinogen
Group 2A	Group B	Probable human carcinogen
	Group B1	Limited human evidence available
	Group B2	Inadequate human evidence, sufficient animal evidence
Group 2B	Group C	Possible human carcinogen
Group 3	Group D	Unclassifiable as to human carcinogenicity
Group 4	Group E	Probably not carcinogenic to humans
n/a	n/a	Unlikely to be carcinogenic to humans

Note:

n/a = Not applicable.

The classifications for the target compounds potentially emitted by the DGR Project are provided in Table 5.1-2.

Table 5.1-2: Carcinogenic Classification of COCs

Compound	IARC Classification	US EPA Classification	Assessed as a Carcinogen?
Volatile Organic Compounds or Criteria Compounds			
Acetaldehyde	Group 2B	Group B1	Yes
Acetone	n/a	n/a	No
Acrolein	n/a	n/a	No
Benzene	Group 1	Group A	Yes
Carbon monoxide (CO)	n/a	n/a	No
Ethylbenzene	n/a	Group D	No
Formaldehyde	Group 1	Group B1	Yes
Nitrogen dioxide (NO_2)	n/a	n/a	No
Particulate Matter ($PM_{2.5}$)	n/a	n/a	No
Particulate Matter (PM_{10})	n/a	n/a	No
Sulfur dioxide (SO_2)	n/a	n/a	No
Toluene	n/a	n/a	No
Xylenes	n/a	n/a	No
Metals			
Aluminum	n/a	n/a	No
Cadmium	Group 1	Group B1	No [(1)]
Chromium	n/a	n/a	No
Lead	Group 2A	Group B2	No [(1)]
Zinc	n/a	n/a	No
Carcinogenic PAHs			
Benzo(a)pyrene	Group 1	Group B2	Yes
Benzo(a)anthracene	Group 2B	Group B2	Yes
Benzo(b)fluoranthene	Group 2B	Group B2	Yes
Benzo(g,h,i)perylene	Group 3	Group D	Yes
Benzo(j)fluoranthene	Group 2B	n/a	Yes
Benzo(k)fluoranthene	Group 2B	Group B2	Yes
Chrysene	Group 2B	Group B2	Yes
Dibenzo(a,h)anthracene	Group 2A	Group B2	Yes
Indeno(1,2,3-c,d)pyrene	Group 2B	Group B2	Yes
Non-carcinogenic PAHs			
Anthracene	Group 3	Group D	No
Acenaphthene	Group 3	n/a	No
Acenaphthylene	n/a	Group D	No
Fluoranthene	Group 3	Group D	No
Fluorene	Group 3	Group D	No
Naphthalene	n/a	n/a	No
Phenanthrene	Group 3	Group D	No
Pyrene	Group 3	Group D	No

Notes:
n/a = Not available.
(1) Carcinogenic evidence for the oral route (dominant exposure pathway) is insufficient. A TRV for carcinogenic potential has not been derived.

5.2 Toxicity Reference Values (TRVs)

The TRVs used in this HHRA to assess human health effects were taken from the US EPA's IRIS, US EPA Regional Screening Level - Resident Air Supporting Table (US EPA, 2010b), California EPA (2008, 2009), Health Canada (2004), World Health Organization (WHO; 2000), the Ministry of the Environment (MOE; 2009) and Agency for Toxic Substances Disease Registry (ATSDR). Full reference details are provided in Section 9.0. Specifically, the reference concentration (RfC) and slope factors (SF) were used to assess non-carcinogenic and carcinogenic effects. Generally, the RfCs provided are estimates (with uncertainty spanning orders of magnitude) of daily continuous 24-hour exposure of the human population, including sensitive subpopulations, that are unlikely to cause adverse effects during a lifetime. Acute TRVs are estimates of 1-hour or 8-hour exposures that are unlikely to cause adverse effects during a short-term exposure period. The TRVs used in this HHRA are provided in Table 5.2-1, 5.2-2, 5.2-3 and 5.2.3-4. Detailed toxicological data on the target compounds and the basis studies for the selected TRVs are provided in the toxicological profiles in Appendix E.

5.2.1 Non-Carcinogens

For non-carcinogens, which are assumed to exhibit a *threshold* effect, the TRVs, referred to as reference doses (RfDs in units of mg/kg-day) are considered to represent conservative exposure limits, below which no adverse health effects are expected.

In developing RfDs for humans, uncertainty factors are applied in extrapolating from animals to humans or from occupational data. Exposures above the RfD may pose a health risk, but the threshold for a response in humans may in fact be much higher than the RfD. Therefore, the calculated non-cancer risks are generally thought to provide conservative estimates of the true risk.

5.2.2 Carcinogens

Carcinogenic potency is typically expressed as a slope factor (SF), the rate of cancer incidence per unit dose ($mg/kg\text{-}day^{-1}$), or as a unit risk factor (URF), the rate of cancer incidence per unit concentration (e.g., for inhalation, $(mg/m^3)^{-1}$). Similar to non-cancer RfCs, inhalation unit risks were converted to SFs using a standard body weight (70 kg) and inhalation rate (20 m^3/day) (U.S. EPA, 1989). The TRVs are typically derived by characterizing responses observed in animals or occupationally-exposed humans at high doses and extrapolating to the low doses expected to be received by human receptors in the environment. The calculated incremental lifetime cancer risks (ILCRs) provide conservative estimates of risk to human receptors.

Table 5.2-1: Chronic TRVs for Inhalation Pathway

Contaminant	Subchronic/Chronic Inhalation Reference Dose (mg/kg-day)	Source	Inhalation Slope Factor (per mg/kg-day)	Source
Acetaldehyde	2.57E-03	IRIS, 1991	7.70E-03	IRIS, 1991
Acetone	3.43E+00	MOE AAQC 2005; as cited in MOE, 2009	—	—
Acrolein	5.71E-06	IRIS, 2003	—	—
Aluminum	1.43E-03	U.S. EPA RSL, 2010b	—	—
Benzene	8.57E-03	IRIS, 2000	1.00E-01	Cal EPA, 2009
Cadmium	8.57E-06	MOE AAQC 2007; as cited in MOE, 2009	4.29E+01	Health Canada, 2004
Carbon monoxide	—	—	—	—
Chromium [1]	2.86E-05	IRIS 1998	3.31E+02	Health Canada, 2004
Ethylbenzene	2.86E-01	IRIS, 1991	—	—
Formaldehyde	2.57E-03	CalEPA, 2008	2.10E-02	Cal EPA, 2005
Lead	1.43E-04	WHO, 2000	—	—
Naphthalene	1.06E-03	ATSDR, 2005; as cited in MOE, 2009	—	—
Nitrogen dioxide	1.10E-02	WHO, 2000	—	—
Particulate Matter (2.5)	8.57E-03	CCME CWS, 2000	—	—
PM10	1.43E-02	Interim MOE AAQC, 2008	—	—
Sulfur dioxide	1.43E-02	WHO, 2000	—	—
Toluene	1.43E+00	IRIS, 2005	—	—
Carcinogenic PAHs (as B[a]P)	—	—	1.37E-01	Health Canada, 2004
Non-carcinogenic PAHs as naphthalene	1.06E-03	ATSDR, 2005; as cited in MOE, 2009	—	—
Xylenes	2.86E-02	IRIS, 2003	—	—
Zinc	8.57E-02	IRIS, 2005	—	—

Table 5.2-2: Chronic TRVs for Ingestion and Dermal Contact Pathways

Contaminant	Ingestion Reference Dose (mg/kg-day)	Source	Ingestion Slope Factor (per mg/kg-day)	Source
Aluminum	1.00E+00	ATSDR, 2008	—	—
Cadmium	8.00E-04	Health Canada, 2004	—	—
Chromium [1]	8.30E-03	modified from IRIS 1998; as cited in MOE, 2009	—	—
Lead	1.85E-03	MOE, 1994	—	—
Zinc	3.00E-01	IRIS 2005	—	—
Carcinogenic PAHs (as B[a]P)	—	—	7.30E+00	IRIS 1992; as cited in MOE, 2009
Non-carcinogenic PAHs as naphthalene	2.00E-02	IRIS 1998; as cited in MOE, 2009	—	—

Table 5.2-3: Acute TRVs for Inhalation Pathway (1-hour)

Contaminant	Acute Inhalation Reference Concentration (mg/m3)	Source
Carbon monoxide	2.30E+01	CalEPA, 1999
Nitrogen dioxide	4.70E-01	CalEPA, 2008
Sulfur dioxide	6.60E-01	CalEPA, 2008

Table 5.2-4: Acute TRVs for Inhalation Pathway

Contaminant	Acute Inhalation Reference Concentration (mg/kg/d)	Source
Acetaldehyde	0.09	CalEPA, 2008
Acetone	8.82	ATSDR, 1994
Acrolein	0.0002	CalEPA, 2008
Aluminum	0.001	US EPA RSL, 2010
Benzene	0.37	CalEPA, 2008
Cadmium	0.000009	ATSDR, 2008
Carbon monoxide	4.49	CalEPA, 1999
Chromium (1)	0.00009	ATSDR, 2008
Ethylbenzene	0.87	ATSDR, 2007
Formaldehyde	0.003	CalEPA, 2008
Lead	0.0001	WHO, 2000
Naphthalene	0.001	ATSDR, 2005; as cited in MOE, 2009

Table 5.2-4: Acute TRVs for Inhalation Pathway (continued)

Contaminant	Acute Inhalation Reference Concentration (mg/kg/d)	Source
Nitrogen dioxide	0.01	WHO, 2000
Particulate Matter (2.5)	0.009	CCME CWS
PM_{10}	0.01	Interim MOE AAQC
Sulfur dioxide	0.04	WHO, 2000
Toluene	0.09	CalEPA, 2008
Non-carcinogenic PAHs as naphthalene	0.001	ATSDR, 2005; as cited in MOE, 2009
Xylenes	0.7	CalEPA, 2008
Zinc	0.09	IRIS, 2005

Note:

(1) = Chromium VI, particulates

6.0 RISK CHARACTERIZATION

In the risk characterization step of the HHRA, information from the exposure and toxicity assessments are combined to determine the potential risks for human receptors. The process of risk characterization conducted in this HHRA reflects a conservative approach to generating risk estimates. The methods used to calculate the risks and the results of the risk characterization are presented below.

6.1 Non-cancer Risk

The non-cancer risks from exposure to chemicals of potential concern were calculated as the ratio of the predicted exposure and the TRV and are defined as the hazard quotient (HQ). The HQ was calculated as follows:

$$Hazard\ \ Quotient = \frac{Exposure\ \ Rate}{TRV} \qquad (5)$$

The HHRA results were expressed as deterministic hazard quotients for long-term exposures to air pollutants. In general, regulatory agencies concur that a hazard quotient value below one (1) is not significant (US EPA, 1989; Health Canada, 2004). However, apportionment is typically applied as the percentage of the regulatory-health based level that is allocated to the source/pathway being regulated; that is, 20% of the TRV is allocated for each source of exposure. Typically, it is assumed that people are exposed to compounds in soil (0.2), groundwater (0.2), air (0.2), food (0.2) and consumer products (0.2) for a total of 100% or 1. An HQ value of 1 has been applied to volatile and inert compounds because substantive exposure for human receptors for these compounds is via inhalation of aerial concentrations. An HQ value of 0.2 for each exposure pathway has been applied for semi-volatile compounds and metals.

Total non-cancer risks associated with the phases of the project are presented in Tables 6.1-1 to 6.1-3. HQs for AR6 (Burial Ground receptor) for the 1-hour acute assessment for NO_2, SO_2 and CO are presented in Table 6.1-4 below. In the second part of the acute assessment for AR6, risks were estimated by comparing the maximum predicted eight-hour concentrations adjusted based on receptor characteristics (e.g. breathing rate, body weight etc.), to the acute TRVs. These acute exposure estimates are presented with the other receptors in the tables below. Values in bold indicate a potential risk to human health.

Table 6.1-1: Existing Environment Total HQ

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	2.4E-02	2.6E-02	2.9E-02	1.6E-02	3.8E-04	5.0E-03	5.3E-03
Acetone	9.6E-06	1.0E-05	1.1E-05	6.3E-06	1.9E-06	2.0E-06	2.1E-06
Acrolein	**2.4E+00**	**2.5E+00**	**2.6E+00**	**2.1E+00**	2.1E-02	4.8E-01	4.9E-01
Aluminum	8.4E-07	8.4E-07	8.4E-07	8.4E-07	1.3E-10	7.6E-08	7.6E-08
Benzene	4.8E-04	5.1E-04	5.7E-04	3.1E-04	5.7E-06	9.8E-05	1.0E-04
Cadmium	1.4E-03	1.4E-03	1.4E-03	1.4E-03	1.1E-07	1.2E-04	1.2E-04
Carbon monoxide	—	—	—	—	4.7E-04	—	—
Chromium	1.3E-05	1.3E-05	1.3E-05	1.3E-05	2.0E-09	1.2E-06	1.2E-06
Ethylbenzene	2.5E-06	2.6E-06	2.9E-06	1.6E-06	4.2E-07	5.0E-07	5.3E-07
Formaldehyde	1.3E-02	1.4E-02	1.5E-02	8.5E-03	6.7E-03	2.6E-03	2.8E-03
Lead	6.0E-05	6.0E-05	6.0E-05	6.0E-05	1.5E-08	5.5E-06	5.5E-06
Naphthalene	9.4E-06	8.0E-06	1.3E-05	6.4E-06	6.1E-06	1.5E-06	1.7E-06
NO_2	5.9E-02	6.0E-02	6.2E-02	5.2E-02	1.7E-02	1.2E-02	1.2E-02
$PM_{2.5}$	5.9E-02	5.8E-02	6.0E-02	5.8E-02	1.2E-02	1.1E-02	1.1E-02
PM_{10}	5.9E-02	6.0E-02	6.0E-02	5.8E-02	1.2E-02	1.1E-02	1.1E-02
SO_2	6.2E-02	5.6E-02	7.5E-02	4.9E-02	1.2E-02	1.1E-02	1.1E-02
Toluene	4.2E-06	4.4E-06	5.0E-06	2.7E-06	3.6E-05	8.5E-07	9.0E-07
Non-Carcinogenic PAHs	1.2E-04	1.2E-04	1.3E-04	1.2E-04	2.5E-05	2.0E-05	2.0E-05
Xylenes	1.7E-04	1.8E-04	2.0E-04	1.1E-04	3.3E-06	3.4E-05	3.6E-05
Zinc	1.6E-05	1.6E-05	1.6E-05	1.6E-05	3.8E-10	1.3E-06	1.3E-06

Table 6.1-2: Site Preparation and Construction Phase Total HQ

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	3.6E-02	3.7E-02	3.1E-02	1.7E-02	7.6E-04	7.1E-03	9.6E-03
Acetone	1.4E-05	1.5E-05	1.2E-05	6.6E-06	3.9E-06	2.8E-06	3.8E-06
Acrolein	**2.9E+00**	**2.9E+00**	**2.7E+00**	**2.2E+00**	3.4E-02	5.6E-01	6.5E-01
Aluminum	1.8E-06	1.8E-06	1.8E-06	1.8E-06	1.9E-10	1.6E-07	1.6E-07
Benzene	7.2E-04	7.3E-04	6.0E-04	3.3E-04	1.1E-05	1.4E-04	1.9E-04
Cadmium	2.6E-03	2.6E-03	2.6E-03	2.6E-03	1.6E-09	2.3E-04	2.3E-04
Carbon monoxide	—	—	—	—	7.2E-04	—	—
Chromium	2.7E-05	2.7E-05	2.7E-05	2.7E-05	2.5E-10	2.5E-06	2.5E-06
Ethylbenzene	3.7E-06	3.7E-06	3.1E-06	1.7E-06	8.4E-07	7.2E-07	9.7E-07
Formaldehyde	1.9E-02	2.0E-02	1.6E-02	8.9E-03	1.4E-02	3.8E-03	5.1E-03
Lead	1.3E-04	1.3E-04	1.3E-04	1.3E-04	1.0E-08	1.2E-05	1.2E-05
Naphthalene	2.1E-05	2.3E-05	1.4E-05	8.6E-06	1.9E-05	4.5E-06	7.0E-06
NO_2	2.0E-01	1.6E-01	7.7E-02	1.0E-01	7.2E-02	3.0E-02	5.1E-02
$PM_{2.5}$	8.6E-02	7.9E-02	6.4E-02	7.1E-02	3.6E-02	1.5E-02	2.3E-02
PM_{10}	8.4E-02	7.8E-02	6.4E-02	7.1E-02	3.5E-02	1.5E-02	2.2E-02
SO_2	6.2E-02	5.6E-02	7.5E-02	4.9E-02	1.2E-02	1.1E-02	1.1E-02
Toluene	6.2E-06	6.3E-06	5.3E-06	2.8E-06	7.3E-05	1.2E-06	1.6E-06
Non-Carcinogenic PAHs	1.8E-04	1.8E-04	1.6E-04	1.5E-04	5.2E-05	2.9E-05	3.4E-05
Xylenes	2.5E-04	2.5E-04	2.1E-04	1.1E-04	6.6E-06	4.8E-05	6.5E-05
Zinc	2.5E-05	2.5E-05	2.5E-05	2.5E-05	2.0E-10	2.1E-06	2.1E-06

Table 6.1-3: Operations Phase Total HQ

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	2.4E-02	2.7E-02	2.9E-02	1.6E-02	3.8E-04	5.2E-03	5.3E-03
Acetone	9.6E-06	1.1E-05	1.2E-05	6.3E-06	1.9E-06	2.1E-06	2.1E-06
Acrolein	**2.4E+00**	**2.5E+00**	**2.6E+00**	**2.1E+00**	2.1E-02	4.9E-01	4.9E-01
Aluminum	9.6E-07	9.6E-07	9.6E-07	9.6E-07	5.8E-10	8.6E-08	8.6E-08
Benzene	4.8E-04	5.4E-04	5.7E-04	3.1E-04	5.7E-06	1.0E-04	1.0E-04
Cadmium	3.6E-03	3.6E-03	3.6E-03	3.6E-03	5.1E-07	3.1E-04	3.1E-04
Carbon monoxide	—	—	—	—	4.7E-04	—	—
Chromium	1.5E-05	1.5E-05	1.5E-05	1.5E-05	8.8E-09	1.3E-06	1.3E-06
Ethylbenzene	2.5E-06	2.8E-06	3.0E-06	1.6E-06	4.2E-07	5.3E-07	5.4E-07
Formaldehyde	1.3E-02	1.5E-02	1.6E-02	8.5E-03	6.7E-03	2.8E-03	2.8E-03
Lead	8.2E-05	8.2E-05	8.2E-05	8.2E-05	6.8E-08	7.4E-06	7.4E-06
Naphthalene	1.0E-05	9.0E-06	1.3E-05	6.5E-06	6.1E-06	1.7E-06	1.9E-06
NO_2	9.7E-02	7.8E-02	6.4E-02	5.4E-02	4.3E-02	1.5E-02	2.0E-02
$PM_{2.5}$	6.0E-02	5.9E-02	6.0E-02	5.8E-02	1.2E-02	1.1E-02	1.1E-02
PM_{10}	5.9E-02	6.0E-02	6.0E-02	5.8E-02	1.2E-02	1.2E-02	1.1E-02
SO_2	6.2E-02	5.6E-02	7.5E-02	4.9E-02	1.2E-02	1.1E-02	1.1E-02
Toluene	4.2E-06	4.7E-06	5.0E-06	2.7E-06	3.6E-05	9.0E-07	9.1E-07
Non-Carcinogenic PAHs	1.2E-04	1.2E-04	1.3E-04	1.2E-04	2.5E-05	2.0E-05	2.1E-05
Xylenes	1.7E-04	1.9E-04	2.0E-04	1.1E-04	3.3E-06	3.6E-05	3.6E-05
Zinc	6.3E-05	6.3E-05	6.3E-05	6.3E-05	1.7E-09	5.1E-06	5.1E-06

Table 6.1-4: Acute Assessment HQs.

	Existing	Construction	Operation
Contaminant	**AR6**	**AR6**	**AR6**
Carbon monoxide	1.5E-02	5.5E-02	2.2E-02
NO_2	1.6E-01	5.4E-01	3.4E-01
SO_2	3.1E-01	3.1E-01	3.1E-01

6.2 Cancer Risk

Cancer risks from exposure to target compounds in air were calculated as the product of the predicted exposure and the TRV and are defined as the incremental lifetime cancer risk (ILCR). The ILCR was calculated as follows:

$$ILCR = Exp \times SlopeFacto\ r \quad (6)$$

In general, regulatory agencies concur that cancer risk levels of one-in-1,000,000 (or 1 x 10^{-6}) are essentially negligible, as stated by Ontario Ministry of Environment (2009) and the United States Environmental Protection Agency (1989).

Total cancer risks associated with each phase of the project are presented in Tables 6.2-1 to 6.2-3. Values in bold indicate a potential risk to human health.

Table 6.2-1: Existing Environment Total ILCR

	Local Resident			**Aboriginal Resident**	**Aboriginal Burial Ground Visitor**	**Seasonal User**	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	1.1E-08	1.3E-08	8.4E-09	5.6E-09	—	5.7E-09	4.7E-09
Benzene	9.5E-09	1.1E-08	7.1E-09	4.7E-09	—	4.8E-09	4.0E-09
Formaldehyde	1.6E-08	1.9E-08	1.2E-08	8.1E-09	—	8.2E-09	6.8E-09
Carcinogenic PAHs	1.7E-08	1.7E-08	1.7E-08	1.7E-08	—	5.0E-10	5.0E-10

Table 6.2-2: Site Preparation and Construction Phase Total ILCR

	Local Resident			**Aboriginal Resident**	**Aboriginal Burial Ground Visitor**	**Seasonal User**	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	1.3E-08	1.6E-08	8.3E-09	6.1E-09	—	1.7E-09	1.8E-09
Benzene	1.1E-08	1.3E-08	7.1E-09	5.2E-09	—	1.5E-09	1.5E-09
Formaldehyde	1.9E-08	2.3E-08	1.2E-08	8.9E-09	—	2.5E-09	2.5E-09
Carcinogenic PAHs	3.6E-08	3.6E-08	3.6E-08	3.6E-08	—	7.9E-10	7.9E-10

Table 6.2-3: Operations Phase Total ILCR

	Local Resident			Aboriginal Resident	Aboriginal Burial Ground Visitor	Seasonal User	
Compound	**AR1**	**AR2**	**AR3**	**AR5**	**AR6**	**AR2**	**AR4**
Acetaldehyde	1.2E-08	1.4E-08	8.5E-09	5.7E-09	—	5.9E-09	5.1E-09
Benzene	1.0E-08	1.2E-08	7.2E-09	4.8E-09	—	5.1E-09	4.4E-09
Formaldehyde	1.7E-08	2.0E-08	1.2E-08	8.3E-09	—	8.6E-09	7.5E-09
Carcinogenic PAHs	1.7E-08	1.7E-08	1.7E-08	1.7E-08	—	5.0E-10	5.0E-10

6.3 Interpretation of Health Risks

6.3.1 Non-carcinogens

Only one of the target compounds (acrolein) had an HQ value in excess of the desired target (i.e., 1.0). All of the remaining target compounds had HQ values that were considerably lower than the relevant targets of either 1.0 for volatile and inert compounds, or 0.2 for semi-volatile compounds and metals.

Acrolein exposures are driven by existing concentrations. Emissions from existing sources at the Bruce nuclear site result in off-site HQ values that range between 0.48 and 2.6, depending on the receptor. These values were predicted to increase to 2.9 during the site preparation and construction phase. During operations, HQ values for acrolein were 2.6 or less, meaning there is no change during operations.

Acrolein is generated by combustion sources including vehicles, forest fires, wood stoves etc. Acrolein's high vapour pressure indicates that it will occur primarily in the vapour phase, with an estimated atmospheric half-life ranging from 10 to 20 hours (MOE, 2005c). As such, acrolein is not likely to be transported over long distances. Maximum ambient air concentrations of acrolein ranged from 0.56 µg/m³ to 0.71 µg/m³ in Ontario from 1996 to 1998, and ranged from 0.05 µg/m³ to 2.47 µg/m³ across Canada (MOE, 2005c). The maximum modelled 24-hour acrolein concentration 0.33 µg/m³ (at receptor R6, during the construction phase) is lower than the range of ambient acrolein concentrations measured in Ontario and within the Canadian range. This indicates that the current Ambient Air Quality criterion in Ontario of 0.08 µg/m^3 is not feasible to meet given that it is set lower than reported levels in ambient air in Ontario and in Canada. The significance of the potential human health risk due to exposures to acrolein in air is further evaluated in the main text (Appendix C).

6.3.2 Carcinogens

The resulting ILCR values are compared to a target risk value of one in a million (an ILCR of 1×10^{-6}). None of the predicted concentrations of carcinogenic compounds result in ILCR values that exceed the target.

7.0 UNCERTAINTY ASSESSMENT

Uncertainty is an inherent component of all aspects of risk assessments and as such, it is important to understand the magnitude of uncertainty associated with risk assessments. One goal of risk assessments is to minimize uncertainty and not being able to eliminate it entirely, it is critical to discuss the uncertainties and to understand their magnitude, which then results in allowing us to bind the uncertainties and to put the results in context. The uncertainties in the risk assessment are discussed below.

- ***Air dispersion modelling:*** In the absence of monitoring data for the project, it is necessary to use air dispersion modelling to estimate the concentrations of the target compounds at various receptor locations. Modelled concentrations are conservative estimates of actual values and actual concentrations are likely to be less.
- ***Exposure estimates for Residents:*** It was conservatively assumed that receptors would be present at AR6 (Burial Ground on the Bruce Nuclear Site) as residents, when in fact an aboriginal visitor would likely visit this location less than one time annually. This leads to a conservative estimate of actual exposure and risk.
- ***Toxicity reference values:*** The TRVs used in this RA (and TRVs in general) are generally based on the most sensitive endpoints, with the application of safety factors to protect-sensitive subpopulations. The uncertainty associated with TRVs is highly dependent on the number of studies available and whether the key study was based on humans (low uncertainty) or small mammals/rodents (high uncertainty). When few studies are available and the studies available are conducted using animals as test organisms, several types of safety factors must be applied to account for this uncertainty (e.g., factors for inter- and intraspecies sensitivity). Given that TRVs are derived with the most sensitive members of the population considered, the risks predicted for most individuals are likely to be overestimates.
- ***Exposure Point Concentrations:*** Maximum modelled concentrations for each phase of the DGR Project were used in the exposure calculations to represent a worst-case scenario at each receptor location. Actual exposure concentrations would be less and therefore, potential human health risks would also be less than predicted.

8.0 CONCLUSIONS AND RECOMMENDATIONS

This attachment provides the detailed methods and results of the human health risk assessment (HHRA) and forms part of the overall human health assessment (HHA; Appendix C), for the Environmental Impact Statement (EIS) for the Ontario Power Generation (OPG) Deep Geologic Repository (DGR). .

The primary objective of this HHRA was to quantitatively interpret the potential overall adverse effect of changes in physical environmental determinants, specifically changes in chemical concentrations in air, surface water, ground water, soil, foods.

The results presented in the Risk Characterization (Section 6.0) indicate potential health risks associated with exposure to acrolein in air in the existing environment and during the DGR Project phases at most receptor locations. Acrolein is generated by combustion sources including vehicles, forest fires, wood stoves etc. Acrolein's high vapour pressure indicates that it will occur primarily in the vapour phase, with an estimated atmospheric half-life ranging from 10 to 20 hours (MOE, 2005c). As such, acrolein is not likely to be transported over long distances. Maximum ambient air concentrations of acrolein ranged from 0.56 µg/m³ to 0.71 µg/m³ in Ontario from 1996 to 1998, and ranged from 0.05 µg/m³ to 2.47 µg/m³ across Canada (MOE, 2005c). The maximum modelled acrolein concentration 0.33 µg/m³ (at receptor R6) is lower than the range of maximum ambient acrolein concentrations measured in Ontario and within the Canadian range. This indicates that the current Ambient Air Quality criterion in Ontario of 0.08 µg/m^3 is not feasible to meet given that it is set lower than reported levels in ambient air in Ontario and in Canada. The significance of the potential human health risk due to exposures to acrolein in air is further evaluated in the main text (Appendix C).

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APPENDIX A

Screening Tables

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Table A-1
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Acetaldehyde

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	1.8	—
R2	—	1.9	—
R3	—	2.1	—
R4	—	2.0	—
R5	—	1.2	—
R6	—	2.7	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	2.7	—
R2	—	2.7	—
R3	—	2.2	—
R4	—	3.7	—
R5	—	1.2	—
R6	—	4.0	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	1.8	—
R2	—	2.0	—
R3	—	2.1	—
R4	—	2.0	—
R5	—	1.2	—
R6	—	2.9	—
Screening Standard	—	500	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-2
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Acetone

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.93	—
R2	—	0.99	—
R3	—	1.11	—
R4	—	1.06	—
R5	—	0.61	—
R6	—	1.41	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	1.40	—
R2	—	1.42	—
R3	—	1.18	—
R4	—	1.92	—
R5	—	0.64	—
R6	—	2.11	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.94	—
R2	—	1.05	—
R3	—	1.12	—
R4	—	1.06	—
R5	—	0.61	—
R6	—	1.52	—
Screening Standard	—	11880	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-3
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Acrolein

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	1.47	0.39	—
R2	1.83	0.40	—
R3	1.43	0.42	—
R4	1.51	0.41	—
R5	0.91	0.34	—
R6	1.63	0.47	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	1.88	0.47	—
R2	3.11	0.47	—
R3	1.45	0.43	—
R4	2.25	0.55	—
R5	1.25	0.35	—
R6	3.51	0.58	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	1.47	0.40	—
R2	1.85	0.41	—
R3	1.43	0.42	—
R4	1.51	0.41	—
R5	0.91	0.34	—
R6	1.63	0.49	—
Screening Standard	0.20	0.08	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
*Screening standard has been converted from 1/2 hr averaging time to 1 hr averaging time using equation from MOE, 2005.			
'—' indicates that this averaging period has not been considered for this compound			

Table A-4
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Benzene

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.12	0.01
R2	—	0.12	0.01
R3	—	0.14	0.01
R4	—	0.13	0.01
R5	—	0.08	0.01
R6	—	0.18	0.02
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.17	0.01
R2	—	0.18	0.02
R3	—	0.15	0.01
R4	—	0.24	0.02
R5	—	0.08	0.01
R6	—	0.26	0.04
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.12	0.01
R2	—	0.13	0.01
R3	—	0.14	0.01
R4	—	0.13	0.01
R5	—	0.08	0.01
R6	—	0.19	0.02
Screening Standard	—	30	0.13
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-5
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Carbon Monoxide

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	8_hr	Annual
R1	280	282	—
R2	381	330	—
R3	220	256	—
R4	441	341	—
R5	245	270	—
R6	351	339	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	8_hr	Annual
R1	706	389	—
R2	1187	391	—
R3	415	281	—
R4	919	529	—
R5	524	310	—
R6	1274	523	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	8_hr	Annual
R1	373	303	—
R2	390	332	—
R3	236	258	—
R4	444	360	—
R5	276	273	—
R6	515	344	—
Screening Standard	36200	15700	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-6
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Ethylbenzene

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.02	—
R2	—	0.02	—
R3	—	0.02	—
R4	—	0.02	—
R5	—	0.01	—
R6	—	0.03	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.03	—
R2	—	0.03	—
R3	—	0.03	—
R4	—	0.04	—
R5	—	0.01	—
R6	—	0.05	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.02	—
R2	—	0.02	—
R3	—	0.02	—
R4	—	0.02	—
R5	—	0.01	—
R6	—	0.03	—
Screening Standard	—	1000	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-7
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Formaldehyde

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.95	—
R2	—	1.01	—
R3	—	1.13	—
R4	—	1.07	—
R5	—	0.62	—
R6	—	1.43	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	1.42	—
R2	—	1.44	—
R3	—	1.19	—
R4	—	1.95	—
R5	—	0.65	—
R6	—	2.14	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.95	—
R2	—	1.07	—
R3	—	1.14	—
R4	—	1.08	—
R5	—	0.62	—
R6	—	1.54	—
Screening Standard	—	65	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-8
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Naphthalene

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.0003	—
R2	—	0.0002	—
R3	—	0.0004	—
R4	—	0.0003	—
R5	—	0.0002	—
R6	—	0.0005	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.0006	—
R2	—	0.0007	—
R3	—	0.0004	—
R4	—	0.0011	—
R5	—	0.0003	—
R6	—	0.0012	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.0003	—
R2	—	0.0003	—
R3	—	0.0004	—
R4	—	0.0003	—
R5	—	0.0002	—
R6	—	0.0006	—
Screening Standard	—	22.5	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-9
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - NO_2

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	66	18.3	—
R2	82	18.7	—
R3	64	19.5	—
R4	68	19.1	—
R5	42	16.1	—
R6	73	21.5	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	**416**	63	—
R2	**552**	49	—
R3	279	24	—
R4	**465**	84	—
R5	288	31	—
R6	252	69	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	223	30	—
R2	193	24	—
R3	84	20	—
R4	198	32	—
R5	75	17	—
R6	159	38	—
Screening Standard	400	200	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-10
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - PM2.5

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	14	—
R2	—	14	—
R3	—	15	—
R4	—	14	—
R5	—	14	—
R6	—	15	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	21	—
R2	—	19	—
R3	—	16	—
R4	—	29	—
R5	—	17	—
R6	—	28	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	15	—
R2	—	14	—
R3	—	15	—
R4	—	14	—
R5	—	14	—
R6	—	15	—
Screening Standard	—	30	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-11
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - PM10

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	23.9	—
R2	—	24.3	—
R3	—	24.2	—
R4	—	24.0	—
R5	—	23.4	—
R6	—	24.9	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	34.2	—
R2	—	31.6	—
R3	—	25.8	—
R4	—	47.5	—
R5	—	28.6	—
R6	—	45.8	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	24.1	—
R2	—	24.4	—
R3	—	24.2	—
R4	—	24.3	—
R5	—	23.5	—
R6	—	25.3	—
Screening Standard	—	50	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-12
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - SO_2

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	181	25	—
R2	229	23	—
R3	175	31	—
R4	185	24	—
R5	92	20	—
R6	204	37	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	181	25	—
R2	229	23	—
R3	175	31	—
R4	185	24	—
R5	92	20	—
R6	204	37	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	181	25	—
R2	229	23	—
R3	175	31	—
R4	185	24	—
R5	92	20	—
R6	204	37	—
Screening Standard	690	275	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-13
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Toluene

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.17	—
R2	—	0.18	—
R3	—	0.20	—
R4	—	0.19	—
R5	—	0.11	—
R6	—	0.26	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.25	—
R2	—	0.26	—
R3	—	0.21	—
R4	—	0.35	—
R5	—	0.12	—
R6	—	0.38	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.17	—
R2	—	0.19	—
R3	—	0.20	—
R4	—	0.19	—
R5	—	0.11	—
R6	—	0.28	—
Screening Standard	—	2000	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-14
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Carcinogenic PAHs

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	—	0.0003
R2	—	—	0.0003
R3	—	—	0.0003
R4	—	—	0.0003
R5	—	—	0.0003
R6	—	—	0.0003
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	—	0.0003
R2	—	—	0.0003
R3	—	—	0.0003
R4	—	—	0.0003
R5	—	—	0.0003
R6	—	—	0.0003
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	—	0.0003
R2	—	—	0.0003
R3	—	—	0.0003
R4	—	—	0.0003
R5	—	—	0.0003
R6	—	—	0.0003
Screening Standard	—	—	0.0003
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-15
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Non-carcinogenic PAHs

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.003	—
R2	—	0.003	—
R3	—	0.003	—
R4	—	0.003	—
R5	—	0.003	—
R6	—	0.003	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.004	—
R2	—	0.004	—
R3	—	0.003	—
R4	—	0.004	—
R5	—	0.003	—
R6	—	0.005	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	—	0.003	—
R2	—	0.003	—
R3	—	0.003	—
R4	—	0.003	—
R5	—	0.003	—
R6	—	0.003	—
Screening Standard	—	22.5	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
'—' indicates that this averaging period has not been considered for this compound			

Table A-16
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Xylenes

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	1.1	0.1	—
R2	1.5	0.1	—
R3	1.1	0.2	—
R4	1.2	0.2	—
R5	0.6	0.1	—
R6	1.3	0.2	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	1.5	0.2	—
R2	2.7	0.2	—
R3	1.1	0.2	—
R4	1.9	0.3	—
R5	0.9	0.1	—
R6	3.0	0.3	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	1.1	0.1	—
R2	1.5	0.2	—
R3	1.1	0.2	—
R4	1.2	0.2	—
R5	0.6	0.1	—
R6	1.3	0.2	—
Screening Standard	1812	730	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
*Screening standard has been converted from 1/2 hr averaging time to 1 hr averaging time using equation from MOE, 2005.			
'—' indicates that this averaging period has not been considered for this compound			

Table A-17
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Aluminum

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.009	0.001	—
R2	0.012	0.001	—
R3	0.009	0.001	—
R4	0.010	0.001	—
R5	0.004	0.001	—
R6	0.011	0.002	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.022	0.002	—
R2	0.042	0.002	—
R3	0.011	0.001	—
R4	0.029	0.003	—
R5	0.013	0.001	—
R6	0.048	0.004	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.009	0.001	—
R2	0.012	0.001	—
R3	0.009	0.001	—
R4	0.010	0.001	—
R5	0.004	0.001	—
R6	0.013	0.002	—
Screening Standard	82	120	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
*Screening standard has been converted from 1/2 hr averaging time to 1 hr averaging time using equation from MOE, 2005.			
'—' indicates that this averaging period has not been considered for this compound			

Table A-18
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Cadmium

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.00698	0.00065	0.00005
R2	0.00894	0.00055	0.00004
R3	0.00672	0.00087	0.00004
R4	0.00714	0.00062	0.00004
R5	0.00336	0.00044	0.00003
R6	0.00790	0.00114	0.00008
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.01644	0.00147	0.00009
R2	0.03187	0.00159	0.00009
R3	0.00788	0.00098	0.00005
R4	0.02204	0.00250	0.00013
R5	0.00993	0.00059	0.00005
R6	0.03567	0.00271	0.00027
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.00698	0.00070	0.00006
R2	0.00922	0.00062	0.00005
R3	0.00674	0.00089	0.00004
R4	0.00715	0.00069	0.00006
R5	0.00337	0.00045	0.00003
R6	0.00974	0.00126	0.00011
Screening Standard	0.062	0.025	0.005
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
*Screening standard has been converted from 1/2 hr averaging time to 1 hr averaging time using equation from MOE, 2005.			
'—' indicates that this averaging period has not been considered for this compound			

Table A-19
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Chromium

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.0012	0.0001	—
R2	0.0015	0.0001	—
R3	0.0011	0.0001	—
R4	0.0012	0.0001	—
R5	0.0006	0.0001	—
R6	0.0013	0.0002	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.0027	0.0002	—
R2	0.0053	0.0003	—
R3	0.0013	0.0002	—
R4	0.0037	0.0004	—
R5	0.0017	0.0001	—
R6	0.0059	0.0005	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.0012	0.0001	—
R2	0.0015	0.0001	—
R3	0.0011	0.0001	—
R4	0.0012	0.0001	—
R5	0.0006	0.0001	—
R6	0.0016	0.0002	—
Screening Standard	4.1	1.5	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
*Screening standard has been converted from 1/2 hr averaging time to 1 hr averaging time using equation from MOE, 2005.			
'—' indicates that this averaging period has not been considered for this compound			

Table A-20
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Lead

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.0012	0.0001	—
R2	0.0015	0.0001	—
R3	0.0011	0.0001	—
R4	0.0012	0.0001	—
R5	0.0006	0.0001	—
R6	0.0013	0.0002	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.0027	0.0002	—
R2	0.0053	0.0003	—
R3	0.0013	0.0002	—
R4	0.0037	0.0004	—
R5	0.0017	0.0001	—
R6	0.0059	0.0005	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.0012	0.0001	—
R2	0.0015	0.0001	—
R3	0.0011	0.0001	—
R4	0.0012	0.0001	—
R5	0.0006	0.0001	—
R6	0.0016	0.0002	—
Screening Standard	1.24	0.5	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
*Screening standard has been converted from 1/2 hr averaging time to 1 hr averaging time using equation from MOE, 2005.			
'—' indicates that this averaging period has not been considered for this compound			

Table A-21
DGR
Bruce County, Ontario

Ambient Air Chemical Screening - Zinc

Ambient Air Concentrations			
Existing Conditions			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.008	0.001	—
R2	0.010	0.001	—
R3	0.008	0.001	—
R4	0.008	0.001	—
R5	0.004	0.001	—
R6	0.009	0.001	—
Site Preparation and Construction Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.019	0.002	—
R2	0.037	0.002	—
R3	0.009	0.001	—
R4	0.026	0.003	—
R5	0.012	0.001	—
R6	0.042	0.003	—
Operations Phase			
Predicted Concentrations (µg/m³)			
Receptor Group	1_hr	24_hr	Annual
R1	0.008	0.001	—
R2	0.011	0.001	—
R3	0.008	0.001	—
R4	0.008	0.001	—
R5	0.004	0.001	—
R6	0.011	0.001	—
Screening Standard	82	120	—
		Prepared by:	GD
Notes:		Checked by:	RS
Values that exceed the screening standard are indicated in bold and shading			
*Screening standard has been converted from 1/2 hr averaging time to 1 hr averaging time using equation from MOE, 2005.			
'—' indicates that this averaging period has not been considered for this compound			

Table A-22
Ambient Air Screening Standards
DGR
Ontario Power Generation
Bruce County, Ontario

	Selected Ambient Air Quality Standard				
Averaging Period	1-hour	8-hour	24-hour	Annual	Source
Units	µg/m^3	µg/m^3	µg/m^3	µg/m^3	
acetaldehyde	—	—	500	—	O.Reg. 419/05/Ontario AAQC
acetone	—	—	11880	—	O.Reg. 419/05/Ontario AAQC
acrolein	0.24[A]	—	0.08	—	O.Reg. 419/05/Ontario AAQC
aluminum	100[A]	—	120	—	O.Reg. 419/05/Ontario AAQC
benzene (1)	—	—	30	0.13	US EPA IRIS
cadmium	0.075[A]	—	0.025	0.005	O.Reg. 419/05/Ontario AAQC
carbon monoxide	36200	15700	—	—	O.Reg. 419/05/Ontario AAQC
chromium	5[A]	—	1.5		O.Reg. 419/05/Ontario AAQC
ethylbenzene	—	—	1000	—	O.Reg. 419/05/Ontario AAQC
formaldehyde	—	—	65	—	O.Reg. 419/05/Ontario AAQC
lead	1.5[A]	—	0.5	—	O.Reg. 419/05/Ontario AAQC
naphthalene	—	—	22.5	—	O.Reg. 419/05/Ontario AAQC
NO_2	400	—	200	—	O.Reg. 419/05/Ontario AAQC
PM2.5(2)	—	—	30	—	CCME Canada-Wide Standard
PM10	—	—	50	—	Interim AAQC
SO_2	690	—	275	—	O.Reg. 419/05/Ontario AAQC
Toluene	—	—	2,000	—	Ontario AAQC; based on odour
carcinogenic PAHs	—	—	—	0.0003[B]	Ontario AAQC
non-carcinogenic PAHs	—	—	22.5[C]	—	Ontario AAQC/O.Reg. 419/05 Guidelines
xylenes	2200[A]	—	730	—	O.Reg. 419/05/Ontario AAQC
zinc	100[A]	—	120	—	O.Reg. 419/05/Ontario AAQC

Prepared by: RS
Checked by: GD

Notes:

Selected screening values are based on health endpoints, unless otherwise noted. Short-term screening standards (10-minute, 1/2-hour and 1-hour) are presented where available and if applicable to human health.

[A] Standard provided is for half-hour averaging period

[B] Benzo(a)pyrene has been selected as a surrogate for carcingenic PAHs. The standard presented is for benzo(a)pyrene 'all sources'

[C] Naphthalene has been selected as a surrogate for non-carcinogenic PAHs

"-" indicates that these contaminants are not considered for this averaging period

"n/a"=not available

(1) Values for 24-hour averaging period were adopted from US EPA IRIS Chronic Reference Concentration (RfC);annual values were adopted from US EPA IRIS air unit risk values

(2) Values for PM2.5 were obtained from the Canadian Council of Ministers of the Environment, Canada-Wide Standards. It is based on the 98th percentile measurement annual, averaged over three consecutive years.

APPENDIX B

Atmospheric Deposition Estimates

March 2011
Report No. 06-1112-0037

Golder Associates

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ATMOSPHERIC DEPOSITION ESTIMATES FOR USE IN THE HUMAN HEALTH RISK ASSESSMENT

Although the inhalation of airborne contaminants is the primary mechanism for exposure with respect to changes in air quality, certain airborne compounds can deposit on the ground. Once deposition occurs, these contaminants can enter the food chain and result in exposures through the consumption of local food products. To determine the magnitude of this exposure pathway, calculations of the dry and wet deposition of selected compounds was undertaken as described below. The focus of the calculations was on the solid particles, as well as the associated deposition of metals and poly-cyclic aromatic hydrocarbons (PAHs).

Dry Deposition

The dry deposition can be determined by multiplying the airborne concentration of the selected compound by its deposition velocity (Hesketh, 1985).

The airborne concentrations of the target health compounds were predicted as part of the assessment presented in the Atmospheric Environment TSD, specifically in Appendix J to that TSD. However, the compounds of primary interest from a deposition perspective are those associated with diesel combustion, or more specifically, the particulate matter associated with diesel combustion. Therefore, the concentrations of diesel particulate matter predicted by the dispersion modeling will be used to calculate the deposition rates of diesel PM on an hourly basis. These values can then be speciated using chemical compositions published by Schauer et al. (1999) to yield the required deposition rates.

Deposition velocities are a function of the particle size, density, atmospheric conditions and the nature of the surface onto which the particles are deposited. While particle deposition velocities can be calculated by models directly, reasonable values are available from published literature (Randerson, 1984). Since the compounds of interest from a deposition perspective are associated with diesel particulate matter, the characteristics of those particles will be used for determining appropriate deposition velocities. Diesel particulate matter is composed mainly of particles smaller than 1 µm in diameter (Bugarski, 2010; Mischeler, 2006). Therefore, a particle diameter off 1 µm was conservatively selected for calculating deposition velocities.

Figures 12.3 through 12.7 of Randerson (1984) show suitable values of deposition velocity, as a function of the particle diameter, surface roughness and particle density for a range of frictional velocity (U*). The frictional velocity is a meteorological scaling factor that is used to describe the mechanical turbulence at the surface and is available from the dispersion meteorological data used in the Atmospheric Environment TSD.

Table 1 provides a listing of the deposition velocities for particles with a conservative density of 11.5 g/m³ and a surface roughness of 10 cm. A surface roughness of 10 cm is at the upper end of suitable values for farmland according to Figure 9.6 of Stull (1989). Hourly deposition velocities were selected on the basis of the corresponding frictional velocity (U*) listed in the dispersion meteorological data.

Table 1: Deposition Velocities Used for Calculating Deposition

Figure Used	Use When Hourly Frictional Velocities Equal	Deposition Velocity (m/s)
Figure 1	0 to 15 cm/s	0.012
Figure 2	15 to 40 cm/s	0.012
Figure 3	40 to 75 cm/s	0.016
Figure 4	75 to 150 cm/s	0.03
Figure 5	>150 cm/s	0.09

Wet Deposition

On hours when there is precipitation, a particle can also be "washed" from the atmosphere increasing the amount of particulate matter deposited. The amount of the particulate deposited as a result of precipitation is a function of the amount of particulate matter in the air, the type of precipitation and the precipitation intensity.

In order to calculate the amount, or mass, of diesel particulate in the air at a particular location, it is necessary to determine the vertical concentration profile of the plume. Since concentrations decrease as you move away from the plume centerline, and because the majority of emissions at the DGR project occur at or near the ground, the plume concentration will decrease as the height increases. Generally, the plume concentration profile can be represented by a normal distribution curve as described by Pasquill (1983), Hanna et al. (1982), and Turner (1969). The concentration profile for the plume can be described by the by the mean value (i.e., the centerline diesel PM concentration) and the standard deviation in the vertical direction (i.e., the σz value). The centerline concentrations are the values calculated directly by the dispersion model, while the standard deviation in the vertical direction is a function of the stability conditions and the distance from the source. Values of vertical standard deviation can be taken from literature (Turner, 1969), but can also be calculated using the equations provided by Pasquill (1983). Table 2 lists the vertical standard deviation terms for each of the six Pasquill-Gifford stability categories. The hourly stability conditions were derived from the dispersion meteorological data.

Table 2: Vertical Standard Deviation

Stability Class	Distance to Receptor	Vertical Dispersion Term (σz in m)
A (highly unstable)	1,500 m	101.07
B (unstable)	1,500 m	40.07
C (slightly unstable)	1,500 m	19.46
D (neutral)	1,500 m	9.85
E (slightly stable)	1,500 m	4.79
F (stable)	1,500 m	1.61

Note: Calculated in accordance with Table 6.VI from Pasquill (1983), assuming a roughness length of 10 cm.

The vertical concentration profile for the plume can be derived from the general Gaussian plume equation (see Figure 1), which can The Gaussian dispersion equation is often written in the following form (Turner, 1969):

$$C = \frac{Q}{2\pi\sigma_y\sigma_z u} \times \left[exp\left\{-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right\}\right] \times \left[exp\left\{-\frac{1}{2}\left(\frac{z-H}{\sigma_z}\right)^2\right\} + exp\left\{-\frac{1}{2}\left(\frac{z+H}{\sigma_z}\right)^2\right\}\right]$$

In the case of calculating deposition for use in the health assessment for the DGR Project, several of these terms can be discarded. Firstly, the "H" term refers to the plume height, as illustrated in Figure 1. Since most of the sources in the DGR project are surface based, the “H” term can be set to zero (0). Secondly, the “y” term is not of interest and can be assumed zero (0) since we are only interested in the vertical profile of the plume. Thus, the equation can be simplified as follows:

$$C = \frac{Q}{2\pi\sigma_y\sigma_z u} \times \left[exp\left\{-\frac{1}{2}\left(\frac{z}{\sigma_z}\right)^2\right\} + exp\left\{-\frac{1}{2}\left(\frac{z}{\sigma_z}\right)^2\right\}\right]$$

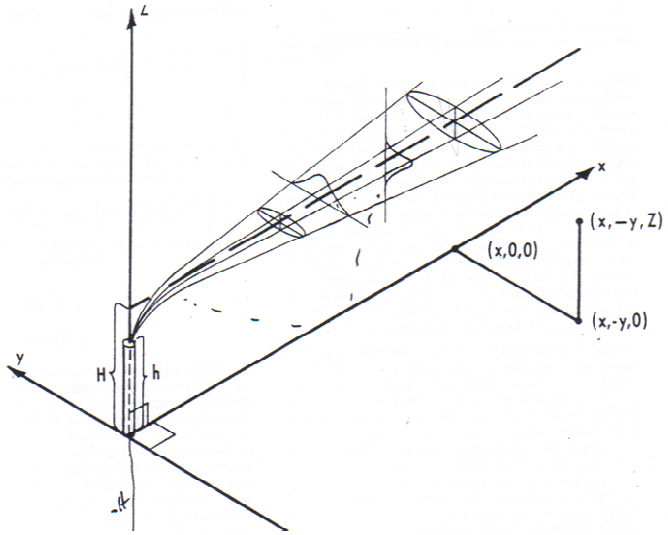

Figure 1: Gaussian Plume Equation

In the above equation, the first fraction represents the ground-level concentration at the centerline of the plume, which is effectively the same as the concentrations predicted by the dispersion model. Therefore, the concentration profile with height “z” can be expressed as a function of the centreline concentration (CLC) as follows:

$$C(z) = CLC \times \left[exp\left\{-\frac{1}{2}\left(\frac{z}{\sigma_z}\right)^2\right\} + exp\left\{-\frac{1}{2}\left(\frac{z}{\sigma_z}\right)^2\right\}\right]$$

By integrating the above equation from the ground to the nominal plume depth (approximately 2.15 standard deviations above the ground), the mass of diesel PM in the air above the receptor can be calculated. This is illustrated in Figure 2.

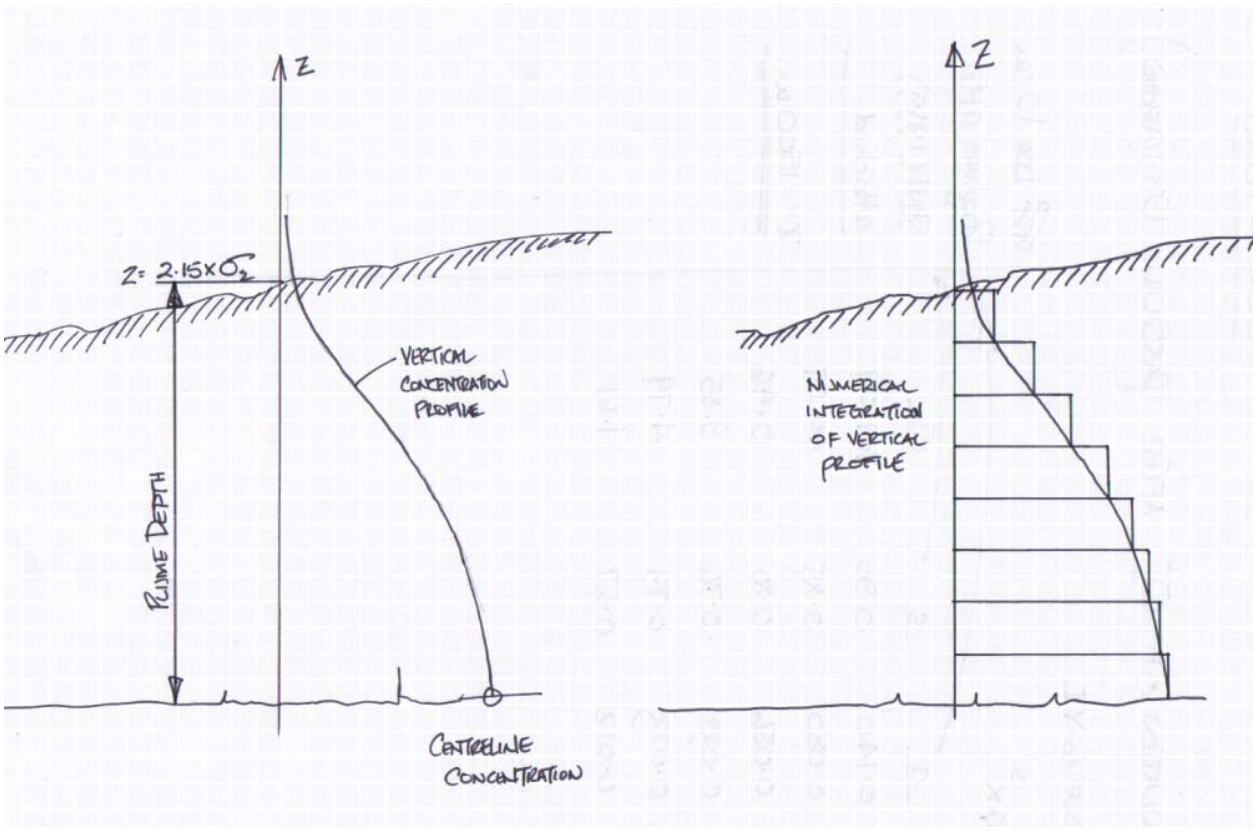

Figure 2: Vertical Integration to Determine Mass of Particles in Air

In order to calculate the amount of the airborne particulate matter removed through precipitation, hourly precipitation type and intensity data are required. This data is not available. The only data available for the period corresponding with the dispersion meteorology is daily data from Wiarton on the total amount of rainfall, snowfall and precipitation. However, hourly flags indicating when precipitation occurs are available. Therefore a more simplified, and conservative approach has been adopted. Specifically, all of the airborne particulate matter has been assumed to be removed on those hours when precipitation was noted (i.e., 100% per hour), regardless of the rate of precipitation. On hours when no precipitation was recorded, no wet deposition was assumed to have occurred.

Total Deposition

The total deposition of diesel particulate was calculated as the sum of the dry and wet deposition values calculated in accordance with the above sections. However, on those hours when wet deposition was assumed to occur, the dry deposition was set to zero (0). The reason is that precipitation was conservatively assumed to remove all of the airborne particles. Therefore, dry deposition could not occur once all of the particles are washed out through wet deposition.

Particle Speciation

The deposition rates for the target compounds used in the health assessment were derived from the deposition rates for diesel particulate using the relationships described in Schauer et al (1999). Specifically, the information

provided in Schauer et al. (1999) was used to derive relationships that express the deposition of metals and poly-cyclic aromatic hydrocarbons (PAHs) as a function of the diesel particulate deposition rates. These relationships (see Table 3) were then applied to the deposition rates of diesel particulate matter, described above.

Table 3: Metal and PAH Speciation Factors

Compound	Deposition as a Percentage of the Deposition of Diesel Particulate Matter
Aluminum	0.080%
Cadmium	0.060%
Chromium	0.010%
Lead	0.010%
Zinc	0.070%
Naphthalene	0.026%
carcinogenic PAHs	0.001%
non-carcinogenic PAHs	0.053%

Source: Derived from the information presented in Schauer et al (1999).

Results

Tables 4 through 6 provide the total annual deposition rates for the target health compounds for the existing conditions site preparation and, construction phase, and operations phase, respectively. These results provide the combined wet and dry deposition rates as discussed above.

Table 4: Existing Deposition Rates

Compound of Interest	Maximum Annual Deposition [g/m²×a]	Annual Deposition Rates [g/m²×a]				
		2005	2006	2007	2008	2009
carcinogenic PAHs	2.396E-07	2.042E-07	1.889E-07	2.166E-07	1.769E-07	2.396E-07
non-carcinogenic PAHs	1.502E-05	1.280E-05	1.184E-05	1.357E-05	1.109E-05	1.502E-05
Lead	2.815E-06	2.400E-06	2.219E-06	2.545E-06	2.079E-06	2.815E-06
Aluminum	2.252E-05	1.920E-05	1.775E-05	2.036E-05	1.663E-05	2.252E-05
Cadmium	1.689E-05	1.440E-05	1.332E-05	1.527E-05	1.247E-05	1.689E-05
Zinc	1.971E-05	1.680E-05	1.554E-05	1.781E-05	1.455E-05	1.971E-05
Chromium	2.815E-06	2.400E-06	2.219E-06	2.545E-06	2.079E-06	2.815E-06
Naphthalene	7.381E-06	6.292E-06	5.819E-06	6.672E-06	5.451E-06	7.381E-06

Table 5: Construction Phase Deposition Rates

Compound of Interest	Maximum Annual Deposition [g/m²×a]	Annual Deposition Rates [g/m²×a]				
		2005	2006	2007	2008	2009
carcinogenic PAHs	5.115E-07	4.659E-07	4.567E-07	4.359E-07	3.734E-07	5.115E-07
non-carcinogenic PAHs	3.206E-05	2.920E-05	2.863E-05	2.733E-05	2.341E-05	3.206E-05
Lead	6.011E-06	5.475E-06	5.367E-06	5.123E-06	4.388E-06	6.011E-06
Aluminum	4.808E-05	4.380E-05	4.293E-05	4.098E-05	3.510E-05	4.808E-05
Cadmium	3.606E-05	3.285E-05	3.220E-05	3.074E-05	2.633E-05	3.606E-05
Zinc	4.207E-05	3.832E-05	3.757E-05	3.586E-05	3.071E-05	4.207E-05
Chromium	6.011E-06	5.475E-06	5.367E-06	5.123E-06	4.388E-06	6.011E-06
Naphthalene	1.576E-05	1.435E-05	1.407E-05	1.343E-05	1.150E-05	1.576E-05

Table 6: Operations Phase Deposition Rates

Compound of Interest	Maximum Annual Deposition [g/m²×a]	Annual Deposition Rates [g/m²×a]				
		2005	2006	2007	2008	2009
carcinogenic PAHs	2.876E-07	2.482E-07	2.330E-07	2.547E-07	2.112E-07	2.876E-07
non-carcinogenic PAHs	1.803E-05	1.556E-05	1.461E-05	1.596E-05	1.324E-05	1.803E-05
Lead	3.380E-06	2.917E-06	2.738E-06	2.993E-06	2.482E-06	3.380E-06
Aluminum	2.704E-05	2.333E-05	2.191E-05	2.394E-05	1.986E-05	2.704E-05
Cadmium	2.028E-05	1.750E-05	1.643E-05	1.796E-05	1.489E-05	2.028E-05
Zinc	2.366E-05	2.042E-05	1.917E-05	2.095E-05	1.737E-05	2.366E-05
Chromium	3.380E-06	2.917E-06	2.738E-06	2.993E-06	2.482E-06	3.380E-06
Naphthalene	8.861E-06	7.646E-06	7.179E-06	7.846E-06	6.507E-06	8.861E-06

Tables 7 through 9 provide the total annual wet deposition rates for the target health compounds for the existing conditions, construction phase, and operations phase, respectively.

Table 7: Existing Wet Deposition Rates

Compound of Interest	Maximum Annual Wet Deposition [g/m²×a]	Annual Wet Deposition Rates [g/m²×a]				
		2005	2006	2007	2008	2009
carcinogenic PAHs	2.717E-08	6.416E-09	1.507E-09	1.590E-08	2.203E-08	2.717E-08
non-carcinogenic PAHs	1.703E-06	4.022E-07	9.446E-08	9.965E-07	1.381E-06	1.703E-06
Lead	3.193E-07	7.540E-08	1.771E-08	1.868E-07	2.589E-07	3.193E-07
Aluminum	2.555E-06	6.032E-07	1.417E-07	1.494E-06	2.071E-06	2.555E-06
Cadmium	1.916E-06	4.524E-07	1.062E-07	1.121E-06	1.553E-06	1.916E-06
Zinc	2.235E-06	5.278E-07	1.240E-07	1.308E-06	1.812E-06	2.235E-06
Chromium	3.193E-07	7.540E-08	1.771E-08	1.868E-07	2.589E-07	3.193E-07
Naphthalene	8.372E-07	1.977E-07	4.642E-08	4.898E-07	6.788E-07	8.372E-07

Table 8: Construction Phase Wet Deposition Rates

Compound of Interest	Maximum Annual Wet Deposition [g/m²×a]	Annual Wet Deposition Rates [g/m²×a]				
		2005	2006	2007	2008	2009
carcinogenic PAHs	2.957E-08	1.001E-08	1.715E-09	1.754E-08	2.449E-08	2.957E-08
non-carcinogenic PAHs	1.853E-06	6.276E-07	1.075E-07	1.099E-06	1.535E-06	1.853E-06
Lead	3.474E-07	1.177E-07	2.015E-08	2.061E-07	2.877E-07	3.474E-07
Aluminum	2.779E-06	9.412E-07	1.612E-07	1.649E-06	2.302E-06	2.779E-06
Cadmium	2.085E-06	7.059E-07	1.209E-07	1.237E-06	1.726E-06	2.085E-06
Zinc	2.432E-06	8.236E-07	1.410E-07	1.443E-06	2.014E-06	2.432E-06
Chromium	3.474E-07	1.177E-07	2.015E-08	2.061E-07	2.877E-07	3.474E-07
Naphthalene	9.109E-07	3.085E-07	5.282E-08	5.404E-07	7.544E-07	9.109E-07

Table 9: Operations Phase Wet Deposition Rates

Compound of Interest	Maximum Annual Wet Deposition [g/m²×a]	Annual Wet Deposition Rates [g/m²×a]				
		2005	2006	2007	2008	2009
carcinogenic PAHs	2.717E-08	6.416E-09	1.507E-09	1.590E-08	2.203E-08	2.717E-08
non-carcinogenic PAHs	1.703E-06	4.022E-07	9.446E-08	9.965E-07	1.381E-06	1.703E-06
Lead	3.193E-07	7.540E-08	1.771E-08	1.868E-07	2.589E-07	3.193E-07
Aluminum	2.555E-06	6.032E-07	1.417E-07	1.494E-06	2.071E-06	2.555E-06
Cadmium	1.916E-06	4.524E-07	1.062E-07	1.121E-06	1.553E-06	1.916E-06
Zinc	2.235E-06	5.278E-07	1.240E-07	1.308E-06	1.812E-06	2.235E-06
Chromium	3.193E-07	7.540E-08	1.771E-08	1.868E-07	2.589E-07	3.193E-07
Naphthalene	8.372E-07	1.977E-07	4.642E-08	4.898E-07	6.788E-07	8.372E-07

Tables 10 through 12 provide the total annual dry deposition rates for the target health compounds for the existing conditions, site preparation and construction phase, and operations phase, respectively.

Table 10: Existing Dry Deposition Rates

Compound of Interest	Maximum Annual Dry Deposition [g/m²×a]	Annual Dry Deposition Rates [g/m²×a]				
		2005	2006	2007	2008	2009
carcinogenic PAHs	2.124E-07	1.978E-07	1.874E-07	2.007E-07	1.549E-07	2.124E-07
non-carcinogenic PAHs	1.331E-05	1.240E-05	1.174E-05	1.258E-05	9.709E-06	1.331E-05
Lead	2.496E-06	2.325E-06	2.202E-06	2.358E-06	1.820E-06	2.496E-06
Aluminum	1.997E-05	1.860E-05	1.761E-05	1.886E-05	1.456E-05	1.997E-05
Cadmium	1.498E-05	1.395E-05	1.321E-05	1.415E-05	1.092E-05	1.498E-05
Zinc	1.747E-05	1.627E-05	1.541E-05	1.651E-05	1.274E-05	1.747E-05
Chromium	2.496E-06	2.325E-06	2.202E-06	2.358E-06	1.820E-06	2.496E-06
Naphthalene	6.544E-06	6.094E-06	5.772E-06	6.182E-06	4.772E-06	6.544E-06

Table 11: Construction Phase Dry Deposition Rates

Compound of Interest	Maximum Annual Dry Deposition [g/m²×a]	Annual Dry Deposition Rates [g/m²×a]				
		2005	2006	2007	2008	2009
carcinogenic PAHs	4.819E-07	4.559E-07	4.550E-07	4.184E-07	3.489E-07	4.819E-07
non-carcinogenic PAHs	3.021E-05	2.858E-05	2.852E-05	2.623E-05	2.187E-05	3.021E-05
Lead	5.663E-06	5.357E-06	5.347E-06	4.917E-06	4.100E-06	5.663E-06
Aluminum	4.530E-05	4.286E-05	4.277E-05	3.933E-05	3.280E-05	4.530E-05
Cadmium	3.398E-05	3.214E-05	3.208E-05	2.950E-05	2.460E-05	3.398E-05
Zinc	3.964E-05	3.750E-05	3.743E-05	3.442E-05	2.870E-05	3.964E-05
Chromium	5.663E-06	5.357E-06	5.347E-06	4.917E-06	4.100E-06	5.663E-06
Naphthalene	1.485E-05	1.404E-05	1.402E-05	1.289E-05	1.075E-05	1.485E-05

Table 12: Operations Phase Dry Deposition Rates

Compound of Interest	Maximum Annual Dry Deposition [g/m²×a]	Annual Dry Deposition Rates [g/m²×a]				
		2005	2006	2007	2008	2009
carcinogenic PAHs	2.124E-07	1.978E-07	1.874E-07	2.007E-07	1.549E-07	2.124E-07
non-carcinogenic PAHs	1.331E-05	1.240E-05	1.174E-05	1.258E-05	9.709E-06	1.331E-05
Lead	2.496E-06	2.325E-06	2.202E-06	2.358E-06	1.820E-06	2.496E-06
Aluminum	1.997E-05	1.860E-05	1.761E-05	1.886E-05	1.456E-05	1.997E-05
Cadmium	1.498E-05	1.395E-05	1.321E-05	1.415E-05	1.092E-05	1.498E-05
Zinc	1.747E-05	1.627E-05	1.541E-05	1.651E-05	1.274E-05	1.747E-05
Chromium	2.496E-06	2.325E-06	2.202E-06	2.358E-06	1.820E-06	2.496E-06
Naphthalene	6.544E-06	6.094E-06	5.772E-06	6.182E-06	4.772E-06	6.544E-06

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APPENDIX C

Calculation of Soil and Vegetation Concentrations

March 2011
Report No. 06-1112-0037

Golder Associates

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CALCULATION OF SOIL AND VEGETATION CONCENTRATIONS

The equations from the Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (2005) were used to quantify concentrations of chemicals in soil and home-grown vegetables. Input parameters and calculations are described as follows.

Input Parameters and Equations

Soil

The parameters that are used to calculate incremental soil concentrations are shown in Table 1.

Table 1: Variables for Calculation of Incremental Soil Concentrations

Variable		Value	Units	Reference
ISC	incremental soil concentration	Chemical specific	mg/kg dry wt	See Appendix C
Dyd	dry deposition rate	Chemical specific	$g/m^2/yr$	See Appendix B
Dyw	wet deposition rate	Chemical specific	$g/m^2/yr$	See Appendix B
tD	deposition time (the period of the baseline phase)	10	yr	Assumed
tD	deposition time (the period of the construction phase)	7	yr	EIS
tD	deposition time (the period of the operations phase)	45	yr	EIS
tD	deposition time (the period of the decommissioning phase)	6	yr	EIS
tD	deposition time (the period of the entire project)	58	yr	EIS
Zs	soil mixing depth	20	cm	Tilled soil US EPA (2005) Appendix B Table B-1-1
BD	bulk density	1.5	g/cm^3	US EPA (2005) Appendix B Table B-1-1
Ks (carcinogenic PAHs)	soil loss constant; loss of soil from biotic and abiotic processes and degradation (carcinogenic PAHs)	0.27	(yr^{-1})	Howard *et al.* (1991) as cited in US EPA 2005; HHRAP Companion Database
Ks (Non-carcinogenic PAHs)	soil loss constant; loss of soil from biotic and abiotic processes and degradation (non-carcinogenic PAHs)	0.55	(yr^{-1})	Howard *et al.* (1991) as cited in US EPA 2005; HHRAP Companion Database

The equations that are used to calculate incremental soil concentrations for inorganic and organic chemicals are provided below:

$$ISC\ (Inorganic\ Chemicals) = (100^* (Dyd+Dyw)^*tD) / (Zs^*BD) \quad \textbf{(1)}$$

$$ISC\ (Organic\ Chemicals) = [(100^*(Dyd+Dyw)^*[1-exp(-Ks * tD)]/(Zs^*BD^*Ks)] \quad \textbf{(2)}$$

The factor of 100 is used to correct the units so that incremental soil concentrations will be generated in mg chemical per kg of soil.

Vegetation

The parameters that are used to calculate incremental leaf, berry and root concentrations are shown in Table 2.

Table 2: Variables for Calculation of Incremental Leaf, Berry and Root Concentrations

Variable		Value	Units	Reference
Dyd	dry deposition rate	Chemical specific	g/m²/yr	See Appendix B
Dyw	wet deposition rate	Chemical specific	g/m²/yr	See Appendix B
Fw	fraction of chemical wet deposition that adheres to plant surfaces	0.6	unitless	cations and organics - US EPA Region 6 (2005) Appendix B Table B-2-7
Fv	fraction of chemical in vapour phase	0	unitless	assumed
Rp	interception fraction; represents portion of chemical deposition intercepted by plants	0.39	unitless	default value - US EPA Region 6 (2005) Appendix B Table B-2-7
Tp	length of plant exposure to deposition per yr	0.164	yr	default value - US EPA Region 6 (2005) Appendix B Table B-2-7
Yp	crop yield	2.24	(kg dry wt/m²)	default value - US EPA Region 6 (2005) Appendix B Table B-2-7
Kp	chemical removal from the plant surface by weathering	18	yr^{-1}	default value - US EPA Region 6 (2005) Appendix B Table B-2-7
ISC	incremental soil concentration	chemical-specific	mg/kg dry wt	Calculated
BCFag	bioconcentration factor	chemical-specific	mg/kg dry wt	Chemical specific US EPA Region 6 (2005); RAIS
BCF (soil to root)	bioconcentration factor	chemical-specific	unitless	Chemical specific US EPA Region 6 (2005); RAIS

Variable		Value	Units	Reference
Vg (Kow <4)	correction factor to account for absorption of chemical through root surface	1	(unitless)	for all chemicals with log Kow < 4 - US EPA Region 6 (2005) Appendix B Table B-2-7
Vg (Kow >4)	correction factor to account for absorption of chemical through root surface	0.01	(unitless)	for all chemicals with log Kow > 4 - US EPA Region 6 (2005) Appendix B Table B-2-7

The equations that are used to calculate incremental leaf, berry and root concentrations are provided below:

Incremental Plant Concentration:

$$Incremental\ Plant\ Concentration\ (IPC) = Incremental\ Plant\ Concentration\ due\ to\ Air\ Depostion\ (Pd) + Incrementation\ Plant\ Concentration\ due\ to\ vapour\ transfer(Pv) + Incremental\ Plant\ Concentration\ due\ to\ root\ uptake\ (Pr) \quad \textit{(3)}$$

Above-Ground (Leaf / Berry):

$$Pd = (1000 * (Dyd + (Fw * Dyw)) * (1 - Fv) * Rp(plant\ material) * (1.0 - exp(-Kp * Tp(plant\ material))/(Yp(plant\ material) * Kp) \quad \textit{(4)}$$

$$Pv = 0$$

$$Pr = ISC * BCFag \quad \textit{(5)}$$

Below-Ground (Root):

$$Pd = 0$$

$$Pv = 0$$

$$Pr = ISC * BCF(soil\ to\ root) * Vg \quad \textit{(6)}$$

SAMPLE CALCULATIONS

The sample calculations below have been provided for non-carcinogenic PAHs for the operations phase.

Incremental Soil Concentration

Dyd = 1.703E-6 g/m^2/yr

Dyw = 1.331E-5 g/m^2/yr

Ks = 0.55 yr^{-1}

tD = 45 years

Zs = 20 cm

BD = 1.5 g/cm^3

ISC (Organic Chemicals) = [(100*(Dyd+Dyw)*[1-exp(-Ks * tD)]/(Zs*BD*Ks)]

ISC (Organic Chemicals) = [(100*(1.703E-6+1.331E-5)*[1-exp(-0.55 * 45)]/(20*1.5*0.55)]

ISC (Organic Chemicals) = 9.10E-5 mg/kg

Incremental Vegetation Concentrations

Dyd = 1.703E-6 g/m^2/yr

Dyw = 1.331E-5 g/m^2/yr

Fw = 0.6

Fv = 0

Rp = 0.39

Tp = 0.164 yr

Yp = 2.24 kg/m^2

Kp = 18 yr^{-1}

ISC = 9.10E-5 mg/kg

BCFag = 0.097

BCFs-r = 0.15

Vg = 0.01

Above-ground produce

$$Incremental\ Plant\ Concentration\ (IPC) = Incremental\ Plant\ Concentration\ due\ to\ Air\ Deposition\ (Pd) + Incrementation\ Plant\ Concentration\ due\ to\ vapour\ transfer(Pv) + Incremental\ Plant\ Concentration\ due\ to\ root\ uptake\ (Pr)$$

$$Pd = (1000 * (Dyd + (Fw * Dyw)) * (1 - Fv) * Rp(plant\ material) * (1.0 - exp(-Kp * Tp(plant\ material))/(Yp(plant\ material) * Kp)$$

$$Pd = (1000 * (1.331E - 5 + (0.6 * 1.703E - 6)) * (1 - 0) * 0.39 * (1.0 - exp(-18 * 0.164))/(2.24 * 18)$$

$$Pd = 1.31E - 4\ mg/kg$$

$$Pv = 0$$

$$Pr = ISC * BCFag$$

$$Pr = 9.1E - 5 * 0.097$$

$$Pr = 8.83E - 6\ mg/kg$$

$$IPC = Pd + Pv + Pr$$

$IPC = 1.31E-4 + 0 + 8.83E-6$

$IPC = 1.40E-4\ mg/kg$

Below-ground produce

$Pd = 0$

$Pv = 0$

$Pr = ISC * BCF(soil\ to\ root) * Vg$

$Pr = 9.1E-5 * 0.15 * 0.01$

$Pr = 1.37E-7\ mg/kg$

$IPC = Pd + Pv + Pr$

$IPC = 0 + 0 + 1.37E-7$

$IPC = 1.37E-7\ mg/kg$

References

United States Environmental Protection Agency (US EPA). 2005. *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*.

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APPENDIX D

Human Health Exposure and Risk Calculations

March 2011
Report No. 06-1112-0037

Golder Associates

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HUMAN HEALTH EXPOSURE AND RISK CALCULATIONS

Exposure Assumptions

The exposure assumptions for each receptor (local residents, members of Aboriginal communities and seasonal users) are provided in Table 4.3-1 and descriptions of these receptors are provided in Section 4.3 of the Humam Health Risk Assessment (HHRA). Worker exposures have been assessed qualitatively and are discussed in Appendix C.

Exposure Assessment

The following exposure equations from the U.S. EPA Risk Assessment Guidance for Superfund (1989) and the Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (2005) were used to quantify the daily exposure that each human receptor may receive as a result of direct or indirect contact with each contaminant of concern (COC) via each complete exposure pathway.

Incidental Ingestion of Soil

$$Dose\ (mg \cdot kg/day) = \frac{C_s \times IR_s \times RAF_{ing} \times EF \times ED}{BW \times AT \times CF} \quad \textbf{(1)}$$

Where:

C_S = concentration of chemical in soil (mg/kg);

IR_S = receptor soil ingestion rate (kg/d);

RAF_{ing} = relative absorption factor from the gastrointestinal tract (unitless);

EF = exposure frequency (d/yr);

ED = exposure duration (yr);

BW = body weight (kg);

AT = averaging time (equal to ED for non-carcinogens; equal to 70 years for carcinogens); and

CF = unit conversion factor (365 d/yr).

Dermal Contact with Soil

$$Dose\ (mg/kg \cdot day) = \frac{C_s \times RAF_{der} \times \sum SA \times R_{adher} \times EV \times EF \times ED}{BW \times AT \times CF}$$

(2)

Where:

C_S = concentration of chemical in soil (mg/kg);

RAF_{der} = relative absorption factor for skin (unitless);

SA = exposed skin surface area (cm^2);

R_{adher} = rate of soil adherence to skin (kg/cm^2-event);

EV = events per day (event/d);

EF = exposure frequency (d/yr);

ED = exposure duration (yr);

BW = body weight (kg);

AT = averaging time (equal to ED for non-carcinogens; equal to 70 years for carcinogens); and

CF = unit conversion factor (365 d/yr).

Inhalation Exposures

$$Dose\ \ (mg/kg \cdot day) = \frac{C_{air} \times CF_1 \times RAF_{inh} \times IR \times ET \times EF \times ED}{BW \times CF_2 \times AT}$$

(3)

Where:

C_{air} = concentration in air (in $\mu g/m^3$);

CF_1 = unit correction factor (0.001mg/µg);

RAF_{inh} = correction factor for absorption by inhalation (unitless);

IR = inhalation rate (m^3/hr);

ET = exposure time (hr/day);

EF = exposure frequency (day/yr);

ED = exposure duration (yr);

BW = body weight (kg);

CF_2 = unit correction factor (365 days/yr); and

AT = averaging time (yr).

Ingestion of Garden Vegetables

$$Dose\ (mg/kg \cdot day) = \frac{C_{veg} \times R_{ing} \times RAF_{ing} \times EF \times ED}{BW \times AT \times CF} \quad \textbf{(4)}$$

Where:

C_{veg} = concentration of compound in vegetables (mg/kg);

R_{ing} = rate of ingestion of backyard vegetables (kg/d);

RAF_{ing} = ingestion relative absorption factor for food (unitless);

EF = exposure frequency expressed as days per year (d/yr);

ED = exposure duration expressed as years (yr);

BW = body weight expressed as kilograms (kg);

AT = averaging time; and

CF = unit correction factor of 365 d/yr.

Tables 4.5.5-1-1 to 4.5.6-3-7 present the exposures for each COC and receptor.

Risk Characterization

Non-Cancer Risks

The risk due to COCs that are threshold toxicants (i.e., non-carcinogens) is calculated by taking the ratio (i.e., hazard quotient; HQ) of the dose to the applicable toxicity reference value (TRV; Table 5.2-1):

$$Hazard\ Quotient\ (HQ) = \frac{Estimated\ Dose\ (mg/kg{\cdot}day)}{RfD\ (mg/kg{\cdot}day)} \quad \textbf{(5)}$$

Where:

RfD= Reference Dose

In general, regulatory agencies concur that a hazard quotient value below one (1) is not significant (US EPA, 1989; Health Canada, 2004). However, apportionment is typically applied as the percentage of the regulatory-health based level that is allocated to the source/pathway being regulated; that is, 20% of the TRV is allocated for each source of exposure. Typically, it is assumed that people are exposed to compounds in soil (0.2), groundwater (0.2), air (0.2), food (0.2) and consumer products (0.2) for a total of 100% or 1. An HQ value of 1 has been applied to volatile and inert compounds because substantive exposure for human receptors for these compounds is via inhalation of aerial concentrations. An HQ value of 0.2 for each exposure pathway has been applied for semi-volatile compounds and metals.

Tables 6.1-1 to 6.1-4 present the non-cancer risk for each COC and receptor.

Cancer Risks

Each exposure rate was multiplied by its respective slope factor or inhalation unit risk and summed to give the total incremental lifetime cancer risk (ILCR; equation 8):

$$ILCR = Exposure\ \ (mg/kg \cdot day) \times Cancer\ Slope\ Factor\ (mg/kg \cdot day)^{-1} \qquad \textbf{(8)}$$

For each exposure pathway, the MOE considers an acceptable cancer risk to be one in one million (1×10^{-6}) (MOE, 2009). The results for the cancer risk assessment for the exposure scenarios are presented in Tables 6.2-1 to 6.2-3.

SAMPLE CALCULATIONS

Non-carcinogenic PAHs, operations phase, local resident (AR1 - toddler)

Incidental Ingestion from Soil

Cs = 9.1 x 10^{-5} mg/kg (Table 3.5.2.1-2; modelled from deposition rates see Appendix C)

IRs = 0.00008 kg/d (see Table 4.3-1)

RAF = 1 (see Table 4.5.3-1)

EF = 365 d/yr (see Table 4.3-1)

ED = 4.5 d/yr (see Table 4.3-1)

BW = 16.5 kg (see Table 4.3-1)

AT = 4.5 years (see Table 4.3-1)

CF = 365 d/yr (see Table 4.3-1)

$$Dose\ (mg \cdot kg/day) = \frac{C_s \times IR_s \times RAF_{GIT} \times EF \times ED}{BW \times AT \times CF}$$

$$Dose\ (mg \cdot kg/day) = \frac{0.003 \times 0.3875 \times 1 \times 365 \times 4.5}{16.5 \times 4.5 \times 365}$$

$$Dose\ (mg \cdot kg/day) = 4.41 \times 10^{-10}$$

Dermal Contact with Soil

Cs = 9.1 x 10^{-5} mg/kg (Table 3.5.2.1-2; determined from deposition rates see Appendix C)

ΣSA_{hands} = 430 cm² (see Table 4.3-1)

$\Sigma SA_{arms + legs}$ = 2580 cm² (see Table 4.3-1)

$R_{adher\ (hands)}$ = 0.0001 g/cm² (see Table 4.3-1)

$R_{adher\ (arms/legs)}$ = 0.00001 g/cm² (see Table 4.3-1)

EV = events per day (event/d)

RAF_{der} = 0.13 (see Table 4.5.3-1)

EF = 365 d/yr (see Table 4.3-1)

ED = 4.5 d/yr (see Table 4.3-1)

BW = 16.5 kg (see Table 4.3-1)

AT = 4.5 yr (see Table 4.3-1)

CF = 365 d/yr (see Table 4.3-1)

$$Dose\ (mg/kg \cdot day) = \frac{C_s \times RAF_{der} \times \sum(SA \times R_{adher}) \times EV \times EF \times ED}{BW \times AT \times CF}$$

$$Dose\ (mg/kg \cdot day) = \frac{9.1 \times 10^{-5} \times 0.001 g/mg \times 0.13 \times \sum(430 \times 0.0001 + 2580 \times 0.00001) \times 1 \times 365 \times 4.5}{16.5 \times 4.5 \times 365}$$

$$Dose\ (mg/kg \cdot day) = 4.93 \times 10^{-11}$$

Total Direct Contact Exposure Dose

$$Total\ Exposure\ Dose\ from\ Direct\ Contact\ (mg/kg \cdot day) = Incidental\ Soil\ Ingestion\ +\ Dermal\ Contact$$

$$Total\ Exposure\ Dose\ from\ Direct\ Contact\ (mg/kg \cdot day) = 4.41\ \times 10^{-10}\ +\ 4.93 \times 10^{-11}$$

$$Total\ Exposure\ Dose\ from\ Direct\ Contact\ (mg/kg \cdot day) = 4.93\ \times 10^{-10}$$

Inhalation Exposures

C_{air} = 0.003 µg/m^3 (Table 4.5.1-3; modelled air concentration)

CF_1 = 0.001mg/µg

A_{inh} = 1 (see Table 4.5.3-1)

IR = 0.3875 m^3/hr (see Table 4.3-1)

ET = 1.5 hr/day (see Table 4.3-1)

EF = 365 day/yr (see Table 4.3-1)

ED = 4.5 yr (see Table 4.3-1)

BW = 16.5 kg (see Table 4.3-1)

CF_2 = 365 days/yr

AT = 4.5 yr (see Table 4.3-1)

$$Dose\ (mg/kg \cdot day) = \frac{0.003 \times CF_1 \times A_{inh} \times IR \times ET \times EF \times ED}{BW \times CF_2 \times AT}$$

$$Dose\ (mg/kg \cdot day) = \frac{0.003 \times 0.001 \times 1 \times 0.3875 \times 1.5 \times 365 \times 4.5}{16.5 \times 365 \times 4.5}$$

$$Dose\ (mg/kg \cdot day) = 1.0\ \times 10^{-7}$$

Ingestion of Garden Vegetables

Above-ground vegetables

C_{veg} = 3.34 x 10^{-4} mg/kg (Table 3.5.2.2-2; determined from deposition rates see Appendix E)

R_{ing} = 0.067 kg/d (see Table 4.3-1)

RAF_{ing} = 1 (see Table 4.5.3-1)

EF = 365 d/yr (see Table 4.3-1)

ED = 4.5 yr (see Table 4.3-1)

BW = 16.5 kg (see Table 4.3-1)

AT = 4.5 yr (see Table 4.3-1)

CF = 365 d/yr

$$Dose\ (mg/kg \cdot day) = \frac{C_{veg} \times R_{ing} \times RAF\ \times EF \times ED}{BW \times AT \times CF}$$

$$Dose\ (mg/kg \cdot day) = \frac{3.34 \times 10^{-4} \times 0.067 \times 1\ \times 365 \times 4.5}{16.5 \times 4.5 \times 365}$$

$$Dose\ (mg/kg \cdot day) = 1.4 \times 10^{-6}$$

Below-ground vegetables

C_{veg} = 1.37x 10^{-7} mg/kg (Table 3.5.2.2-3; determined from deposition rates see Appendix E)

R_{ing} = 0.105 kg/d (see Table 4.3-1)

RAF_{ing} = 1 (see Table 4.5.3-1)

EF = 365 d/yr (see Table 4.3-1)

ED = 4.5 yr (see Table 4.3-1)

BW = 16.5 kg (see Table 4.3-1)

AT = 4.5 yr (see Table 4.3-1)

CF = 365 d/yr (see Table 4.3-1)

$$Dose\ (mg/kg \cdot day) = \frac{C_{veg} \times R_{ing} \times RAF\ \times EF \times ED}{BW \times AT \times CF}$$

$$Dose\ (mg/kg \cdot day) = \frac{1.37 \times 10^{-7} \times 0.105 \times 1\ \times 365 \times 4.5}{16.5 \times 4.5 \times 365}$$

$$Dose\ (mg/kg \cdot day) = 8.7 \times 10^{-10}$$

Total Exposure Dose from Ingestion of Garden Vegetables

$$Total\ Exposure\ Dose\ from\ Ingestion\ of\ Vegetables\ (mg/kg \cdot day) = Aboveground\ vegetables\ +\ Belowground\ vegetables$$

$$Total\ Exposure\ Dose\ from\ Ingestion\ of\ Vegetables\ (mg/kg \cdot day) = 1.4 \times 10^{-6} + 8.7 \times 10^{-10}$$

$$Total\ Exposure\ Dose\ from\ Ingestion\ of\ Vegetables\ (mg/kg \cdot day) = 1.4 \times 10^{-6}$$

Non-cancer Risk

Direct Contact

Estimated Dose = 4.93 x 10^{-10} mg/kg-day

Reference Dose = 0.02 mg/kg-day

$$Hazard\ Quotient\ (HQ) = \frac{Estimated\ Dose\ (mg/kg \cdot day)}{RfD\ (mg/kg \cdot day)}$$

$$Hazard\ Quotient\ (HQ) = \frac{4.93\ \times 10^{-10}}{0.02}$$

$$Hazard\ Quotient\ (HQ) = 2.5\ \times\ 10^{-8}$$

Inhalation

$$Hazard\ Quotient\ (HQ) = \frac{Estimated\ Dose\ (mg/kg \cdot day)}{RfD\ (mg/kg \cdot day)}$$

$$Hazard\ Quotient\ (HQ) = \frac{1 \times 10^{-7}}{0.001}$$

$$Hazard\ Quotient\ (HQ) = 1 \times 10^{-4}$$

Ingestion of Garden Vegetables

$$Hazard\ Quotient\ (HQ) = \frac{Estimated\ Dose\ (mg/kg \cdot day)}{RfD\ (mg/kg \cdot day)}$$

$$Hazard\ Quotient\ (HQ) = \frac{1.4 \times 10^{-6}}{0.02}$$

$$Hazard\ Quotient\ (HQ) = 7 \times 10^{-5}$$

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APPENDIX E

Toxicological Profiles

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PHYSICAL / CHEMICAL PROPERTIES	
CAS #	75-07-0
Molecular Weight	44.05
Synonyms	Acetic aldehyde, ethanal, ethyl aldehyde
Production and Uses	Commonly used as a synthetic flavouring agent and as an intermediate in many chemical syntheses.
Sources of Exposure	The general public can be exposed to acetaldehyde via inhalation of ambient air or cigarette smoke, ingestion of food containing acetaldehyde, and metabolism of ethanol alcohol.
Environmental Fate	Acetaldehyde is expected to volatilize from soil and water and to biodegrade rapidly in the environment. Gas-phase acetaldehyde in the atmosphere is degraded by solar radiation with an estimated half-life of 8.4 hours.

REFERENCES

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Furia, T.E. (ed.). CRC Handbook of Food Additives. 2nd ed. Cleveland: The Chemical Rubber Co., 1972., p. 784;

Graedel TE. Chemical Compounds in the Atmosphere. NY, NY: Academic Press, pp. 158-69 (1978);

Mopper K, Stahovec WL. Mar Chem 19: 305-12 (1986);

NIOSH. National Occupational Exposure Survey (NOES) (1983) (2) IARC; Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva, Switzerland: WHO 36: 106 (1985);

SCS Engineers. Selected Biodegradation Techniques for Treatment and/or Ultimate Disposal of Organic Materials. USEPA-600/2-79-006 (1979);

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Respiratory effects were noted in hamsters exposed to acetaldehyde by inhalation, degenerative changes were observed in the trachea. Degenerative changes in respiratory epithelium and larynx were noted at higher concentrations.

Chronic Toxicity

No data available.

Genotoxicity and Mutagenicity

Acetaldehyde is genotoxic in vitro, inducing gene mutations, clastogenic effects and sister chromatid exchanges (SCEs) in mammalian cells in the absence of exogenous metabolic activation.

Reproductive and Developmental Toxicity

Parenteral exposure of pregnant rats and mice to acetaldehyde induced fetal malformations.

Carcinogenicity

Acetaldehyde has been determined to be a class B2 carcinogen by the U.S. EPA and a class 2B by the IARC, meaning it is a probable human carcinogen. This is based on inadequate evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in animals.

Sensitive Subpopulations

Individuals with chronic respiratory, liver, kidney, or skin diseases.

REFERENCES

Appelman LM *et al*. Toxicol 23 (4): 293-308 (1982);
Giavini E *et al*. In Vitro Cell Dev Biol 28A (3 Pt 1): 205-10 (1992);
L'ahdetie J. Mutat Res 202 (1): 171-8 (1988);
Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) Publication No. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981., p. 2;

ECOLOGICAL TOXICOLOGICAL PROPERTIES

Wildlife Toxicity

Rats were exposed for life (6 hr/day, 5 days/wk, for 28 mo) to acetaldehyde at 1350, 2700, or 1800-5400 mg/m^3. Growth retardation occurred throughout the study at all dose levels. Mortality was greater than in controls in all dose groups and animals in the high dose group died by wk 102. There were generative changes in the olfactory nasal epithelium at all dose levels including slight to severe hyperplasia and keratinized stratified metaplasia of the larynx (high dose only). At 28 months, carcinomas of the nose developed in all exposed groups. Tumor incidence was dose-related, but the latency period was independent of concentration, with tumors appearing at 12 months of exposure (WHO, 1995; as cited in HSDB, 2005).

Plant Toxicity

Concentrations of 0.54-1.08 µg/m^3 affected head lettuce, as evidenced by dark-green, water-soaked, necrotic areas on the outer leaves. Concentrations of up to 0.36 µg/m^3 did not affect the lettuce (Aharoni *et al*., 1979; Stewart *et al*., 1980; as cited in IPCS, 1995).

REFERENCES

Hazardous Substances Data Bank (HSDB). 24 June 2005. "Acetaldehyde" <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~jkwNDU:1>. Accessed: 05 Sept 2008.

International Programme on Chemical Safety (IPCS). (2002) "Environmental Health Criteria 167 – Acetaldehyde" <http://www.inchem.org/documents/ehc/ehc/ehc167.htm>. Accessed; 12 Sept 2008.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work	-	-	MOE 2007 Draft Rationale
Tier 2: AAQC	AAQC	500 µg/m^3	O.Reg. 419
Tier 3: IRIS*	RfD/RfC	2.57E-03 mg/kg-day	Appleman *et al.*, 1986; 1982; as cited in IRIS, 1991
	SF	7.7E-03 per mg/kg-day	Woutersen and Appleman, 1984; as cited in IRIS, 1991
Tier 4: ATSDR	MRL	-	-
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}	-	-
Tier 6: CCME	CWS	-	-
Tier 7: WHO	-	-	-
Tier 8: RIVM	-	-	-
Tier 9: Cal EPA	Chronic REL	2.57E-03 mg/kg-day	Air Resources Board- Toxic air Contaminants Identification Reports
	Slope Factor	1E-02 per mg/kg-day	OEHHA Cancer Potency Value
Tier 10: HEAST	-	-	-
Tier 11: U.S. EPA	PPRTV	-	-

TRV Details				
Agency	**Test Species**	**Study Details**	**Uncertainty**	**Primary Reference**
AAQC	NA	NA	NA	NA
IRIS* RfD	Rat	Based on NOAEL(HEC) of 8.7mg/m^3 Degeneration of olfactory epithelium Dose Levels: 6 hours/day, 5 days/week for 4 weeks to 0, 150, and 500 ppm (Appleman *et al.*, 1986) and 6 hours/day, 5 days/week for 4 weeks to 0, 400, 1000, 2200, or 5000 ppm (Appleman *et al.*, 1982)	1000	Appleman *et al.*, 1986; 1982
IRIS* SF	SPF Wistar rat (male)	Nasal squamous cell carcinoma or adenocarcinoma Dose levels: low -727/735 and medium -1438/1412 ppm	-	Woutersen and Appleman, 1984
Cal EPA Chronic REL				Adopted from US EPA, IRIS
Cal EPA SF	Rat/ Hamster	Endpoint: Nasal tumours in rats; laryngeal tumours in hamsters Dose levels: Woutersen *et al.*,, 1986- 0, 750, 1500, or 3000/1000	-	Woutersen *et al.*, 1986; Feron *et al.*, 1982.

		ppm; 6 hours/day, 5 days/week for up to 28 months; Feron *et al.*,1982 -Initial concentration was 2500 ppm (4500 mg/m3), gradually decreased (between weeks 9 and 44) to 1650 ppm (2970 mg/m3) 6 hours/day, 5 days/week for 52 weeks.		

REFERENCES

Appleman, L.M., *et al.* 1986. Effect of variable versus fixed exposure levels on the toxicity of acetaldehyde in rats. J. Appl. Toxicol. 6(5): 331-336.

Appleman, L.M., R.A. Woutersen, and V.J. Feron. 1982. Inhalation toxicity of acetaldehyde in rats. I. Acute and subacute studies. Toxicology. 23: 293-297.

Feron VJ, Kruysse A and Woutersen RA. 1982. Repiratory tract tumours in hamsters exposed to acetaldehyde vapour alone or simultaneously to benzo[a]pyrene or diethylnitrosamine. Eur J Cancer.

Woutersen RA, Appleman LM, Van Garderen-Hoetmer A and Feron VJ. 1986. Inhalation toxicity of acetaldehyde in rats. III. Carcinogencity study. Toxicology 41:213-232. Clin Oncol 18:13-31.

REVISION HISTORY

Date	**Revised by:**
September 08, 2008	Stephen Cioccio/Rachel Saldanha
June 24, 2010	Stephen Cioccio

NA= Not Available

* Selected TRV

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	67-64-1
Molecular Weight	58.09
Synonyms	2-propanone, dimethyl ketone
Production and Uses	The United States imported 110 million pounds of acetone in 1989 and it's used primarily as an intermediate in chemical production and as a solvent (Nelson and Webb, 1978).
Sources of Exposure	Acetone is released to the atmosphere from both natural and anthropogenic sources. Natural sources of acetone include plants and trees, volcanic eruptions, forest fires, animal wastes, insect and microbial respiration. Acetone is also produced within the mammalian body from the breakdown of fats, and released to the atmosphere through exhalation. Major anthropogenic sources include: vehicular exhaust, chemical manufacturing, petroleum production and refining, tobacco smoke, wood burning and pulping, garbage combustion, and the use of several consumer products such as nail polish removers, particle board, waxes, cleansers and polishes (MOE, 2005)
Environmental Fate	Acetone is released into groundwater mainly as a result of leaching from municipal and industrial landfills (Brown and Donnelly, 1988). The principal sources of acetone in soil are municipal and industrial discharge in landfills, but also atmospheric deposition (Grosjean and Wright, 1983). Acetone is released in soil from natural sources, such as disposed agricultural and food wastes and animal wastes (Graedel *et al*., 1986).

REFERENCES

Nelson, D.L. and Webb, B.P. 1978. Acetone. In: Grayson M. ed. Kirk-Othmer *Encyclopedia of Chemical Technology*, vol. 1, 3rd ed. New York, NY: John Wiley and Sons, 179-191.

Brown KW, Donnelly KD. 1988. An estimation of the risk associated with the organic constituents of hazardous and municipal waste landfill leachates. Hazardous Waste and Hazardous Materials 5: l-30.

Grosjean D, Wright B. 1983. Carbonyls in urban fog, ice fog, cloudwater and rainwater. Atmosphere and Environment 17:2093-2096.

Graedel TE, Hawkins DT, Claxton LD. 1986. Atmospheric chemical compounds: Sources, occurrence, and bioassay. New York, NY: Academic Press, Inc., 263.

MOE, 2005. Ontario Air Standard for Acetone. Standards Development Branch, Ontario Ministry of the Environment. June, 2005.

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Symptoms of acute inhalation exposure to acetone include: eye, throat and nasal irritation, headache, restlessness, fatigue, vomiting, unconsciousness, dizziness, unsteadiness, confusion, weakness, delayed visual and auditory responses, and increased irritability (MOE, 2005).

Chronic Toxicity

Chronic inhalation exposure to acetone has been reported to result in such effects as: respiratory tract irritation, dizziness, loss of strength, fatigue, annoyance, malaise, discomfort, and mild neurological and neurobehavioral deficits (MOE, 2005). Studies on rodent exposure to orally-administered acetone have identified several treatment-related health effects. Subchronic oral exposure resulted in kidney, testis, and hematologic system effects; however, the effects were characterized as mild. Although the nephrotoxic effects noted in

rodents have been identified as the most critical effects, they tend to occur in male rats only and at high levels of exposure (20,000 and 50,000 ppm in drinking water).

Genotoxicity and Mutagenicity

Acetone does not appear to be genotoxic or mutagenic (MOE, 2005).

Reproductive and Developmental Toxicity

Little information is available on the reproductive and developmental toxicity of acetone (MOE, 2005).

Carcinogenicity

Acetone is classified by the U.S. EPA's IRIS database as a Group D carcinogen (i.e., not classifiable as to human carcinogenicity). No slope factors have been derived for acetone (US EPA, 2000).

Sensitive Subpopulations

No Data

REFERENCES

MOE, 2005. Ontario Air Standard for Acetone. Standards Development Branch, Ontario Ministry of the Environment. June, 2005.

U.S. Environmental Protection Agency's Integrated Risk Information System (IRIS). Summary on Acetone (67-64-1). Available from, as of March 15, 2000: http://www.epa.gov/iris/

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work			MOE 2007 Draft Rationale
Tier 2: AAQC*	AAQC	12 mg/m^3	MOE AAQC 2005
Tier 3: IRIS	RfD/RfC	0.9 mg/kg-day	IRIS 2003
Tier 4: ATSDR	MRL	2.0 mg/kg-day	ATSDR 1994
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}		
Tier 6: CCME	CWS		
Tier 7: WHO			
Tier 8: RIVM			
Tier 9: Cal EPA			
Tier 10: HEAST			
Tier 11: U.S. EPA	PPRTV		
*MA DEQE and MA DEP	RfC	0.8 mg/m^3	MA DEQE 1989 and MA DEP 1995

TRV Details

Test Species	**Endpoint**	**Uncertainty**	**Primary Reference**
2. Humans*	Irritation and neurological effects (LOAEL of 594 mg/m^3)	50 (10 to account for sensitive individuals, 5 to account for extrapolation from LOAEL to NOAEL)	Dick *et al.*, 1989; Matsushita *et al.*, 1969; Nelson *et al.*, 1943; Satoh *et al.*, 1996
3. Rats	Nephropathy	1000	Dietz et al., 1991
Humans	Threshold effects exposure level		MA DeP, 1995

REVISION HISTORY	
Date	**Revised by:**
16 July 2007	GD
24 June 2010	SC

* Selected TRV

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	107-02-8
Molecular Weight	56.06
Synonyms	Acraldehyde, acrylaldehyde, propenal
Production and Uses	Acrolein is commonly used in the manufacture of plastics and perfumes, and is also used in organic synthesis.
Sources of Exposure	The general population is exposed to acrolein primarily through atmospheric contact. Acrolein is manufactured as an end-use product and as an un-isolated intermediate in the production of acrylic acid. It can also be produced through the condensation of acetaldehyde with formaldehyde in the presence of lithium phosphate. Acrolein is used in several commercial and industrial applications such as the formulation of herbicides, biocides, slimicides, and algicides; leather tanning, pharmaceutical production, and photography. According to Health Canada, acrolein is not produced in Canada but is imported from the United States for use as an aquatic herbicide and a microbiocide. Most direct releases to the atmosphere are associated with its application as a pesticide (MOE, 2005).
Environmental Fate	Acrolein is expected to volatilize from moist soil and possibly dry soil. Any acrolein that remains in soil is expected to be readily degraded by microbial populations. Acrolein is also expected to volatilize from water surfaces, and is degraded in the atmosphere with an estimated half-life of 20 hours.

REFERENCES

Atkinson R. J Phys Chem Ref Data. Monograph No. 1 (1989).

Budavari, S. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 1996., p. 23.

Callahan MA *et al*. Water-Related Environmental Fate of 129 Priority Pollutants. USEPA-440/4-79-029A. pp. 20-1 to 20-11 (1979).

Hultman B. Water Sci Tech 14: 79-86 (1982).

Lyman WJ *et al*. Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 4-9, 15-1 to 15-29 (1990).

NIOSH. National Occupational Exposure Survey (NOES) (1984).

Stover EL, Kincannon DF. J Water Poll Control Fed 55: 97-109 (1983).

MOE, 2005. Ontario Air Standard for Acetone. Standards Development Branch, Ontario Ministry of the Environment. June, 2005.

TOXICOLOGICAL PROPERTIES

Acute Toxicity

When swallowed, acrolein produces severe gastrointestinal distress. Inhalation of acrolein is irritating to the eyes and respiratory tract at low concentrations; at higher exposure levels, degeneration of respiratory epithelium and perturbation of respiratory function develops.

Chronic Toxicity

The respiratory tract is the main target for chronic acrolein toxicity (MOE, 2005).

Genotoxicity and Mutagenicity

Acrolein has been shown to interact with nucleic acids in vitro and to inhibit their synthesis both in vitro and in vivo. Without activation it induced gene mutations in bacteria and fungi and caused sister chromatid exchanges in mammalian cells.

Reproductive and Developmental Toxicity

Acrolein can induce teratogenic and embryotoxic effects if administered directly into the amnion.

Carcinogenicity

The U.S. EPA has determined acrolein to be a class C carcinogen, meaning it is a possible human carcinogen. This classification is based on no human data, but evidence of carcinogenicity of acrolein in rats, carcinogenicity of an acrolein metabolite, and mutagenicity of acrolein to bacteria. It is a class 3 carcinogen based on IARC criteria, meaning that it is not classifiable as to carcinogenicity to humans.

Sensitive Subpopulations

Individuals with or prone to pulmonary infections may be at a greater risk from exposure to acrolein, since it has been shown to suppress pulmonary antibacterial defenses.

REFERENCES

Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984., p. II-186;

Hazardous Substances Data Bank (HSDB). 24 June 2005. "Acrolein " <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~IBgDK8:1>. Accessed: 08 Sept 2008.

IARC. 12 May 2008. "Agents Reviewed by the IARC Monographs (Volumes 1-99)" < http://monographs.iarc.fr/ENG/Classification/Listagentsalphorder.pdf>. Accessed 08 September 2008.

International Programme on Chemical Safety. 1992. Environmental Health Criteria 127: Acrolein pp. 12-14;

U.S. Environmental Protection Agency's Integrated Risk Information System (IRIS) on Acrolein (107-02-8) Available from: http://www.epa.gov/ngispgm3/iris on the Substance File List as of March 15, 2000.

MOE, 2005. Ontario Air Standard for Acetone. Standards Development Branch, Ontario Ministry of the Environment. June, 2005.

ECOLOGICAL TOXICOLOGICAL PROPERTIES

Wildlife Toxicity

Groups of beagle dogs, squirrel monkeys, guinea pigs, and rats were exposed to 0.7 and 3.7 ppm acrolein vapor for 8 hr/day on 5 days/wk for 6 consecutive weeks; squamous metaplasia & basal cell hyperplasia in the trachea were observed in dogs and monkeys. Squamous metaplasia of the lung was seen in 7 out of 9 monkeys (IARC, 1985; as cited in HSDB, 2005). Repeated inhalation by chickens of 50 and 200 ppm (115 and 450 mg/m^3) acrolein vapor for 5 min/day for 1 to 27 days produced concentration-dependent decreases in the numbers of ciliated cells, goblet cells and mucous glands in the trachea. Lymphocytic inflammatory lesions in the tracheal mucosa were also observed (IARC, 1985; as cited in HSDB, 2005).

Plant Toxicity

Toxicity data on acrolein in air to terrestrial plants is limited to three acute studies on crop plants. Smog-like leaf damage was observed for seven species exposed to of acrolein concentrations of 233 to 4700 µg/m^3 (Haagen-Smit *et al*., 1952; Darley *et al*., 1960; Masaru *et al*., 1976; as cited in IPCS, 2002). Alfalfa was the he most sensitive plant tested, developing speckled surface necrosis after a 9-h exposure to 233 µg acrolein/m^3, the lowest concentration tested (Haagen-Smit *et al*., 1952; as cited in IPCS, 2002). This concentration was the NOEC for the four other crop plants tested (sugar beet, endive, spinach and oats). Exposure involved the vaporization of liquid acrolein continuously injected into a fumigation chamber (Haagen-Smit *et al*., 1952; as cited in IPCS, 2002). There was a complete inhibition of pollen tube elongation following a 5-h exposure to 910 µg acrolein/m^3 in Easter lilies (Masaru *et al*., 1976; as cited in IPCS, 2002). Pinto beans exposed to 4700 µg acrolein/m3 in air for 1.2 h exhibited 10% surface damage (Darley *et al*., 1960; as cited in IPCS, 2002).

REFERENCES

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TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work	-	-	MOE 2007 Draft Rationale
Tier 2: AAQC	AAQC	0.08 µg/m^3 (24-hour)	O. Reg. 419
Tier 3: IRIS*	RfD/RfC	5.71E-06 mg/kg-day	Feron *et al.*, 1978
Tier 4: ATSDR	MRL	0.003ppm (acute) or 1.96E-03 mg/kg-day	ATSDR, 2007
	MRL	0.00004ppm (intermediate) or 2.62E-05 mg/kg-day	ATSDR, 2007
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}	-	-
Tier 6: CCME	CWS	-	-
Tier 7: WHO	-	-	-
Tier 8: RIVM	-	-	-
Tier 9: Cal EPA	Acute REL	5.42E-05 mg/kg-day	OEHHA, 1999
Tier 10: HEAST	-	-	-
Tier 11: U.S. EPA	PPRTV	-	-

TRV Details

Agency	**Test Species**	**Study Details**	**Uncertainty**	**Primary Reference**
AAQC	NA	Health	NA	NA
IRIS RfC	Rat	Endpoint: Nasal lesions from LOAEL (HEC)=0.02mg/m^3 Dose levels: 6 hr/day, 5 days/week for 13 weeks to 0, 0.4, 1.4, or 4.9 ppm (0, 0.9, 3.2, or 11 mg/m^3) acrolein in a whole-body exposure chamber	1000	Feron *et al.*, 1978
ATSDR acute MRL	Human	LOAEL of 0.3ppm Nasal and throat irritation, and decreased respiratory rate Exposure duration: 60 minutes.	100	Weber –Tschopp *et al.*, 1977)
ATSDR intermediate MRL	Rat	LOAEL=0.4ppm for nasal epithelial metaplasia, 13-week study; (human equivalent LOAEL=0.012ppm)	300	Feron *et al.*,1978
Cal EPA Acute REL (1-hour)	Human	LOAEL=0.06ppm for eye irritation; 5 minute exposures to 0.06 ppm; carbon filter respirators worn during exposure	60	Darley *et al.*,1960

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REVISION HISTORY

Date	**Revised by:**
September 8, 2008	Stephen Cioccio/Rachel Saldanha
June 24, 2010	Stephen Cioccio

NA= Not Available
* Selected TRV

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	7429-90-5
Molecular Weight	26.98
Synonyms	None
Production and Uses	Used in the manufacture of printing inks, and in the automobile and jewelry industries (HSDB, 2005).
Sources of Exposure	The most common human source of exposure to aluminum is with ingestion of food and beverages and with inhalation of dust (HSDB, 2005).
Environmental Fate	Aluminum is a ubiquitous metal in the environment. Due to its extreme reactivity it is not found on its own, rather, it occurs in organic matter, in combination with fluorine, sodium or in oxide, hydroxide, or silicate formations. The toxicity of aluminum to the environment has received a great deal of attention, as toxicity seems to increase greatly in areas of low pH. This combination of low pH frequently manifested as acid rain and aluminum have been identified as a cause of extensive die-back of forests of North America and Europe (Sparling and Lowe, 1996). This toxicity has also been witnessed in certain invertebrate species including Cladocera, Plecoptera and Ephemeroptera, to which a concentration of 1.0 mg/L may prove fatal (Sparling and Lowe, 1996). Aluminum is an important metal in building, canning, automobile, and aviation industries (Venugopal and Luckey, 1978).

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TOXICOLOGICAL PROPERTIES

Acute Toxicity

Contact with aluminum can occur via direct contact with soil or with dusts from mining. In animal studies of acute oral toxicity, aluminum has provoked only minor reactions at the highest dose levels, as aluminum is effectively removed in urine. No acute effects in the general population have been described after exposure to aluminum. No information was available regarding the acute toxicity of aluminum in humans. Greger and Baier (1983) gave 4 healthy men a control diet containing 4.6 mg aluminum/day for 20 days, while 4 other men received a test diet of 125 mg aluminum/day as aluminum lactate. The diets were then exchanged for an additional 20 days, and each subject acted as his own control. Fecal, urine, and serum albumin

measurements indicated that absorption and rapid excretion occurred. No adverse effects were observed.

Aluminum compounds are used in antiperspirant products without harmful effects to the skin or other organs. However, some people are unusually sensitive to these products and may develop skin rashes (ATSDR, 1990). Children who had injections of vaccines or allergens in an aluminum-based vehicle showed hypersensitivity to aluminum chloride in a patch test (ATSDR, 1990).

Pulmonary fibrosis has been associated with occupational exposure to aluminum powder and dust (ATSDR, 1990; U.S. EPA, 1987). However, this association is inconclusive because of concurrent exposure to other irritants, cigarette smoking, or previous occupational exposures. The U.S. EPA reports that there is no evidence of fibrogenic activity of aluminum at exposure levels recommended by the ACGIH (10 mg/m3 for dust and 5 mg/m3 for powder) and classifies aluminum dust and powder as inert particles (U.S. EPA, 1987). Workers were treated with 350 mg/m3 of respirable alumina powder for 10 minutes/day as a treatment for silicosis (Stokinger, 1981). Over 42,000,000 treatments were given over a 27-year period, and no adverse effects were observed.

Chronic Toxicity

Long term exposure to aluminum fumes can cause severe pulmonary reactions including fibrosis, emphysema and pneumothorax, and progressive encephalopathy followed by dementia and convulsions (Gosselin et al., 1984; Venugopal and Luckey, 1978). There is considerable evidence that aluminum in neurotoxic in experimental animals. Long term exposure to aluminum dust causes lung damage.

Workers exposed to aluminum fumes have reported declines in cognitive functioning, motor functioning, and peripheral neuropathy. Aluminum has recently been shown to alter the function of the blood-brain barrier, which regulates exchanges between the central nervous system and peripheral circulation (Banks and Kastin, 1989; as cited in HSDB 2005). Symptoms such as encephalopathy, microcytic anemia, and vitamin D resistant osteomalacia have been observed in chronic renal failure patients whose dialysis fluid has contained high levels of aluminum (HSDB, 2005).

Aluminum may be involved in Alzheimer's disease, "dialysis dementia", and Amyotrophic Lateral Sclerosis and Parkinsonism-Dementia Syndromes of Guam (Guam ALS-PD complex) but the causal link between aluminum and these diseases is tenuous at best (ATSDR, 1990; Goyer, 1991). Increased amounts of aluminum have been observed in the brains of persons dying of Alzheimer's disease, however aluminum content varies greatly in these patients. Also, neurofibrillary tangles (NFTs) are found in patients suffering from aluminum encephalopathy and Alzheimer's disease. The formation of NFTs is associated with loss of synapsis and atrophy of the dendritic tree (Goyer, 1991). Although Alzheimer's patients often have more aluminum than usual in the NFTs, there are no significant differences between Alzheimer's patients and controls in the aluminum content of hair, serum or spinal fluid (Shore and Wyatt, 1986). This may indicate that Alzheimer's patients have a decreased blood-brain barrier for aluminum that may be the result of genetic factors, viral, or immune mediated damage (Goyer, 1991). "Dialysis dementia" occurs in patients on renal dialysis who receive large amounts of aluminum orally or intravenously (ATSDR, 1990; Goyer, 1991). Symptoms include speech disorders, dementia, convulsions, and myoclonus. These symptoms usually occur after 3 to 7 years of dialysis treatment and may be due to aluminum intoxication. Aluminum content of brain, muscle, and bone increases in these patients (Goyer, 1991).

People of Guam and Rota have an unusually high incidence of neurodegenerative diseases associated with nerve cell loss and neurofibrillary degeneration of the Alzheimer type termed

Amyotrophic Lateral Sclerosis and Parkinsonism-Dementia Syndromes of Guam (Guam ALS-PD complex). The volcanic soil in the region of Guam where the high incidence of ALS-PD occurs, contains high levels of aluminum and manganese and low levels of calcium and magnesium. It is hypothesized that low calcium and magnesium intake induce secondary hyperparathyroidism resulting in an increase in aluminum and other toxic metals. It is unknown how aluminum enters the brains of the ALS-PD patients (Goyer, 1991)

Genotoxicity and Mutagenicity

No data.

Reproductive and Developmental Toxicity

No fetotoxicity was noted in rats.

Carcinogenicity

There is insufficient information to allow for classification of the cancer risk for humans exposed to aluminum.

Sensitive Subpopulations

No data.

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TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work			MOE 2007 Draft Rationale
Tier 2: AAQC	AAQC		
Tier 3: IRIS	RfD/RfC		
Tier 4: ATSDR	MRL	1.0 mg/kg-day	ATSDR (2007)
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}		
Tier 6: CCME	CWS		
Tier 7: WHO			
Tier 8: RIVM			
Tier 9: Cal EPA			
Tier 10: HEAST			
Tier 11: U.S. EPA	PPRTV		

TRV Details

Test Species	**Endpoint**	**Uncertainty**	**Primary Reference**
Mice	Neurological	90	Golub and Germann (2001)

REVISION HISTORY	
Date	**Revised by:**
June 24, 2010	Andrea Amendola

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	71-43-2
Molecular Weight	78.112
Synonyms	Benzol
Production and Uses	Benzene is a common contaminant, with a variety of sources. It is used in the manufacture of explosives, tanning, nylon intermediates, food processing and photographic chemicals (Verschueren, 1996; as cited in HSDB 2005). It is also a breakdown product of polycyclic aromatic hydrocarbons.
Sources of Exposure	Sources of benzene exposure include tobacco smoke, automobile service stations, exhaust from motor vehicles, industrial emissions, and vapours from products, such as glues, paints, furniture wax and detergents.
Environmental Fate	Kazumi et al. (1997) found that benzene biodegradation occurred over time, but it took a lag period of over 400 days for the bacteria to be acclimated to metabolize benzene. Those microbial populations that are already adapted begin to biodegrade benzene immediately, without a lag time (Weiner & Lovely, 1998). Benzene degradation can also occur through abiotic mechanisms. In aqueous solution, benzene is expected to have a half-life of 103 days when degradation occurs via hydroxyl radicals (Buxton et al., 1988). According to a model developed by Tucker et al. (1986), the rates of volatilization and leaching are the principal factors in determining the persistence of benzene in sandy soils. This model showed that 67% of benzene was volatilized, 29% leached into groundwater, 3% remained in the soil and 1% was degraded within 17 months. A study by Reinhard et al. (1999) showed that benzene does not undergo biodegradation under anaerobic conditions: benzene was found to be stable for 60 days under sulfate- and nitrate-reducing conditions. However, benzene is expected to undergo biodegradation under aerobic conditions (Haider et al., 1974). The primary limiting factor for biodegradation in groundwater is dissolved oxygen concentration (Salanitro, 1993).

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TOXICOLOGICAL PROPERTIES

Acute Toxicity

Benzene can exert its toxic effect in two ways: non-carcinogenic and carcinogenic effects. The non-carcinogenic effects include skin irritation upon dermal contact with benzene, characterized by erythema, vesiculation, and dry and scaly dermatitis (Clayton & Clayton, 1994). Short-term exposure to benzene through ingestion or inhalation of vapours is quite common in industrial workers and is mainly manifested through CNS effects. Mild symptoms include dizziness, weakness, euphoria, headache, nausea and vomiting. More serious effects include blurred vision, tremors, ventricular abnormalities, paralysis and unconsciousness (Hardman et al., 1996).

Chronic Toxicity

Long-term exposure to benzene is usually through the dermal and inhalation routes. The main manifestation of long-term effects is aplastic anemia, though CNS and GI effects are also apparent (Hardman et al., 1996).

Genotoxicity and Mutagenicity

In vivo and *in vitro* data from both humans and animals indicate that benzene and/or its metabolites are genotoxic. Chromosomal aberrations (hypo- and hyperdiploidy, deletions, breaks, and gaps) in peripheral lymphocytes and bone marrow cells are the predominant effects seen in humans.

Reproductive and Developmental Toxicity

Evidence of an effect of benzene exposure on human reproduction is not sufficient to demonstrate a causal association. Some animal studies provide limited evidence that benzene affects reproductive organs following inhalation exposure. Benzene has not been shown to be teratogenic, but has been shown to be fetotoxic in animals at high concentrations that are maternally toxic.

Carcinogenicity

Carcinogenic effects are also seen with exposure to benzene. The most common type of cancer is leukemia, and deaths due to benzene are equally caused by aplastic anemia and leukemia (Hardman et al., 1996). Benzene is a confirmed human carcinogen with evidence of carcinogenicity from all routes of exposure in both animals and humans; it is listed by IARC as class 1 (IARC, 1987).

Sensitive Subpopulations

Individuals with Glucose 6-Phosphate Dehydrogenase deficiency have been found to be more susceptible to hemolytic effects of benzene. It has also been observed that levels of leukocyte agglutins were elevated in selected individuals exposed to benzene, suggesting that in some people benzene toxicity may be accounted for in part by an allergic blood dyscrasia. Thalassemia minor, and presumably other disorders in which there is increased bone marrow turnover, are thought to potentially predispose a person to benzene-induced aplastic anemia.

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ECOLOGICAL TOXICOLOGICAL PROPERTIES

Wildlife Toxicity

Cats and primates experienced ventricular extrasystole, with periods of ventricular tachycardia that occasionally terminated in ventricular fibrillation after inhalation of air saturated with benzene vapour. Sudden death from ventricular fibrillation has been observed in rabbits and in acute inhalation by male rats, benzene-induced respiratory paralysis occurred, followed by ventricular fibrillation. Hypertension, followed by paralysis of vasomotor system due to effects on the smooth muscle of blood vessels was seen in dogs. Rats, guinea-pigs and rabbits that were exposed to 80-88 ppm for 7 hrs/day for 30-40 weeks had increased testicular weight and degeneration of seminiferous tubules. Alteration of estrous cycles have also been reported in rats exposed to 1.6 or 9.4 ppm for 4 months, but no effect on their subsequent fertility or litter size was observed (HSDB, 2005).

Plant Toxicity

No data avilable.

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Hazardous Substances Data Bank (HSDB). 24 June 2005. "Benzene " <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~IBgDK8:1>. Accessed: 12 Sept 2008.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work	Inhalation RfD	0.00857 mg/kg/day	MOE 2007 Draft Rationale
	Inhalation Slope Factor	0.0273 $(mg/kg\text{-}day)^{-1}$	
Tier 2: AAQC	AAQC	-	-
Tier 3: IRIS*	RfD/RfC	0.00857 mg/kg-day	Rothman *et al.*, 1996; as cited in IRIS, 2000
	Slope Factor	0.0273 $(mg/kg\text{-}day)^{-1}$	Leukemia (Rinsky *et al.* 1981; 1987)
Tier 4: ATSDR	MRL(acute)	0.009ppm or 8.3E-03mg/kg-day	Rozen *et al.*,1984
	MRL(intermediate)	0.006ppm or 5.47E-03 mg/kg-day	Rosenthal and Snyder, 1987
	MRL(chronic)	0.003ppm or 2.74E-03 mg/kg-day	Lan *et al.*, 2004
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}	$15mg/m^3$ (SF=1.46E-02 $mg/kg\text{-}day^{-1}$)	Rinsky *et al.*,1987
Tier 6: CCME	CWS	-	-
Tier 7: WHO	SF from air unit risk (1 in 1 million)	0.021 $mg/kg\text{-}day^{-1}$	Crump and Allen, 1994; as cited in Air Quality Guidelines (2000)
Tier 8: RIVM	Cancer $Risk_{inhal}$ for excess lifetime cancer risk of 10^{-4}	20 $\mu g/m^3$	Rinsky *et al.*,1987
Tier 9: Cal EPA	Acute REL (6-hour)	0.371 mg/kg-day	Coate *et al.*, 1984
	Chronic REL	0.017 mg/kg-day	Tsai *et al.*,1983
	Inhalation SF	0.101 $mg/kg\text{-}day^{-1}$	Rinsky *et al.*,1981; as cited in Technical Support Document Describing Available Cancer Potency Factors
Tier 10: HEAST	Inhalation SF	2.9E-02 $(mg/kg\text{-}day)^{-1}$	Wong *et al.*, 1983; as cited in HEAST 1997
Tier 11: U.S. EPA	PPRTV	-	-

TRV Details				
Agency	**Test Species**	**Study Details**	**Uncertainty**	**Primary Reference**
MOE RfD	-	-	-	Adopted from IRIS, 2003
MOE SF_{inhal}	-	-	-	Adopted from IRIS, 2000
IRIS RfC*	Human (occupational)	Decreased lymphocyte count	300	Rothman *et al*., 1996; as cited in IRIS, 2003
	Human (occupational)	Leukemia	-	Rinsky *et al.* 1981; 1987; Paustenbach *et al*., 1993; Crump and Allen, 1984; Crump, 1992, 1994; U.S. EPA, 1998.; as cited in IRIS, 2000
ATSDR Acute MRL	Mice	LOAEL=10.2 for immunological effects Exposure: 6hours/day for 6 days	300	Rozen *et al.*,1984
ATSDR Intermediate MRL	Mice	LOAEL=10ppm for delayed splenic lymphocyte reaction to foreign antigens Exposure= 6hours/day, 5days/ week for 20 exposure days	300	Rosenthal and Snyder, 1987
ATSDR Chronic MRL	Human (Occupational)	BMCL=0.10ppm for immunological effects	10	Lan *et al.,* 2004
Health Canada TC_{05}	Human (Occupational)	Acute myelogenous leukemia	-	Rinksy *et al.*,1987
WHO	Human (Occupational)	Leukemia	-	Crump and Allen, 1984
RIVM	-	-	-	Adopted from EU Working Group (1999)
Cal EPA-Acute REL	Pregnant Rat	Decreased fetal body weights NOAEL =40ppm Exposure: 0, 1, 10, 40, 100 ppm; 6hours/day for 5 days	100	Coate *et al.*, 1984; as cited in OEHHA Determination of Acute REL for Airborne Toxicants (1999)

Cal EPA-Chronic REL	Human (Occupational), male	NOAEL=0.53ppm for haematological effects; average occupational exposure=0.19ppm, 8 hours/day, 5 days per week for 7.4 years (average)	10	Tsai *et al.*, 1983; as cited in OEHHA Chronic Toxicity Summary
Cal EPA SF*	Human (Occupational)	Leukemia	-	Rinksy *et al.*, 1981
HEAST	Human (Occupational)	Leukemia	-	Wong *et al.*, 1983

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REVISION HISTORY

Date	Revised by:
02 September 2008	Stephen Cioccio/Rachel Saldanha
24 June 2010	Stephen Cioccio

*Selected TRV

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	50-32-8
Molecular Weight	252.32
Synonyms	Benz(a)pyrene, BaP
Production and Uses	Used as a research chemical. No commercial uses in the USA.
Sources of Exposure	Exposure to BaP can occur via ingestion, or inhalation or dermal contact with particulates or combustion products.
Environmental Fate	BaP is not expected to volatilize from moist or dry soil, and will have little or no mobility in soil. BaP will not volatilize from water surfaces, and is expected to adsorb to suspended solids and biodegrade. BaP will exist solely in the particulate-phase in the atmosphere and will be removed by wet and dry deposition.

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Lyman WJ *et al*. Handbook of Chemical Property Estimation Methods. Washington,DC: Amer Chem Soc pp. 4-9, 5-4, 5-10, 7-4, 7-5, 15-1 to 15-29 (1990);

Ten Hulscher TEM *et al*. Environ Toxicol Chem 11: 1595-603 (1992);

Wallingford KM, Quehee SS. Polynuclear Aromatic Hydrocarbons: Mechanism, Methods, Metabolism. Cooke M, Dennis AJ eds, Battelle Press (1985);

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Human bronchial mucosa treated with BaP has shown destruction of all cell types.

Chronic Toxicity

Rats subcutaneously injected with BaP showed increased weights of the liver, spleen, and lungs, and decreased kidney and thymus weights.

Genotoxicity and Mutagenicity

BaP has produced positive results in many genotoxicity assays.

Reproductive and Developmental Toxicity

Sterility was observed in offspring of female mice exposed to BaP.

Carcinogenicity

BaP has been determined to be a probable human carcinogen by the U.S. EPA and the IARC. This is based on no evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in animals.

Sensitive Subpopulations

Pregnant women or individuals with skin disorders are at special risk.

REFERENCES

IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work)., p. S7 58 (1987);

Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) Publication No. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981., p. 1;

Medical College of Virginia. Immunotoxicity of Benzopyrenes in Fischer 344 Rats (Final Report). (1986), EPA Document No. FYI-AX-0686-0309, Fiche No. OTS0000309-2;

Shepard, T.H. Catalog of Teratogenic Agents. 4th ed. Baltimore, MD: Johns Hopkins University Press, 1983., p. 52;

U.S. Environmental Protection Agency's Integrated Risk Information System (IRIS) on Benzo(a)pyrene (BaP) (50-32-8) Available from: http://www.epa.gov/ngispgm3/iris on the Substance File List as of March 15, 2000;

ECOLOGICAL TOXICOLOGICAL PROPERTIES

Wildlife Toxicity

Rats and mice were exposed to combustion gases of coal-burning furnace enriched with benzo(a)pyrene (50-90 µg/m^3) and other PAHs for16 hr/day, 5 days/wk. The incidence of lung neoplasm was approximately 10-fold above controls after 22 months of exposure (Heinrich, *et al.* 1986; as cited in HSDB, 2005).

Plant Toxicity

In a series of pot tests of the higher plants, tobacco, rye, and radish, results indicate that certain polycyclic aromatic hydrocarbons have growth-promoting effects on plants. Further, the degree of the promoting effect corresponded to the oncogenic activity of the hydrocarbon. The six polycyclic aromatic hydrocarbons found in plants were tested one at a time or in combination. Considerable growth-promotion was noted, near to 100% in some cases (Health & Welfare Canada, 1979; as cited in HSDB, 2005)

REFERENCES

Hazardous Substances Data Bank (HSDB). 23 June 2005. “Benzo(a)pyrene” <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>. Accessed: 15 Sept 2008.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work	Slope Factor	3.08 per mg/kg-day	MOE 2007 Draft Rationale (WHO, 2000)
Tier 2: AAQC	AAQC	0.0011 µg/m^3 (24-hour; single facility)	O. Reg. 419
		0.00022 µg/m^3 (annual, single facility)	
		0.0003 µg/m^3 (all sources)	
Tier 3: IRIS*	Oral SF	7.3 mg/kg-d^{-1}	IRIS, 1994
Tier 4: ATSDR	MRL	-	-
Tier 5: Health Canada*	TC/TDI or TD_{05}/TC_{05}	Slope factor=0.137 per mg/kg-day	Health Canada PQRA, 2004; Health Canada Priority Substances List, 1996
Tier 6: CCME	CWS	-	-
Tier 7: WHO	-	-	-
Tier 8: RIVM	-	-	-
Tier 9: Cal EPA	Slope Factor	3.9 per mg/kg-day	Thyssen *et al.*, 1981; Cancer Potency Values
Tier 10: HEAST	-	-	-
Tier 11: U.S. EPA	PPRTV	-	-

TRV Details

Agency	**Test Species**	**Endpoint**	**Uncertainty**	**Primary Reference**
MOE Draft Rationale	-	-	-	Adopted from WHO, 2000
Ontario AAQC	NA	Health-based.	NA	NA
IRIS*	Mice/ Rats	Forestomach, squamous cell papillomas and carcinomas/ forestomach, larynx and esophagus, papillomas and carcinomas Oral, Diet	NA	Neal and Rigdon, 1967; Rabstein et al., 1973; Brune et al., 1981
Health Canada*	Hamster	Respiratory tract tumours;TC_{05}= 1.6mg/m^3; 96-week inhalation study	NA	Thyssen *et al.*, 1981
Cal EPA SF	Hamster (male)	Respiratory tract tumour incidence; Exposure levels: 2.2, 9.5, 46.5 mg/m^3	-	Thyssen *et al.*, 1981

REFERENCES	
Thyssen J, Althoff J, Kimmerle G and Mohr U. 1981. Inhalation studies with Benzo[a]pyrene in Syrian Golden hamsters. JNCI 66:575-577.	
REVISION HISTORY	
Date	**Revised by:**
September 15, 2008	Stephen Cioccio/Rachel Saldanha
June 24, 2010	Stephen Cioccio

NA= Not Available
*Selected TRV

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	7440-43-9
Molecular Weight	112.41g/mol
Synonyms	Addendum
Production and Uses	Used in batteries, pigments, coatings/plating, and as a stabilizer from plastic.
Sources of Exposure	Exposure to cadmium can occur via inhalation of cigarette smoke or ingestion.
Environmental Fate	Cadmium in water is quickly adsorbed onto particulate matter and settles out. Cadmium will exist in the particulate-phase in the atmosphere and is removed by wet and dry deposition.

REFERENCES

Budavari, S. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 1996., p. 265;

IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work)., p. V11 44 (1976);

WHO. Environmental Health Criteria 134: Cadmium p.18 (1992);

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Inhalation causes throat dryness, cough, headache, vomiting, and chest pain. Ingestion is much less lethal than inhalation, partly because it induces vomiting and is not retained.

Chronic Toxicity

Hypertension was noted in workers exposed to cadmium for 1-35 years. Inhalation can cause centrilobular emphysema and bronchitis.

Genotoxicity and Mutagenicity

Reproductive and Developmental Toxicity

Carcinogenicity
The U.S. EPA has determined cadmium to be a probable human carcinogen. This is based on sufficient evidence of carcinogenicity in animals and limited evidence in humans.
Sensitive Subpopulations

REFERENCES

Engvall J, Perk J. Arch Env Health 40 (3): 185-90 (1985);

Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984., p. III-78;

The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983., p. 223

USEPA. Health Assessment Document: Cadmium p.1-11 (1981) EPA-600/8-81-023;

U.S. Environmental Protection Agency's Integrated Risk Information System (IRIS) on Cadmium (7440-43-9) from the National Library of Medicine's TOXNET System, March 6, 1995;

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work			MOE 2007 Draft Rationale
Tier 2: AAQC	AAQC	RfC = $3x10^{-5}$ mg/m^3 (modified from 24-hour AAQC)	MOE (2009)
Tier 3: IRIS	RfD/RfC		
Tier 4: ATSDR	MRL		
Tier 5: Health Canada	RfD/RfC/ SF/IUR	RfD= 0.0008 mg/kg-d IUR= 42.9 (mg/kg-d)$^{-1}$ (from TC_{05} of 9.8 mg/m^3)	Health Canada, 2004 Health Canada, 2004
Tier 6: CCME	CWS		
Tier 7: WHO			
Tier 8: RIVM			
Tier 9: Cal EPA			
Tier 10: HEAST			
Tier 11: U.S. EPA	PPRTV		

TRV Details

Test Species	**Endpoint**	**Uncertainty**	**Primary Reference**
2: Humans	Kidney damage; cancer		MOE (2007)
5. RfD: Drinking Water Guideline	MAC of 0.005 mg/L, based upon 0.01% of population having a renal cortical concentration of 0.2 mg/g over 50 years		Health Canada (2003)
5. Inhalation Unit Risk: Rats (inhalation bioassay)	Lung tumour incidences after inhaling cadmium chloride, cadmium oxide dust, cadmium sulphate and cadmium sulphide		Oldiges *et al.*, 1989; Glasser *et al.*, 1990

REVISION HISTORY	
Date	**Revised by:**
October 25, 2007	Gavin Anderson
June 24, 2008	Shylene Dutt
June 24, 2010	Andrea Amendola

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	630-08-0
Molecular Weight	28.01 g/mol
Synonyms	Carbon oxide, Carbonic oxide
Production and Uses	Carbon monoxide is used as a reducing agent in metallurgical operations and as a chemical intermediate (Gerhartz, 1985-present; Budavari, 1989; as cited in HSDB, 2005).
Sources of Exposure	Due to a boiling point of -191.5ºC, human exposure to carbon monoxide is almost exclusively through the inhalation route. The most probable routes of exposure for the general public result from inhalation of fumes from motor vehicles, exposure to combustion sources, cooking or heating with domestic gas charcoal or wood fires and smoke from tobacco (EHC 213, 1999)
Environmental Fate	Carbon monoxide is a colourless, odourless gas produced by the incomplete combustion of carbon-containing fuels (Budavari, 1989; International Programme on Chemical Safety, 1999; as cited in HSDB, 2005). In most regions, carbon monoxide in the atmosphere will suppress OH and increase ozone (O3) concentrations, but these trends may be opposed by stratospheric O3 depletion and climate change (Thompson and Stewart, 1989; as cited in HSDB, 2005). Atmospheric carbon monoxide eventually oxidizes to carbon dioxide (Australian Department of the Environment and Heritage, 2001).

REFERENCES

Australian Department of the Environment and Heritage, "State of Knowledge Report: Air Toxics and Indoor Air Quality in Australia." Environment Australia (2001) 06 Jul 2006 http://www.deh.gov.au/atmosphere/airquality/publications/sok/profiles/carbonmonoxide.html.

IPCS; Environmental Health Criteria Monographs (13): Carbon Monoxide. Last updated: 1999; Available online: http://www.inchem.org/documents/ehc/ehc/ehc018.htm; Accessed: 2008/9/06.

Hazardous Substances Data Bank (HSDB). 23 Aug 2005. "Carbon Monoxide" <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?/temp/~OQ5A8W:1>. Accessed: 06 Jul 2006.

TOXICOLOGICAL PROPERTIES

Acute Toxicity

The majority of adverse effects caused by carbon monoxide are due to its binding to hemoglobin and reducing the oxygen carrying capacity of blood (International Programme on Chemical Safety, 1999; as cited in HSDB, 2005). Acute inhalation exposure to carbon monoxide can cause neurological symptoms, including headache, dizziness, weakness, confusion, disorientation, and visual disturbances. Studies on healthy subjects showed decreased exercise performance at carboxyhaemoglobin (COHb; an indicator of CO exposure in blood) levels of 5%.

Chronic Toxicity

Exertional dyspnea and an increase in pulse and respiratory rates are observed with continuous exposure. Complications from carbon monoxide poisoning include death, myocardial impairment, hypotension, arrhythmias, pulmonary oedema, and delayed development of neuropsychiatric impairment (International Programme on Chemical Safety, 1999; as cited in HSDB, 2005). Carbon monoxide is exhaled fairly slowly, with 50% of the original amount eliminated in 30-180 minutes, and 90% of the original amount eliminated within 180-420 minutes (WHO, 1979; as cited in HSDB, 2005).

Genotoxicity and Mutagenicity

No data available.

Reproductive and Developmental Toxicity

Carbon monoxide poisoning during pregnancy results in high risk for the mother, by increasing the short-term complication rate and for the fetus by causing fetal death, developmental disorders, and cerebral anoxic lesions (EHC 213; as cited in HSDB, 2005).

Carcinogenicity

No data on the carcinogenicity of carbon monoxide was available.

Sensitive Subpopulations

Pregnant women as well as persons with a history of coronary heart disease, anaemia, pulmonary heart disease, cerebrovascular disease, thyrotoxicosis, and smokers would be expected to be at increased risk from exposure to carbon monoxide (Mackison *et al*.; as cited in HSBD, 2005).

REFERENCES

IPCS; Environmental Health Criteria Monographs (13): Carbon Monoxide. Last updated: 1999; Available online: http://www.inchem.org/documents/ehc/ehc/ehc018.htm; Accessed: 2008/9/06.

Hazardous Substances Data Bank (HSDB). 23 Aug 2005. “Carbon Monoxide” <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?/temp/~OQ5A8W:1>. Accessed: 06 Jul 2006.

ECOLOGICAL TOXICOLOGICAL PROPERTIES
Wildlife Toxicity
Dogs exposed 5.5 hours/day, 6 days/week for 11 weeks to 100 ppm CO showed changes in their EKG as earlier as week 2. Degeneration in individual muscle fibres, as well as hemorrahges and necrosis, were seen in the myocardium. Some dogs also showed disturbances of their gait, as well as their postural and position reflexes. Histological changes were seen in the cortex of the hemispheres and in the globus pallidus of the brain stem (Hamilton, *et al*., 1974; as cited in HSDB, 2005).
Plant Toxicity
No data avaialable.
REFERENCES
Hazardous Substances Data Bank (HSDB). 23 Aug 2005. "Carbon Monoxide" <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?/temp/~OQ5A8W:1>. Accessed: 15 Sept 2006.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work		NV	MOE 2007 Draft Rationale
Tier 2: AAQC	AAQC	6000 µg/m^3 ½ hour avg period; 36200 µg/$m^3$1-hour; 15700 µg/m^3 8-hour	O. Reg. 419, Schedule 3
Tier 3: IRIS	RfD/RfC	NV	
Tier 4: ATSDR	MRL	NV	
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}	NV	
Tier 6: CCME	CWS	13ppm or 15 mg/m^3 (8-hour); 31ppm or 36mg/m^3(1-hour)	NAAQS- Maximum Acceptable Level
Tier 7: WHO	AAQS	30 mg/m^3 for 1 hour avg period; 100 mg/m^3 for 15 minutes; 60 mg/m^3 for 30 minutes; 10 mg/m^3 for 8 hours	Air Quality Guidelines (2nd ed.)
Tier 8: RIVM		NV	
Tier 9: Cal EPA	Acute REL California AAQS	23 mg/m^3 (1-hour)	OEHHA; Determination of Acute REL for Airborne Toxicants, 1999
Tier 10: HEAST			
Tier 11: U.S. EPA	PPRTV	NV	

TRV Details

Agency	Test Species	Endpoint	Uncertainty	Primary Reference
Ontario MOE-AAQCs	-	Health-based	-	-
CCME NAAQS	Human	Based on studies showing that carboxyhaemoglobin (COHb) levels of 2% induced angina in exercising individuals. Guideline concentrations result in COHb levels at or less	-	Health Canada, National Ambient air Quality Objectives for Carbon Monoxide

		than 2%.		
WHO AAQS		This value has been determined such that the blood COHb level does not exceed 2.5% in sensitive individuals when engaging in light to moderate physical activity	-	Based on several studies and Coburn *et al.,* 1965; as cited in Air Quality Guidelines
Cal EPA Acute REL	Human	Aggravation of angina and other cardiovascular diseases; NOAEL= 1.1=1.3% COHb in blood corresponding to 20ppm; 1-hour exposure period	UF=1	Aronow, 1981

REFERENCES

Aronow WS. Aggravation of angina pectoris by two percent carboxyhemoglobin. Am Heart J 1981;101:154-157.

Coburn, R.F. *et al.* Considerations of the physiological variables that determine the blood carboxyhemoglobin concentration in man. *Journal of clinical investigation*, **44**: 1899–1910 (1965).

REVISION HISTORY

Date	**Revised by:**
September 15, 2008	Stephen Cioccio/Rachel Saldanha
June 24, 2010	Stephen Cioccio

Notes:
NV= No value
NA= Not applicable

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	7440-47-3
Molecular Weight	51.996
Synonyms	
Production and Uses	Used in alloys, in the processing of insoluble salts, and as catalysts for halogenation and alkylation.
Sources of Exposure	Stainless steel mixing containers in the baking industry can result in chromium in foods.
Environmental Fate	Environmental fate of chromium depends on the oxidation state. Trivalent chromium is considered to be a nutritionally essential trace element in the human diet (Goyer, 1996). Though trivalent chromium may exist in soils and sediments, it is not readily bioavailable. Alternatively, hexavalent chromium primarily exists in aerobic media such as surface waters, and is more bioavailable than the trivalent species (Health Canada, 1994). Hexavalent chromium can be converted to chromium (III) by a variety of reducing agents such as S^{2-}, Fe(II), fulvic acid, low molecular weight organic compounds, and proteins; the effectiveness of these reducing agents is dependent on pH, redox conditions, and the total concentrations of chromium (Nriagu et al., 1993).

REFERENCES

Lide, DR (ed.). CRC Handbook of Chemistry and Physics. 81st Edition. CRC Press LLC, Boca Raton: FL 2000, p. 4-53;
Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) Publication No. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981., p. 3;
Nat'l Research Council Canada. Effects of Chromium in the Canadian Envir p.43 (976) NRCC No.15017;

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Ingestion of chromium salts results in gastroenteritis, circulatory collapse, and nephritis (Gosselin et al. 1984). Ingestion has also been associated with renal lesions, albuminuria, renal hyperemia, fatty degeneration and necrosis in non-industrial populations (Browning 1969). Acute oral toxicity may be manifested by dizziness, oliguria or anuria, abdominal pain, vomiting, shock, with death resulting from uremia (Dreisbach 1983). As described by Seiler et al. (1988), very few oral toxicity studies have been completed on humans, though toxicity is believed to be manifested by GI hemorrhage rather than systemic effects. The lethal dose in humans is reported as ranging between one and three grams (Seiler et al. 1988).

Chronic Toxicity

Genotoxicity and Mutagenicity

Rats inhaling chromium fumes had higher incidence of chromosome aberrations.

Reproductive and Developmental Toxicity

Carcinogenicity

Trivalent chromium is not considered carcinogenic to humans (group D), though hexavalent chromium is a confirmed group A human carcinogen via the inhalation and dermal routes of exposure; hexavalent chromium has not shown carcinogenicity via the oral route, presumably due to *in vivo* metabolism which converts hexavalent chromium to the trivalent variety (U.S. EPA 2003).

Sensitive Subpopulations

REFERENCES

American Conference of Governmental Industrial Hygienists TLVs and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, OH, 2005, p. 20;

DHHS/ATSDR. Toxicological Profile for Chromium, p. 55 (2000);

Goyer, R.A. 1996. Toxic Effects of Metals. In: Cassarett and Doull's Toxicology. The Basic Science of Poisons. 5th Edition. Klaasen, C.D. (Ed.). McGraw-Hill, N.Y.

Nriagu, J., S. Beaubien, and D. Blowes. 1993. Chemistry of chromium in lakes. Environmental Reviews, 1(2):104-120

Health Canada. 1994. Prior*ity Substances List Assessment Report: Chromium and Its Compounds*. Health Canada, under the Canadian Environmental Protection Act, 1994.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work	RfD /RfC		
Tier 2: AAQC	AAQC		
Tier 3: IRIS	RfD/RfC	RfD = 0.0083 mg/kg-day (modified from IRIS RfD of 0.003 mg/kg-day) RfC = 0.0000286 mg/kg-day (from Cr(VI) particulates IRIS RfC of 0.0001 mg/m^3)	MOE (2009); U.S. EPA (1998) U.S. EPA (1998)
Tier 4: ATSDR	MRL		
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}	IUR = 331 $(mg/kg\text{-}day)^{-1}$ (from TC_{05} of 0.66 $\mu g/m^3$)	Health Canada (2004)
Tier 6: CCME	CWS		
Tier 7: WHO			
Tier 8: RIVM			
Tier 9: Cal EPA			
Tier 10: HEAST			
Tier 11: U.S. EPA	PPRTV		

TRV Details

Test Species	**Endpoint**	**Uncertainty**	**Primary Reference**
3. RfD – Rat (1-year drinking water study)	No adverse effects were observed at the highest dose level of 25 mg/L when administered as potassium chromate	UF = 300 MF = 3	MacKenzie *et al.* (1958)
3. RfC – Rat (subchronic study)	Lactate dehydrogenase in bronchioalveolar fluid	UF = 300	Glaser *et al.* (1990); Malsch *et al.* (1994)
5. Epidemiological study in production plant workers	Lung cancer		Mancuso (1975)

REVISION HISTORY	
Date	**Revised by:**
November 2, 2007	Gavin Anderson
June 24, 2010	Andrea Amendola

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	100-41-4
Molecular Weight	106.16
Synonyms	Phenylethane
Production and Uses	Used in the production of synthetic rubber, as a solvent, and as a component of automotive and aviation fuels.
Sources of Exposure	The general population may be exposed to ethylbenzene via inhalation of ambient air, ingestion of foods and fish, drinking contaminated water, and dermal contact with ethylbenzene containing compounds such as gasoline.
Environmental Fate	Ethylbenzene has moderate mobility in soil and may volatilize from moist and dry soil surfaces. Volatilization from water surfaces is expected, and biodegradation may occur in soil and water. Vapour-phase ethylbenzene in the atmosphere is degraded with an estimated half-life of 55 hours.

REFERENCES

Ball HA et al. pp. 458-63 in In-Situ Bioreclamation. Hinchee RE, Olfenbuttel RF, eds. Boston, MA: Butterworth-Heinemann (1991);

Borden RC et al. Anaerobic biodegradation of BTEX in aquifer material. USEPA/600/S-97/003 pp. 9 (1997);

Budavari, S. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 1996., p. 643;

International Labour Office. Encyclopedia of Occupational Health and Safety. Vols. I&II. Geneva, Switzerland: International Labour Office, 1983., p. 2114;

Lyman WJ et al. Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 4-9, 15-1 to 15-29 (1990);

NIOSH. National Occupational Exposure Survey (NOES) (1983);

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Ethylbenzene is a central nervous system depressant, as well as an irritant to the eyes and mucous membranes. It can also cause dizziness at high exposure levels.

Chronic Toxicity

Prolonged exposure to vapours may cause functional disorders, respiratory irritation, and haematological disorders.

Genotoxicity and Mutagenicity

Although the majority of the data suggest that ethylbenzene is not mutagenic in most systems, two studies (Norppa and Vainio 1983a; Midorikawa et al. 2004). that showed positive results suggest that ethylbenzene might cause an increased potential for genotoxicity in humans.

Reproductive and Developmental Toxicity

No human studies found.

Carcinogenicity

The U.S. EPA has determined that ethylbenzene is not classifiable as to its carcinogenicity in humans. This is based on no evidence of carcinogenicity in humans or animals.

Sensitive Subpopulations

Individuals with pulmonary, liver, kidney, nervous system, and blood disorders may be at special risk.

REFERENCES

ATSDR. Agency for Toxic Substance and Disease Registry. Draft for public comments on Ethylbenzene, September, 2007.

Environmental Health Criteria 186: Ethylbenzene pp. 19-20 (1996) by the International Programme on Chemical Safety (IPCS) under the joint sponsorship of the United Nations Environment Programme, the International Labour Organisation and the World Health Organization.;

International Labour Office. Encyclopedia of Occupational Health and Safety. Vols. I&II. Geneva, Switzerland: International Labour Office, 1983., p. 2114;

Midorikawa K, Uchida T, Okamoto Y, et al. 2004. Metabolic activation of carcinogenic ethylbenzene leads to oxidative DNA damage. Chem Biol Interact 150:271-281.

Norppa H, Vainio H. 1983b. Genetic toxicity of styrene and some of its derivatives. Scand J Work Environ Health 9:108-114.

U.S. Environmental Protection Agency's Integrated Risk Information System (IRIS) on Ethylbenzene (100-41-4) Available from: http://www.epa.gov/NCEA/iris/subst/0051.htm#carc on the Substance File List as of February 3, 2009.

IPCS (International Programme on Chemical Safety). 1996. *Environmental Health Criteria 186: Ethylbenzene*. Under the joint sponsorship of the United Nations Environment Programme, the International Labour Organization, and the World Health Organization.

ECOLOGICAL TOXICOLOGICAL PROPERTIES

Wildlife Toxicity

In a laboratory experiment, rats and mice were exposed to ethylbenzene for 6 h per days for 13 weeks. There was an increase in liver and kidneys of animal exposed to the highest doses (3225 and 4300 mg/m^3). No chemically related histopathological changes were observed in any rat or mouse tissues (NTP, 1992; as cited in IPCS INCHEM, 1996). However, in a laboratory study from Elovaara et al., 1985 (as cited in IPCS INCHEM, 1996), histopathological changes were observed at the highest dose. Rats were exposed to ethylbenzene at concentration varying between 0 and 2580 mg/m^3 for 6h/day, 5days/week .

In an inhalation study on rats, guinea-pigs, rabbits and rhesus monkey, slight effects were seen in rats: increased liver and kidney weights at 1720 mg/m^3; increased liver and kidney weights at 2580 mg/m^3; and small histopathological changes (cloudy swelling) in liver and kidney at 5375 and 9460 mg/m^3 (Wolf et al. 1956). In guinea-pigs and monkeys slightly increased liver weights were noted in the 2580 mg/m^3 group only. At the same exposure level, small histopathological effects in the testes, described as degeneration of the germinal epithelium, were seen in rabbits and monkeys. At 5375 mg/m^3 a slight growth depression was noted in guinea-pigs. The no-observed-effect level (all four species) was considered to be about 860 mg/m^3 (200 ppm) (Wolf et al., 1956). It should be noted, however, that Cragg et al. (1989) found no histopathological effects in the testes of rats and rabbits exposed to up to 3363 mg/m^3 (782 ppm) for 4 weeks, and the lack of toxicity was confirmed by NTP (1992).

Plant Toxicity
On exposing leaves of the runner bean (*Phaseolus multiflorus*) and parsnip (*Pastinaca sativa*) to ethylbenzene at a range of vapour concentrations for 1 h it was found that the concentrations causing no damage and those completely killing the leaves were close. The author subsequently determined an EC50 of 27 and 48 g/m³ respectively (Ivens, 1952; as cited in EU RA, 2005).
REFERENCES
International Program on Chemical Safety (IPCS) INCHEM. 1996. Ethylbenzene. http://www.inchem.org/documents/ehc/ehc/ehc186.htm. Accessed June 11, 2009. European Union Risk Assessment Report (EURA). October 2005. Risk Assessment Draft on Ethylbenzene, Environmental Part. http://ecb.jrc.ec.europa.eu/documents/Existing-Chemicals/RISK_ASSESSMENT/DRAFT/R057_0510_env.pdf. Accessed June 11, 2009.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work	RfD / RfC SF_i	1.0 mg/m^3= 0.29mg/kg-day	MOE 2007 Draft Rationale
Tier 2: AAQC	AAQC	1400µg/m^3 (1/2-hour); 1000 µg/m^3(24-hour)	O. Reg. 419
Tier 3: IRIS*	RfD/RfC	1000 µg/m^3 0.3 mg/kg/day	IRIS, 1991
Tier 4: ATSDR	Acute MRL	10ppm= 12.4 mg/kg-day	ATSDR, 2007
	Intermediate MRL	0.7ppm=3 mg/kg-day	ATSDR, 2007
	Chronic MRL	0.3ppm= 0.4mg/kg-day	ATSDR, 2007
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}	n/a	n/a
Tier 6: CCME	CWS	n/a	n/a
Tier 7: WHO	Air Quality Guidelines (2^{nd} ed.)	n/a	n/a
Tier 8: RIVM	TCA	770 µg/m^3/ 0.2mg/kg-day	RIVM, 2001
Tier 9: Cal EPA	Chronic REL	2000 µg/m^3/ 0.6mg/kg-day	OEHHA, 2008
Tier 10: HEAST	n/a	n/a	n/a
Tier 11: U.S. EPA	PPRTV	n/a	n/a

TRV Details

Agency	**Test Species**	**Study Details**	**Uncertainty**	**Primary Reference**
US EPA IRIS RfC	Rat and Rabbit	Based on a NOAEL of 434 mg/m^3 for developmental toxicity where rats and rabbits were exposed to 0, 100,or 1000 ppm for 6-7 hr/d, 6d/k for 1-19 and 1-24 of gestation	300	Andrew et al., 1981; Hardin et al., 1981
ATSDR Acute MRL	Rat	Based on a NOAEL of 400ppm for deterioration in the auditory thresholds and losses of the outer hair cells of the Organ of Corti in rats exposed for 8h/d for 5 days	30	Cappaert et al. 2000
ATSDR Int MRL	Rat	Based on a LOAEL of 200ppm for significant loss of outer hair cells in the organ of Corti in rats exposed for 6 hours/day, 6 days/week for 13 weeks	300	Gagnaire et al. 2007
ATSDR	Rat	Based on a LOAEL of 75ppm	300	NTP, 1999

Chronic MRL		for a significant increase in the severity of nephropathy in female rats exposed to ethylbenzene by inhalation for 5 d/wk, 6 h/d, for 104 weeks		
RIVM TCA	Rat and Mouse	Based on a NOAEL of 430mg/m^3 for liver and kidney effects in rats and mice exposed for 6h/d, 5d/wk	100	NTP, 1992
Cal EPA Chronic MRL	Rat and Mouse	Based on NOAEL of 75ppm for nephrotoxicity, body weight reduction (rats) hyperplasia of the pituitary gland; liver cellular alterations and necrosis (mice) exposed 6h/d, 7d/wk	30	NTP, 1999; Chan *et al.*, 1998

REVISION HISTORY	
Date	**Revised by:**
February 3, 2009	Raphaël Lambert
April 24, 2009	R. Saldanha
June 24, 2010	S. Cioccio

n/a= not available

*Selected TRV

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	50-00-0
Molecular Weight	30.0g/mol
Synonyms	Formaldehyde, gas, Formic aldehyde, Methaldehyde, Methyl aldehyde, Methylene oxide, Oxomethane, Oxymethylene (IARC, 2006).
Production and Uses	Formaldehyde is used in fertilizers, as a textile finish, preservative, stabilizer, disinfectant, and antibacterial food additive (Budavari, 1996; as cited in HSDB, 2003). Also formaldehyde is used extensively as an intermediate in the manufacture of industrial chemicals, such as 1,4-butanediol, 4,4'-methylenediphenyl diisocyanate, pentaerythritol and hexamethylenetetramine (IARC,2006). It is also commonly used as an embalming fluid in anatomy labs (Kitchens JF *et al*, 1976 and National Research Council, 1982; as cited in HSDB, 1993).
Sources of Exposure	The general public may be exposed to formaldehyde via inhalation of ambient air, ingestion of food and dermal contact with cosmetic and aerosol products with formaldehyde (IARC, 1995; as cited in HSDB, 2003). Also, some rugs, papers and plywood are treated with resin and releases formaldehyde which can build up in homes (Kitchens JF *et al*, 1976 and National Research Council, 1982; as cited in HSDB, 1993). Formaldehyde is a major component found in smog and may also be exposed to the general public via cigarette and other tobacco products, gas cookers and open fireplaces (ATSDR, 1999).
Environmental Fate	Formaldehyde may be directly released to the environment by its production and use as a fertilizer (Budavari, 1996; as cited in HSDB, 2003). When released to the environment, formaldehyde is expected to have high mobility in soil, and to volatilize from dry soil but not moist soil (Boublik *et al.*, 1984; as cited in HSDB, 2003). Formaldehyde is readily biodegradable under aerobic and anaerobic conditions in terrestrial and aqueous environments (HSDB, 2003). Formaldehyde in aqueous systems is not expected to adsorb to suspended solids and sediments or to volatilize from water (Lyman *et al.*, 1990; as cited in HSDB, 2003). Formaldehyde in the atmosphere exists as a gas, and is degraded by photochemically-produced hydroxyl radicals; a process with a half-life of 41 hours (HSDB, 2003). Formaldehyde is also photolyzed by sunlight and oxidized by NO3 radicals. The half-lives for these reactions are estimated at 1.6 hours and 12 days, respectively (Atkinson *et al.*, 1984; Su *et al.*, 1979; as cited in HSDB, 2003).

REFERENCES

ATSDR (Agency for Toxic Substances and Disease Registry). Toxicological Profile for Formaldehyde. Accessed online at: <http://www.atsdr.cdc.gov/tfacts111.pdf> Last Updated: June 1999. Accessed: 2008/11/06.

Hazardous Substances Data Bank (HSDB). 29 Aug 2003. "Formaldehyde" <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?/temp/~ZMOVsv:1> Accessed: 26 Jun 2006.

IPCS, International Agency for Research on Cancer (IARC). Summary of Data Reported and Evaluation –Formaldehyde (2006): 88; Accessed: 2008/11/06; Available online: <http://www.inchem.org/documents/iarc/vol88/volume88.pdf>.

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Since formaldehyde can exist as a liquid or gas, exposure can be through dermal, oral, and inhalation exposure routes. When inhaled, formaldehyde produces respiratory irritation and low concentrations. High concentrations produce dysphagia, bronchitis, pneumonia, and edema or spasm of the larynx (Gosselin *et al*., 1984; as cited in HSDB, 2003). Ingestion of formaldehyde produces intense pain in the mouth, pharynx, and trachea. Once the formaldehyde is absorbed, symptoms include nausea, vomiting, diarrhea, hematuria, and central nervous system depression (Gosselin *et al*., 1984; as cited in HSDB, 2003). Dermal contact with formaldehyde causes irritation, hardening of the skin, and hypersensitivity after prolonged exposure (Gosselin *et al*., 1984; as cited in HSDB, 2003).

Chronic Toxicity

No data available.

Genotoxicity and Mutagenicity

Human studies have shown an increase in DNA protein crosslinks amongst workers exposed to formaldehyde. A single animal study reported cytogenic abnormalities in the bone marrow of rats that inhaled formaldehyde (IARC, 2006).

Reproductive and Developmental Toxicity

After conducting 11 occupational studies, results show that occupational exposure to formaldehyde produced spontaneous abortions, congenital malformations, decreased birth weight, infertility and endometriosis (IARC, 2006)

Carcinogenicity

According to the IARC, Formaldehyde is carcinogenic to humans (Group 1).

Sensitive Subpopulations

Two populations at special risk are asthmatics and those with dermal sensitization (ATSDR, 1999; as cited in HSDB, 1993).

REFERENCES

Hazardous Substances Data Bank (HSDB). 29 Aug 2003. "Formaldehyde" <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?/temp/~ZMOVsv:1>. Accessed: 26 Jun 2006.

IARC. 2006. "IARC Monographs on the Evaluation of Carcinogenic Risks to Humans Volume 88 - Formaldehyde, 2-Butoxyethanol and 1-tert-Butoxypropan-2-ol" <http://monographs.iarc.fr/ENG/Monographs/vol88/mono88-6.pdf>. Accessed 08 September 2008.

IPCS, International Agency for Research on Cancer (IARC). Summary of Data Reported and Evaluation –Formaldehyde (2006): 88; Accessed: 2008/11/06; Available online: <http://www.inchem.org/documents/iarc/vol88/volume88.pdf>

ECOLOGICAL TOXICOLOGICAL PROPERTIES

Wildlife Toxicity

Acute effects in rats to low (<1 ppm) or moderate (10-50 ppm) concentrations of vapor resulted in increased airway resistance, decreased sensitivity of nasopalatine nerve, irritation of the eyes and the respiratory system, and changes in hypothalamus. Exposure to high doses (>100 ppm) caused salivation, acute dyspnea, vomiting, cramps and death. (IARC 1982; as cited in HSDB, 2006) There was an 80% mortality rate in mice that were exposed to formaldehyde vapors at 40 ppm, 6 hr/day, 5 day/week for up to 13 weeks. Mice exposed with the same protocol to 20 ppm showed no mortalities within the exposure period. The deaths mainly occurred in the fifth and sixth week of exposure and were associated with ataxia, severe body weight depression, and inflammation and metaplasia in the nasal cavity, larynx, trachea, and lungs. Deaths were attributed to occlusive tracheal lesions and/or prominent seropurulent rhinitis (ATSDR, 1999).

Plant Toxicity

The common bean (Phaseolus vulgaris) experienced an increase in the growth of shoots, but not of roots after exposure to average measured concentrations of 78, 128, 239, and 438 µg/m^3 in air (day: 25 °C, 40% humidity; night: 14 °C, 60% humidity) for 7 h/day, 3 days/week, for 4 weeks, beginning at the appearance of the first macroscopic floral bud, 20 days after emergence (Mutters *et al*., 1993; as cited in IPCS, 2002). Mutters *et al*. (1993; as cited in IPCS, 2002) concluded that there were no short-term harmful effects, however Barker and Shimabuku (1992; as cited in IPCS, 2002) have suggested that these plants may not be able to cope with environmental stresses such as drought, because the root system may not be large enough to provide water and nutrients for healthy plant growth. Mild atypical signs of injury in alfalfa were seen, (Medico sativa), but not in spinach, beets or oats (Haagen-Smit *et al*., 1952; as cited in IPCS, 2002). Significant reduction of the pollen tube length of lily following a 5-h exposure to 440 µg/m^3 in air; at 1680 µg/m^3 total inhibition of pollen tube elongation occurred (Masaru *et al*., 1976; as cited in IPCS, 2002).

REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for

Formaldehyde. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Hazardous Substances Data Bank (HSDB). 20 December 2006. "Formaldehyde" <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~5ePWpw:1>. Accessed: 15 Sept 2008.

International Programme on Chemical Safety (IPCS). (2002) "Concise International Chemical Assessment Document 40 – Formaldehyde" <http://www.inchem.org/documents/cicads/cicads/cicad40.htm>. Accessed: 12 Sept 2008.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work	-	-	MOE 2007 Draft Rationale
Tier 2: AAQC	AAQC	65µg/m^3 (24-hour)	Health-based
Tier 3: IRIS	RfD/RfC	-	-
Tier 4: ATSDR	Acute MRL	0.04ppm= 0.02 mg/kg-day	Pazdrak *et al.*, 1993; as cited in ATSDR, 2007
	Intermediate MRL	0.03ppm = 0.01mg/kg-day	Rusch *et al.*, 1983; as cited in ATSDR, 2007
	Chronic MRL	0.008 ppm/ 0.002 mg/kg/d	Holmstrom *et al.*, 1989; as cited in ATSDR, 2007
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}	-	-
Tier 6: CCME	CWS	-	-
Tier 7: WHO		0.1 mg/m^3 (30-min) (1) = 9.66E-03 mg/kg-day	Air Quality Guidelines (2nd ed.) 2000
Tier 8: RIVM	-	-	-
Tier 9: Cal EPA*	Acute REL (1-hour)	55µg/m^3 or 0.0157 mg/kg-d	OEHHA; Non-cancer RELs, 2008
	Chronic REL*	9 µg/m^3 or 2.57E-03 mg/kg-day	OEHHA; Non-cancer RELs. 2008
	SF*	0.021 mg/kg-day^{-1}	Cancer Potency Values, 2005
Tier 10: HEAST	Inhalation SF	4.5E-02 mg/kg-day	Kerns *et al.*, 1983
Tier 11: U.S. EPA	PPRTV	-	-

TRV Details

Agency	**Test Species**	**Study Details**	**Uncertainty**	**Primary Reference**
Ontario MOE AAQC	NA	Health-based	NA	NA
ATSDR Acute MRL	Human	Clinical symptoms and nasal alterations; based on LOAEL of 0.4ppm	9	Pazdrak *et al.*, 1993
ATSDR Intermediate MRL	Monkey	NOAEL=0.98ppm; Exposure; 22 hours/day, 5 days per week for 26 weeks;	30	Rusch *et al.*, 1983

		endpoint: hoarseness, nasal congestion, lesions in nasal epithelium		
ATSDR Chronic MRL	Human (occupational)	LOAEL of 0.24 for mild nasal epithelial tissue damage	30	Holmstrom *et al.*, 1989
WHO		Review of several studies		
Cal EPA Acute REL	Human (occupational)	Endpoint: mild to moderate eye irritation Exposure: 0.5 to 3ppm in nonasthmatic, non smoking individuals, NOAEL=0.5ppm for 3-hours	10 to account for sensitive subpopulations	Kulle *et al.*,1987
Cal EPA Chronic REL*	Human (occupational)	Endpoint: Nasal and eye irritation, nasal obstruction, and lower airway discomfort; histopathological nasal lesions; NOAEL 0.09 $mg/m^{3;}$ Exposure: 8 hours/day, 5 days/ week for 10 years	10	Wilhelmsson and Holmstrom, 1992; supported by Edling *et al*., 1988
Cal EPA SF*	Rat	Squamous cell carcinomas in nasal passages; Exposure levels: 0, 2.0, 5.6, or 14.3 ppm for 6 hours/day, 5 days/week for up to 24 months	-	Kerns *et al.*, 1983 and US EPA, 1987
HEAST	Rat	Nasal cavity tumours; 24-month study	-	Kerns *et al.*, 1983

REFERENCES

Edling C, Hellquist H, Odkvist L. 1988. Occupational exposure to formaldehyde and histopathological changes in the nasal mucosa. Br. J. Ind. Med. 45(11):761-765.

*Holmstrom M, Wilhelmsson B, Hellquist H, *et al*. 1989c. Histological changes in the nasal mucosa in persons occupationally exposed to formaldehyde alone and in combination with wood dust. Acta Otolaryngol (Stockh) 107:120-129.

Kerns WD, Pavkov KL, Donofrio DJ, Gralla EJ and Swenberg JA. 1983. Carcinogenicity of formaldehyde in rats and mice after long-term inhalation exposure. Cancer Res 43:4382-4392.

Kulle JT, Sauder LR, Hebel JR, Green D, Chatham MD. Formaldehyde dose-response in healthy nonsmokers. J Air Pollution Control Assoc 1987;37:919-924.

Pazdrak K, Gorski P, Krakowiak A, *et al*. 1993. Changes in nasal lavage fluid due to formaldehyde inhalation. Int Arch Occup Environ Health 64:515-519.

Rusch GM, Clary JJ, Rinehart WE, *et al*. 1983. A 26-week inhalation toxicity study with formaldehyde in the monkey, rat, and hamster. Toxicol Appl Pharmacol 68:329-343.

U.S. Environmental Protection Agency (US EPA) 1987. Assessment of Health Risks to Garment Workers and Certain Home Residents from Exposure to Formaldehyde. Office of Pesticide and Toxic Substances.

Wilhelmsson B, and Holmstrom M. 1992. Possible mechanisms of formaldehyde-induced discomfort in the upper airway. Scand. J. Work. Environ. Health 18(6):403-407.

REVISION HISTORY

Date	**Revised by:**
June 11, 2008	Shylene Dutt
September 8, 2008	Stephen Cioccio
June 24, 2010	Stephen Cioccio

NA=Not available

(1) This value has been converted to a 24-hour averaging period using the Ministry of Environment, *Air Dispersion Modelling Guideline* (2005) conversion factor; it was then converted to an RfD_{inhal}

*Selected TRV

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	7439-92-1
Molecular Weight	207.2 g/mol
Synonyms	
Production and Uses	Lead is found in batteries, insecticides and lead-based paints
Sources of Exposure	Largely industrial exposure. For general populations, though water, food, and milk.
Environmental Fate	Lead rarely exists in the elemental phase in the environment, but rather in the form of ores. It can be derived from decay of radon and can be found in the earth's crust, through burning of fossil fuels and mining. Lead itself cannot be broken down. However, its compounds can, via sunlight, air and water. When released in soil, it sticks to particles and can remain there for a long time (ASTDR, 2007).

REFERENCES

ATSDR (Agency for Toxic Substances and Disease Registry). Toxicological Profile for Lead. Accessed online at: http://www.atsdr.cdc.gov/tfacts13.pdf. Last Updated: August 2007. Accessed: 2008/24/06.

HSDB, Substance File on Lead, Elemental. Last updated 2005/06/24; Accessed 2007/12/05.

TOXICOLOGICAL PROPERTIES

Acute Toxicity

No data.

Chronic Toxicity

Blood and renal changes may occur: Trivalent lead interferes with iron incorporation in the porphyrin ring of heme by replacing iron with zinc, thus reducing oxygen-carrying capacity and inducing anemia. As in arsenic and antimony, lead also binds to sulfhydryl groups in several proteins, altering their structural and functional properties. In this respect, the biosynthesis of heme is disrupted, through reduced activity of δ-aminolevulinic acid dehydratase. Renal effects are generally uncommon, are reversible if acute, but may induce irreversible functional and morphological changes in the long-term.

Genotoxicity and Mutagenicity

In cows administered a heavy metal mixture including toxic levels of lead, there was no significant excess of chromosome damage in leukocytes (HSDB, 2005).

Reproductive and Developmental Toxicity

Lead toxicity in children has been associated with mental insufficiency, loss of coordination and fine motor dysfunction. Children may experience decreased growth associated with lead

deposition in bone (HSDB, 2005). Pregnant women, exposed to high lead levels may lead to miscarriage (ASTDR, 2007).

Carcinogenicity

Classified as a Group B2 carcinogen (sufficient animal evidence and inadequate human evidence) by IRIS. Classified as a Group A3 carciongen by ACGIH (confirmed animal carcinogen with unknown relevance to humans).

Sensitive Subpopulations

No data.

REFERENCES

ATSDR (Agency for Toxic Substances and Disease Registry). Toxicological Profile for Lead. Accessed online at: http://www.atsdr.cdc.gov/tfacts13.pdf. Last Updated: August 2007. Accessed: 2008/24/06.

HSDB, Substance File on Lead, Elemental. Last updated 2005/06/24; Accessed 2007/12/05.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
MOE	RfD	RfD= 0.00185 mg/kg-d	MOEE (1994)
Tier 1: MOE in recent vapour intrusion work			MOE 2007 Draft Rationale
Tier 2: AAQC	AAQC		
Tier 3: IRIS	RfD/RfC or SF/IUR		
Tier 4: ATSDR	MRL		
Tier 5: Health Canada	RfD/RfC		
Tier 6: CCME	CWS		
Tier 7: WHO		RfC = 0.000143 mg/kg-day (based upon the WHO guideline of 0.5 $\mu g/m^3$)	WHO (2000)
Tier 8: RIVM			
Tier 9: Cal EPA			
Tier 10: HEAST			
Tier 11: U.S. EPA	PPRTV		

TRV Details

Test Species	Endpoint	Uncertainty	Primary Reference
1. Humans (Children)	Neurological development in children		MOE (1994)
7. Humans (Children)	Neurological development in children		WHO (2000)

REVISION HISTORY	
Date	**Revised by:**
December 5, 2007	Andrea Amendola
June 24, 2008	Shylene Dutt
June 24, 2010	Andrea Amendola

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	91-20-3
Molecular Weight	128.17 g/mol
Synonyms	Naphthalin, naphthene, naphthaline
Production and Uses	Naphthalene is used in the manufacture of phthalic anhydride, used as an intermediate in the production of phthalate plasticizers, resins, dyes, pharmaceuticals, insect repellents, and other materials. It is also used as a wood preservative, a Greenhouse fumigant and is an ingredient found in some moth repellents and toilet bowl deodorants.
Sources of Exposure	The general public is not generally exposed to naphthalene. However, occupational exposure may occur with workers who produce beta-naphthol, celluloid, dye chemicals, fungicides, hydronaphthalene, moth repellants, phthalic anhydride, textile chemicals and tannery, coal tar and aluminum reduction plant workers.
Environmental Fate	With the manufacture of phthalic anhydride, naphthalene may be released into the environment through various waste streams. The primary release of this compound occurs from the combustion of wood and fossil fuels or through the production of coal tar. When released in the air, naphthalene exists as a vapour. Vapour-phase naphthalene can be degraded by photochemically-produced hydroxyl radicals and nitrate radicals with half lives of 16 and 18 hours respectively. Naphthalene also absorbs light in the environmental UV spectrum and is subject to direct photolysis. In soils, it has mid to low mobility with a Koc value of 440 – 871. The volatilization half-life for naphthalene varies in moist soil and water according to Henry's Law constant, with values of 1.1 and 3-5 days respectively. This compound has been shown to biodegrade in water with half lives ranging from 0.8 to 43 days. Naphthalene is not expected to undergo hydrolysis since there are no hydroxyl functional groups attached.

REFERENCES

ATSDR; Toxicological profile for Naphthalene/1-Methylnaphthalene/2-Methylnaphthalene. US Dept Health Human Services. Agency for Toxic Substances and Disease Registry (1995).

HSBD (Hazardous Substances Data Bank). 2005. Substance File: Naphthalene. Accessed online at: http://toxnet.nlm.nih.gov/cgi-bin/sis/search/ Last Updated: 2005/24/06; Accessed: 2008/14/05.

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Dermal and inhalation exposure of naphthalene (i.e. from exposure to mothballs containing naphthalene) may cause anaemia, jaundice, headache, confusion, nausea, vomiting, lethargy, anorexia, conjunctivitis, fever, and retinal lesions, cataracts and decreased vision (for exposure to eyes). Upon ingestion, naphthalene causes abdominal cramps with nausea, vomiting and diarrhoea. Also, continuous handling of naphthalene may cause dermatitis, characterized by itching, redness, scaling, weeping and crusting of the skin.

Chronic Toxicity

Chronic sniffing/abuse of mothballs (with naphthalene) has been reported to induce peripheral neuropathy, liver necrosis and chronic renal failure.

Genotoxicity and Mutagenicity

Many negative tests for mutagenic activity of naphthalene suggest that a genotoxic mechanism is unlikely.

Reproductive and Developmental Toxicity

The results from a study on pregnant rabbits provide no definitive evidence for naphthalene being toxic to the fetus. Fetal growth, viability, & morphological development were not significantly affected by naphthalene, even at doses which caused significant maternal toxicity in a rat study.

Carcinogenicity

According to International Agency for Research on Cancer (IARC), naphthalene is classified as a group 2B carcinogen possibly being carcinogenic to humans.

Sensitive Subpopulations

Individuals particularly women, who are deficient in glucose-6-phosphate-dehydrogenase or those with sickle cell anaemia are susceptible to hemolytic anemia induced by naphthalene ingestion or inhalation. Also, pregnant women and those with skin disorders are at special risk.

REFERENCES

HSBD (Hazardous Substances Data Bank). 2005. Substance File: Naphthalene. Accessed online at: http://toxnet.nlm.nih.gov/cgi-bin/sis/search/ Last Updated: 2005/24/06; Accessed: 2008/14/05.

IPCS; Poisons Information Monograph 363: Naphthalene. (Date of last update: September 2000). Available from: http://www.inchem.org/documents/pims/chemical/pim363.htm as of July 17, 2003.

USEPA; Toxicological Review of Naphthalene p. 7 (August 1998). Available from http://www.epa.gov/iris/toxreviews/0436-tr.pdf as of July 21, 2003.

ECOLOGICAL TOXICOLOGICAL PROPERTIES

Wildlife Toxicity

Chronic inflammation of the lung, chronic nasal inflammation, hyperplasia of the respiratory epithelium in the nose, and metaplasia of the olfactory epithelium were reported in mice chronically exposed to naphthalene via inhalation (EPA, 2000).

Plant Toxicity

Naphthalene is selectively phytotoxic (HSDB, 2005).

REFERENCES

HSBD (Hazardous Substances Data Bank). 2005. Substance File: Naphthalene. Accessed online at: http://toxnet.nlm.nih.gov/cgi-bin/sis/search/ Last Updated: 2005/24/06; Accessed: 2009/11/06.

U.S. EPA Hazard Summary – Naphthalene. Accessed online at: http://www.epa.gov/ttn/atw/hlthef/naphthal.html#ref3 Last updated: January, 2000. Accessed: 2009/11/06.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE	RfC	0.003 mg/m^3	MOE 2008 draft rationale document
Tier 2: AAQC	AAQC	22.5 µg/m^3 (24 hour)	O. Reg. 419, Schedule 3
Tier 3: IRIS	RfC	0.003 mg/m^3 or 8.57E-04 mg/kg-d	IRIS 1998
	RfD*	0.02 mg.kg-d	IRIS 1998
Tier 4: ATSDR*	MRL	0.003 mg/m^3	ATSDR 2005
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}		
Tier 6: CCME			
Tier 7: WHO			
Tier 8: RIVM			
Tier 9: Cal EPA	REL	0.009 mg/m^3	Cal EPA 2003
Tier 10: HEAST			
Tier 11: U.S. EPA	RfC	0.003 mg/m^3	NTP 1992

TRV Details

Test Species	Endpoint	Uncertainty	Primary Reference
1. Mice	Nasal lesions	300	Abdo et al. 2001
2. Rats	Decreased mean body weight (oral gavage, 13 weeks)	3000	BCL, 1980a
3. Mice	Nasal effects (inhalation, 103 weeks)	3000	NTP 1992
3. Rat*	Decreased mean body weight; NOAEL (adj) 71 mg/kg-d; Subchronic oral	3000	BCL, 1980
4. Mice*	Nasal lesions	300	Abdo et al. 2001
9. Mice	Respiratory effects	1000	NTP 1992
11. Mice	Nasal lesions	3000	NTP 1992

REVISION HISTORY	
Date	**Revised by:**
June 11, 2009	Gillian Daly
May 13, 2008	Shylene Dutt
June 24, 2010	Stephen Cioccio

*Selected TRV

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	10102-44-0
Molecular Weight	46.006g/mol
Synonyms	Nitrogen peroxide
Production and Uses	Nitrogen dioxide is used in the production of nitric acid, as a nitrating and oxidizing agent, and as an oxidizer for rocket fuels (Lewis, 1993; as cited in HSDB, 2005). Nitrogen dioxide is also a product of combustion and occurs in the exhaust from motor vehicles (Graham *et al.*, 1997; Wolff, 1991; as cited in HSBD, 2005).
Sources of Exposure	Human exposure to nitrogen dioxide can occur though ingestion or dermal contact with the liquid form, or through inhalation of gas-phase nitrogen dioxide (Gosselin *et al.*, 1984; as cited in HSDB, 2005).
Environmental Fate	Nitrogen dioxide is a red/brown gas above 21.1ºC and a brown liquid below 21.1ºC, with a pungent, irritating odour (Lewis, 1993; NIOSH, 1994; Budavari, 1996; as cited in HSDB, 2005). Nitrogen dioxide is also a product of combustion and occurs in the exhaust from motor vehicles (Graham *et al.*, 1997; Wolff, 1991; as cited in HSBD, 2005). When released to the environment, nitrogen dioxide is expected to decompose to nitric acid in moist soil surfaces and may volatilize from dry soil surfaces (Graham *et al.*, 1997; as cited in HSDB, 2005). Nitrogen dioxide is expected to decompose to nitric acid when released to aquatic systems as well (HSDB, 2005). In the atmosphere, nitrogen dioxide exists as a gas and is degraded by photochemically-produced hydroxyl radicals with an estimated half-life of 35 hours (HSDB, 2005). Nitrogen dioxide is also expected to undergo direct photolysis in the environment, leading to the production of ozone and smog conditions in the lower troposphere (Graham *et al.*, 1997; as cited in HSDB, 2005).

REFERENCES

Hazardous Substances Data Bank (HSDB). 24 Jun 2005. "Nitrogen Dioxide" http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~Vne2WM:2. Accessed: 10 Jul 2006.

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Inhalation of nitrogen dioxide usually produces no immediate symptoms other than slight cough or fatigue. The symptom-free period lasts 5-72 hours, and is followed by rapid and shallow respiration, cyanosis, coughing, pulmonary oedema, anxiety, confusion, loss of consciousness, anoxia, circulatory collapse, and an asphyxial death (Gosselin *et al.*, 1984; as cited in HSDB, 2005). Liquid nitrogen dioxide or high concentrations of nitrogen dioxide gas can react with

moisture on the skin to form nitric acid, causing severe burns (ATSDR, 2001). Ingestion of liquid nitrogen dioxide may produce gastrointestinal irritation or burns (ATSDR, 2001).

Chronic Toxicity

Long term exposure to nitrogen dioxide effects the immune system and lungs resulting in a decrease in resistance to infection (ICSC [IPCS], 2003).

Genotoxicity and Mutagenicity

No data available.

Reproductive and Developmental Toxicity

Toxic effects have been noted in human reproduction (ICSC [IPCS], 2003).

Carcinogenicity

The American Conference of Governmental Industrial Hygienists classifies nitrogen dioxide as a group A4, meaning it is not classifiable as to human carcinogenicity (HSDB, 2005)

Sensitive Subpopulations

Asthmatics and patients with chronic obstructive pulmonary disease (COPD) are sensitive to NO_2 exposure.

REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). "Nitrogen Oxides". Managing Hazardous Material Incidents (MHMI). Volume III. (2001). 10 Jul 2006 http://www.atsdr.cdc.gov/MHMI/mmg175.html

Hazardous Substances Data Bank (HSDB). 24 Jun 2005. "Nitrogen Dioxide" http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~Vne2WM:2. Accessed: 10 Jul 2006.

IPCS; International Safety Chemical Cards- Nitrogen Dioxide. Accessed online at: http://www.inchem.org/documents/icsc/icsc/eics0930.htm. Last updated: May 2003; Accessed 2008/12/06.

ECOLOGICAL TOXICOLOGICAL PROPERTIES

Wildlife Toxicity

Cats, guinea pigs, mice, rats and rabbits died from asphyxiation resulting from pulmonary edema induced by irritation of the lung tissue when exposed to 100 to 1000 ppm NO_2 (Patty, 1963; as cited in HSDB, 2005). The lungs of beagles developed emphysema like lesions when exposed to 25 ppm NO_2 for 6 months (Doull, *et al*., 1986; as cited in HSDB, 2005). When squirrel monkeys where exposed to 50 ppm NO_2 for 2 hours, primary lesions in the alveoli were observed (Doull, *et*

al., 1986; as cited in HSDB, 2005).

Plant Toxicity

No data available.

REFERENCES

Hazardous Substances Data Bank (HSDB). 20 December 2006. "Nitrogen Dioxide" <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~R4NZqW:1>. Accessed: 15 Sept 2008.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work	-	-	MOE 2007 Draft Rationale
Tier 2: AAQC	AAQC	200 µg/m^3 (24-hour)	O. Reg. 419
		400 µg/m^3 (1-hour)	O. Reg. 419
Tier 3: IRIS	RfD/RfC	100 µg/m^3 (annual)	National Ambient Air Quality Standard
Tier 4: ATSDR	MRL	-	-
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}	-	-
Tier 6: CCME	CWS	53 ppb (annual)	National Ambient Air Quality Objectives & Guidelines
		106 ppb (24-hour)	
		213 ppb (1-hour)	
Tier 7: WHO*		200 µg/m^3 (1-hour)	Air Quality Guidelines
	*	40 µg/m^3 (annual)	
Tier 8: RIVM	-	-	-
Tier 9: Cal EPA	Acute REL	470 µg/m^3 (1-hour)	OEHHA
Tier 10: HEAST	-	-	-
Tier 11: U.S. EPA	PPRTV	-	-

TRV Details

Agency	Test Species	Study Details	Uncertainty	Primary Reference
Ontario AAQCs	NA	Health-based	NA	NA
IRIS RfC -NAAQS	NA	Health-based	NA	NA
CWS	NA	Health-based	NA	NA
WHO*	Human clinical data	Airway responsiveness and respiratory symptoms; 0.2-0.3ppm LOAEL;	-	Based on several studies
Cal EPA Acute REL		Increased airway reactivity in asthmatics; NOAEL= 0.25ppm	1	California Air Resources Board, 1992

REFERENCES

(CARB) California Air Resources Board. Review of the one-hour ambient air quality standard for nitrogen dioxide technical support document. Sacramento: State of California Air Resources Board Technical Support Division; December 1992.

REVISION HISTORY

Date	Revised by:
September 15, 2008	Stephen Cioccio/Rachel Saldanha
June 24, 2010	Stephen Cioccio

NA=Not Available

*Selected TRV

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	N/A
Molecular Weight	N/A
Synonyms	PM, particulates
Production and Uses	Particulate matter includes organic chemicals, dust, smoke, soot, fly ash and diesel exhaust. Sources of PM include: soil, forest fires, pollen, spores, livestock, motor vehicle exhaust, factories, incinerators, power plants and both tobacco and cooking smoke.
Sources of Exposure	Most particulates are formed during fossil fuel combustion. The majority of exposure occurs via inhalation.
Environmental Fate	Particulates in the atmosphere are removed by wet and dry deposition. Dry conditions and wind cause particulates to become suspended in the atmosphere again.

REFERENCES

ATSDR (Agency for Toxic Substances and Disease Registry). Community based Air Monitoring Effort. Accessed online at: http://www.atsdr.cdc.gov/sites/mirant/Final_ATSDR_Activities_in_Alex.pdf. Last Updated: June 2007. Accessed: 2008/08/07.

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Acute exposure to PM_{10} results in increased respiratory function impairment and respiratory disease. Increased levels of $PM_{2.5}$ are associated with an increase in daily mortality and an increased number of cardio-respiratory hospitalizations. Respiratory infections, recurrent sinus infections and inflammations, eye irritation and respiratory congestion are common symptoms (Scott, R., 1998; as cited in ASTDR, 2008).

Chronic Toxicity

Long term exposure to PM_{10} can cause decreased lung function and increased respiratory illness. Long term exposure to $PM_{2.5}$ has also be shown to decrease lung function and increase respiratory symptoms. $PM_{2.5}$ is also able to penetrate more deeply into the lungs, in comparison to PM10. In children, an increase in mortality, intrauterine growth reduction or pre-term delivery was observed. Also, PM's may lead to asthma, as they trigger a specific biochemical reaction that causes an allergic inflammation, commonly seen in those with asthma (CARB, 2001).

Genotoxicity and Mutagenicity

No data available.

Reproductive and Developmental Toxicity
Adverse consequences have been noted in the mother, fetus and infant from prolonged exposure to particulate matters. Studies show a relationship between pre-term birth or low birth weight and particulate matter exposure (Dejmek *et al*., 1999; as cited in CARB, 2001).
Carcinogenicity
Long-term exposure to combustion-related fine particulate air pollution is an important environmental risk factor for cardiopulmonary and lung cancer mortality (Arden *et al*., 2002; as cited in WHO, 2004)
Sensitive Subpopulations
Children and those with existing respiratory diseases are at special risk. Children have higher activity levels and are thus more likely to have an increase in personal exposure.

REFERENCES

CARB (California Air Resources Board). Particulate Matter and Sulphate: evaluation of current California Air Quality Standards with respect to Protection of Children. September 2001. Available: ftp://ftp.arb.ca.gov/carbis/ch/ceh/001207/pmsul.PDF. Accessed: July 8, 2008.

C. Arden Pope III; Richard T. Burnett; Michael J. Thun; Eugenia E. Calle; Daniel Krewski; Kazuhiko Ito; George D. Thurston. "Lung Cancer, Cardiopulmonary Mortality, and Long-term Exposure to Fine Particulate Air Pollution." JAMA 287:9 (2002) 1132-1141. <http://jama.ama-assn.org/cgi/reprint/287/9/1132> Accessed: 09 Sept. 2008.

World Health Organization (WHO). 14 April 2005. "Fact sheet EURO/04/05 - Particulate matter air pollution: how it harms health" <http://www.euro.who.int/document/mediacentre/fs0405e.pdf> Accessed: 09 Sept. 2008.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work	-	-	MOE 2007 Draft Rationale
Tier 2: AAQC*	AAQC	30 µg/m^3 (24-hour) $PM_{2.5}$	Canada-wide standard (98th percentile measurement)
		*50 µg/m^3 (24-hour) PM_{10}	Interim AAQC
Tier 3: IRIS/US EPA	RfD/RfC	-	-
	NAAQS	150 µg/m^3 (24-hour) PM_{10}	
		15 µg/m^3 (Annual arithmetic mean) $PM_{2.5}$	
		35 µg/m^3 (24-hour) $PM_{2.5}$	
Tier 4: ATSDR	MRL	-	-
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}	-	-
Tier 6: CCME*	CWS	*30 µg/m^3 (24-hour) $PM_{2.5}$	(Target for 2010)
Tier 7: WHO	-	-	-
Tier 8: RIVM	-	-	-
Tier 9: Cal EPA	AAQS	20 µg/m^3 (annual) PM_{10}	OEHHA; California Air Resources Board
	AAQS	50 µg/m^3 (24-hour) PM_{10}	
		12 µg/m^3 (annual) $PM_{2.5}$	
Tier 10: HEAST		Same as U.S. NAAQS	
Tier 11: U.S. EPA	PPRTV	-	-

TRV Details

Agency	**Test Species**	**Study Details**	**Uncertainty**	**Primary Reference**
Ontario AAQC	NA	Health-based	NA	NA
IRIS-NAAQS	NA	Health-based	NA	NA
CWS	NA	Health-based	NA	NA
Cal EPA	NA	Health-based	NA	NA

REVISION HISTORY	
Date	**Revised by:**
September 09, 2008	Stephen Cioccio/Rachel Saldanha
June 24, 2010	Stephen Cioccio

*Selected TRV

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	7446-09-5
Molecular Weight	64.065g/mol
Synonyms	Sulfurous oxide, Sulfurous anhydride, Sulfur oxide
Production and Uses	Sulphur dioxide is a colourless gas with a strong, suffocating odour (Budavari, 1996; as cited in HSDB, 2005). Sulphur dioxide is used as a chemical intermediate, for sterilization, bleaching, and fruit preservation (Budavari, 1996; as cited in HSDB, 2005).
Sources of Exposure	Human exposure to sulphur dioxide can occur via exposure to sulphur dioxide as a gas or as a liquefied compressed gas (Grant, 1986; as cited in HSBD, 2005).
Environmental Fate	Since sulphur dioxide is a gas, it is unlikely for sulphur dioxide to remain in soil or water when released to the environment. Although snow covered surfaces are inefficient receptors of sulphur dioxide, accumulation may occur during the winter causing short-term inputs of high sulphate, low pH water to freshwater systems during the spring melt (Monitoring and Assessment Research Center, 1978; as cited in HSDB, 2005). Sulphur dioxide released into the atmosphere is removed by wet and dry deposition. Wet and dry deposition appears to be of similar importance on an annual basis. Dry deposition occurs all the time near the source location and wet deposition can occur farther away but only periodically (Monitoring and Assessment Research Center, 1978; as cited in HSDB, 2005).

REFERENCES

Hazardous Substances Data Bank (HSDB). 24 Jun 2005. "Sulphur Dioxide" http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~jOlCno:1. Accessed: 11 Jul 2006.

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Liquefied sulphur dioxide can cause immediate and severe eye injury upon contact (Grant, 1986; as cited in HSBD, 2005). Dermal exposure to sulphur dioxide produces irritation, urticaria, lesions, and burns to the exposed area (Environment Canada, 1985; as cited in HSDB, 2005). Acute inhalation exposure to sulphur dioxide produces sneezing, coughing, respiratory irritation, bronchospasm, acidosis, and, at very high concentrations, death due to respiratory depression (Thienes and Haley, 1972; as cited in HSDB, 2005).

Chronic Toxicity

Symptoms of long term exposure to low concentrations of sulphur dioxide include chronic bronchitis, emphysema, reduction in pulmonary function, nervous system disorders, and dental destruction (International Labour Office, 1983; Sullivan and Krieger, 1992; as cited in HSDB, 2005). Other reported effects of chronic exposure to sulphur dioxide include alteration of sense of taste and smell, and destruction of ciliated lung epithelium which can lead to an invasion of bacteria (Patty, 1963; Hamilton and Hardy, 1974; as cited in HSDB, 2005). Ingestion of sulphur dioxide causes irritation, lacrimation, iritis, burns, corneal damage, and blindness (Environment Canada, 1985; as cited in HSDB, 2005).

Genotoxicity and Mutagenicity

It has been noted that Sulphur dioxide induced sister chromosomal aberration in human lymphocytes. It also induced gene mutation in yeast, bacteria and phage (IARC[IPCS], 1992].

Reproductive and Developmental Toxicity

No data available.

Carcinogenicity

The International Agency for Research on Cancer (IARC) has classified sulphur dioxide as a Group 3 substance, meaning it is not classifiable as to its carcinogenicity to humans. This is based on inadequate evidence of carcinogenicity in humans and limited evidence for the carcinogenicity of sulphur dioxide to animals. However, in population-based case-control study from Canada, results suggested an increased risk for stomach cancer in men exposed to sulphur dioxide. In female mice, an increase in lung cancer was observed (IARC [IPCS], 1992).

Sensitive Subpopulations

Individuals suffering from asthma and cardiovascular disease are at special risk (Doull *et al.*, 1987; as cited in HSDB, 2005).

REFERENCES

Hazardous Substances Data Bank (HSDB). 24 Jun 2005. "Sulphur Dioxide" http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~jOlCno:1. Accessed: 11 Jul 2006.

IPCS, International Agency for Research on Cancer (IARC). Summary of Data Reported and Evaluation –Sulphur Dioxide(1992): 54; Accessed: 2008/17/06; Available online: http://www.inchem.org/documents/iarc/vol54/02-sulfur-dioxide.html.

IPCS; International Safety Chemical Cards- Sulphur Dioxide. Accessed online at: http://www.inchem.org/documents/icsc/icsc/eics0074.htm. Last updated October 2006;

Accessed 2008/17/06.

ECOLOGICAL TOXICOLOGICAL PROPERTIES

Wildlife Toxicity

Pigs exposed to 5-40 ppm sulphur dioxide for 8 hours showed eye and respiratory tract irritation. Pulmonary haemorrhages and emphysema were also seen (Clarke, et at., 1981; as cited in HSDB, 2005). Dogs exposed to 1300-1560 mg/m3 for 2 hr periods twice weekly for 4 to 5 months showed an increase in goblet cells near the ends of bronchi and bronchioles, and hyperplasia of bronchial glands. It was concluded that sulphur dioxide produces chronic bronchitis in dogs (Chakrin, *et al*., 1977; as cited in HSDB, 2005). Rats were exposed for 96 days to concentrations of 0.1, 0.5, and 1.5 mg/m3 and histological examination showed interstitial pneumonia, bronchitis, tracheitis, and peribronchitis at the two higher levels (Elfimova, *et al*., (1969); as cited in HSDB, 2005).

Plant Toxicity

Green plants are extremely sensitive to atmospheric sulphur dioxide. Concentrations between 0.15 – 0.20 ppm can injure alfalfa, barley, cotton, and wheat. Potatoes, onions, and corn are far more resistant to injury (Seiler, *et al*., 1988; as cited in HSDB, 2005).

REFERENCES

Hazardous Substances Data Bank (HSDB). 24 June 2005. “Sulphur Dioxide” <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~GxHY8N:1>. Accessed: 15 Sept 2008.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work		-	MOE 2007 Draft Rationale
Tier 2: AAQC	AAQC	690 µg/m^3 (1-hour); 275 µg/m^3 (24-hour); 55 µg/m^3 (annual)	Health and vegetation effects
Tier 3: IRIS	RfD	-	-
Tier 4: ATSDR	MRL	0.01 ppm	ATSDR 2008
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}	-	-
Tier 6: CCME	CWS	23ppb (annual); 115ppb(24-hour); 334ppb(1-hour)	NAAQSs
Tier 7: WHO*	AAQ	500 µg/m^3 (10-minute); 125 µg/m^3 (24-hour); *50 µg/m^3 (annual)	Air Quality Guidelines for Europe Second Edition
Tier 8: RIVM	-	-	-
Tier 9: Cal EPA		660 µg/m^3 (1-hour)	California Office of Environmental Health Hazard Assessment
Tier 10: HEAST	-	-	-
Tier 11: U.S. EPA	PPRTV	-	-

TRV Details

Agency	Test Species	Study Details	Uncertainty	Primary Reference
Ontario AAQCs	NA	Health-based	NA	NA
ATSDR	Humans	No specific data were identified regarding the oral toxicity of sulphur dioxide to human health. An MRL of 0.01ppm was reported for effects on respiration in humans exposed to sulphur dioxide for duration of 10 minutes via inhalation. Significant increases in airway resistance during moderate exercise were observed. An uncertainty factor of 9 was applied to the LOAEL.	9	Sheppard *et al*., 1981
CCME	NA	NA	NA	Health Canada, National Ambient air Quality Objectives
WHO*	Humans	Exposure and epidemiological studies.	NA	Multiple studies as cited WHO, 2000

Cal EPA	Humans	adverse respiratory effects, bronchoconstriction	1	multiple studies as cited in OEHHA, 1994

REFERENCES

OEHHA (Office of Environmental Health Hazard Assessment). Recommendation for the one hour Ambient Air Quality Standard for sulfur dioxide. Draft recommendation made to the California Air Resources Board, May, 1994.

WHO (World Health Organization). Air Quality Guidelines for Europe, Second Edition. Copenhagen, 2000.

REVISION HISTORY

Date	**Revised by:**
June 17, 2008	Shylene Dutt
September 10, 2008	Stephen Cioccio/Rachel Saldanha
June 24, 2010	Stephen Cioccio

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	108-88-3
Molecular Weight	92.14
Synonyms	Methylbenzene, phenylmethane
Production and Uses	Toluene is mainly released in the environment due to automobile exhaust, as toluene is a component of gasoline. It may also be found in several household items such as nail polish remover, paint thinner, and adhesives (ATSDR, 2000).
Sources of Exposure	Exposure to toluene can occur via inhalation, ingestion in food and drinking water, and absorption through the skin.
Environmental Fate	Toluene is a liquid at room temperature, but volatilizes quickly, even when released into water or soil (ATSDR 2000). Toluene also biodegrades rapidly in soil, with a half-life as low as several hours. Vapour-phase toluene in the atmosphere is degraded quickly with an estimated half-life of 3 days.

REFERENCES

Aronson D et al. Aerobic biodegradation of organic chemicals in environmental media: a summary of field and laboratory studies. USEPA (1999);
Atkinson R. J Phys Chem Ref Data Monograph 2 (1994);
ATSDR (Agency for Toxic Substances and Disease Registry). 2000. *Toxicological profile for Toluene*. Accessed online at: http://www.atsdr.cdc.gov/toxprofiles/tp56.html Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service;
NIOSH. National Occupational Exposure Survey (NOES) (1983);

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Toluene is primarily a central nervous system depressant; its effects are reversible and are also seen on the liver and kidneys (Benignus, 1981). Exposure to low doses of toluene results in dizziness, exhilaration, and confusion; higher doses result in incoordination, ataxia, unconsciousness, and lead to death (Benignus, 1981). Toluene vapours are considered eye and upper respiratory tract irritants, and are associated with dizziness, headache, ataxia, and respiratory distress (U.S. Coast Guard, 1984). Aspiration of toluene is associated with coughing, and eventually pulmonary edema (U.S. Coast Guard, 1984). Ingestion results in vomiting, diarrhea, and depressed respiration (U.S. Coast Guard, 1984).

Chronic Toxicity

Rats exposed to 30 or 300 ppm toluene 6 hours/day, 5 days/week for 4 weeks showed istopathological changes in the tracheal epithelium (Poon et al. 1994). Rats exposed to 600 ppm for 5 weeks, 7 hours/day showed irritation of the lung and rats exposed to 2,500 and 5,000 ppm had pulmonary lesions (von Oettingen et al. 1942; as cited in ATSDR, 2000). Signs of respiratory distress or histological abnormalities were not observed in the lungs of mice exposed to 4,000 ppm 3 hours/day, for 8 weeks, or in rats and mice exposed to12,000 ppm for seven 10-minute periods per day separated by a 20-minute recovery period (Bruckner and Peterson 1981; as cited in ATSDR, 2000).

Genotoxicity and Mutagenicity

Toluene exposure *in vitro* did not increase the number of sister-chromatid exhanges or the number of chromosomal aberrations.

Reproductive and Developmental Toxicity

Exposure to toluene causes effects similar to fetal alcohol syndrome, fetal toxicity, and teratogenicity.

Carcinogenicity

Toluene is not classifiable as to its carcinogenicity (Group 3) according to IARC (IARC 1999). This is based on inadequate data on carcinogenicity in humans, and evidence that suggests a lack of carcinogenicity in animals. This concurs with the U.S. EPA's evaluation of toluene as an unclassifiable human carcinogen (U.S. EPA, 2005). ACGIH also cannot classify toluene with respect to carcinogenicity; it is a group A4 carcinogen (ACGIH, 2000).

Sensitive Subpopulations

Individuals with central nervous systems and liver diseases are at special risk.

REFERENCES

American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values and Biological Exposure Indices. 6th ed. Volumes I, II, III. Cincinnati, OH: ACGIH, 1991., p. 1575;

ACGIH (American Conference of Governmental Industrial Hygienists). 2000. *TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices for 2000*. Cincinnati, OH: 2000;

Benignus, V.A. 1981. Neurobehavioral effects of toluene: a review. Neurobehavioral Toxicology and Teratology, 3(4):407-415;

Ellenhorn, M.J., S. Schonwald, G. Ordog, J. Wasserberger. Ellenhorn's Medical Toxicology: Diagnosis and Treatment of Human Poisoning. 2nd ed. Baltimore, MD: Williams and Wilkins, 1997., p. 166;

Gerner-Scmidt P, Friedrich U. Mutation Research 58: 313 (1978);

IARC (International Agency for Research on Cancer). 1999. *Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man*. Geneva: World Health Organization, International Agency for Research on Cancer, volume 71 p. 522;

ITII. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute, 1988., p. 526;

U.S. Coast Guard, Department of Transportation. 1984. *CHRIS – Hazardous Chemical Data*. Volume II. Washington, D.C.: Government Printing Office;

U.S. EPA (United States Environmental Protection Agency). 2005a. IRIS Substance File – Toluene (CASRN 108-88-3). URL: http://www.epa.gov/iris/. Last Revised 09/23/2005. Accessed 02/23/2007;

ECOLOGICAL TOXICOLOGICAL PROPERTIES

Wildlife Toxicity

Toluene exposure acutely impairs cognitive function in macaque monkeys at concentrations above 7500 mg/m^3 (D. EPA, 2001). Behavioural effects have been reported in acute inhalation studies on rats (D. EPA, 2001). A chronic NOAEC of 1125 mg/m^3 has been reported in a 2-year rat study (D.EPA, 2001).

Plant Toxicity

Short-term exposure to toluene (i.e. 15 – 30 min) in the air at concentrations above 6.4 g/m^3 resulted in leaf damage to barley, tomato and carrots (D.EPA, 2001). In studies on tomato, sunflower, soya, sugar beet and wheat with a 3-hour exposure time, visible effects occurred at toluene air concentrations between 15 and 50 g/m^3, effects on growth at 1 g/m^3 and on photosynthesis at 3.6 g/m^3 (D.EPA, 2001).

Overall, the studies of plant toxicity based on exposure to gaseous toluene indicate negligible effect except at very high concentrations.

REFERENCES

Danish Environmental Protection Agency (D.EPA). Risk Assessment – Toluene. EINECS-No.:203-625-9. Final Report, March 2001.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work	RfD / RfC	0.08 mg/kg-day 5 mg/m^3	MOE 2007 Draft Rationale
Tier 2: AAQC	AAQC	2000 µg/m^3 (24-hour)	O. Reg. 419
Tier 3: IRIS*	RfC	5000 µg/m^3 or 1.43 mg/kg-day	US EPA,2005
Tier 4: ATSDR	Acute MRL	1ppm= 1.1mg/kg-day	ATSDR, 2000
	Chronic MRL	0.08ppm= 0.09mg/kg-day	ATSDR, 2000
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}	3800 µg/m^3/1.1mg/kg-day	Health Canada PQRA, 2004
Tier 6: CCME	CWS	n/a	n/a
Tier 7: WHO		26 µg/m^3/7.4E-03 mg/kg-day	Air Quality Guidelines, 2000
Tier 8: RIVM	Tolerable Concentration in Air	400 µg/m^3/0.11mg/kg-day	RIVM, 2001
Tier 9: Cal EPA	Acute REL	37,000 µg/m^3 / 10.6 mg/kg-day	OEHHA, 2008
	Chronic REL	300 µg/m^3/ 0.09mg/kg-day	OEHHA, 2008
Tier 10: HEAST	n/a	n/a	n/a
Tier 11: U.S. EPA	PPRTV	n/a	n/a

TRV Details

Agency	**Test Species**	**Study Details**	**Uncertainty**	**Primary Reference**
US EPA IRIS RfC	Human*	Based on an adjusted NOAEL of 46,000 µg/m^3 for neurological effects in exposed workers	10	Based on 10 occupational exposure studies: Abbate *et al.*, 1983; Boey et al., 1997; Cavalleri et al., 2000; Eller et al., 1999; Foo et al., 1990; Murata et al., 1993; Nakatsuka et al., 1992; Neubert et al., 2001; Vrca et al., 1995; Zavalic et al., 1998a
ATSDR Acute MRL	Human	Based on NOAEL for neurological effects in humans	n/a	Andersen *et al.*, 1983
ATSDR Chronic MRL	Human	Based on LOAEL for neurological effects in humans	n/a	Zavalic *et al.*,1998
Health	Human	Based on a NOAEL of	10	Andersen *et al.*,

Canada TC		150 mg/m3 for decrease in neurological function, increase of neurological symptoms and irritation of the respiratory tract (Supported by animal study by NTP, 1990)		1983
WHO	Human	Based on a LOAEL of 332mg/m^3 for central nervous system effects from occupational studies	300	Foo *et al.,* 1990; Foo *et al.,* 1993
RIVM TCA				*Adopted from US EPA*
Cal EPA Acute REL	Human	Based on NOAEL of 40ppm, LOAEL of 100ppm for impaired reaction time and symptoms of headache, dizziness, a feeling of intoxication and slight eye and nose irritation in humans exposed for 6 hours	10	Andersen *et al.*, 1983
Cal EPA Chronic REL	Male Sprague-Dawley Rats	Based on a LOAEL of 80ppm and a NOAEL of 40ppm for neurological effects of decreased brain weight and altered dopamine receptor in rats exposed 6 hr/d, 5d/wk for 4 weeks and supported by an occupational exposure study with a LOAEL of 88ppm for neurobehavioural deficits in 6 of 8 tests	100	Hillefors-Berglund *et al*. (1995); supported by Orbaek and Nise (1989), Foo *et al.* (1990)

REVISION HISTORY	
Date	**Revised by:**
17 July 2007	Gillian Daly
January 24, 2008	Gavin Anderson
April 24, 2009	R. Saldanha
June 24, 2010	S. Cioccio

n/a = not available
*Selected TRV

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	67-64-1
Molecular Weight	106.16
Synonyms	
Production and Uses	Xylene exists as three isomers: *m*-xylene, *o*-xylene, and *p*-xylene. They are referred to collectively as xylene. Xylene does not occur naturally in the environment, except as a by-product of forest fires or as constituents of petroleum that seep into oceans (ATSDR, 1995). It is mainly released into the environment through automobile exhaust and volatilization of released solvents (ATSDR, 1995).
Sources of Exposure	Humans mainly come into contact with xylene through inhalation, as it volatilizes readily from surfaces; however, xylene that leaches into groundwater from soil may persist for several years (ATSDR, 1995).
Environmental Fate	

REFERENCES

ATSDR (Agency for Toxic Substances and Disease Registry). 1995. *Toxicological profile for Xylenes* (Draft submitted for public comment). Accessed online at: http://www.atsdr.cdc.gov/toxprofiles/tp71.html Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Xylene acts as a central nervous system depressant, and is associated with dizziness, nausea, headache, and ataxia at low doses. At higher doses, confusion, respiratory depression and coma are apparent (Ellenhorn and Barceloux 1988). Initially, xylene exposure results in CNS excitation, followed by depression, which is characterized by paresthesia, tremors, vertigo, anorexia, and nausea (Clayton and Clayton, 1982). Inhalation of low doses produces conjunctivitis, nasal irritation, and sore throat; at higher doses, xylene is a potent respiratory tract irritant (Ellenhorn and Barceloux, 1988). A case in which painters were exposed to paint fumes in an enclosed ship compartment for 18 hours resulted in one death; two individuals were comatose. The survivors developed no long-term sequelae, though transient increase in hepatic animotransferase and reversible renal failure were observed (Ellenhorn and Barceloux, 1988). It is estimated that concentrations of xylene up to 10,000 ppm were present (Ellenhorn and Barceloux, 1988).

Chronic Toxicity

Chronic occupational exposures to vapours of mixed xylene are associated with laboured breathing and impaired pulmonary function (Hipolito 1980; Roberts et al. 1988; as cited in ATSDR, 2007). A significant increase in the prevalence of nose and throat irritation was reported by workers chronically exposed to mixed xylene vapors at a geometric mean TWA concentration of 14 ppm (Uchida et al. 1993). Respiratory effects noted in humans have also been observed in studies in rats, mice and guinea pigs (Carpenter et al. 1975a; De Ceaurriz et al. 1981; Furnas and Hine 1958; Korsak et al. 1990; as cited in ATSDR, 2007). Chronic occupational exposure to xylene in a mixture of chemical agents has resulted in complaints of heart palpitations, chest pain, and an abnormal electrocardiogram (ECG) (Hipolito 1980; Kilburn et al. 1985). The contribution of other chemicals in the mixture must also be considered however. Intermediate duration exposures to mixed or *o*-xylene results in effects to the liver as observed in rats, mice and guinea pigs.

Genotoxicity and Mutagenicity

Evaluations of the genotoxic effects of xylenes has consistently yielded negative results (US EPA IRIS, 2003).

Reproductive and Developmental Toxicity

In women exposed to xylene vapour, menstrual and pregnancy disturbances have been noted, such as menorrhagia and metrorrhagia; pregnancy disorders include toxicosis, increased risk of miscarriage, and hemorrhage during birth (International Labour Office, 1983).

Carcinogenicity

Due to inadequate evidence of carcinogenicity in both humans and animals, xylene is not classifiable as a human carcinogen (Group 3) (IARC, 1999). The U.S. EPA also cannot classify xylene with respect to carcinogenicity (Group D); this is based on no data in humans, and a lack of carcinogenicity in oral studies in rats (U.S. EPA, 2003). Xylene is considered a group A4 carcinogen by ACGIH (ACGIH, 2000). Group VI –unlikely to be carcinogenic to humans (Health Canada, 1996).

Sensitive Subpopulations

Pregnant women, fetuses, and very young children may be at greater risk of adverse health effects from xylene exposure than the population in general (Barlow and Sullivan 1982; Holmberg and Nurminen 1980; Hudak and Ungvary 1978; Kucera 1968; Marks et al. 1982; Mirkova et al. 1983; Ungvary et al. 1980b, 1981; as cited in ATSDR, 2007). People with subclinical and clinical epilepsy are at increased risk of seizures if exposed to xylene because of its excitatory central nervous system effects (ATSDR, 2007).

REFERENCES

Agency for Toxic Substances Disease Registry (ATSDR). 2007 Toxicological Profile for Xylenes. Department of Health & Human Services. Accessed on April 24, 2009: http://www.atsdr.cdc.gov/toxprofiles/tp71.pdf

Ellenhorn, M.J. and D.G. Barceloux. 1988. *Medical Toxicology - Diagnosis and Treatment of Human Poisoning*. New York, NY: Elsevier Science Publishing Co., Inc., p. 986.

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IARC (International Agency for Research on Cancer). 1999. *Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man*. Geneva: World Health Organization, International Agency for Research on Cancer, volume 71 p. 522.

U.S. EPA (United States Environmental Protection Agency). 2003b. IRIS Substance File – Xylenes (CASRN 1330-20-7). URL: http://www.epa.gov/iris/. Last Revised 02/21/2003. Accessed 02/23/2007.

ACGIH (American Conference of Governmental Industrial Hygienists). 2000. *TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices for 2000.* Cincinnati, OH: 2000.

ECOLOGICAL TOXICOLOGICAL PROPERTIES

Wildlife Toxicity

A study on Japanese quail identified a NOAEL of 5000 mg/kg and an LC50 of 20 000 mg/kg diet in a 5-day dietary study (WHO, 1997). Exposure of guinea pigs to o-xylene at concentrations up

to 780 ppm for 8 h/day, 5 days/week for 6 weeks resulted in a decrease in body weight but no effects on the liver, kidney, heart, spleen or lungs based on a histological examination (WHO, 1997). Chronic rat inhalation studies have found liver cell changes and decreased spontaneous motor activity (WHO, 1997).
Plant Toxicity
A reduction in growth and photosysnthesis have been observed in algae exposed to xylenes in water at concentrations above 3 mg/L (WHO, 1997).
REFERENCES
World Health Organization (WHO). 1997. IPCS – INCHEM. Xylenes – Environmental Health Criteria; 190.

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work	Chronic RfC	700 µg/m^3/ 0.2mg/kg-day	Cal EPA Chronic REL; as cited in MOE 2007 Draft Rationale
Tier 2: AAQC	AAQC	730 µg/m^3	O. Reg. 419
Tier 3: IRIS*	RfC	100µg/m^3 or 0.0286 mg/kg/day	IRIS, 2003
Tier 4: ATSDR	Acute MRL	2ppm/7.0 mg/kg-day	ATSDR, 2007
	Intermediate	0.6ppm/ 0.7 mg/kg-day	ATSDR, 2007
	Chronic MRL	0.05ppm/ 0.06 mg/kg-day	ATDSR, 2007
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}	0.18mg/m^3	Health Canada PQRA, 2004
Tier 6: CCME	CWS	n/a	n/a
Tier 7: WHO	Air Quality Guidelines (2nd ed.)	n/a	n/a
Tier 8: RIVM	Tolerable concentration in air (TCA)	870 µg/m^3	Maximum Permissable Risk Levels, 2001
Tier 9: Cal EPA	Acute REL	22,000 µg/m^3/ 6.3 mg/kg-day	OEHHA, 2008
	Chronic REL	700 µg/m^3/ 0.2mg/kg-day	OEHHA, 2008
Tier 10: HEAST	n/a	n/a	n/a
Tier 11: U.S. EPA	PPRTV	n/a	n/a

TRV Details

Agency	Test Species	Study Details	Uncertainty	Primary Reference
IRIS RfC*	Rats (male)	Based on a LOAEL of 50ppm (39mg/m^3) and a NOAEL of 100ppm (78 mg/m^3) for impaired motor coordination for rats exposed 6 hr/day, 5d/wk for 3 months to 0, 50 or 100 ppm *m*-xylene	300	Korsak *et al.*, 1994
ATSDR Acute MRL	Human	Based on LOAEL of 50ppm (217 mg/m3) for mild respiratory effects and subjective neurological effects; 2-hour exposure; *m*-xylene	30	Ernstgard *et al.*, 2002
ATSDR	Rat	Based on on LOAEL of 50ppm	90	Korsak *et al.*, 1992

Int MRL		(217 mg/m3) for latency of paw-lick response in males rats exposed to *m*-xylene for 6 h/day, 5d/wk for 3 months		
ATSDR Chronic MRL	Human	Based on LOAEL of 14ppm for mild subjective respiratory and neurological symptoms in workers exposed to 70% xylene 8 hr/day, 5 d/wk for 1to 7 years	300	Uchida *et al.*, 1993
Health Canada TC	Rats	Based on LOAEL of mg/m^3 for maternal effects and fetal skeletal retardation; continuous exposure for 7-15 days of gestation; compositionof compound not specified	1000	Ungvary and Tatrai, 1985
RIVM	Rat	Based on a LOAEL of 870 mg/m^3 for adverse effects on CNS development in offspring of rats.	1000	Hass and Jakobsen, 1993; IPCS, 1997
Cal EPA	Human	Based on LOAEL of 860 mg/m^3 and NOAEL of 430 mg/$m^3$for subjective reports of eye, nose and thoat irritation in subjects exposed for 30 minutes to 430, 860 or 1720 mg/m^3 xylene (technical grade)	10	Hastings *et al*., 1984 (with support from Carpenter et al., 1975; Nelson *et al*., 1943)
Cal EPA	Human	Based on LOAEL of 14.2ppm for dose-related increase in the prevalence of eye irritation, sore throat, floating sensation and poor appetite in occupationally exposed subjects 8 h/d, 5d/wk for an average of 7 years	30	Uchida *et al.*, 1993

REVISION HISTORY	
Date	**Revised by:**
17 July 2007	Gillian Daly
24 April 2009	R. Saldanha
24 June 2010	Stephen Cioccio

n/a=not available

*Selected TRV

PHYSICAL / CHEMICAL PROPERTIES	
CAS #	7440-66-6
Molecular Weight	65.39
Synonyms	
Production and Uses	Used as a protective coating for metals, in electrical batteries, in building materials, automotive equipment, household utensils, and in electrical apparatus (O'Neil, 2001)
Sources of Exposure	
Environmental Fate	Zinc is a naturally-occurring metal in the earth's crust, and it can be released by both natural and anthropogenic sources. Zinc is most often found in elevated amounts in soil, and the source may be coal ash. It does not readily volatilize from soil, but rather adsorbs to soil and sediment, as well as particulates in groundwater. Leaching is not common, though has been at sites of contamination. Zinc may bioconcentrate in organisms, particularly aquatic organisms such as higher crustaceans and bivalve species, but not particularly in fish. Since zinc is an essential nutrient in many microbes, the metal can be beneficial; although, the metal may also bioconcentrate in these organisms (ATSDR 1994).

REFERENCES

ATSDR (Agency for Toxic Substances and Disease Registry). 1994. Toxicological profile for zinc. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Lide, D.R. CRC Handbook of Chemistry and Physics 86TH Edition 2005-2006. CRC Press, Taylor & Francis, Boca Raton, FL 2005, p. 4-95;

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1810;

TOXICOLOGICAL PROPERTIES

Acute Toxicity

Oral ingestion of zinc resulted only in pronounced lethargy. Metal fume fever results from inhalation of zinc.

Several deaths have been reported as a result of acute exposure to zinc compounds. In particular, the explosion of many generator liberated zinc chloride into the air with an estimated concentration of 33,000 mg Zn/m3 in a tunnel as a result of a bombing raid in World War II. Out of 70 exposed people, 10 died within four days (Evans, 1945). However, less severe non-carcinogenic effects are also associated with exposure to high levels of zinc. For example,

excessive ingestion of zinc may result in copper and iron deficiencies, as well as nausea, vomiting, headache, fever, chills, malaise, and abdominal pain (AMA, 1986). In the case of a suicidal injection of zinc, symptoms such as hypotension, diarrhea, vomiting, pulmonary edema, jaundice, hyperamylasemia, oliguria, anemia, and thrombocytopenia were observed (Ellenhorn et al., 1997). Inhalation of zinc may cause throat dryness, cough, a sweet taste, nausea, vomiting, generalized aches, chills, and fever (Lewis, 1996). In addition, zinc acts as a skin irritant (Lewis, 1996).

Chronic Toxicity

Genotoxicity and Mutagenicity

Reproductive and Developmental Toxicity

There were no differences between mothers receiving zinc and controls.

Carcinogenicity

Zinc is classified as a class D carcinogen, or not classifiable with respect to human carcinogenicity (U.S. EPA, 2003). This classification is based on inadequate data in both humans and animals.

Sensitive Subpopulations

REFERENCES

American Medical Association, Department of Drugs. Drug Evaluations. 6th ed. Chicago, Ill: American Medical Association, 1986., p. 859;

Bingham, E. Cohrssen, B. Powell, C.H. Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:268;

Ellenhorn, M.J., S. Schonwald, G. Ordog, and J. Wasserberger. 1997. Ellenhorn's Medical Toxicology: Diagnosis and Treatment of Human Poisoning. Second Edition. Baltimore, MD: Williams and Wilkins, p. 1612.

Evans, E.H. 1945. Casualties following exposure to zinc chloride smoke. Lancet, 249:368-370.

Gossel, T.A., J.D. Bricker. Principles of Clinical Toxicology. 3rd ed. New York, NY: Raven Press, Ltd., 1994., p. 202;

Lewis, R.J. 1996. Sax's Dangerous Properties of Industrial Materials. Ninth Edition. Volumes 1-3. New York, N.Y.: Van Nostrand Reinhold, p. 3419.

U.S. Environmental Protection Agency's Integrated Risk Information System (IRIS) on Zinc and compounds (7440-66-6) Available from: http://www.epa.gov/ngispgm3/iris on the Substance File List as of March 15, 2000;

TOXICITY REFERENCE VALUES (HUMAN HEALTH)			
Agency	**TRV Type**	**Value**	**Reference**
Tier 1: MOE in recent vapour intrusion work			MOE 2007 Draft Rationale
Tier 2: AAQC	AAQC		
Tier 3: IRIS	RfD/RfC	RfD = 0.3 mg/kg-day RfC = 0.0857 mg/kg-day (modified from RfD using 20 m^3/day and 70 kg)	IRIS (2005) IRIS (2005)
Tier 4: ATSDR	MRL		
Tier 5: Health Canada	TC/TDI or TD_{05}/TC_{05}		
Tier 6: CCME	CWS		
Tier 7: WHO			
Tier 8: RIVM			
Tier 9: Cal EPA	RfC		
Tier 10: HEAST			
Tier 11: U.S. EPA	PPRTV		

TRV Details			
Test Species	**Endpoint**	**Uncertainty**	**Primary Reference**
3. Human	Decreases in erythrocyte Cu, ESOD activity (oral, 42-200 days)	3	Yadrick *et al*., 1989; Fischer *et al*., 1984; Davis *et al*., 2000; Milne *et al*., 2001.

REVISION HISTORY	
Date	**Revised by:**
January 29, 2008	Gavin Anderson
June 24, 2010	Andrea Amendola

APPENDIX D: PUBLIC PARTICIPATION

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APPENDIX D1: DGR COMMUNICATIONS PLANS

- Community Consultation Plan: Long-Term Low-Level Waste Management Independent Assessment Study (Golder Associates, 2003)
- Western Waste Management Facility Public Affairs 2004 Communication Plan (Ontario Power Generation, 2004)
- Nuclear Waste Management Division Integrated 2005 Public Affairs Communication and Work Plan (Ontario Power Generation, 2005)
- Nuclear Waste Management Division 2006 Communication Plan (Ontario Power Generation, 2006)
- Nuclear Waste Management Division 2007 Communication Plan (Ontario Power Generation, 2007)
- Nuclear Waste Management Division (NWMD) 2008 Communication Plan (Ontario Power Generation, 2008)
- Low & Intermediate Level Waste (L&ILW) Deep Geologic Repository (DGR) Project 2009 Communication Plan (Nuclear Waste Management Organization, 2009)
- Low & Intermediate Level Waste (L&ILW) Deep Geologic Repository (DGR) Project 2010 Communication Plan (Nuclear Waste Management Organization, 2009)

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COMMUNITY
CONSULTATION PLAN

LONG-TERM LOW-LEVEL WASTE MANAGEMENT
INDEPENDENT ASSESSMENT STUDY

Submitted to:
The Steering Committee

by:

Golder Associates

April 2003

COMMUNITY CONSULTATION PLAN

LONG-TERM LOW-LEVEL AND INTERMEDIATE LEVEL WASTE MANAGEMENT OPTIONS INDEPENDENT ASSESSMENT STUDY

Prepared by:

Golder Associates Ltd.

Approved by: _____

Dr. Duncan Moffett Date
Golder Associates Ltd.

Accepted by: _____

Mr. Larry Kramer Date
Mayor Municipality of Kincardine

Accepted by: _____

Mr. Ken Nash Date
VP, Nuclear Waste Management Division
Ontario Power Generation

TABLE OF CONTENTS

1.0 INTRODUCTION

This document sets out in detail the workplan for community consultation on a study of potential options for the long-term management of low-level waste (LLW) and short-lived intermediate level waste (ILW) at Ontario Power Generation's (OPG) Western Waste Management Facility (WWMF) on the Bruce site. The results of the study will be presented in an Independent Assessment Report (IAR). The IAR will provide decision makers with a clear and justifiable assessment of the social and economic costs and benefits of the long-term waste management options being considered. Golder Associates will prepare the IAR and implement this workplan. Golder will work with the Municipality of Kincardine and OPG to ensure all the objectives will be met. This oversight will be provided by the Steering Committee established by Kincardine and OPG to develop a long-term plan for the management of low and intermediate level waste at the WWMF.

Every effort has been made to design a consultation program that is flexible and that anticipates the needs and contingencies of a study of this nature. However, this should be considered as a living document subject to review and modification in response to events or issues as they arise and input from the participants in the consultation process. All revisions to the plan will be approved by the Steering Committee.

Key principles guiding this workplan include:

- Including all interested stakeholders and members of the community at a level of involvement suitable to their needs and interests;
- Ensuring all interested stakeholders and the community are provided with sufficient information on the low-level (LLW) and intermediate-level (ILW) waste management options;
- Providing stakeholders with an opportunity to comment on the options under consideration;
- Incorporating issue identification, tracking and management capability in recognition of the reality that issues frequently arise through increased community awareness resulting from the consultation process and the related enhanced profile of the WWMF; and
- Maintaining flexibility to respond to unanticipated issues and stakeholder input throughout the study period.

The following sections of this document set out the objectives of the community consultation plan (the "plan"), present the initial list of stakeholders known or anticipated to have an interest in the

study, describe the consultation and issue management activities, and provide an initial calendar of planned events and activities known at this time. The dates presented here are subject to change in response to stakeholder needs and other factors beyond the control of Golder and the Steering Committee.

2.0 STEERING COMMITTEE

The Municipality of Kincardine and OPG has signed a Memorandum of Understanding (MOU) to look at long-term plans for the management of LLW and ILW at the WWMF. A Steering Committee has been established to provide oversight and direction for the study of the long-term LLW management options. The Steering Committee is comprised of the Mayor, a number of councilors and the CAO of the Municipality of Kincardine and senior managers from OPG. Golder Associates' manager for the assessment study also attends meetings of the Steering Committee to report on progress on the Independent Assessment Report.

Among other things, the Steering Committee is responsible for the oversight and direction of all consultation activities being carried out for the IAR. The Steering Committee will discharge this responsibility by approving this community consultation plan and by monitoring its implementation and results throughout the study. Specifically, this entails the following:

- Reviewing and approving of all consultation materials, including Fact Sheets, Newsletters and Advertisements;
- Confirming and updating the list of the stakeholders to be consulted throughout the study;
- Accompanying and introducing Golder staff, as appropriate, at interviews, briefings and presentations on the study;
- Facilitating consultation with Municipality of Kincardine and OPG staff on the study;
- Monitoring the results of the consultation process, including receiving reports on the issues; and
- Directing additional consultation as required.

3.0 STUDY AREA

Figure 1 shows the study area for the community consultation program. It consists of the Municipality of Kincardine and contiguous municipalities. The two First Nations with treaty rights to the local waters are also included.

4.0 OBJECTIVES

The following objectives guide the activities and messages of the plan. The first five objectives are concerned with community consultation. The last three relate specifically to issue management.

- Identify affected and interested stakeholders and their communication and consultation needs. Establish a stakeholder list;
- Inform Municipality of Kincardine and OPG employees, stakeholders, the local general public and the media about the discussions on the various options and long-term plans for LLW and ILW storage at the WWMF;
- Provide opportunities for stakeholders to provide data and information as input to the IAR and to identify and discuss any concerns they may have;
- Ensure that the consultation activities for the IAR identified in this plan take into consideration and do not conflict with other consultation and communication programs undertaken by the Municipality of Kincardine and OPG;
- Document the consultation process and its outcomes;
- Identify and document issues, comments and concerns raised by stakeholders related to the study as they arise. Develop and maintain a Stakeholder Comment Database;
- Develop and co-ordinate, in conjunction with the Steering Committee, the appropriate responses to address and resolve issues as they arise; and
- Document the study related issues, responses and ultimate disposition as part of the consultation report and throughout the IAR. Report the disposition (i.e., how it affected the study) in a manner that allows all interested stakeholders to track how each issue was addressed.

5.0 STAKEHOLDERS

5.1 Identification of Stakeholders

Stakeholders will be identified from:

- Contact lists maintained by the Municipality of Kincardine and OPG;
- Response to advertisements;
- Attendance at Open Houses; and

- Suggestions from stakeholder interviewees.

Stakeholder groups and individuals will be identified in the following stakeholder categories:

1. First Nations;
2. Federal government –Local MPs, departmental and agency staff;
3. Provincial government – Local MPPs, ministry and agency staff;
4. Regional and local municipal councils, agencies and staff;
5. Community Committees;
6. Established non-governmental organizations;
7. Immediate neighbouring landowners;
8. Local businesses and agricultural community;
9. Community residents and ratepayers associations;
10. Municipality of Kincardine and OPG Employees;
11. General public;
12. Tourists; and
13. Print and Broadcast Media.

Table 1 presents an *initial* listing of stakeholders. Others will be added throughout the study process as they are identified. Stakeholders will be selected on one or more of the following grounds:

- Have a regulatory responsibility for or regulatory interest in the study;
- Reside or carry on business in a community or location near the WWMF;
- Make regular or periodic use of the area potentially affected by the study (e.g. fishing, hiking, waterfront recreation);
- Have a demonstrated interest in the environmental quality and characteristics of the area;
- Have a demonstrated economic interest in the area;

- Have social and/or cultural ties to the area;
- Have a self-declared stake in the study; or
- Are a potential source of information or input to the study.

Stakeholders will be provided with an interview or briefing on the study. Table 1 identifies whether a briefing or interview is proposed. These interviews and briefings will be conducted by Golder Associates. It is expected that Golder would be introduced by representative(s) of the Steering Committee, as appropriate. This will ensure that the context of the study is explained and the role of the Municipality of Kincardine, OPG and Golder Associates is understood.

An interview consists of formal and scheduled correspondence that involves obtaining responses/comments to specific questions and will be used as part of the socio-economic assessment component of the study.

A briefing is conducted during a less formal reception or meeting and will provide a broad overview of the study and the IAR. This form of consultation is primarily directed towards providing the information to the stakeholders and identifying their comments and/or concerns regarding the study.

5.2 Stakeholder Database

A stakeholder contact database will be developed and maintained throughout the study period. Building on the initial list of stakeholders, this database will identify the name, affiliation and contact details for each stakeholder:

- Identified in the initial stakeholder list;
- Contacted by Golder during the study, for example as a result of the interviews being conducted as part of the socio-economic assessment;
- Contacting Golder, the Municipality of Kincardine or OPG for information regarding the study; and
- Attending a study event (e.g., Open House).

Table 1: Preliminary List of Stakeholders

Stakeholder		**Interview (I) Briefing (B)**
Category	**Group**	
First Nations	❑ Chippewas of Nawash FN ❑ Saugeen First Nation	To be determined
Federal Government & Agencies	❑ MPs ❑ Canadian Nuclear Safety Commission ❑ Atomic Energy of Canada Limited ❑ Natural Resources Canada	Briefing
Provincial Government & Agencies	❑ MPPs ❑ Ministry of Environment & Energy ❑ Ministry of Natural Resources ❑ Emergency Management Ontario	Briefing
Regional & Local Government & Agencies	❑ Bruce County Council ❑ Arran-Elderslie Municipal Council* ❑ Huron-Kinloss Municipal Council* ❑ Kincardine Municipal Council* ❑ Saugeen Shores Town Council* ❑ Brockton Municipal Council* ❑ City of Owen Sound ❑ Local Chambers of Commerce ❑ Saugeen Valley Conservation Authority ❑ Regional and Local Works, Planning and Parks & Recreation Staff ❑ Medical Officer of Health ❑ Blue Water District School Board	Briefing (* Presentation at meeting of Impact Advisory Committee)

Stakeholder		Interview (I) Briefing (B)
Category	**Group**	
	❑ Ontario Provincial Police	
Community Committees	❑ Rotary Club ❑ Lions Club ❑ Lake Huron Fishing Club ❑ Optimist Club ❑ Probus Club ❑ Field Naturalists	Briefing
Non-Governmental Organizations	❑ Sierra Club of Canada/Nuclear Awareness ❑ Citizens for Renewable Energy	Interview
Neighbouring Landowners	❑ Mr. Eugene Bourgois ❑ Others to be determined	Interview
Businesses and Agriculture	❑ Bruce Municipal Telephone System ❑ Bruce Power ❑ Bruce Tropical Produce Inc ❑ Bi-Ax International Inc ❑ Bruce Agra Foods Inc ❑ Bruce Agra Dehy Inc ❑ Commercial Alcohols Inc ❑ St. Lawrence Technologies ❑ Bruce Community Development Corporation ❑ Ontario Federation of Agriculture ❑ Bruce County Cattleman's Association	Interview

Stakeholder		Interview (I) Briefing (B)
Category	**Group**	
Community Residents, and Ratepayers	❑ Inverhuron & District Ratepayers Association ❑ Bruce Pines Association ❑ Dr. Jim Cameron ❑ Others to be determined	Interview
Municipality of Kincardine and OPG Employees	❑ Society of Energy Professionals ❑ Power Workers Union ❑ Municipal Staff	Interview or briefing, as required
General Public	❑ As identified throughout the consultation	Interview or briefing, as required
Tourists	❑ To be determined (see Section 6.3.5)	Interview
Media	❑ Print ❑ Electronic	Briefing

6.0 COMMUNITY CONSULTATION PROGRAM

The following community consultation activities will be undertaken throughout the study. The consultation area will comprise, in general terms, the Municipality of Kincardine and surrounding communities, including the First Nations, as shown on Figure 1.

6.1 Notification Advertisements

Display advertisements will be placed in local media on the following occasions:

- ❑ Open House events; and
- ❑ Completion of the IAR.

Media outlets will be selected by Golder to provide broad coverage throughout the area. Golder will be responsible for advertisement design, layout and media buy. The Steering Committee will

review and approve the final advertisements prior to their distribution. The following candidate media outlets are initially identified:

Dailies: Owen Sound Sun Times

Community Papers: Kincardine News, Kincardine Independent, The Beacon Times (Saugeen Shores)

Radio: CFOS/CFPS, CIXX-FM (Owen Sound), CKNX FM 102 (Wingham)

Television: New NX (Wingham), CKCO TV (Kitchener)

A direct mail flyer announcing the Open Houses will also be drafted for mail drop distribution throughout the study area in advance of the Open Houses (see below). Golder will prepare a copy of the invitation and will be responsible for design, layout and distribution. The Steering Committee will review and approve the final invitation prior to its distribution.

6.2 Notification Letters

Notification letters will be drafted for distribution to stakeholders together with the appropriate advertisements on the following occasions:

- Commencement of the study and Open Houses; and
- IAR completion and submission.

The Steering Committee will review and approve the final notification letters prior to their distribution.

6.3 Stakeholder Contact

A series of stakeholder contact activities will be undertaken for the initial identification of stakeholder concerns and issues with respect to the study and to maintain communication throughout the study period to ensure questions and concerns are addressed in a timely fashion.

Contact activities will take the form of interviews, meetings and/or surveys.

In advance of these interviews, meetings or surveys, the following material will be prepared:

- Study information package;
- Schedule of the IAR activities; and
- Outline of proposed community consultation activities.

An agenda will be prepared for use to ensure that all relevant aspects of the study and the IAR are discussed, including:

- IAR schedule;
- The technical components to be assessed;
- Stakeholder identification;
- Community consultation activities;
- Issues and concerns;
- Upcoming events and activities of interest; and
- Future meetings and/or ongoing contact.

6.3.1 Government and Agencies Briefings and Interviews

Initial and update presentations will be made by Golder to federal, provincial and regional/local government stakeholders. It is expected that representatives of the Steering Committee will accompany and introduce Golder at these briefings. All feedback received at these briefings will be recorded in meeting reports for incorporation into the stakeholder comment database and issue management tracking system, as appropriate.

6.3.2 First Nations

Stakeholder contact with Chippewas of Nawash First Nation and the Saugeen First Nation will be conducted as part of the plan. A communications protocol will be developed by Golder with the goal of facilitating a productive exchange of information between First Nations and the study team. Once the protocol has been developed, Golder will initiate a dialogue with the First Nations on the study. One community event is proposed to take place on each reserve. This may include an open house, working group discussion, or dinner or community picnic. Contact will take place in April and May 2003.

6.3.3 Municipality of Kincardine and OPG Employees

Communications with their employees related to the study is the responsibility of the Municipality of Kincardine and OPG. The community consultation plan and the study information package will support the Municipality of Kincardine and OPG by providing information as required.

6.3.4 Businesses and Agricultural Community

The business and agricultural community may have specific comments and concerns regarding the long-term management options. An important part of the Community Consultation plan is to provide opportunities for local businesses and farmers to find out about the plans for the long-term management of LLW and ILW at the WWMF and to provide comments on the proposed options. The views of the business and agricultural community will be obtained through a series of interviews with selected businesses and farmers. The interviews will provide information on assessment study and solicit opinions with respect to the options under consideration. The interviews will be conducted between April and June 2003.

The interviews will take the form of personal and/or telephone interviews and will be conducted by Golder using an interview guide developed specifically for the study. The Steering Committee will review and approve the interview guide.

6.3.5 Tourist Interviews

A survey will be undertaken with actual tourists visiting the Municipality and the South Bruce area in general. The survey will be based on a questionnaire administered in person to individuals visiting the various attractions in the study area (e.g., the Bruce Power Visitors' Center, Kincardine Lighthouse Museum, Point Clarke Lighthouse, and Downtown Kincardine).

In addition, a survey of potential tourists to the study area is under consideration, to determine if and how the location of a long-term waste management facility at the WWMF may impact on their decisions to visit Kincardine. The locations of the survey have yet to be determined, however, it is expected that they will include other tourist areas in the vicinity of the study area.

The surveys will be taken over the course of one week in late June or early July 2003. The interviews will be conducted by Golder using questionnaires developed specifically for the study. The Steering Committee will review and approve the questionnaires.

6.3.4 Ongoing Stakeholder Contact

In addition to the initial interviews and the open house events that will be scheduled, a program of regular contact with stakeholder groups will be undertaken.

Stakeholders will be contacted on at least two occasions throughout the course of the IAR:

- Spring 2003 – first newsletter, briefings and Open Houses; and
- Early Summer 2003 – second Newsletter.

6.4 Web Site

A study website will be established to provide information to the general public and to receive comments and questions. It will be located at http://IAR.golder.com and will be operational in early May, 2003. The website will be accessible form clearly identified links on the Municipality of Kincardine and OPG web pages. The website will include information such as the following:

- Study objectives;
- Study Overview;
- Organizations involved with the study;
- Schedule of public briefings and Open Houses;
- Frequently Asked Questions; and
- Contact Information.

The website will be maintained by Golder Associates and will have links to the following websites:

- Consultants involved in the study (Quintessa, SGN, Gartner Lee and Golder);
- Municipality of Kincardine; and
- Ontario Power Generation.

6.5 Open Houses

One round of Open Houses is planned for May 2003. The Open Houses will be held at the locations listed below.

- Kincardine;
- Port Elgin;

- Tiverton;
- Lucknow; and
- Chesley.

Information for the Open Houses, including the panel displays, will be developed from the study information package. The Steering Committee will review and approve the final study information package, panel displays and other material prepared for the Open Houses prior to their distribution.

Specific dates will be determined in consultation with the Steering Committee and to ensure there is no conflict with other planned events.

Each Open House will include the following elements:

- Registration table for sign-in;
- Panel displays introducing the topic at hand (see below);
- Representatives of the Steering Committee and Golder staff to answer questions;
- Brief presentation by Golder on the theme of the Open House;
- Distribution of printed copies of the panel displays; and
- A questionnaire and comment forms.

Following the Open Houses, Golder will prepare a summary of their notes from conversations with attendees. These notes will identify issues and concerns and will form part of the record of each Open House. All comments will be recorded in the Stakeholder Comment Database. A brief summary report of the Open Houses will be prepared, including an analysis and summary of the questionnaire and comment sheet responses.

6.6 Newsletters

Two newsletters will be prepared throughout the duration of the IAR study and distributed to all contacts in the study contact database and to all residents and businesses in the study area. The first newsletter will be distributed in the spring of 2003 and the second will follow in early summer of 2003. A project-specific newsletter design will be created by Golder which will identify the Municipality of Kincardine and OPG as partners in the study.

The context of the newsletters is as outlined below:

Newsletter #1 Spring 2003	❑ Study outline ❑ General introduction to study ❑ IAR schedule and decision points ❑ Community consultation program ❑ Contact for additional information
Newsletter #2 Early Summer 2003	❑ Progress to date ❑ Engineering and safety criteria ❑ Environmental feasibility ❑ Community consultation input and response ❑ Contact for additional information

6.7 Stakeholder Comments and Issues – Tracking and Management

A database will be created to track all comments, correspondence and communications with stakeholders in the study process. All stakeholder comments, issues, concerns and inquiries will be recorded in a Stakeholder Comment Database that allows for ready categorization and cross-referencing. This database will serve as the study record of all comments and input received through the community consultation program. All communications (letters, e-mails, voice-mail reports, contact reports, meeting reports) received throughout the study will be given an identifier number and analyzed for issues content. The Stakeholder Comment Database will:

- Identify the source of the comment (name of person or group);
- Indicate the date and event of origin;
- Identify the type of communication and the original document for cross-referencing (letter, meeting report, email, voicemail report, etc.);
- Provide a summary of the comment and response;
- Indicate the response action taken, when and by whom; and
- Document how the response was communicated to the comment source, where applicable.

The Stakeholder Comment Database will serve to track issues as they arise, and to monitor and record responses to issues provided by Golder and for the Steering Committee.

Issues may arise around many things, for example: public perceptions of study effects; the methods used to assess environmental effects and the level of detail or age of the data used in the study. It will be the responsibility of Golder, with input from the Steering Committee, to determine what constitutes an issue and how it should be addressed.

Issue identification will be carried out through the following:

- Review of documents relating to existing technologies to be used for the study;
- Review of reports documenting the proposed engineering designs;
- Stakeholder interviews;
- Contacts with municipal officials;
- Discussions with government agencies;
- Open Houses; and
- Study communications.

Golder will be responsible for identifying study-related issues, arising from the technical components, socio-economic component and initial stakeholder interviews, Open Houses, media scans and on-going stakeholder contacts and referring them to the appropriate IAR team members for a response.

Issues that are not related to the study will be referred to the Municipality of Kincardine or OPG for consideration prior to determining what action or response is necessary and who should be responsible for dealing with the issue.

6.8 Media Relations

Media relations as it pertains to the study will be the responsibility of Golder with direction from the Steering Committee. Ongoing media liaison will be initiated and maintained by Golder with reporters and news editors for both the electronic and print media in the regional study area.

In addition to responding to media requests, Golder will set up and attend media briefings at the time the Open Houses are planned. It is expected that representatives of the Steering Committee will attend the briefings, as appropriate.

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7.0 PRELIMINARY CALENDAR OF EVENTS AND ACTIVITIES

The following calendar identifies proposed activities throughout the period of the study. As they become known, related community activities and events (e.g. Council meetings and Open Houses) will be added to this calendar. As noted in the Introduction, this schedule may change in response to factors beyond the control of Golder, the Municipality of Kincardine or OPG.

Month	Event / Activity
Feb 03	❑ Prepare Draft and Final Community and Stakeholder Consultation and Communication Plan
March 2003	❑ Develop Stakeholder List ❑ Prepare Information Package ❑ Develop interview guides for the socio-economic studies ❑ Develop the public attitude research interview guides ❑ Develop First Nations Protocol
April 2003	❑ Conduct focus groups on Information Package ❑ Conduct potential tourist focus groups ❑ Establish web site ❑ Commence briefings ❑ Commence Socio-economic interviews ❑ Issue First Newsletter
May 2003	❑ Continue Socio-economic briefings
June 2003	❑ Conduct second round of briefings ❑ Conduct Open Houses ❑ Issue Second Newsletter ❑ Conduct Tourist interviews ❑ Conduct Public Attitude Research interviews ❑ Continue Stakeholder contact

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ONTARIO POWER GENERATION

Plan

For Internal Use Only
Document Number: **0125-PLAN-08260-00002**
Revision: **R003**

Title:

WESTERN WASTE MANAGEMENT FACILITY PUBLIC AFFAIRS 2004 COMMUNICATION PLAN

Western Waste Management Facility
Public Affairs 2004 Communication Plan

0125-PLAN-08260-00002-R003

January 19, 2004

For Internal Use Only

Submitted by:

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Communications Specialist
Public Affairs

Reviewed by:

T. Squire
Director
Public Affairs

Reviewed by:

H.H. Morrison
Director
Nuclear Waste Operations

Approved by:

C. Pautler
Vice President
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Approved by:

K. Nash
Vice President
Nuclear Waste Management Division

Title: **WESTERN WASTE MANAGEMENT FACILITY PUBLIC AFFAIRS 2004 COMMUNICATION PLAN**

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Title:
WESTERN WASTE MANAGEMENT FACILITY PUBLIC AFFAIRS 2004 COMMUNICATION PLAN

Revision Summary

Revision Number	Date	Comments
R003	January 2004	Updated annual communication plan.

Title:
WESTERN WASTE MANAGEMENT FACILITY PUBLIC AFFAIRS 2004 COMMUNICATION PLAN

1.0 BACKGROUND

OPG, Nuclear Waste Management Division facilities at the Bruce site consist of the Western Waste Management Facility, Radioactive Waste Operations Site #1, Spent Solvent Treatment Facility, Radioactive Material Transportation and a conventional landfill operation. Also at site is the Bruce Heavy Water Plant and OPG's Inspection Services Division, who through agreements with Bruce Power are responsible for supplying reactor fuel channel, boiler and turbine inspections and maintenance such as SLAR (Spacer Location and Relocation).

The purpose of this document is to identify a public affairs communication plan for OPG's waste operations that recognizes OPG's ongoing presence and involvement at the Bruce.

2.0 COMMUNICATION OBJECTIVES

(a) To continue building community awareness that OPG has key components of its business located at the Bruce site.

(b) To maintain and increase community awareness and understanding of OPG's nuclear waste management program and plans in order to facilitate an effective issues resolution process. Through these activities, OPG will demonstrate that it is open, accessible and honest.

(c) To demonstrate that OPG is a good corporate citizen.

(d) To continue developing a relationship with the Chippewas of Saugeen and Nawash First Nations.

(e) To continue to deliver OPG's "Radioactive Material Transportation and Emergency Response" communication plan to emergency responders.

(f) To assist NWMD and Inspection Services Division line management with employee communications in order to have informed, productive and supportive employees.

Specific objectives include:

(a) provide timely information to stakeholders about all existing and planned waste operations activities such as: Transportation Package and Maintenance Building project; Low Level Storage Building Environmental Assessment; proposed new Office Building; and status of work on the Memorandum of Understanding with Kincardine regarding the long-term management of low and intermediate level waste;

(b) assist in obtaining CNSC approvals for Heavy Water Plant decommissioning;

(c) integrate work with the Nuclear Waste Management Organization (NWMO), as required, in the Bruce community;

(d) communicate Significant Environmental Aspects, to key stakeholders, as determined by the Environmental Management Review Team;

(e) ensure nuclear waste management communications is compliant with OPG Standard N-STD-AS-0013 for external communications; and

(f) ensure Inspection Services Division communication is compliant with OPG Standard N-STD-AS-0013 for external communications.

3.0 COMMUNICATION STRATEGY

In accordance with OPG's commitment of keeping stakeholders, especially in communities where OPG operates facilities, well informed about its activities and plans, NWMD public affairs will employ a planned, multi-tactic proactive communication approach designed to keep stakeholders informed about NWMD business objectives and provide opportunities for two-way dialogue.

The strategy is to communicate the "big picture" that focuses on the overall planned development and expansion of the waste operations, while continuing to provide details regarding operational and environmental performance.

4.0 SPOKESPEOPLE

Lead Spokespeople: Director, Nuclear Waste Operations or delegate, with support provided by Public Affairs.

5.0 TARGET AUDIENCES

(a) Elected Bruce area municipal, provincial and federal government officials

(b) Appointed government officials

(c) Regulators

(d) Employees

(e) Bruce Power

(f) Media

(g) General Public

(h) First Nations

(i) NGOs and Special Interest Groups

(j) OPG Retirees

6.0 KEY MESSAGES

OPG is committed to the management of nuclear waste, now and in the future, in an environmentally, socially and financially responsible way.

OPG has been and will continue to operate its nuclear waste management facilities in a manner that focuses on a continuous improvement approach to safety and environmental protection.

Ontario Power Generation has been safely managing all of its nuclear waste for the past 30 years.

Ontario Power Generation's nuclear waste management plans are flexible and will reflect stakeholder expectations and changing financial, political and regulatory conditions.

Ontario Power Generation has established a segregated fund to pay for the full costs of managing nuclear waste and decommissioning all of its nuclear facilities.

All of OPG's nuclear waste management processing and storage systems are safe, robust and strictly regulated by the Canadian Nuclear Safety Commission.

Until the federal government decides on a long-term management approach for used nuclear fuel, OPG will continue to store its nuclear used fuel at the locations were it has been produced in either water filled bays and/or dry storage containers.

7.0 DETAILED COMMUNICATIONS

Activity	Responsibility	Completed by
Joint Kincardine, Bruce Power, OPG Liaison Committee meetings	Director Waste Operations and Public Affairs	**Monthly meetings**
South Bruce Impact Advisory Committee meetings	Director Waste Operations and Public Affairs	**Monthly meetings**

Activity	Responsibility	Completed by
Regular key stakeholder face-to-face meetings, MPs, MPP, etc.	Public Affairs, assisted by the Director Waste Operations as required	**Two per year or as required**
Communication meeting with Medical Officer of Health and Ministry of Environment.	Director Waste Operations or delegate and Public Affairs	**May and November**
Band council briefing re: OPG's nuclear waste management program and plans. Facilitate access to Chiibegmegoong burial site. Invite First Nations Chiefs and Councils to tour WWMF.	Director Waste Operations and Public Affairs	**Offer Council presentation and/or send information to Council** **Burial ground access as required** **Second/third quarter**
Provide public affairs support for the following EA projects: (a) Transportation Package and Maintenance Building (b) Heavy Water Plant Decommissioning. (c) Low Level Storage Buildings	Public Affairs	**(a) Ongoing** **(b) Ongoing** **(c) Ongoing**
Assist Nuclear Waste Management Organization (NWMO) regarding the long-term management of nuclear fuel waste.	Public Affairs (Site and Corporate)	**As required and approved**

Activity	Responsibility	Completed by
Assist with the Memorandum of Understanding with Kincardine regarding long-term management of low and intermediate level waste	Public Affairs (Site and Corporate)	**As required and approved**
Event notification	Public Affairs	**As required**
Public information	Public Affairs	Public information will include: (a) distribution of two WWMF "Neighbours" newsletters. **Spring and Fall**; (b) participation in key community events, i.e., Port Elgin Pumpkinfest and Kincardine Scottish Festival and Highland Games, etc.; (c) update WWMF fact sheet. **As required**; (d) arrange three speaking opportunities. **TBD**; (e) manage OPG's NWMD Internet Mailbox and coordinate responses. **Ongoing**; (f) respond to public inquiries. **As required**.

Activity	Responsibility	Completed by
Corporate Citizenship Program	Director Waste Operations and Public Affairs	Ensure continuance of the OPG Corporate Citizenship Program
Media Relations	Public Affairs and Corporate Media	Two good news stories in local media/quarter. Provide media response capability. Arrange WWMF media day. **As required and approved**.
Employee communications	NWMD line management and Public Affairs	Assist with coordination of the NWMD Intranet. Investigate/develop electronic bulletin board. Support 3 Stratum meetings. **TBD** Support annual NWMD communications Conference. **TBD**
TERP	Director Waste Operations and Public Affairs	Continue with delivery of the Radioactive Material Transportation and Emergency Response communication plan. Ensure TERP has adequate public affairs support.

8.0 EVALUATION

(a) Stakeholder feedback will provide evidence of increased awareness about OPG's continued presence at site.

(b) Regular communication channels with stakeholders are established and maintained.

(c) NWMD's business licensing activities are supported.

(d) Media stories are neutral and balanced in tone.

(e) Stakeholder inquires are responded to in a timely manner.

(f) OPG's site nuclear waste operations have a reputation of being open, accessible and honest.

ONTARIO POWER GENERATION

Plan

For Internal Use Only
Document Number: W-PLAN-08260-00001
Revision: R000

Title:

NUCLEAR WASTE MANAGEMENT DIVISION INTEGRATED 2005 PUBLIC AFFAIRS COMMUNICATION AND WORK PLAN

Nuclear Waste Management Division Integrated 2005 Public Affairs Communication and Work Plan

W-PLAN-08260-00001-R000

February 24, 2005

Prepared by:

T. Squire
Director, Public Affairs
NWMD

Approved by:

K. Nash
Vice President
NWMD

Associated with document type PLAN

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Title:

NUCLEAR WASTE MANAGEMENT DIVISION INTEGRATED PUBLIC AFFAIRS 2005 COMMUNICATION AND WORK PLAN

Revision Summary

Revision Number	Date	Comments
R000	January 2005	Annual Integrated Communication and Work Plan.

1.0 BACKGROUND

OPG's Nuclear Waste Management Division (NWMD) is responsible for the interim storage of low, intermediate and high level nuclear waste for Ontario's 20 nuclear reactors. The Division operates or has facilities under construction at the Bruce, Darlington and Pickering nuclear sites. In addition, Engineering and Support functions reside at 700 University Avenue in Toronto to support the field operations and for the long-term planning (both technical and financial) of L&ILW facilities and reactor decommissioning. The Division, also, operates a Radioactive Material Transportation program for OPG.

The purpose of this document is to identify an integrated public affairs communication plan for OPG's Nuclear Waste Management Division that recognizes OPG's ongoing presence and involvement in the Bruce, Darlington and Pickering communities and on the roads of Ontario.

2.0 COMMUNICATION OBJECTIVES

(a) Continue building, at the appropriate level for the maturity of the business, community awareness that OPG has key components of its business located at the Bruce, Darlington and Pickering nuclear sites.

(b) To maintain and increase community awareness and understanding of OPG's nuclear waste management operations and projects in order to facilitate construction, licensing and operations.

(c) Continue to build and strengthen relationships with key stakeholders in the government, the media and communities where NWMD operates. Building a reputation as an open, accessible and honest business in the communities.

(d) Effectively use the Corporate Citizenship Program to support key community initiatives to demonstrate that OPG is a good corporate citizen in the communities where it conducts business.

(e) Strengthen Public Affairs advice to management, issue identification, tracking and resolution across NWMD in order to facilitate an effective issues resolution process.

(f) Build awareness, inside OPG, of NWMD – including its mission, the magnitude of its operations and its accomplishments.

(g) Continue to deliver OPG's "Radioactive Material Transportation and Emergency Response" communication plan to emergency responders.

(h) Highlight NWMD Environment, Health and Safety issues and performance and in particular communicate Significant Environmental Aspects (SEAs) as determined by the Environment, Health & Safety Management Review Team.

3.0 COMMUNICATION STRATEGY

In accordance with OPG's commitment of keeping stakeholders, especially in communities where OPG operates facilities, well informed about its activities and plans, NWMD public affairs will employ a planned, multi-tactic proactive communication approach designed to keep stakeholders informed about NWMD business objectives and provide opportunities for two-way dialogue.

The strategy is to communicate the "big picture" that focuses on the overall planned development and expansion of the waste operations, while continuing to provide details regarding operational and environmental performance.

In 2005, NWMD will maintain a proactive and aggressive approach to external communications at the WWMF, especially in light of the DGR proposal. A more cautious, but informative communication approach to meet regulatory requirements will be taken at NWMD facilities in Darlington and Pickering. This approach is being recommended in light of the NWMO's pending recommendation on used nuclear fuel and how the Darlington and Pickering Councils could react to our interim storage facilities as a result of the recommendation.

4.0 SPOKESPEOPLE

Lead Spokespeople: Vice President, Nuclear Waste Operations or delegates (Director Nuclear Waste Operations, Director Nuclear Waste Projects, Senior Manager for the East) with support provided by NWMD Public Affairs and Corporate Public Affairs.

5.0 TARGET AUDIENCES

(a) Elected area municipal, provincial and federal government officials

(b) Appointed government officials

(c) Regulators

(d) Employees

(e) Bruce Power

(f) Media

(g) General Public in the vicinity of the waste facilities

(h) First Nations

(i) Business Groups, i.e. Boards of Trade, Chambers of Commerce, etc.

(j) NGOs and Special Interest Groups

(k) OPG Retirees

6.0 NWMD KEY MESSAGES

- OPG is committed to the management of nuclear waste, now and in the future, in an environmentally, socially and financially responsible way.
- OPG has been and will continue to construct and operate its nuclear waste management facilities in a manner that focuses on a continuous improvement approach to safety, environmental protection and our relationship with our host communities.
- Ontario Power Generation has been safely managing all of its nuclear waste for the past 30 years.
- Ontario Power Generation's nuclear waste management plans are flexible and will reflect stakeholder expectations and changing financial, political and regulatory conditions.
- Ontario Power Generation has established a segregated fund to pay for the full costs of managing nuclear waste and decommissioning at all of its nuclear facilities.
- All of OPG's nuclear waste management processing and storage systems are safe, robust and strictly regulated by the Canadian Nuclear Safety Commission.
- Until the federal government decides on a long-term management approach for used nuclear fuel, OPG will continue to store its nuclear used fuel at the locations were it has been produced in either water filled bays and/or dry storage containers.

7.0 DETAILED COMMUNICATIONS FOR THE WESTERN WASTE MANAGEMENT FACILITY

Lead Spokesperson – The Director Nuclear Waste Operations with support from NWMD Public Affairs

Additional Key Messages for the WWMF

- All the low & intermediate level nuclear waste from the 20 nuclear reactors that OPG owns (including those leased to Bruce Power) is transported to and stored in interim facilities at the Western Waste Management Facility.
- The deep geologic repository proposal would provide a safe long-term solution for the low & intermediate level wastes.

Activity	Responsibility	Schedule
Joint Kincardine, Bruce Power, OPG Liaison Committee Meetings. Provide updates on waste operations, projects and issues and receive information from elected officials about community issues/perceptions with NWMD operations.	Director Waste Operations or delegate supported by NWMD Public Affairs	Monthly meetings
South Bruce Impact Advisory Committee Meetings. (Includes Regional government and Mayors from the surrounding municipalities) Provide updates on waste operations, projects and issues and receive information from elected officials about community issues/perceptions with NWMD operations	Director Waste Operations or delegate supported by NWMD Public Affairs	Monthly meetings

Title:
NUCLEAR WASTE MANAGEMENT DIVISION INTEGRATED PUBLIC AFFAIRS 2005 COMMUNICATION AND WORK PLAN

Activity	Responsibility	Schedule
Regular key stakeholder face-to-face meetings, MPs, MPP, etc. to provide updated information on WWMF operations and to understand and manage issues that constituents have with OPG's operations.	NWMD Public Affairs, assisted by the Director Waste Operations as required	Two per year or as required
Communication meeting with Medical Officer of Health and Ministry of Environment to provide updated information on WWMF operations and projects to understand and manage issues that the public have with OPG's operations.	Director Waste Operations or delegate supported by NWMD Public Affairs	May and November
Nawash & Saugeen First Nation briefing re: OPG's nuclear waste management program and plans.	Director Waste Operations or delegate supported by NWMD Public Affairs	As required.
Facilitate access to Chiibegmegoong burial site.	NWMD Public Affairs, with assistance from Bruce Power	Burial ground access as required for ceremonies and inspection.
Employee communications	NWMD line management and supported by NWMD Public Affairs	Ongoing
Event notification	NWMD Public Affairs	As required
Production & distribution of two WWMF "Neighbours" newsletters	NWMD Public Affairs	Spring & Fall
Displays at key Community events i.e. Pumpkinfest & Kincardine Scottish Festival	NWMD Public Affairs with assistance from WWMF staff	As required.

Activity	Responsibility	Schedule
Prepare & update communication products, i.e. Fact sheets, Videos, etc.	NWMD Public Affairs	As required.
Arrange speaking opportunities to get OPG and NWMD key messages out to the public.	NWMD Public Affairs with assistance from WWMF staff	Ongoing.
Document and arrange responses to public questions about NWMD operations or projects.	NWMD Public Affairs with assistance from NWMD staff or Corporate Public Affairs	Ongoing.
Arrange and process Corporate Citizenship Program grants and presentations	Director Waste Operations and Corporate and NWMD Public Affairs	Ongoing throughout the year
Provide Media Response Capability, working with OPG Corporate Media Relations as required.	NWMD Public Affairs and Corporate Media	Ongoing.
Participate in Transportation & Emergency Response Seminars to key audiences to build understanding and confidence in our transportation progam.	Public Affairs and NWMD Transportation Staff	As required.

8.0 DETAILED COMMUNICATIONS FOR THE EASTERN WASTE MANAGEMENT FACILITIES (DARLINGTON AND PICKERING)

Lead Spokesperson – Senior Manager Nuclear Waste Site, with support from NWMD EA staff, NWMD Projects staff and NWMD/Darlington/Pickering Public Affairs

Additional Key messages for Darlington and Pickering Waste Management facilities

- Darlington and Pickering Low & intermediate level nuclear waste is transported by OPG to the Western Waste Management Facility, located on the Bruce Nuclear site, where it is currently stored in interim facilities.

Notes:

- Key activities associated with the NWMD operations and projects will be coordinated with Darlington/Pickering Public Affairs staff in order to integrate wherever possible into the ongoing Public Affairs program for the Darlington/Pickering Nuclear Generating Stations.

Activity	Responsibility	Schedule
Participate in Darlington Site Planning Committee Meetings, identifying and addressing nuclear waste management issues	NWMD East Staff with support from Public Affairs & in concert with Darlington Public Affairs Staff	Bi-Monthly Committee Meetings
Participate in the Pickering Community Advisory Committee Meetings, identifying and addressing nuclear waste management issues	NWMD East Staff with support from Public Affairs & in concert with Pickering Public Affairs Staff	Quarterly Meetings
Participate in the Durham Nuclear Health Committee Meetings, identifying and addressing nuclear waste management issues	NWMD East Staff with support from Public Affairs & in concert with Darlington/Pickering Public Affairs Staff	Quarterly Meetings
NWMD stories in the Darlington and Pickering "Neighbours Newsletters"	NWMD Public Affairs in conjunction with Darlington/Pickering Public Affairs Staff	One story in each publication in 2005, i.e. Award of the DUFDSF D/B contract
Establish an NWMD presence at community events attended by Darlington/Pickering Public Affairs	NWMD Public Affairs in conjunction with Darlington/Pickering Public Affairs Staff	2005 Community Safety Day at Darlington

Activity	Responsibility	Schedule
Respond to media requests as required	NWMD Public Affairs in conjunction with Corporate Media Relations	As required and appropriate.

9.0 DETAILED COMMUNICATIONS FOR NWMD PROJECTS

Deep Geologic Repository

Lead Spokesperson – The VP Nuclear Waste with support from NWMD Public Affairs

Notes:

- 2005 will be an important year for NWMD to build awareness and understanding of the DGR ahead of the decision by the Federal Government on the type of EA to be conducted

Activity	Responsibility	Schedule
Third round of key stakeholder briefings on the result of the Kincardine "polling" and the next steps	NWMD Senior Staff and Public Affairs	Prior to February 16th
Address Media questions concerning the announcement of the Kincardine 'polling" results by Kincardine	NWMD VP assisted by Public Affairs and Kincardine Mayor/CAO	February 16th Council Meeting in Kincardine
Council presentations to Arran-Elderslie, Brockton, Huron-Kinloss and Saugeen Shores on the results of the Kincardine "polling" and the next steps	NWMD Public Affairs	February/March
Issue 2nd DGR newsletter conveying the results of the Kincardine "polling" and the next steps	NWMD Staff	February/March

Activity	Responsibility	Schedule
Expand Media reach for the DGR project to Brockton, Owen Sound and Saugeen Shores building a better understanding of the DGR Project	NWMD Public Affairs	Throughout 2005
Establish a "speakers bureau" for the DGR project targeting groups in Kincardine and the surrounding municipalities of Arran-Elderslie, Brockton, Huron-Kinloss and Saugeen Shores to build better understanding of the proposal.	NWMD Public Affairs	Throughout 2005 Pickering CAC March 15 DNHC April 15
Look for Opportunities to use Advertising or "Factorials" to convey key messages on the DGR	NWMD Public Affairs	Throughout 2005
Look for exhibit possibilities in the five targeted municipalities	NWMD Public Affairs	Throughout 2005
Complete the "tax agreement" with Bruce County	NWMD Public Affairs	May
Continue work with the Nawash and Saugeen First Nations on areas of cooperation and consultation on the DGR Project	NWMD Staff with support from NWMD Public Affairs	Throughout 2005

WWMF Refurbishment Waste Storage Project

Lead Spokesperson – The Director Nuclear Waste Projects or delegate with support from NWMD EA section and NWMD Public Affairs

Additional Key Messages for the WWMF Refurbishment Waste Storage Project

- The Refurbishment Waste Storage (RWS) Project is being undertaken in support of the continued operation of the nuclear generating stations in Ontario. As these stations age, replacement of some reactor components and steam generators may be required.

- The RWS Project EA is being undertaken as a planning tool in anticipation of the future need to accommodate these specific refurbishment wastes at the WWMF.

- The WWMF RWS Project will be located entirely within the existing Canadian Nuclear Regulatory Commission licensed WWMF.

- The RWS Project is focused on increasing the interim storage capacity for L&ILW only, until long-term L&ILW solutions, such as the Deep Geologic Repository Proposal is implemented.

- The RWS Project does not alter or affect in any way the interim storage of used nuclear fuel at the WWMF.

Notes:

One of the key challenges of 2005 will be to convey clarity on all of the projects underway in the Bruce area, i.e. B1 & 2 refurbishment, DGR, WWMF Refurbishment Waste Storage Project etc.

Activity	Responsibility	Schedule
Joint Kincardine, Bruce Power, OPG Liaison Committee Meetings. Provide updates as required to ensure key stakeholders are informed about the RWS Project and can convey their views to OPG.	Director Waste Operations/Director NWMD Projects or delegate supported by NWMD Public Affairs	February 2005
South Bruce Impact Advisory Committee Meetings. Provide updates as required to ensure key stakeholders are informed about the RWS Project and can convey their views to OPG.	Director Waste Operations or delegate supported by NWMD Public Affairs	February 2005

Activity	Responsibility	Schedule
Key stakeholder face-to-face meetings, MPs, MPP, etc.	NWMD EA section with support from NWMD Public Affairs	As required.
Two rounds of Open Houses (6 in total) in Kincardine, Saugeen Shores and Brockton to ensure the public in the vicinity of the WWMF are informed about the RWS Project and can convey their views to OPG.	NWMD EA section with support from NWMD Public Affairs	March and June 2005
Bruce Neighbours Newsletters articles on the RWS Project.	NWMD Public Affairs	As required

Darlington Used Fuel Dry Storage Project

Lead Spokesperson – Senior Manager Nuclear Waste Site or delegate, with support from NWMD Projects/EA section and NWMD, Darlington/ Pickering Public Affairs

Additional Key Messages for the DUFDSP

- OPG considers the proposed facility necessary to continue generating electricity at the Darlington Nuclear Generating Station and to manage used nuclear fuel safely, cost-effectively and with minimal environmental effects
- Based on detailed assessment, the regulator (CNSC) considers the proposed facility to be safe, needed and with limited and manageable environmental effects.
- The propose facility will be very similar to already existing OPG facilities at the Bruce and Pickering sites that have proven operational records.
- There has been an extensive public involvement process. Concerns raised by the public have been heard by OPG and the CNSC considers that all remaining concerns “are of a nature that could be addressed in the follow-up program and future licensing stages of the project.”

Notes:

- Key activities associated with the DUFDSP will be coordinated with Darlington Public Affairs staff in order to integrate wherever possible into the ongoing Public Affairs program for the Darlington Nuclear Generating Station.

Activity	Responsibility	Schedule
Regular key stakeholder face-to-face meetings, MPs, MPP, etc. to provide and receive information on the public's perception of the DUFDSP	Darlington Public Affairs, assisted by NWMD Public Affairs and Staff	Quarterly or as required
Update to the Darlington Site Planning Committee to provide and receive information on the public's perception of the DUFDSP.	Darlington Public Affairs, assisted by NWMD Public Affairs and Staff	Bi-monthly briefings to be provided as required, i.e. at key milestones like award of the D/B contract
Participate in the Durham Nuclear health Committee Meetings, identifying and addressing DUFDSP issues	Darlington/Pickering Public Affairs Staff, assisted by NWMD Public Affairs and Staff	Quarterly or as require
Follow-up actions from the EA process: Interface with Darlington Provincial Park staff and Sports Field and Waterfront Trail users to alleviate concerns with the DUFDSP. Develop a Public Attitude survey to assess the effectiveness of mitigation efforts.	NWMD Public Affairs and EA staff, assisted by Darlington Public Affairs	Spring 2005 Late 2005, early 2006

Activity	Responsibility	Schedule
Get the news out to Darlington Employees about the progress of the DUFDSP through the internal web site and other communication vehicles	Darlington Public Affairs with the assistance of NWMD Public Affairs	As required at key milestones, i.e. Announcement of the selection of a Contractor for the construction of the DUFDSP

Pickering Used Fuel Dry Storage Facility Expansion Phase 2 (Storage Building 3 & 4)

Lead Spokesperson – Senior Manager Nuclear Waste Site or delegate, with support from NWMD EA section and NWMD, Darlington/ Pickering Public Affairs

Additional Key Messages for the PUFDSP

- OPG considers the proposed facility necessary to continue generation of electricity at the Pickering Nuclear Generating Station and to manage used nuclear fuel safely, cost-effectively and with minimal environmental effects
- Based on detailed assessment, the regulator (CNSC) considers the proposed facility to be safe, needed and with limited and manageable environmental effects.
- The proposed facility will be very similar to already existing OPG facilities at the Pickering site which have a proven operational record.

Notes:

- Key activities associated with the PUFDSF Expansion will be coordinated with Pickering Public Affairs staff in order to integrate wherever possible into the ongoing Public Affairs program for the Pickering Nuclear Station.
- Because there is little visible activity on the Pickering site until 2006, and because of potential “sensitivities” with Pickering Council around the issue of compensation for interim nuclear fuel storage in light of the NWMO’s work and pending recommendations, NWMD will take a low key communication approach on the Phase 2 project in 2005

Activity	Responsibility	Schedule
Use existing opportunities at the Pickering CAC and DNHC to keep key stakeholders aware or the Phase 2 expansion and key milestones, i.e. selection of a contractor for D/B	NWMD project staff in consultation with NWMD and Pickering Public Affairs	As required.
As NWMD moves to a Pickering site construction presence at the Phase 2 location use the Pickering internal website to inform employees about the project	Pickering Public Affairs with support form NWMD Public Affairs and Project staff	Not likely until 2006.

Western Used Fuel Dry Storage Facility Expansion (Building 2)

Lead Spokesperson – Director Nuclear Waste Projects or delegate, with support from NWMD Public Affairs

Additional Key Messages for the WUFDSP Expansion

- OPG considers the proposed facility necessary to continue generation of electricity at the Bruce Power Generating Stations and to manage used nuclear fuel safely, cost-effectively and with minimal environmental effects

Activity	Responsibility	Schedule
Joint Kincardine, Bruce Power, OPG Liaison Committee Meetings. Provide updates, as required, on the previously discussed expansion of the WUFDSF.	Director Waste Operations/Director NWMD Projects or delegate supported by NWMD Public Affairs	Monthly meetings

Activity	Responsibility	Schedule
South Bruce Impact Advisory Committee Meetings. Provide updates on waste operations/issues and receive information from elected officials about community issues/perceptions with NWMD operations	Director Waste Operations or delegate supported by NWMD Public Affairs	Monthly meetings
Regular key stakeholder face-to-face meetings, MPs, MPP, etc.	NWMD Public Affairs, assisted by the Director Waste Operations as required	Two per year or as required

BHWP De-Commissioning Project

Lead Spokesperson – Director Nuclear Waste Projects or delegate, with support from NWMD Public Affairs

Additional Key Messages for the BHWP Decommissioning Project

- The purpose of the decommissioning project is to permanently retire the BHWP from service as a nuclear facility, licensed for the production of heavy water. BHWP enriching units and support buildings used in the production of heavy water will be removed or demolished so that upon completion of the decommissioning the site can be used for industrial purposes unrelated to the production of heavy water.

- The work is being done in accordance with the Environmental Assessment and a Detailed Decommissioning Plan, both of which were approved by the CNSC

- The BHWP site will be monitored before, during and after the demolition activities for environmental concerns and impacts. After demolition, a remediation phase will be carried out to place the site in a brown field state in accordance with Ministry of Environment Guidelines, and conditions of the Decommissioning Licence and Environmental Assessment. No new or significant issues are expected to arise.

- Previous demolition projects at the BHWP have been carried out without any problems, and this project will be executed using similar methods and controls.

- The CNSC issued a licence to OPG to decommission the BHWP in 2004, during which the CNSC concluded that OPG is qualified to decommission this facility and that it will make adequate provision for the protection of the environment and the health and safety of persons.

- The demolition of the plant has been contracted to Murray Demolition Corporation with OPG providing a Project Manager and a Project Engineer to monitor progress, and environmental and health and safety performance.

- The demolition of the plant will result in a net payment (in the millions of dollars) to OPG due to the market value of the recyclable metals in the plant.

Activity	Responsibility	Schedule
Joint Kincardine, Bruce Power, OPG Liaison Committee Meetings. Provide updates on the progress of the demolition.	Director Waste Operations/Director NWMD Projects or delegate supported by NWMD Public Affairs	As required.
South Bruce Impact Advisory Committee Meetings. Provide updates on the progress of the demolition.	Director Waste Operations/Director NWMD Projects or delegate supported by NWMD Public Affairs	As required.
Brief key stakeholders during regular face-to-face meetings, MPs, MPP, etc. on the progress of the demolition.	NWMD Public Affairs, assisted by the Director Waste Operations as required	As required
Arrange for Power News article on the demolition	NWMD Public Affairs	Feb 2005

10.0 ISSUE IDENTIFICATION AND MANAGEMENT

Activity	Responsibility	Schedule
Provide advice and guidance to NWMD staff on how to handle enquiries form the public, media and government.	NWMD Public Affairs in consultation with Corporate Public Affairs as required.	Throughout 2005
Prepare Briefing Papers and key messages for major NWMD Project and Initiatives in anticipation of government and media interest.	NWMD VP and Public Affairs	Throughout 2005
Implement N-STD-AS-0013 External Communications across NWMD particularly N-FORM-10387, Nuclear Public Communications Tracking to start to build a database of issues and responses on public enquiries.	NWMD Public Affairs	December 2005

11.0 ADDITIONAL COMMUNICATION AND PUBLIC AFFAIRS ACTIVITIES

Activity	Responsibility	Schedule
Provide advice and guidance to NWMD staff on employee communications issues.	NWMD Public Affairs	As requested

Activity	Responsibility	Schedule
Act as Power News Board member looking for opportunities to position NWMD positively within OPG and to assist in educating OPG employees to the valuable role that NWMD plays inside the Company.	NWMD Public Affairs	Throughout 2005
Act as a "communication" contact for the NWMO, ensuring that OPG's Public Affairs staff is made aware of NWMO activities in site communities.	NWMD Public Affairs	Throughout 2005
Assist with discussions and strategies to minimize NWMO ramifications of NWMO recommendations on current NWMD operations.	NWMD Public Affairs	Throughout 2005

12.0 EVALUATION

(a) Stakeholder feedback will provide evidence of increased awareness about OPG and NWMD's continued presence at sites.

(b) Regular communication channels with stakeholders are established and maintained.

(c) NWMD's business licensing activities are supported and project disruption is minimized.

(d) Media stories are neutral and balanced in tone.

(e) Stakeholder inquires are responded to in a timely manner.

(f) OPG's site nuclear waste operations have a reputation of being open, accessible honest and a part of the community.

(g) Investigate possible community leader survey of NWMD operations in conjunction with Corporate surveys.

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ONTARIO POWER GENERATION

Plan

Internal Use Only	
Document Number:	
W-PLAN-08260-00002	
Sheet Number:	Revision:
N/A	**R000**

Title:

NUCLEAR WASTE MANAGEMENT DIVISION 2006 COMMUNICATION PLAN

Nuclear Waste Management Division
2006 Communication Plan

W-PLAN-08260-00002-R000

2006-06-02

Order Number: N/A
Other Reference Number: N/A

Internal Use Only

Prepared by:

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Director
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Nuclear Waste Management Division

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Revision Summary

Revision Number	Date	Comments
R000	2006-06-02	Initial Issue of the Annual NWMD Communication Plan for 2006.

1.0 BACKGROUND

OPG, Nuclear Waste Management Division (NWMD) is responsible for the interim storage of low, intermediate and high level nuclear waste from Ontario's 20 nuclear reactors. The Division operates or has facilities under construction at the Bruce, Darlington and Pickering nuclear sites. In addition, Engineering and Support functions reside at 700 University Avenue in Toronto to support the field operations and for the long-term planning (both technical and financial) of waste facilities and reactor decommissioning. The Division also operates a Radioactive Material Transportation program for OPG.

The purpose of this document is to outline a communication plan for OPG's Nuclear Waste Management Division that recognizes OPG's ongoing presence and involvement in the Bruce, Darlington and Pickering communities and on the roads of Ontario.

The plan is a "living document" and can be changed and adapted to accommodate new issues and timetables.

2.0 COMMUNICATION OBJECTIVES

(a) Continue building, at the appropriate level for the maturity of the business, community awareness that OPG has key components of its business located at the Bruce, Darlington and Pickering nuclear sites.

(b) To maintain and increase community awareness and understanding of OPG's nuclear waste management operations and projects in order to facilitate construction, licencing and operations.

(c) Continue to build and strengthen relationships with key stakeholders in the government, the media and communities where NWMD operates. Maintain a reputation as an open, accessible and honest business in these communities.

(d) Effectively use the Corporate Citizenship Program to support key community initiatives to demonstrate that OPG is a good corporate citizen in the communities where it conducts business and has a "community licence to operate."

(e) Strengthen Public Affairs advice to management, issue identification, tracking and resolution across NWMD in order to facilitate an effective issues resolution process.

(f) Build awareness, inside OPG, of NWMD, its mission, the magnitude of its operations and its accomplishments.

(g) Continue to deliver OPG's "Radioactive Material Transportation and Emergency Response" communication program to emergency responders.

3.0 COMMUNICATION STRATEGY

In accordance with OPG's commitment of keeping stakeholders, especially in communities where OPG operates facilities, well informed about its activities and plans, NWMD public affairs will employ a planned, multi-tactic proactive communication approach designed to keep stakeholders informed about NWMD business objectives and provide opportunities for two-way dialogue.

The strategy is to communicate the "big picture" that focuses on the overall planned development of the waste facilities, while continuing to provide details regarding operational and environmental performance.

In 2006, NWMD will maintain a proactive and aggressive approach to external communications at the WWMF, highlighting the Deep Geologic Repository (DGR) project. A more cautious, but informative communication approach to meet regulatory requirements will be taken at NWMD facilities in Pickering and Darlington. This approach is being recommended because of the focus on power generation facilities, possible nuclear new build at these sites and the timing of the Federal Government's decision on the Nuclear Waste Management Organization's recommendation to follow an adaptive phased management approach for the long-term management of used nuclear fuel.

4.0 SPOKESPEOPLE

Lead Spokespeople: Vice President, NWMD or delegate, with support provided by NWMD Public Affairs.

5.0 TARGET AUDIENCES

(a) Elected area municipal, provincial and federal government officials

(b) Appointed government officials

(c) Regulators

(d) Employees

(e) Bruce Power

(f) Media

(g) General Public in the vicinity of the waste facilities

(h) First Nations

(i) Business Groups,
(i.e., Boards of Trade, Chambers of Commerce, Service Clubs, etc.)

(j) NGOs and Special Interest Groups

(k) OPG Retirees

6.0 NWMD KEY MESSAGES

- OPG is committed to the management of nuclear waste, now and in the future, in an environmentally, socially and financially responsible way.
- OPG has been and will continue to operate its nuclear waste management facilities in a manner that focuses on a continuous improvement approach to safety and environmental protection.
- Ontario Power Generation has been safely managing all of its nuclear waste for the past 30 years.
- Ontario Power Generation's nuclear waste management plans are flexible and will reflect stakeholder expectations and changing financial, political and regulatory conditions.
- Ontario Power Generation has established segregated funds to pay for the full costs of managing nuclear waste and decommissioning at all of its nuclear facilities.
- All of OPG's nuclear waste management processing and storage systems are safe, robust and strictly regulated by the Canadian Nuclear Safety Commission.
- Until the federal government decides on a long-term management approach for used nuclear fuel, OPG will continue to store its nuclear used fuel at the locations were it has been produced in either water filled bays and/or dry storage containers.

7.0 WESTERN COMMUNICATIONS

Lead Spokesperson – Director Nuclear Waste Operations, with support from NWMD Public Affairs

WWMF Key Messages

- All the low & intermediate level nuclear waste from the 20 nuclear reactors that OPG owns (including those leased to Bruce Power) is transported to and stored in interim facilities at the Western Waste Management Facility.

Activity	Responsibility	Schedule/Target
Joint Kincardine, Bruce Power, OPG Liaison Committee Meetings. Provide updates on WWMF projects and operations and receive information from elected officials about community issues/perceptions.	Director Nuclear Waste Operations and NWMD Public Affairs	Monthly meetings
South Bruce Impact Advisory Committee Meetings. (Includes County government and Mayors/delegates from the surrounding municipalities.) Provide updates on WWMF projects and operations and receive information from elected officials about community issues/perceptions.	Director Nuclear Waste Operations and NWMD Public Affairs	Monthly meetings
Regular key stakeholder face-to-face meetings, MPs, MPP, etc. to provide updates on WWMF projects and operations and to understand and manage issues that constituents have with the WWMF.	NWMD Public Affairs, assisted by the Director Nuclear Waste Operations as required	Two per year or as required

Activity	Responsibility	Schedule/Target
Communication meeting with Medical Officer of Health and Ministry of Environment to provide updates on WWMF projects and operations and to understand and manage issues that the public have with the WWMF.	Director Nuclear Waste Operations or delegate and NWMD Public Affairs	Two per year - in the Spring & Fall
Bruce County Council Presentation.	NWMD Public Affairs	Annual presentation – 2nd Quarter
Offer WWMF Tours to Bruce County Councils.	NWMD Public Affairs and Director Nuclear Waste Operations	5 Council Tours
Conduct WWMF Tours, as required.	NWMD Public Affairs and Director Nuclear Waste Operations	Ongoing through the year. Accommodate 95% of requests
Nawash & Saugeen First Nation briefing re: OPG's nuclear waste management program and plans.	Director Nuclear Waste Operations or delegate supported by NWMD Public Affairs	As required
Facilitate access to Jiibegmegoong burial site.	NWMD Public Affairs, with assistance from Bruce Power	Burial ground access as required for ceremonies and inspection
Production & distribution of two WWMF "Neighbours" newsletters.	NWMD Public Affairs	Spring & Fall
Join/participate in local Chambers of Commerce.	NWMD Public Affairs	Saugeen Shores and Kincardine Chamber of Commerce
Employee communications.	NWMD line management and supported by NWMD Public Affairs	Ongoing
Event notification.	NWMD Public Affairs	As required
Participate in community events (see DGR Communications for more details).	NWMD Public Affairs, with assistance from WWMF staff	As planned

Activity	Responsibility	Schedule/Target
Re-design of NWMD Mobile Exhibit.	NWMD Public Affairs	To be complete by end of March
Prepare and revise communication products, i.e., Fact Sheets, etc.	NWMD Public Affairs	As required
Speaking engagements (see DGR Communications for more details).	NWMD Public Affairs, with assistance from WWMF staff	Ongoing
Document and arrange responses to public questions about WWMF projects or operations.	NWMD Public Affairs with assistance from WWMF staff or Corporate Public Affairs	Ongoing
Arrange and process Corporate Citizenship Program grants and presentations.	NWMD Public Affairs	Ongoing through the year. Disperse 90% of budget
WWMF Open House.	NWMD Public Affairs	Investigate the feasibility of holding a WWMF Open House
Conduct Community Leader Survey.	NWMD Public Affairs	3rd Quarter
Participate in local Santa Claus Parades.	NWMD Public Affairs	Participate in Port Elgin, Southampton and Kincardine parades
Provide media response capability, working with OPG Corporate Media Relations as required.	NWMD Public Affairs and Corporate Media	Ongoing
WWMF/DGR Media Day.	NWMD Public Affairs	2nd Quarter
WWMF Advertising.	NWMD Public Affairs	Ongoing, as required
Participate in Transportation & Emergency Response Seminars to “First Responders” to build understanding and confidence in our transportation program.	NWMD Public Affairs and Radioactive Material Transportation staff	Four to six per year

8.0 DGR COMMUNICATIONS

Lead Spokesperson – The VP Nuclear Waste with support from NWMD Public Affairs

Notes:

- 2006 will be an important year for NWMD to build awareness and understanding of the DGR project, ahead of the EA Guidelines being finalized mid-year.

Activity	Responsibility	Schedule/Target
DGR Community Consultation Group.	NWMD Public Affairs	Quarterly
DGR briefings to key stakeholders, such as IAC, Liaison, MOH/MOE, MP, MPP, Unions.	NWMD Public Affairs	Semi-annually
DGR project newsletters.	NWMD Staff	3 per year, with the first to be completed in February
Establish a "DGR Speakers Bureau" targeting groups in Kincardine and the surrounding municipalities of Arran-Elderslie, Brockton, Huron-Kinloss and Saugeen Shores to build better understanding of the project.	NWMD Public Affairs	12-18 events throughout 2006
DGR Video.	NWMD Public Affairs	To be complete by end of March
Conduct Public Attitude Research.	NWMD Public Affairs	As required throughout the year
Conduct Focus Group.	NWMD Public Affairs	As required throughout the year
DGR Open Houses?	NWMD Public Affairs	As required throughout the year
DGR events for seasonal residents.	NWMD Public Affairs	Summer 2006

Activity	Responsibility	Schedule/Target
DGR/WWMF Media Day.	NWMD Public Affairs	2nd Quarter
DGR advertorial in Marketplace Magazine and local newspapers.	NWMD Public Affairs	4 to 6 pages per year
Participate in community events with Mobil Exhibit.	NWMD Public Affairs	10-12 events
Conduct proactive media program, such as participation in Open Line radio programs.	NWMD Public Affairs	Ongoing
DGR status update to staff.	NWMD Public Affairs and Director Nuclear Waste Operations	As required
Continue work with the Nawash and Saugeen First Nations on areas of cooperation and consultation on the DGR Project.	NWMD Consultant with support from NWMD Public Affairs	Throughout 2006

9.0 EASTERN COMMUNICATIONS

Lead spokesperson – Senior manager nuclear waste site, with support from NWMD Public Affairs and Darlington/Pickering Public Affairs

Additional Key messages for Darlington and Pickering Waste Management Facilities.

- Darlington and Pickering Low & intermediate level nuclear waste is transported by OPG to the Western Waste Management Facility, located on the Bruce Nuclear site, where it is currently stored in interim facilities.

Notes:

- Key activities associated with the NWMD operations and projects will be coordinated with Darlington/Pickering Public Affairs staff in order to integrate wherever possible into the ongoing Public Affairs program for the Darlington/Pickering Nuclear Generating Stations.

Activity	Responsibility	Schedule/Target
Participate as required in Darlington Site Planning Committee Meetings. Provide updates on projects and operations and receive information from elected officials about community.	NWMD East Staff with support from Public Affairs & in concert with Darlington Public Affairs Staff	Bi-Monthly Committee Meetings
Participate in the Pickering Community Advisory Committee Meetings, identifying and addressing nuclear waste management issues.	NWMD East Staff with support from Public Affairs & in concert with Pickering Public Affairs Staff	Quarterly Meetings
Participate in the Durham Nuclear Health Committee Meetings, identifying and addressing nuclear waste management issues.	NWMD East Staff with support from Public Affairs & in concert with Darlington/Pickering Public Affairs Staff	Quarterly Meetings
NWMD stories in the Darlington and Pickering “Neighbours Newsletters”.	NWMD Public Affairs in conjunction with Darlington/Pickering Public Affairs Staff	One story in each publication in 2006
Establish an NWMD presence at community events attended by Darlington/Pickering Public Affairs.	NWMD Public Affairs in conjunction with NWMD East Staff and Darlington/Pickering Public Affairs Staff	Attend 3 to 4 events per year such as 2006 Clarington Family Safety Day
Respond to media requests as required.	NWMD Public Affairs in conjunction with Corporate Media Relations	As required and appropriate
NWMD, Pickering and Darlington Public Affairs Coordination meeting.	NWMD, Pickering and Darlington Public Affairs	Quarterly
Participate in Pickering and Darlington Lunch and Learn Series.	NWMD Public Affairs	One per year
NWMD displays at Information Centers.	NWMD Public Affairs	December 2006

10.0 ISSUE IDENTIFICATION AND MANAGEMENT

Activity	Responsibility	Schedule/Target
Provide advice and guidance to NWMD staff on how to handle inquiries from the public, media and government.	NWMD Public Affairs in consultation with Corporate Public Affairs as required	Throughout 2006
Prepare Briefing Papers and key messages for major NWMD Project and Initiatives in anticipation of government and media interest.	NWMD VP and Public Affairs	Throughout 2006
Implement N-STD-AS-0013 External Communications across NWMD, particularly N-FORM-10387, Nuclear Public Communications Tracking to start to build a database of issues and responses on public inquiries.	NWMD Public Affairs	December 2006
Review and update the event notification template.	NWMD Public Affairs	1st Quarter

11.0 ADDITIONAL COMMUNICATION AND PUBLIC AFFAIRS ACTIVITIES

Activity	Responsibility	Schedule/Target
Provide advice and guidance to NWMD staff on employee communications issues.	NWMD Public Affairs	As requested
Act as Power News Board member looking for opportunities to position NWMD positively within OPG and to assist in educating OPG employees to the valuable role that NWMD plays inside the Company.	NWMD Public Affairs	Throughout 2006
Act as a “communication” contact for the NWMO, ensuring that OPG’s Public Affairs staffs are made aware of NWMO activities in site communities.	NWMD Public Affairs	Throughout 2006
Assist with discussions and strategies to minimize NWMO ramifications of NWMO recommendations on current NWMD operations.	NWMD Public Affairs	Throughout 2006

12.0 EVALUATION

(a) Stakeholder feedback, such as the Community Leader Survey, will provide evidence of increased awareness about OPG and NWMD's continued presence at sites.

(b) Regular communication channels with stakeholders are established and maintained.

(c) NWMD's business licensing activities are supported and project disruption is minimized.

(d) Media stories are neutral and balanced in tone.

(e) Stakeholder inquires are responded to in a timely manner.

(f) OPG's nuclear waste operations have a reputation of being open, accessible, honest and a part of the community.

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ONTARIO POWER GENERATION

Plan

Internal Use Only	
Document Number:	
W-PLAN-08260-00003	
Sheet Number:	Revision:
N/A	**R000**

Title:

NUCLEAR WASTE MANAGEMENT DIVISION 2007 COMMUNICATION PLAN

Nuclear Waste Management Division
2007 Communication Plan

W-PLAN-08260-00003-R000

2007-03-07

Order Number: N/A
Other Reference Number: N/A

Internal Use Only

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Nuclear Waste Management Division

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Revision Summary

Revision Number	Date	Comments
R000	2007-03-07	Initial Issue of the Annual NWMD Communication Plan for 2007.

1.0 BACKGROUND

OPG, Nuclear Waste Management Division (NWMD) is responsible for the interim storage of low, intermediate and high level nuclear waste from Ontario's 20 nuclear reactors. The Division operates or has facilities under construction at the Bruce, Darlington and Pickering nuclear sites. In addition, Engineering and Support functions reside at 700 University Avenue in Toronto to support the field operations and for the long-term planning (both technical and financial) of waste facilities and reactor decommissioning. The Division also operates a Radioactive Material Transportation program for OPG.

The purpose of this document is to outline a communication plan for OPG's Nuclear Waste Management Division that recognizes OPG's ongoing presence and involvement in the Bruce, Darlington and Pickering communities, long-term planning for waste management and our transportation program.

The plan is a "living document" and can be changed and adapted to accommodate new issues and timetables.

2.0 COMMUNICATION OBJECTIVES

(a) Continue building, at the appropriate level for the maturity of the business, community awareness that OPG has key components of its business located at the Bruce, Darlington, and Pickering nuclear sites.

(b) Maintain and increase community awareness and understanding of OPG's nuclear waste management operations and projects in order to facilitate construction, licencing and operations.

(c) Continue to build and strengthen relationships with key stakeholders in the government, the media and communities where NWMD operates. Maintain a reputation as an open, accessible and honest business in these communities.

(d) Effectively use the Corporate Citizenship Program to support key community initiatives to demonstrate that OPG is a good corporate citizen in the communities where it conducts business and understands that it needs a "community licence to operate."

(e) Provide Public Affairs advice to management, issue identification, tracking and resolution across NWMD in order to facilitate an effective issues resolution process.

(f) Build awareness, inside OPG, of NWMD, its mission, the magnitude of its operations and its accomplishments.

(g) Continue to deliver OPG's "Radioactive Material Transportation and Emergency Response" communication program to emergency responders.

(h) Support line employee communication, as requested and to the extent resources will allow.

(i) Provide communications support and assistance to the NWMO, as required.

3.0 COMMUNICATION STRATEGY

In accordance with OPG's commitment of keeping stakeholders, especially in communities where OPG operates facilities, well informed about its activities and plans, NWMD public affairs will employ a planned, multi-tactic proactive communication approach designed to keep stakeholders informed about NWMD business objectives and provide opportunities for two-way dialogue.

The strategy is to communicate the "big picture" that focuses on the overall planned development of the waste facilities, while continuing to provide details regarding operational and environment, health and safety performance.

In 2007, NWMD will maintain a proactive and aggressive approach to external communications at the WWMF, highlighting the Deep Geologic Repository (DGR) project and WWMF re-licensing. A more cautious, but informative communication approach to meet regulatory requirements will be taken at NWMD facilities in Pickering and Darlington. This approach is being recommended because of the focus on power generation facilities, possible nuclear refurbishment and new build at these sites and the anticipated announcement of the Federal Government's decision on the Nuclear Waste Management Organization's recommendation to follow an adaptive phased management approach for the long-term management of used nuclear fuel.

4.0 SPOKESPEOPLE

Senior Vice President, NWMD

Director, Public Affairs, NWMD

Media Relations Manager, Public Affairs, NWMD

Director of Operations, NWMD

Senior Manager, Eastern Nuclear Waste Operations, NWMD

5.0 TARGET AUDIENCES

(a) Elected area municipal, provincial and federal government officials;

(b) Appointed government officials;

(c) Regulators;

(d) Employees;

(e) Bruce Power;

(f) Media;

(g) General Public in the vicinity of the waste facilities;

(h) First Nations;

(i) Business Groups,
(i.e., Boards of Trade, Chambers of Commerce, Service Clubs, Agricultural Groups, etc.);

(j) NGOs and Special Interest Groups;

(k) OPG Retirees; and

(l) Other interested individuals or organizations.

6.0 NWMD KEY MESSAGES

(a) OPG is committed to the safe management of nuclear waste, now and in the future, in an environmentally, socially, and financially responsible way.

(b) OPG has been and will continue to operate its nuclear waste management facilities in a manner that focuses on a continuous improvement approach to safety and environmental protection.

(c) Ontario Power Generation has been safely managing all of its nuclear waste for the over 30 years.

(d) Ontario Power Generation's nuclear waste management plans are flexible and will reflect stakeholder expectations and changing financial, political, and regulatory conditions.

(e) Ontario Power Generation has established segregated funds to pay for the full costs of managing nuclear waste and decommissioning at all of its nuclear facilities.

(f) All of OPG's nuclear waste management processing and storage systems are carefully planned, safe, robust, and strictly regulated by the Canadian Nuclear Safety Commission. The facilities are based on proven technologies in Canada and the international community.

(g) Until the federal government decides on a long-term management approach for used nuclear fuel, OPG will continue to safely store its nuclear used fuel at the locations were it has been produced in either water filled bays and/or dry storage containers.

7.0 WESTERN COMMUNICATIONS

Spokesperson – Director Nuclear Waste Operations, with support from NWMD Public Affairs

WWMF Key Messages

For over 30 years OPG has been safely storing low & intermediate level waste from the Bruce, Darlington, and Pickering nuclear stations at our Western Waste Management Facility located on the Bruce site within the Municipality of Kincardine.

Activity	Responsibility	Schedule/Target
Joint Kincardine, Bruce Power, OPG Liaison Committee Meetings. Provide updates on WWMF projects and operations and receive information from elected officials about community issues/perceptions.	Director Nuclear Waste Operations and NWMD Public Affairs	Monthly meetings
South Bruce Impact Advisory Committee Meetings. (Includes County government and Mayors/delegates from the surrounding municipalities.) Provide updates on WWMF projects and operations and receive information from elected officials about community issues/perceptions.	Director Nuclear Waste Operations and NWMD Public Affairs	Monthly meetings

Activity	Responsibility	Schedule/Target
Regular key stakeholder face-to-face meetings, MPs, MPP, etc. to provide updates on WWMF projects and operations and to understand and manage issues that constituents have with the WWMF.	NWMD Public Affairs, assisted by the Director Nuclear Waste Operations as required	Two (2) per year or as required
Communication meeting with Medical Officer of Health and Ministry of Environment to provide updates on WWMF projects and operations and to understand and manage issues that the public have with the WWMF.	Director Nuclear Waste Operations or delegate and NWMD Public Affairs	Two (2) per year - in the Spring & Fall
Bruce County Council Presentation.	NWMD Public Affairs	Annual presentation – 2nd Quarter
Offer WWMF Tours to Bruce County Councils.	NWMD Public Affairs and Director Nuclear Waste Operations, as required	One (1) or two (2) Council Tours
Conduct WWMF Tours, as required.	NWMD Public Affairs and Director Nuclear Waste Operations, as required	Ongoing through the year. Accommodate 95% of requests
Nawash & Saugeen First Nation briefing re: OPG's nuclear waste management program and plans.	Director Nuclear Waste Operations or delegate supported by NWMD Public Affairs	As required
Facilitate access to Jiibegmegoong burial site.	NWMD Public Affairs	Burial ground access as required for ceremonies and inspection
Production & distribution of two WWMF "Neighbours" newsletters.	NWMD Public Affairs	Spring & Fall
Participate in local Chambers of Commerce.	NWMD Public Affairs	Saugeen Shores, Kincardine and Walkerton Chambers of Commerce

Activity	Responsibility	Schedule/Target
Employee communications.	NWMD line management, supported by NWMD Public Affairs	Ongoing
Event Notification	NWMD Public Affairs	As required
Participate in community events (see DGR Communications for more details).	NWMD Public Affairs, with assistance from WWMF staff	As planned
Maintain NWMD Mobile Exhibit.	NWMD Public Affairs	Ongoing
Revise communication products, such as WWMF, DWMF and PWMF Fact Sheets	NWMD Public Affairs	To be complete by the end of the 1st Quarter
Speaking engagements (see DGR Communications for more details).	NWMD Public Affairs, with assistance from WWMF staff	Ongoing
Document and arrange responses to public questions about WWMF projects or operations.	NWMD Public Affairs with assistance from WWMF staff or Corporate Public Affairs	Ongoing
Arrange and process Corporate Citizenship Program grants and presentations.	NWMD Public Affairs	Ongoing through the year. Disperse 90% of budget
WWMF Open House.	NWMD Public Affairs	Investigate the feasibility of hosting a WWMF Open House
Conduct Community Leader Survey.	NWMD Public Affairs	3rd Quarter
Participate in local Santa Claus Parades.	NWMD Public Affairs	Participate in Port Elgin, Southampton and Kincardine parades
Provide media response capability, working with OPG Corporate Media Relations as required.	NWMD Public Affairs and Corporate Media	Ongoing
WWMF Media Events.	NWMD Public Affairs	Throughout the year as opportunities arise

Activity	Responsibility	Schedule/Target
WWMF Advertising, such as Performance Ads.	NWMD Public Affairs	Ongoing, as required
Participate in Transportation & Emergency Response Seminars to "First Responders" to build understanding and confidence in our transportation program.	NWMD Public Affairs and Radioactive Material Transportation staff	Four (4) to six (6) per year

8.0 DGR COMMUNICATIONS

Spokespersons - Senior Vice President, NWMD

- Director, Public Affairs, NWMD
- Media Relations Manager, NWMD

DGR Key Messages

(a) OPG continues to safely store the low and intermediate level nuclear waste, while the DGR project continues through the rigorous regulatory phase.

(b) The proposed DGR for low and intermediate level nuclear waste was developed after Kincardine approached OPG and asked to enter into a Memorandum of Understanding (MOU) to jointly study the possibility of locating a long-term facility on the Bruce site.

(c) After an independent study of various options by Golder Associates, the Municipality of Kincardine chose the Deep Geologic Repository or DGR as their preferred option for further study. OPG agreed with this choice.

(d) The proposed DGR is designed to provide not interim, but long-term isolation of the wastes from the public and the environment for thousands of years into the future.

(e) The DGR proposal has been the subject of an extensive information campaign over the last 5 years and is supported by the residents of Kincardine (confirmed in an independent poll), the surrounding municipalities, the County of Bruce and many groups, individuals and politicians throughout the area.

(f) OPG continues to work with the Saugeen Obijway Nations to ensure that they are familiar with the proposed DGR. OPG is committed to continuing to work with both First Nations.

(g) The Deep Geologic Repository proposal will be subjected to a long, careful regulatory review and approvals process to confirm its safety.

(h) The site investigation and safety and environmental assessments will be carried out and will be thoroughly reviewed by an independent panel, experts in the CNSC and other government bodies.

(i) During the next 10 years, the public will have many opportunities to comment on the project and participate during the regulatory phase of the project.

Note: 2007 will be an important year for NWMD to continue to build awareness and understanding of the DGR project, as the project is now in the regulatory review phase.

Activity	Responsibility	Schedule/Target
DGR Community Consultation Group.	NWMD Public Affairs	Quarterly
DGR briefings to key stakeholders, such as IAC, Liaison, MOH/MOE, MP, MPP, Unions.	NWMD Public Affairs	Semi-annually
"Neighbours" DGR special edition project newsletters.	NWMD Public Affairs	Three (3) to four (4) per year
Operate a "DGR Speakers Bureau" targeting groups in Kincardine and the surrounding municipalities of Arran-Elderslie, Brockton, Huron-Kinloss and Saugeen Shores to build better understanding of the project.	NWMD Public Affairs	10 to 16 events
Update DGR Video.	NWMD Public Affairs	To be complete by the end of the 2nd Quarter
Update DGR Brochure	NWMD Public Affairs	To be complete by the end of the 2nd Quarter
Conduct Public Attitude Research.	NWMD Public Affairs	As required throughout the year
DGR Open Houses	NWMD Public Affairs	One (1) Round in 2007
DGR Media Events.	NWMD Public Affairs	2nd Quarter

Activity	Responsibility	Schedule/Target
DGR advertorial in Marketplace Magazine and local newspapers.	NWMD Public Affairs	Four (4) to six (6) pages per year
Participate in community events with the Mobile Exhibit.	NWMD Public Affairs	25 to 30 events
DGR status update to WWMF, PWMF, and DWMF staff.	NWMD Public Affairs and Director Nuclear Waste Operations	As required
Continue to work with the Nawash and Saugeen First Nations on areas of cooperation and consultation on the DGR Project.	NWMD Consultant with support from NWMD Public Affairs	Throughout 2007

9.0 EASTERN COMMUNICATIONS

Spokesperson – Senior Manager, Eastern Nuclear Waste Operations, NWMD with support from NWMD Public Affairs and Darlington/Pickering Public Affairs

Additional Key messages for Darlington and Pickering Waste Management Facilities.

Darlington and Pickering Low & intermediate level nuclear waste is transported by OPG to the Western Waste Management Facility, located on the Bruce Nuclear site, where it is currently stored in interim facilities.

Note: Key activities associated with the NWMD operations and projects will be coordinated with Darlington/Pickering Public Affairs staff in order to integrate wherever possible into the ongoing Public Affairs program for the Darlington/Pickering Nuclear Generating Stations.

Activity	Responsibility	Schedule/Target
Participate as required in Darlington Site Planning Committee Meetings. Provide updates on projects and operations and receive information from elected officials about community.	Senior Manager, Eastern Nuclear Waste Operations , NWMD with support from NWMD Public Affairs & in concert with Darlington Public Affairs Staff	Bi-Monthly Committee Meetings
Participate in the Pickering Community Advisory Committee Meetings, identifying and addressing nuclear waste management issues.	Senior Manager, Eastern Nuclear Waste Operations , NWMD with support from NWMD Public Affairs & in concert with Darlington Public Affairs Staff	Quarterly Meetings
Participate in the Durham Nuclear Health Committee Meetings, identifying and addressing nuclear waste management issues.	Senior Manager, Eastern Nuclear Waste Operations , NWMD with support from NWMD Public Affairs & in concert with Darlington Public Affairs Staff	Quarterly Meetings
NWMD stories in the Darlington and Pickering “Neighbours Newsletters”.	Senior Manager, Eastern Nuclear Waste Operations , NWMD with support from NWMD Public Affairs & in concert with Darlington Public Affairs Staff	One story in each publication in 2007
Plan DWMF Opening	Senior Manager, Eastern Nuclear Waste Operations , NWMD with support from NWMD Public Affairs & in concert with Darlington Public Affairs Staff	Mid 2007
Establish an NWMD presence at community events attended by Darlington/Pickering Public Affairs.	NWMD Public Affairs in conjunction with NWMD East Staff and Darlington/Pickering Public Affairs Staff	Attend three (3) to four (4) events per year such as 2007 Clarington Family Safety Day
Respond to media requests as required.	NWMD Public Affairs in conjunction with Corporate Media Relations	As required and appropriate

Activity	Responsibility	Schedule/Target
NWMD, Pickering and Darlington Public Affairs Coordination meeting.	NWMD, Pickering and Darlington Public Affairs	Annually
Participate in Pickering and Darlington Lunch and Learn Series.	NWMD Public Affairs	One (1) per year
Review and update NWMD displays at Information Centres.	NWMD Public Affairs	December 2007

10.0 ISSUE IDENTIFICATION AND MANAGEMENT

Activity	Responsibility	Schedule/Target
Provide advice and guidance to NWMD staff on how to handle inquiries from the public, media and government.	NWMD Public Affairs in consultation with Corporate Public Affairs as required	Throughout 2007
Prepare Briefing Papers and key messages for major NWMD Project and Initiatives in anticipation of government and media interest.	NWMD Public Affairs	Three (3) by the end of the 2nd Quarter and 3 by the end of the 3rd Quarter
Review and update N-STD-AS-0013 External Communications, particularly N-FORM-10387, Nuclear Public Communications Tracking, for use by NWMD in building a database of issues and responses on public inquiries.	NWMD Public Affairs	December 2007
Review and update the event notification template.	NWMD Public Affairs	2nd Quarter

11.0 ADDITIONAL COMMUNICATION AND PUBLIC AFFAIRS ACTIVITIES

Activity	Responsibility	Schedule/Target
Provide advice and guidance to NWMD staff on employee communications issues.	NWMD Public Affairs	As requested
Act as Power News Board member looking for opportunities to position NWMD positively within OPG and to assist in educating OPG employees to the valuable role that NWMD plays inside the Company.	NWMD Public Affairs	Throughout 2007
Act as a "communication" contact for the NWMO, ensuring that OPG's Public Affairs staffs are made aware of NWMO activities in site communities.	NWMD Public Affairs	Throughout 2007
Assist with discussions and strategies to minimize NWMO ramifications of NWMO recommendations on current NWMD operations.	NWMD Public Affairs	Throughout 2007
Prepare Nuclear Waste Media Guide	NWMD Public Affairs	To be complete by the end of the 2nd Quarter
Coordinate/Maintain NWMD Internet Site	NWMD Public Affairs	Ongoing

12.0 EVALUATION

(a) Stakeholder feedback, such as the Community Leader Survey, will provide evidence of increased awareness about OPG and NWMD's continued presence at sites.

(b) Regular communication channels with stakeholders are established and maintained.

(c) NWMD's business licensing activities are supported and project disruption is minimized.

(d) Local media evaluation shows media stories are neutral and balanced in tone.

(e) Stakeholder inquires are responded to in a timely manner.

(f) OPG's nuclear waste operations have a reputation of being safe, transparent, and accessible and a part of the community.

(g) Evaluate website trends and feedback.

(h) Evaluate WWMF tours.

(i) Hold Annual Meeting with Senior Vice President, NWMD, Director, Waste Operations, NWMD, Senior Manager, Eastern Nuclear waste Operations, NWMD and Public Affairs staff to discuss how we are doing and suggestions for change.

ONTARIOPOWER GENERATION

Plan

Internal Use Only	
Document Number:	
W-PLAN-08260-00004	
Sheet Number:	Revision:
N/A	R000

Title:

NUCLEAR WASTE MANAGEMENT DIVISION (NWMD) 2008 COMMUNICATION PLAN

Nuclear Waste Management Division (NWMD) 2008 Communication Plan

W-PLAN-08260-000044-000

2008-02-13

Order Number: N/A
Other Reference Number: N/A

Internal Use Only

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Revision Summary

Revision Number	Date	Comments
R000	2008-02-13	Initial Issue of the Annual NWMD Communication Plan for 2008.

1.0 BACKGROUND

Ontario Power Generation's (OPG), Nuclear Waste Management Division (NWMD) is responsible for the interim storage of low, intermediate and high level nuclear waste from Ontario's 20 nuclear reactors. The Division operates facilities at the Bruce, Darlington and Pickering nuclear sites. In addition, Engineering and Support functions reside in Toronto to support the field operations and for the long-term planning (both technical and financial) of waste facilities and reactor decommissioning. The Division also operates a Radioactive Material Transportation program for OPG.

The purpose of this document is to outline a communication plan for NWMD that recognizes OPG's ongoing presence and involvement in the Bruce, Darlington and Pickering communities, long-term planning for waste management and our transportation program. A unique challenge for 2008 is to adapt to increasing pressure to escalate our communications beyond the facility communities.

The plan is a "living document" and can be changed and adapted to accommodate new issues and timetables throughout the year.

2.0 STRATEGIC DIRECTION

Identify, plan and carry out public affairs activities to maintain and enhance "social license" to operate waste management facilities in our host communities and create greater understanding of the nuclear waste role throughout Ontario and beyond.

Enhance communications along transportation routes to build public awareness of our Transportation program.

3.0 COMMUNICATION OBJECTIVES

(a) Continue building community awareness that OPG has key components of its business located at the Bruce, Darlington, and Pickering nuclear sites.

(b) Maintain and increase community awareness (including outlying communities) and understanding of OPG's nuclear waste management operations and projects in order to facilitate construction, licencing and operations.

(c) Continue to build and strengthen relationships with key stakeholders in the government, the media and communities where NWMD operates. Maintain a reputation as an open, accessible and honest business in these communities.

(d) Effectively use the Corporate Citizenship Program to support key community initiatives to demonstrate that OPG is a good corporate citizen in the communities where it conducts business and understands that it needs a "community licence to operate".

(e) Provide Public Affairs advice to management, issue identification, tracking and resolution across NWMD in order to facilitate an effective issues resolution process.

(f) Interact with OPG Corporate Public Affairs to build awareness inside OPG, of NWMD and its mission and the magnitude of its operations and accomplishments.

(g) Continue to deliver OPG's "Radioactive Material Transportation and Emergency Response" communication program to emergency responders.

(h) Provide communications support and advice to the NWMO, as required.

(i) Provide (as resources allow) employee communications support for corporate initiatives and NWMD initiatives.

4.0 COMMUNICATION STRATEGY

In accordance with OPG's commitment of keeping stakeholders, especially in communities where OPG operates facilities, well informed about its activities and plans, NWMD Public Affairs will employ a planned, multi-tactic proactive communication approach designed to keep stakeholders informed about NWMD business objectives and provide opportunities for two-way dialogue.

In 2008, NWMD will actively communicate on its operations and projects at the Bruce, Pickering and Darlington sites and will continue to aggressively communicate on the Deep Geologic Repository (DGR) project.

5.0 SPOKESPEOPLE

Senior Vice President, NWMD

Director, Public Affairs, NWMD

Vice President, Operations, NWMD

Media Relations Manager, NWMD and OPG

6.0 TARGET AUDIENCES

(a) elected area municipal, provincial and federal government officials;

(b) appointed government officials;

(c) regulators;

(d) employees;

(e) Bruce Power;

(f) media;

(g) General Public in the vicinity of the waste facilities and beyond;

(h) First Nations;

(i) Business Groups,
(i.e., Boards of Trade, Chambers of Commerce, Service Clubs, Agricultural Groups, etc.);

(j) NGOs and Special Interest Groups;

(k) OPG Retirees; and

(l) other interested individuals or organizations.

7.0 NWMD KEY MESSAGES

(a) OPG is committed to the safe management of nuclear waste, now and in the future, in an environmentally, socially, and financially responsible way.

(b) OPG has been and will continue to operate its nuclear waste management facilities in a manner that focuses on a continuous improvement approach to safety and environmental protection.

(c) Ontario Power Generation has been safely managing all of its nuclear waste for the over 40 years.

(d) Ontario Power Generation's nuclear waste management plans are flexible and will reflect stakeholder expectations and changing financial, political, and regulatory conditions.

(e) Ontario Power Generation has established segregated funds to pay for the full costs of managing nuclear waste and decommissioning at all of its nuclear facilities.

(f) All of OPG's nuclear waste management processing and storage systems are carefully planned, safe, robust, and strictly regulated by the Canadian Nuclear Safety Commission. The facilities are based on proven technologies in Canada and the international community.

(g) Until a long-term management approach for used nuclear fuel is operationalized, OPG will continue to safely store its nuclear used fuel at the locations were it has been produced in either water filled bays and/or dry storage containers.

8.0 OPERATIONS COMMUNICATIONS

8.1 Spokesperson

Vice President, Nuclear Waste Operations, with support from NWMD Public Affairs

8.2 Operations Key Messages

For approximately 40 years OPG has been safely storing low & intermediate level waste from the Bruce, Darlington, and Pickering nuclear stations at our Western Waste Management Facility located on the Bruce site within the Municipality of Kincardine.

NWMD also operates dry storage facilities at the Bruce, Pickering and Darlington nuclear sites.

Note: Key activities associated with the NWMD operations and projects in the East will be coordinated with Darlington and Pickering Public Affairs staff in order to integrate wherever possible into the ongoing Public Affairs programs for the Darlington and Pickering Nuclear sites.

Activity	Schedule/Target	Strategic Initiative
Joint Kincardine, Bruce Power, OPG Liaison Committee Meetings. Provide updates on WWMF projects and operations and receive information from elected officials about community issues/perceptions.	Monthly meetings	Review strategy of maintaining the committee going forward, given its mandate and the emergence of new committees.
South Bruce Impact Advisory Committee Meetings. (Includes County government and Mayors/delegates from the surrounding municipalities.) Provide updates on WWMF projects and operations and receive information from elected officials about community issues/perceptions.	Monthly meetings	Introduce NWMO and give it a platform to explain its current work.

Activity	Schedule/Target	Strategic Initiative
Regular key stakeholder face-to-face meetings, MPs, MPP, etc. to provide updates on WWMF projects and operations and to understand and manage issues that constituents have with the WWMF.	One(1) to two(2) per year	Expand meetings to include Bruce-Grey MP Larry Miller and Bruce-Grey MPP Bill Murdoch
Communication meeting with Medical Officer of Health and Ministry of Environment to provide updates on WWMF projects and operations and to understand and manage issues that the public have with the WWMF.	Two (2) per year - in the Spring & Fall	
Bruce County Council Presentation	Annually	
Offer WWMF Tours to Bruce County municipal councils.	One (1) or two (2) Council Tours	Extend invitations to the Municipality of Kincardine and the Township of South Bruce
Conduct NWMD Facility Tours, as required.	Ongoing through the year. Accommodate 95% of requests	
Facilitate access to Jiibegmegoong burial site.	Burial ground access as required for ceremonies and monitoring	
Production & distribution of "Neighbours" newsletters	Produce two(2) to three(3) WWMF Neighbours newsletters per year	Expand coverage of Darlington and Pickering operations and the transportation program. Expand coverage of Corporate initiatives to expand our reputation.
Maintain contact with Chambers of Commerce and Board of Trade	Maintain ongoing contact	Provide presentations to Chambers in the East and to the Board of Trade

Activity	Schedule/Target	Strategic Initiative
NWMD Mobile Exhibit	Maintain mobile exhibit	Order new van with DGR wrap
Revise NWMD communication products, as required	Revise WWMF Fact Sheet by end of Q3 , using new photography Revise PWMF and DWMF Fact Sheets by end of Q3 to include information on low and intermediate level waste operations and transportation	Revise WWMF Fact Sheet to include information on refurbishment waste storage and PWMF and DWMF Fact Sheets to include information on waste operations and transportations
Speaking engagements (see DGR Communications for more details)	Ten(10) to sixteen(16) per year	Look at some opportunities beyond host and neighbouring impact municipalities
Participate in Transportation Seminars	Six (6) to eight(8) per year	Review history of Transportation program and messaging
PWMF Relicensing Hearing	Eight(8) to ten(10) letters of support	
Participate as required in Darlington Site Planning Committee Meetings. Provide updates on projects and operations and receive information from elected officials about community.	Bi-Monthly Committee Meetings	
Participate in the Pickering Community Advisory Committee Meetings, identifying and addressing nuclear waste management issues.	Monthly Meetings	
Participate in the Durham Nuclear Health Committee Meetings, identifying and addressing nuclear waste management issues.	Quarterly Meetings	

Activity	Schedule/Target	Strategic Initiative
Establish an NWMD presence at community events attended by Darlington/Pickering Public Affairs.	Attend one (1) to four (4) events per year such as 2008 Clarington Family Safety Day	
NWMD, Pickering and Darlington Public Affairs Coordination meeting	Ongoing throughout the year	
EA Monitoring work	Complete Darlington EA monitoring commitments by Q4	Create plan by end of Q1
NWMD Environmental Management System	Update EMS Fact Sheets, as required	Look for external publicity opportunities

9.0 DGR COMMUNICATIONS

9.1 Spokespersons

Senior Vice President, NWMD

Director, Public Affairs, NWMD

Media Relations Manager, NWMD

9.2 DGR Key Messages

(a) OPG continues to safely store the low and intermediate level nuclear waste, while the DGR project continues through the rigorous regulatory phase.

(b) The proposed DGR for low and intermediate level nuclear waste was developed after Kincardine approached OPG and asked to enter into a Memorandum of Understanding (MOU) to jointly study the possibility of locating a long-term facility on the Bruce site.

(c) After an independent study of various options by Golder Associates, the Municipality of Kincardine chose the Deep Geologic Repository or DGR as their preferred option for further study. OPG agreed with this choice.

(d) The proposed DGR is designed to provide not interim, but long-term isolation of the wastes from the public and the environment for thousands of years into the future.

(e) The DGR proposal has been the subject of an extensive information campaign over the last 5 years and is supported by the residents of Kincardine (confirmed in an independent poll), the surrounding municipalities, the County of Bruce and many groups, individuals and politicians throughout the area.

(f) OPG continues to work with the Saugeen Obijway Nations to ensure that they are familiar with the proposed DGR and have the capacity to participate in the regulatory review process.

(g) The Deep Geologic Repository proposal will be subjected to a long, careful regulatory review and approvals process to confirm its safety.

(h) The site investigation and safety and environmental assessments will be carried out and will be thoroughly reviewed by an independent panel, experts in the CNSC, other government bodies, and the international community.

(i) During the next 10 years, the public will have many opportunities to comment on the project and participate during the regulatory phase of the project.

Activity	Schedule/Target	Strategic Initiative
DGR Steering Committee	Bi-weekly	Include Media Relations Manager
Maintain DGR public information and consultation program	Ongoing	Third party endorsement of the Site Characterization Program
DGR briefings to key stakeholders, such as IAC, Liaison, DNHC, CAC, SPC, MOH/MOE, MP, MPP, Unions.	Annually, or more frequently as required	Suggested DGR presentations to include: Q1-latest DGR design, Q2-Update on site characterization program and safety case, Q3-update on borehole drilling results and Q4-update on second round of Open Houses
DGR Consultation Committee	Two(2) per year, or at the call of the Chair	
OPG Kincardine Nuclear Waste Steering Committee	Two(2) per year, or at the call of the Chair	
Participate in community events	Forty-five(45) event days for 2008	

Activity	Schedule/Target	Strategic Initiative
Operate a "DGR Speakers Bureau"	10 to 16 events	Broaden speaking engagements to centres beyond the local Bruce area
Public Attitude Research	Conduct research before the end of the Q3	
DGR Open Houses	Conduct 2nd round in the Fall	
DGR Media Day	Fall 2008	
DGR advertising and advertorials in Marketplace Magazine and local newspapers	Three(3) ads and twelve(12) advertorials	
Update DGR Video	To be complete by Fall 2008	
Update DGR Brochure	To be complete by Fall 2008	
"Neighbours" DGR special edition project newsletters	Three (3) to four (4) per year	
Continue dialogue with Saugeen Obijway Nation and assist with the development of a consultation protocol.	Throughout 2008	

10.0 MEDIA AND ISSUE MANAGEMENT

Activity	Schedule/Target	Strategic initiative
Provide media response capability, working with OPG Corporate Media Relations, as required.	As required	
Prepare Nuclear Waste Media Guide	To be complete by the end of the 2nd Quarter	Coordinate with Corporate Media Relations and Nuclear Public Affairs
NWMD Operations media events	Throughout the year as opportunities arise	

Activity	Schedule/Target	Strategic initiative
Document and arrange responses to public questions about NWMD projects or operations.	Ongoing	
Event Notification	As required	Review and update the event notification template for the Bruce.
Provide advice and guidance to NWMD staff on handling inquiries from the public, media and government.	Throughout 2008	
Prepare Briefing Papers and key messages for major NWMD Project and Initiatives in anticipation of government and media interest.	Summer 2008	Topics to include: Waste operations, transportation, DGR, Funds for long-term management and decommissioning
Review and update N-STD-AS-0013 External Communications, particularly N-FORM-10387, Nuclear Public Communications Tracking, for use by NWMD in building a database of issues and responses on public inquiries.	Summer 2008	Review standard and use by NWMD.

11.0 CORPORATE COMMUNICATIONS

Activity	Schedule/Target	Strategic Initiative
Arrange and process Corporate Citizenship Program grants and presentations.	Ongoing through the year. Disperse 90% of budget	Direct ten(10) to fifteen(15) percent to First Nations and a minimum of three(3) sponsorship initiatives to outlying municipalities
Advertising, such as Performance Ads	Ongoing, as required	

Activity	Schedule/Target	Strategic Initiative
Act as Power News Board member looking for opportunities to position NWMD positively within OPG and to assist in educating OPG employees to the valuable role that NWMD plays inside the Company.	Throughout 2008	Produce six(6) positive nuclear waste stories
OPG Sustainable Energy Development Report	Throughout 2008	Enhance coverage of NWMD
Act as a "communication" contact for the NWMO, ensuring that OPG's Public Affairs personnel are made aware of NWMO activities in site communities.	Throughout 2008	
Assist with discussions and strategies to minimize NWMO ramifications of NWMO recommendations on current NWMD operations.	Throughout 2008	
Coordinate/maintain NWMD Internet Site	Ongoing	Highlight use of internet to regulatory authorities and its ability to communicate beyond facility communities.

12.0 EVALUATION

(a) Review Communication Plan results. Target completion of 85% of initiatives.

(b) Continued positive feedback from stakeholders.

(c) Hold Annual Meeting with Senior Vice President, NWMD and NWMD Public Affairs staff to discuss how we are doing and suggestions for change.

Title: L&ILW Deep Geologic Repository Project - 2009 Communication Plan		Security Classification:	
Document No.: DGR-PLAN-08510-0002	Revision: 000	Date: Feb 10/09	Page: 1 of 12

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NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

Low & Intermediate Level Waste (L&ILW) Deep Geologic Repository (DGR) Project

2009 Communication Plan

Authorization

Author: A. Castellan for Marie Wilson Date: Feb 10/09
Media Relations Manager

Approved By: A. Castellan Date: Feb 10/09
Angelo Castellan
Vice President

Revision Summary		
Revision Number	**Date**	**Description of Changes/Improvements**
000	2009-02-10	Initial Issue of the 2009 annual plan

Low & Intermediate Level Waste (L&ILW) Deep Geologic Repository (DGR) Project

2009 Communication Plan

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1 BACKGROUND

Ontario Power Generation (OPG) is proposing to construct a Deep Geologic Repository (DGR) for the long-term management of the low and intermediate level nuclear waste (L&ILW) from its 20 reactors. As owner and licencee of the proposed project, OPG has contracted the Nuclear Waste Management Organization (NWMO) to deliver Environmental Assessment and Construction Licence approval, including the management and integration of technical, community and regulatory relations.

The NWMO, in its role as project manager, will formulate and execute a communication plan designed to garner and maintain support for the DGR which will also ensure the community understands the long-term safety case for the DGR.

The purpose of this document is to define a communication plan for the L&ILW DGR Project, that outlines strategy, objectives, challenges, spokespeople, target audiences, key messages and a projected list of activities, and consistent with the Public Affairs Protocol (January 30, 2009) between both OPG and NWMO.

The plan is a "living document" which will be adapted when necessary to reflect changing or emerging issues, revisions to the projected list of activities and scheduling adjustments.

2 STRATEGIC DIRECTION

a) Identify, plan and carry out public affairs activities to support the development of a Deep Geologic Repository for the long term management of low and intermediate level radioactive waste at the Bruce site.

b) Create an identity and reputation for the NWMO within the Bruce community and surrounding areas, ensuring that the communication plan reflects the wider corporate objectives, while maintaining the distinct and separate nature of the DGR project.

c) It will be important to ensure that the communication of the transfer of the DGR project for development to the NWMO doesn't negatively impact the reputation of OPG or come into conflict with its wider company objectives.

3 COMMUNICATION OBJECTIVES

a) Given that community support as well as an understanding of the long-term safety of the DGR is critical to the successful licencing of the project, it is vital to develop NWMO's credibility and reputation as a good corporate citizen within the Bruce community.

b) Continue to build Bruce community awareness and understanding of the L&ILW DGR Project in order to facilitate environmental assessment and construction licence approval.

c) Communicate the transfer of the development of the L&ILW DGR Project from OPG to the NWMO so the public is fully aware and informed of the process, recognizing that OPG continues to be the owner, operator and funding source.

d) Continue to build and strengthen relationships with key stakeholders in the government, the media and local community. It is important to emphasize the need for the local communities to actively engage in advocacy for the DGR project and to embrace their role as "partners" in this initiative.

e) Establish and implement a modest NWMO Community Partnership Program to support key community initiatives to demonstrate NWMO as a good corporate citizen in the communities where it conducts business. This program is intended to complement and not compete against OPG's corporate citizenship efforts in the community. Given that NWMO is focused on enhancing its brand and reputation in the community and abroad, it is vital that new initiatives associated be established.

f) Ensure OPG is kept fully informed of communication plans and progress in keeping with the communication protocol between OPG and NWMO. All strategies and objectives of the plan, to be implemented by the NWMO, will be in keeping with OPG's wider corporate strategies.

g) Educate Bruce community leaders to ensure they are able to offer meaningful support to the L&ILW DGR Project based on a thorough knowledge of the project gained from extensive technical presentations as well as independent peer review.

4 COMMUNICATION STRATEGY

In accordance with NWMO's commitment to keeping the community/stakeholders well informed about its activities and plans, DGR Public Affairs will employ a planned, multi-tactic proactive communication approach designed to keep community/ stakeholders informed about project objectives and provide opportunities for two-way dialogue.

In 2009, NWMO will be extremely active and highly visible with its communication of the L&ILW Deep Geologic Repository (DGR) Project.

5 SPOKESPEOPLE

President, NWMO

Vice President, Environmental Assessment & Corporate Support, NWMO

Media Relations Manager, NWMO

6 TARGET AUDIENCES

a) Elected area municipal, provincial and federal government representatives;

b) Regulators and government civil servants;

c) NWMO employees;

d) OPG employees;

e) Bruce Power employees;

f) Local media

g) General Public in the vicinity of the waste facilities and surrounding communities;

h) Saugeen Ojibway Nations;

i) Historic Saugeen Metis, and Metis Nation of Ontario;

j) Business Groups (i.e., Boards of Trade, Chambers of Commerce, Service Clubs, Agricultural Groups, etc.);

k) NGOs and Special Interest Groups;

l) OPG/Bruce Power Retirees; and

m) Other interested individuals or organizations, including those located in Michigan.

7 DGR KEY MESSAGES

a) OPG has a proven track record in the safe management of low and intermediate level nuclear waste that spans over 35 years.

b) Kincardine Council chose the DGR because it wanted a long-term management option for L&ILW that is consistent with best international practice and provides the highest margins of safety for both the public and the environment. The waste will be managed over the long-term in a safer place.

c) The geology of the proposed DGR Project presents multiple natural barriers that will provide for the safe long-term isolation and containment of L&ILW from the public and the environment for many thousands of years.

d) The L&ILW DGR Project will only be constructed following regulatory approval, with community support, and be subjected to international peer review.

e) NWMO will be open and transparent in all of its communications related to the L&ILW DGR Project.

8 COMMUNICATION ACTIVITIES

NWMO plans to maintain a DGR Communications Calendar, incorporating and scheduling many of the activities identified in the tables that follow.

Activity	Schedule/Target	Strategic Initiative
DGR Project Review Meeting	Bi-weekly	Provide updates at source to ensure proper messaging and public consultation.
DGR briefings to key stakeholders, such as IAC, Liaison, MOH/MOE, MP, MPP, Bruce County Council, Unions, Bruce Power.	Annually, or more frequently as required	Provide technical and social updates in order to avoid surprises while maintaining an informed group of key stakeholders who will be able to offer meaningful comments at the public hearing.
Arrange and process new Community Partnership Program which will support initiatives designed to enhance the reputation of the NWMO with key stakeholders.	Ongoing throughout the year with at least 90 per cent of the budget dispersed.	One of the key ways to establish an identity and reputation for the NWMO will be through this community partnership program. The grants and presentations should be significant enough to attract public recognition in order to promote the new company. The program is documented under separate cover.
DGR Community Consultation Advisory Group – consists of the eight mayors (one of whom is the Bruce County Warden) and CAOs for the eight municipalities that make up Bruce County as well as representatives from NWMO. OPG will also have representation as per the communication protocol.	Two (2) to three (3) per year	Provide technical and social updates to all eight county mayors at the same time in order to create a sense of solidarity/continuity, while avoiding surprises and divisiveness among the group. This committee provides ongoing intelligence of the Bruce community as well as advice on the effectiveness of our public communication program. They need to be properly prepared and informed through extensive technical presentations and independent peer review, which will allow them to offer meaningful and informed support at the public review panel hearing.

Activity	Schedule/Target	Strategic Initiative
Provide annual update to all 8 municipal councils.		Provide wrap-up of year's events and pave way for milestones in coming year. An update will ensure all council members are aware of developments, plus ensure media coverage of update.
OPG Kincardine Nuclear Waste Steering Committee – consists of the Kincardine Mayor, Deputy-Reeve, two councillors, NWMO representatives and OPG representative as per the communication protocol.	Two(2) to three (3) per year	Important to acknowledge special status of host municipality while maintaining balance with the other municipalities. Emphasis needed to ensure host municipality is actively engaged in supporting the project in keeping with its status as a "partner."
Maintain contact with local Chambers of Commerce	Maintain ongoing contact Create a new award sponsored by the NWMO for the 2009 season – March	
Follow through with the Michigan initiative, as outlined by OPG in the fall 08, with Muchmore, Harrington, Smalley and Associates (MHSA) to monitor, strategize and execute outreach to groups and officials in Michigan who have an interest in the DGR project.	Ongoing	Intelligence provided by this firm will keep us ahead of any future issues building in Michigan and their possible impact to the future.
Communication progress reports to the CNSC.	As needed.	Regular updates to the CNSC about the DGR consultation activities and their results will ensure that the regulator is aware of the current, high level of community support for the DGR and any changes in that support.
Participate in community events	Forty-five(45) event days for 2009	
Operate a "DGR Speakers Bureau"	16 – 20 events	Broaden speaking engagements to centres beyond the local Bruce area

Activity	Schedule/Target	Strategic Initiative
Offer WWMF/DGR tours to key stakeholders	As required	
DGR Open Houses	If required in 2009 – may be a lack of new information	
Provide media response capability, as required.	As required while seeking out more one on one opportunities with new sources such as Kincardine Cable TV, print media on the Peninsula.	Increase coverage, awareness of project.
Consider DGR Media Day for Michigan Media or some other form of activity such as meeting with editorial boards.	May/June	Ensure the correct information is available to the media – create sense of openness and transparency, and hopefully goodwill.
DGR advertising and advertorials in Marketplace Magazine and local newspapers	12 issues of Marketplace, utilize business progress editions and opportunities for sponsorship pages and seasonal advertising	Create positive identity for NWMO within Bruce County.
Document and arrange responses to public questions	Ongoing as part of the EA process	
Update DGR Van and Trailer	Mid - March	Needs to be ready for local events that begin at the end of March, as identified in the DGR Communications Calendar.
DGR project newsletters	Three (3) to four (4) per year	
Continue dialogue with Aboriginal groups including Saugeen Ojibway Nation and Metis. Assist with the development of a consultation protocol.	Throughout 2009 – designate accountability	
Update pop-up displays or design new display	End of first quarter	

Activity	Schedule/Target	Strategic Initiative
Host DGR Network Dinner	October	Recognize key stakeholders, contractors, OPG staff and principals who contribute and support the DGR.
Coordinate/maintain DGR Internet Site	Create a new DGR website at NWMO; to be linked with OPG	Highlight use of internet to regulatory authorities and its ability to communicate beyond facility communities.
NWMO and OPG DGR Communication Coordination Meeting(s)	As per the Communication Protocol.	
Participate in nuclear industry events for training and development purposes	As approved	
Host two outdoor movies for seasonal residents utilizing the opportunity to show the DGR video before the feature presentation	Summer in Saugeen Shores and the Municipality of Kincardine	Target seasonal residents as well as permanent residents.
Create a one-page fact sheet for the NWMO/DGR	April	Clearly identify the role of the NWMO with respect to the DGR to avoid confusion and misinformation about relationship and future use of DGR.
Finish updating DGR booklet	End of February	
Compile DGR annual report	End of March	
Update portable DGR exhibit displays and materials to reflect NWMO and OPG		

9 EVALUATION

a) Review Communication Plan results. Target completion of 80% of initiatives.

b) Continued positive feedback from stakeholders.

c) Hold Annual Meeting with OPG Communication SPOC to review the execution of the plan.

Title: OPG's Deep Geologic Repository Project for Low & Intermediate Level Waste - 2010 Communication Plan		Security Classification:	
Document No.: DGR-PLAN-08510-0002	Revision: 000	Date: Jan 29/10	Page: 1 of 12

nwmo

NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

OPG's Deep Geologic Repository Project For Low & Intermediate Level Waste

2010 Communication Plan

Authorization

Authored By: A. Castellan for Kevin Orr Date: Jan 29/10
Sr. Communication Advisor

Approved By: A. Castellan Date: Jan 29/10
Angelo Castellan
Vice President

Revision Summary		
Revision Number	**Date**	**Description of Changes/Improvements**
000		Initial Issue of the 2010 annual plan

OPG's Deep Geologic Repository Project

for Low & Intermediate Level Waste

2010 Communication Plan

Table of Contents

1 BACKGROUND

Ontario Power Generation (OPG) is proposing to construct a Deep Geologic Repository (DGR) for the long-term management of the low and intermediate level nuclear waste (L&ILW) from its 20 reactors. As owner and licensee of the proposed project, OPG has contracted the Nuclear Waste Management Organization (NWMO) to deliver Environmental Assessment and Site Preparation and Construction Licence approval, including the management and integration of technical, community and regulatory relations.

The NWMO, in its role as project manager, will formulate and execute a communication plan designed to garner and maintain support for the DGR and ensure the community understands the long-term safety case for the project.

Communications will be focused on Bruce County municipalities, Aboriginal communities and other specifically targeted areas, such as Michigan.

The purpose of this document is to define a communication plan for the DGR L&ILW Project, in 2010 that outlines objectives, strategy, spokespeople, target audiences, key messages and a projected list of communication activities.

The plan is a "living document" that will be adapted when necessary to reflect changing or emerging issues, revisions to the projected list of activities and scheduling adjustments.

2 COMMUNICATION OBJECTIVES

a) Build Bruce community awareness, understanding and support for the DGR project in order to facilitate environmental assessment and site preparation/construction licence approval.

b) Inform and educate Bruce community leaders to ensure they are able to offer meaningful input and support, emphasizing the importance for local communities to actively embrace their role as "community partners".

c) Monitor community views on the DGR project and gauge level of support.

d) Highlight that as owner, operator and licensee of the DGR project, OPG has contracted NWMO to manage the project through the regulatory approvals process, and also that DGR and Adaptive Phased Management (APM) are separate, distinct projects.

e) Establish NWMO's and OPG's credibility and reputation as a good corporate citizen within the Bruce community, in support of successful licensing of the project.

3 COMMUNICATION STRATEGY

To achieve the communication objectives DGR Public Affairs will employ a planned, multi-pronged, communication strategy. The strategy includes:

a) Using a wide range of communication tactics and products such as: stakeholder briefings, presentations to interested groups, open houses, newsletters, and other publications, DGR website and outreach events with the DGR mobile exhibit to deliver DGR information directly to the people.

b) Provide regular detailed briefings to key community leaders and stakeholders (including Michigan where appropriate) to ensure they are able to offer meaningful participation and input.

c) Obtain community feedback from our engagement efforts and public attitude research.

d) Continue to build a working relationship with the local media by regularly providing the media with factual, up-to-date project information and analyzing it for accuracy and balance.

e) Sponsor and support local community projects and initiatives in order to build NWMO's brand.

4 SPOKESPEOPLE

President, NWMO

Vice President, Environmental Assessment & Corporate Support, NWMO

Media Relations Manager, NWMO

Senior Communications Advisor, NWMO

OPG EVP/VP Public Affairs (where applicable)

5 TARGET AUDIENCES

a) Elected area municipal, provincial and federal government representatives;

b) Regulators and government civil servants;

c) NWMO employees;

d) OPG employees;

e) Bruce Power employees;

f) Local media

g) General Public in the vicinity of the waste facilities and Bruce communities;

h) Aboriginal Groups, including local Saugeen Ojibway Nations, Métis Nation of Ontario and Historic Saugeen Métis;

i) Community Groups (i.e., Boards of Trade, Chambers of Commerce, Service Clubs, Agricultural Groups, Recreational Groups, Anglers and Fishers, etc.);

j) NGOs and Special Interest Groups;

k) OPG/Bruce Power Retirees; and

l) Other interested individuals or organizations, including those located in Michigan.

6 DGR KEY MESSAGES

a) OPG has a proven track record in the safe management of low and intermediate level nuclear waste that spans over 40 years.

b) As the owner, operator and licensee of the DGR Project, OPG has contracted NWMO to manage the project through the regulatory approvals process.

c) Kincardine chose the DGR because it wanted a long-term management option for L&ILW that is consistent with best international practice and provides the highest margins of safety for both the public and environment.

d) The geology of the proposed DGR project presents multiple natural barriers that will provide for the safe long-term isolation and containment of L&ILW from the public and the environment for thousands of years.

e) The DGR project will only be constructed following regulatory approval, with community support, and be subjected to international peer review.

f) The DGR will not contain used nuclear fuel. It is for the long-term management of low and intermediate level waste. The long-term management project for Canada's used fuel is NWMO's Adaptive Phased Management (APM) project. DGR and APM are separate, distinct projects.

7 ISSUES MANAGEMENT

An important aspect of managing the project is the identification and mitigation of risks to a successful project outcome. NWMO prepares a project Risk Management Plan and risk register that is updated semi-annually, and that presents the assessment of risks to the DGR Project during the Regulatory Approvals Phase. The following list has been extracted from the registry as the highest ranking risks pertaining to public affairs and communications:

a) The current level of municipal support may decline such that the municipalities do not actively support the proposal. Mitigation measures include:

- NWMO/OPG and the eight municipalities of Bruce County meet regularly to discuss communications initiatives.
- NWMO/OPG continues to meet regularly with Municipal officials to provide updates, identify potential issues and develop ways to address issues.

b) NGOs or external/international groups launch an opposition campaign. Mitigation measures include:

- NGOs briefed on a periodic basis. Extensive public communications effort.
- Impact counterbalanced by local support.
- Key messages for the project will be developed and used in external communications.

c) Opposition from Aboriginal groups. Mitigation measures include:

- Ongoing communications with local First Nations and Métis about the proposed DGR. Memorandum of Understanding with First Nations & Métis will provide a common basis for their involvement in the DGR Project, and could provide opportunity for incorporating traditional knowledge into the EA process.

- Support OPG in their efforts to reach a long-term relationship agreement with SON for their facilities / operations at the Bruce nuclear site, including the proposed DGR for L&ILW.
- Continue dialogue and increase coordination meetings with Crown Agencies.

d) Siting process for APM and possible expressions of interest to learn more from communities within Bruce County cause public support for the L&ILW DGR to deteriorate from local residents. There may be confusion in the Bruce community regarding the distinct and separate nature of the L&ILW DGR and the APM processes. Mitigation measures include:

- Coordination of APM and DGR activities within NWMO.
- Publically reinforce, especially within Bruce County, that any host community must have strong local support as its foundation before NWMO would commence any feasibility.
- Ensure clarity in communication for both APM and L&ILW DGR that differentiates and separates the two processes, well in advance of the DGR hearings.

Many of the mitigation measures identified above form the basis of the communication activities identified in the next section.

8 COMMUNICATION ACTIVITIES

NWMO plans to maintain a DGR Communications Calendar, incorporating and scheduling many of the activities identified in the table below.

Activity	Schedule/Target	Rationale
DGR Community Consultation Advisory Group – consists of the Bruce County Warden and CAO, Bruce County Mayors and CAOs, NWMO representatives and OPG representative as per the communication protocol.	2 to 3 per year	Provide project updates to all eight county mayors at the same time in order to create a sense of solidarity/continuity, while avoiding surprises and divisiveness among the group. This committee provides ongoing intelligence of the Bruce community as well as advice on the effectiveness of our public communication program. They need to be properly prepared and informed through extensive technical presentations and independent peer review that will allow them to offer meaningful and informed support at the public review panel hearing.
OPG Kincardine Nuclear Waste Steering Committee – consists of the Kincardine Mayor, Deputy-Mayor, two councillors, NWMO representatives and OPG representative as per the communication protocol.	2 to 3 per year	Provide project updates to the host municipality. It is important to acknowledge special status of the host municipality while maintaining balance with the other municipalities. Emphasis is needed to ensure the host municipality is actively engaged in supporting the project in keeping with its status as "community partner."
Continue engagement with Aboriginal groups including Saugeen Ojibway Nation (SON), Métis Nation of Ontario and Saugeen Métis.	This will be determined in consultation with Aboriginal groups and OPG.	Dialogue with Aboriginal groups to share information and receive input, including traditional knowledge if possible.

Activity	Schedule/Target	Rationale
DGR briefings to key stakeholders, such as IAC, Liaison, MOH/MOE, MP, MPP, Government Ministries/Departments, NGOs, Unions, Bruce Power.	Annually, or more frequently as required	Provide project updates in order to avoid surprises while maintaining an informed group of key stakeholders who will be able to offer meaningful comments at the public hearing.
Participate in community events and DGR Open Houses	35 to 40 event days for 2010. DGR Open Houses to be scheduled in August/September.	Provide up-to-date information on the status of the project and obtain feedback to incorporate in the Environmental Impact Statement.
Operate a "DGR Speakers Bureau"	16 – 20 events	Inform and receive input from the public
Maintain membership in local Chambers of Commerce	Maintain ongoing contact with Kincardine and Saugeen Shores Chambers of Commerce. Sponsor an NWMO award at their annual business awards event.	Maintain contact with local Chambers of Commerce and provide project updates so that they remain fully informed and can participate meaningfully in the public hearing.
Partner with OPG to continue outreach efforts in Michigan.	This will be determined in consultation with OPG.	Michigan has been identified in the EIS Guidelines and by the regulator as an area to target communications.
Coordinate/maintain DGR Internet Site	Ongoing	Highlight use of internet to regulatory authorities and its ability to communicate beyond facility communities.
Manage/process DGR Community Partnership Program initiatives, that complements OPG's Corporate Citizenship Program.	Ongoing, with at least 85 per cent of the budget dispersed.	One of the key ways to establish an identity and reputation for the NWMO will be through this DGR Community Partnership Program. The grants and presentations should be significant enough to attract public recognition in order to promote the new company. The program is documented in DGR-PLAN-08510-0001.
Arrange facility tours for interested parties	As required	Inform and educate stakeholders

Activity	Schedule/Target	Rationale
DGR project newsletters	3 to 4	Inform and educate the public
Provide media briefings and media response capability, consistent with NWMO Media Policy.	2 series of media briefings in 2010	Continue to build a working relationship with local media.
DGR Media Day	Post 2010 municipal election	Ensure correct information is available to the media and create a sense of openness, transparency and goodwill.
DGR advertising and advertorials in Marketplace Magazine and local newspapers	12 issues of Marketplace, utilize business progress editions and opportunities for sponsorship pages and seasonal advertising	Inform the public about the DGR and create a positive identity for NWMO.
Host two outdoor movies for seasonal residents utilizing the opportunity to show the DGR video before the feature presentation	Summer and Fall – holding one on the Bruce Peninsula	Target seasonal residents as well as permanent residents.
2009 DGR Annual Report	Q1	Inform the public and key stakeholders
Update DGR Van and Trailer	Q1	Update information to be ready for local events that begin at the end of March, as identified in the DGR Communications Calendar.
Update DGR Video	Q1	Inform and educate the public
Update DGR Booklet	Q1	Inform and educate the public
Establish a list of stakeholders "in support" and "potentially in support" of the DGR	Q1	DGR Hearing preparation
Distribute updated DGR information to local libraries, municipal offices and Chamber of Commerce offices	Ongoing	Inform the public and key stakeholders
Update waste displays at the Bruce Power Information Centre	Q1	Inform and educate

Activity	Schedule/Target	Rationale
Communication Activities for consideration in 2011/2012 include: DGR update presentation to Bruce County Municipal Councils, DGR Networking Dinner, DGR Billboard, DGR Storefront Office, Update waste displays at OPG Information Centres		Inform the public and key stakeholders

9 EVALUATION

a) Review Communication Plan results. Target completion of 80% of initiatives.

b) Continued positive feedback from stakeholders.

c) Hold an annual meeting with the OPG Communication SPOC to review the execution of the plan.

APPENDIX D2: COMMUNICATION AND CONSULTATION MATERIALS RELATED TO THE INDEPENDENT ASSESSMENT STUDY (IAS)

- Independent Assessment Study website (Golder Associates, 2003)
- Long-Term Management of Low and Intermediate Level Radioactive Waste – Independent Assessment Study Newsletter – Issue No.1, May 2003
- Long-Term Management of Low and Intermediate Level Radioactive Waste – Independent Assessment Study Newsletter – Issue No.2, May 2004
- Report on Open Houses, June 2003, Community Consultation Program, Long-term Management of Low and Intermediate level Waste, Independent Assessment Study (Golder Associates, 2003)
- Public Attitudes Towards Long Term Management of Low and Intermediate Level Radioactive Wastes at the Western Waste Management Facility (Intellipulse, 2003)

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Welcome to the Independent Assessment Study

In early 2003, the Municipality of Kincardine and Ontario Power Generation (OPG) signed a Memorandum of Understanding (MOU). The purpose of the MOU is to set out terms under which OPG, in consultation with the Municipality, will develop a long-term plan for the management of low and intermediate level radioactive waste at the Western Waste Management Facility (WWMF).

Under the work plan of the MOU, Kincardine and OPG are conducting a fact-based assessment of the possible long-term management options for low and intermediate level waste at the WWMF. Golder Associates Ltd., a third party consultant, has been retained by Kincardine and OPG to conduct this Independent Assessment Study (IAS) to be issued in January 2004. The IAS will examine the technical feasibility, safety and licensibility, environmental protection feasibility, and socio-economic costs and benefits of each of the long-term management options. To be considered, any option must be capable of meeting the required high level of worker, public and environmental safety.

Members from the Municipality of Kincardine and OPG have formed a Steering Committee to oversee the IAS. On behalf of the Steering Committee, we encourage you to find out about the plans being considered for the long-term management of low and intermediate level wastes in our community. Your opinions and comments on the important issue will allow us to make socially-responsible decisions that ensure the continued safe and environmentally acceptable waste management practices at the WWMF. Good decisions will contribute to the continued operation of nuclear facilities in Ontario and the associated economic benefits to the people of Kincardine.

Located on the shores of Lake Huron, the Bruce Site hosts OPG's Western Waste Management Facility. This is the proposed location for the long-term storage of low level and intermediate level waste.

Links of Interest

- What are the options?
- Learn more about low and intermediate level radioactive wastes.
- Learn about how wastes are currently managed at the WWMF.
- How can I get involved in this review of the options
- I have questions/comments. Who can I talk to?

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Long-Term Management of Low and Intermediate Level Radioactive Waste

Independent Assessment Study

newsletter

Issue No.1, May 2003

Kincardine and OPG Sign Memorandum of Understanding

The Municipality of Kincardine and Ontario Power Generation (OPG) have signed a Memorandum of Understanding (MOU) regarding the long-term management of low and intermediate level radioactive wastes. The purpose of the MOU is for OPG, in consultation with the Municipality of Kincardine, to develop a plan for the long-term management of low and intermediate level waste at the Western Waste Management Facility (WWMF) located on the Bruce site.

As a part of the agreed work plan for the MOU, Kincardine and OPG are conducting a fact-based assessment of the costs and benefits of the possible long-term management options for low and intermediate level waste at the WWMF. Golder Associates Ltd., an environmental consulting firm, is carrying out the assessment and will provide the results in an Independent Assessment Study report to be issued in January 2004.

Aerial view of the Western Waste Management Facility at the Bruce site.

Range of Options to be Reviewed

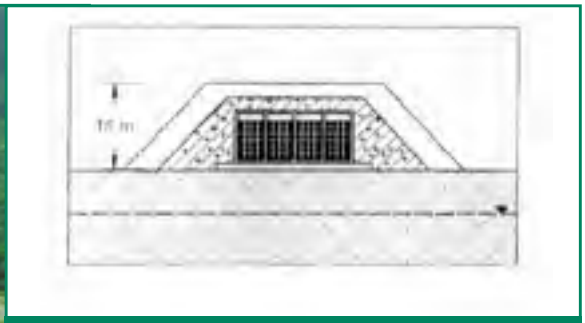
There are three options currently under consideration for the long-term management of low and intermediate level radioactive wastes. The first is an Enhanced Processing, Treatment and Long-Term Storage option, which relies on a high level of on-going control and facility management. The others are long-term repository options, which do not require the same degree of on-going control and maintenance. These long-term repository options employ Covered Above-Ground Concrete Vault or Deep Rock Cavern Vault designs.

What's Inside

Golder Associates

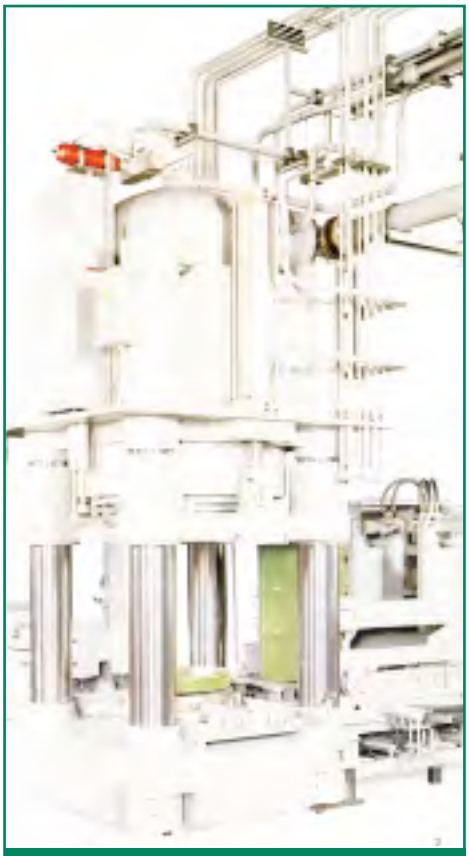
http://ias.golder.com

Aerial view of the long-term repository facility at the Centre de L'Aube, France. This facility was recently visited by Kincardine and Ontario Power Generation.



Schematic of the Covered Above-Ground Concrete Vault technology used at the facility at Centre de L'Aube, France. The vaults are located in the upper left corner of the photo at left.

Enhanced Processing, Treatment and Long-Term Storage involves the use of a high force super-compactor to achieve a maximum reduction in low level waste volume. The dense, compacted waste would then be placed in steel containers, filled with concrete and stored in new upgraded Low Level Storage Buildings. The Enhanced Processing, Treatment and Long-Term Storage option, which is currently used in the Netherlands, would be capable of safely managing low level waste for more than a century.



Super-compactor showing how much a drum (green) can be compacted.

The Covered Above-Ground Concrete Vault option involves the construction of concrete vaults at or slightly below the ground surface. After the vaults are full, they are covered with an engineered soil cover as much as 5 meters thick. The Covered Above-Ground Concrete Vault option is capable of storing all low level and some intermediate level waste.

The Deep Rock Cavern Vault option involves construction of a number of vaults within the low permeability bedrock using mining methods. It would be constructed within the stable rock formations located 425 to 750 meters below the Bruce site. It is capable of storing all low and all intermediate level waste.

Kincardine and Ontario Power Generation recently visited facilities in Europe and met with local community leaders.

Kincardine and OPG Conduct Fact Finding Mission

Representatives from the Municipality of Kincardine and OPG recently visited several long-term low and intermediate level waste management facilities in Europe. The purpose of the fact-finding mission was to see first hand how other countries manage their wastes. Specifically, Kincardine and OPG visited sites in Forsmark, Sweden, and Centre de L'Aube, France, which are similar in design to those being considered for the WWMF. Kincardine and OPG representatives also met with local community leaders to gain an understanding of the local response to the presence and activities at these facilities. Information gathered during the visits will be useful in the decision making process for a long-term waste management facility at the WWMF.

Safety of Options Reviewed

The first activities undertaken in the study of the long-term

Schematic of the underground works at the Forsmark repository in Sweden.

Aerial view of surface facilities for the long-term repository in Forsmark, Sweden. This facility was recently visited by Kincardine and Ontario Power Generation. Forsmark nuclear generating station is in the background.

management options were an examination of the geotechnical feasibility and an assessment of the safety of the options. Golder and another consultant, Quintessa, were retained by OPG to conduct the geotechnical feasibility study and the safety assessment, respectively. These assessments determined that two long-term repository options (the Covered Above-Ground Concrete Vault and the Deep Rock Cavern Vault) are geotechnically feasible for the Bruce site and would be designed to meet or exceed strict international safety criteria.

Independent Study One of Many Decision Steps

The Independent Assessment Study being undertaken by Golder will be completed before any decision is made with respect to the preferred option for long-term waste management. Subsequent major decision steps are illustrated on page 4 of this newsletter.

What Happens after the Independent Assessment Study is Completed?

Once the study is complete, the results of research on the technical feasibility, safety and licensability, environmental protection feasibility, and socio-economic costs and benefits of the options will be provided in an Independent Assessment Study report. The report will be reviewed by Kincardine and OPG and be made available to the community when it is issued in January 2004. The report will serve as the basis for discussions between Kincardine and OPG on a plan regarding offset costs and benefits. Only after these discussions will a decision be made on which, if any, of the long-term management options is to be implemented at the WWMF.

Your Input Counts

The community will have many opportunities to provide input to the selection and development of any long-term waste management option. These include during the preparation of the Independent Assessment Study report, during the referendum on the community benefits and offsets plan, during any future environmental assessment and as part of the Canadian Nuclear Safety Commission's licensing process. Notifications and advertisements regarding community events and open houses will be issued over the next few weeks.

Upcoming Open Houses:

The Municipality of Kincardine and Ontario Power Generation invite all interested persons to visit the following venues where the Independent Assessment Study will be explained:

Kincardine	**Lucknow**	**Port Elgin**	**Underwood**	**Chesley**
Monday June 9, 2003	Tuesday June 10, 2003	Friday June 13, 2003	Saturday June 14, 2003	Monday June 16, 2003
3:00 p.m. until 8:00 p.m.	3:00 p.m. until 8:00 p.m.	3:00 p.m. until 8:00 p.m.	11:00 a.m. until 4:00 p.m.	3:00 p.m. until 8:00 p.m.
Royal Canadian Legion	Royal Canadian Legion	Royal Canadian Legion	Community Hall	The Fire Hall

Decision Steps Towards Facility Operation

Completed ☑ *Underway* ☐ *Not Yet Begun* ○

Current Interim Storage of Low and Intermediate Level Waste

Kincardine and Ontario Power Generation Study of Long-Term Options

- ☑ Kincardine/Ontario Power Generation Sign Memorandum of Understanding
- ☑ Kincardine and Ontario Power Generation initiate Independent Assessment Study
- ☑ Conduct Geotechnical Feasibility Study
- ☑ Conduct Preliminary Safety Assessment
- ☐ *Conduct Social Assessment*
- ☐ *Conduct Economic Analysis*
- ☐ *Conduct Environmental Protection Feasibility*
- ☐ *Carry Out Consultation in Communities*

Independent Assessment Study Report

Seek Community Agreement

- ○ *Kincardine and Ontario Power Generation Develop Community Offsets and Benefits Plan*
- ○ *Community Discussions and Decision*

Positive Result in Referendum?

No → *OPG Considers Alternatives*

Yes

Conduct Environmental Assessment

- ○ *Design of Selected Option*
- ○ *Carry Out Environmental Assessment Studies and Consultation*
- ○ *Prepare and Submit Environmental Assessment Study Report*
- ○ *Public Review*

Environmental Assessment Accepted?

No → *OPG Considers Alternatives*

Yes

Seek Construction and Operating Approvals

- ○ *Prepare Facility Safety Report*
- ○ *Application to Canadian Nuclear Safety Commission for Site/Construction Approval*
- ○ *Application to Canadian Nuclear Safety Commission for Operating Licence*

Canadian Nuclear Safety Commission Issues Licence?

No → *OPG Considers Alternatives*

Yes

Operating Long-Term Waste Management Facility

Long–Term Management of Low and Intermediate Level Radioactive Waste

Independent Assessment Study

Newsletter

Issue No.2, March 2004

INDEPENDENT ASSESSMENT OF LONG-TERM WASTE MANAGEMENT OPTIONS COMPLETED

In 2002 the Municipality of Kincardine and Ontario Power Generation (OPG) signed a Memorandum of Understanding (MOU) regarding the long-term management of low and intermediate level radioactive waste at the Western Waste Management Facility (WWMF). Under the terms of the MOU, the safety, geotechnical feasibility, potential environmental, social and economic effects were studied. The results of these studies are provided in the recently published Independent Assessment Study report. See the box on page 3 to find out where to get copies of the report.

The study looked at three options for the long-term management of low and intermediate level radioactive wastes:

- Enhanced Processing and Storage
- Surface Concrete Vaults
- Deep Rock Vaults

The current low and intermediate level waste management operation at the WWMF, identified as the "Status Quo", was assessed for comparison.

The geotechnical feasibility study of the options reviewed existing geological, groundwater and geotechnical information for the Bruce Power site. The study confirmed that Deep Rock Vaults are feasible in the shale and limestone formations deep underneath the WWMF. The study also concluded that Surface Concrete Vaults are feasible for the surficial soils adjacent to the WWMF. A separate study determined that Enhanced Processing and Storage is feasible. There is considerable international experience using each of the three options for the long-term management of low and intermediate level waste.

A safety assessment showed each option is capable of meeting stringent Canadian and international safety criteria with a considerable margin. The potential exposure of members of the public to radiation from releases from sample scenarios was estimated to range from less than 0.001% to 0.003% of the dose constraint in the case of the Deep Rock Vaults and from 2.3% to 3% of the dose constraint for the Surface Concrete Vaults. The estimated dose from the Enhanced Processing and Storage and Status Quo options was determined to be less than 1% of the dose constraint.

The members of the community who attended the Open Houses held in June of 2003 had an opportunity to ask questions and obtain additional information about the technologies being considered for long-term waste management at the WWMF. The majority of participants felt that the Open Houses were informative and helpful.

Continues on PAGE 2

What's Inside

Golder Associates
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Continued from PAGE 1

An examination of the environmental protection feasibility of the options showed that each potential adverse effect from all of the options could be mitigated or managed using known and proven methods. Therefore, no adverse residual environmental effects are expected.

Each of the options would have significant economic benefits to Kincardine and the neighbouring municipalities. These benefits include direct expenditures and employment as well as indirect employment and associated economic activity in the community. No adverse economic effects were identified in the analysis.

Public attitude research conducted as part of the study found that none of the options would have significant adverse effects on residents', businesses' or farm operators' feelings of personal security, community satisfaction or commitment to farming. In addition, residents did not anticipate any changes in their daily behaviour as a result of a long-term waste management facility being built in their community. Tourism research found that none of the options would be expected to have any measurable effect on tourist activities or visits to Kincardine. No clear preference for any of the options was identified throughout the public attitude and tourism research.

The IAS report focuses primarily on low level waste (LLW) since it comprises 95 percent of the total waste volume. The options being considered could accommodate all of the LLW and varying amounts of intermediate level waste (ILW). The Deep Rock Vaults option could safely accept all of the ILW with other options being suitable for lesser amounts. The additional cost for ILW could be about $200 million.

RESEARCH ASSESSES RESIDENTS' ATTITUDES TOWARDS MANAGEMENT OPTIONS

How residents feel about their community hosting one of the long-term management options is an important consideration in deciding to move forward with any of the options. Research was conducted to determine residents' attitudes towards LLW and ILW management at the WWMF. Other research focussed on determining how the options might affect the perceptions and attitudes of tourists.

The attitude research involved 751 telephone surveys, 400 in the Municipality of Kincardine and 351 in the neighbouring communities and included permanent residents and cottagers. The survey examined the issues currently affecting the community and explored the potential for the long-term management options to affect any of the attitudes or activities in the community.

The issues currently of most concern in Kincardine and the neighbouring municipalities are healthcare and drinking water. The nuclear generating stations and radioactive wastes were identified as a concern by approximately 5 percent of the respondents in Kincardine, and by even fewer respondents in the neighbouring municipalities.

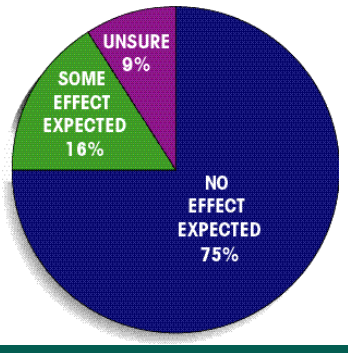
Three quarters of the Kincardine study participants responded that none of the long-term management options would affect their satisfaction with their community. Of the 16 percent of respondents who believe that a facility may have an effect, over half felt that this effect would be a positive one.

A majority of respondents also indicated that a long-term waste management facility would not negatively affect the community as a place to live, operate a business or visit. Over 85 percent of respondents for both Kincardine and neighbouring municipalities indicated that constructing and operating a long-term management facility at the WWMF would not cause them to move from the community or change their behaviour with respect to their use of beaches, trails or parks or reduce fishing or boating activities.

The business and farming participants' responses were similar to those of the community as a whole. Over two thirds believe that none of the options would have an effect on their community as a place to operate a business. Of those who anticipate an effect, four out of every ten believe that the effect would be positive. Over 90 percent of the farm respondents indicated that a long-term management facility would not affect their commitment to farming.

The tourism research included interviews with local businesses, surveys conducted with visiting tourists and a round table discussion conducted with local tourist business operators. The overwhelming majority of tourists expected no change in their behaviour as a result of implementing any of the options at the WWMF.

Most residents asked felt that any of the Long-term management options will have no effect on satisfaction with the community.



LONG-TERM OPTIONS HAVE SIGNIFICANT ECONOMIC BENEFITS

Economic benefits experienced by Kincardine and the neighbouring municipalities would include direct and indirect jobs and purchasing in the communities. Expenditures associated with the long-term facility, including construction and operating funds, were estimated over a 31 year period. The total lifetime expenditures range from $776 million to over $900 million depending on which option is chosen. These expenditures may be compared with an estimated $648 million if the current storage operations at the WWMF were continued over the same period.

The long-term options would be expected to produce a total employment of between 321 and 421 annually over a period of 31 years. The similar total for continuing current storage operations is 279 jobs. This total employment is made up as follows:

- **Direct employment** is the number of OPG employees working directly at the facility. Currently there are 81 people engaged in activities related to ILW and LLW management at the WWMF. Implementing one of the long-term options would add between 12 and 41 jobs annually.
- **Indirect employment** is the number of employees of other businesses or contractors involved in activities directly related to the construction and operation of the facility. This includes, for example, contractors engaged in the maintenance or modification to existing facilities at the WWMF. The estimated current indirect employment related to ILW and LLW at the WWMF would increase from the current 118 to between 136 and 179, depending on the option chosen.
- **Induced employment** is the jobs generated in the community as a result of OPG and employee spending in the community, including, for example, jobs in local stores and restaurants. The induced employment would increase from the current 80 jobs to between 92 and 120 jobs per year.

A portion of the income earned by direct and indirect employees will be spent on goods and services. The estimated current income spending related to LLW and ILW management operations at the WWMF is $12.2 million. Income spending in Kincardine associated with the long-term management options is estimated to be between $3 and 3.8 million annually. Surrounding communities would experience income spending between $1.8 and 2.4 million each year.

These estimates are based on current spending patterns. Any of the long-term management options could result in opportunities for new businesses and result in additional economic activity in the community.

What Happens Now That The IAS Report Has Been Issued?

The release of the Independent Assessment Study report is just one step in a multi-step community, environmental and regulatory approval process that must be completed before any of the long-term options could be implemented. The figure on the back cover shows the major steps and decisions required before any of the options could be built.

OPG Vice President Ken Nash and Kincardine Mayor Glenn Sutton accept IAS report.

How Can I Comment on the IAS Report?

We would like to hear your opinions and comments on the IAS report and the options for the long-term management of LLW and ILW in Kincardine.

Copies of the report are available at the Municipal Offices, local libraries and on the website at http://ias.golder.com.

Decision Steps Towards Facility Operation

Completed ☑ *Not Yet Begun* ○

Current Interim Storage of Low and Intermediate Level Waste

Kincardine and Ontario Power Generation Study of Long-Term Options

- ☑ Kincardine/Ontario Power Generation Sign Memorandum of Understanding
- ☑ Kincardine and Ontario Power Generation Initiate Independent Assessment Study
- ☑ Conduct Geotechnical Feasibility Study
- ☑ Conduct Preliminary Safety Assessment
- ☑ Conduct Social Assessment
- ☑ Conduct Economic Analysis
- ☑ Conduct Environmental Protection Feasibility Study
- ☑ Carry Out Consultation in Communities

Independent Assessment Study Report

Seek Community Agreement

- ○ *Kincardine and Ontario Power Generation Develop Community Offsets and Benefits Plan*
- ○ *Community Discussions and Decision*

Positive Result in Referendum?

No → *OPG Considers Alternatives*

Yes

Conduct Environmental Assessment

- ○ *Design of Selected Option*
- ○ *Carry Out Environmental Assessment Studies and Consultation*
- ○ *Prepare and Submit Environmental Assessment Study Report*
- ○ *Public Review*

Environmental Assessment Accepted?

No → *OPG Considers Alternatives*

Yes

Seek Construction and Operating Approvals

- ○ *Prepare Facility Safety Report*
- ○ *Application to Canadian Nuclear Safety Commission for Site/Construction Approval*
- ○ *Application to Canadian Nuclear Safety Commission for Operating Licence*

Canadian Nuclear Safety Commission Issues Licence?

No → *OPG Considers Alternatives*

Yes

Operating Long-Term Waste Management Facility

For additional information contact:
Duncan Moffett at Golder Associates Ltd. dmoffett@golder.com 1-800-414-8314

Golder Associates Ltd.

2390 Argentia Road
Mississauga, Ontario, Canada L5N 5Z7
Telephone: (905) 567-4444
Fax: (905) 567-6561

REPORT ON

OPEN HOUSES
JUNE 2003
COMMUNITY CONSULTATION PROGRAM
LONG-TERM MANAGEMENT OF LOW AND INTERMEDIATE LEVEL WASTE
INDEPENDENT ASSESSMENT STUDY

Prepared by:

Golder Associates Ltd.

July 2003 031-115012

OPEN HOUSES
JUNE 2003
COMMUNITY CONSULTATION PROGRAM
LONG-TERM MANAGEMENT OF LOW AND INTERMEDIATE LEVEL WASTE
INDEPENDENT ASSESSMENT STUDY

Prepared by:

Golder Associates Ltd.

Recommended by: _____ **July 23, 2003**
Dr. Duncan Moffett Date
Golder Associates Ltd.

Accepted by: _____ **July 23, 2003**
Mr. Larry Kraemer Date
Mayor, Municipality of Kincardine

Accepted by: _____ **July 23, 2003**
Mr. Ken E. Nash Date
Vice President, Nuclear Waste Management Division
Ontario Power Generation

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LIST OF APPENDICES

1.0 INTRODUCTION

In January 2003, the Municipality of Kincardine and Ontario Power Generation Inc. (OPG) contracted Golder Associates to conduct an Independent Assessment Study on the options for long-term management of low and intermediate level radioactive waste at the Western Waste Management Facility (WWMF) located within the Bruce Power site. An important and integral component of the Independent Assessment Study is the implementation of a Community Consultation Plan.

Two key objectives of the plan are to:

- Inform the Municipality of Kincardine and OPG employees, the local general public, other stakeholders and the media about the discussions on the various options for long-term management of low and intermediate level waste at the WWMF; and
- Provide opportunities for stakeholders to provide data and information as input to the Independent Assessment Study and to identify and discuss any concerns they may have.

Public Open Houses were held in June 2003 (details in Section 3.0) to inform local community and other stakeholders about the purpose and process of the Independent Assessment Study.

The Open Houses were held at five locations within the Study Area: Kincardine, Lucknow, Port Elgin, Underwood and Chesley (Study Area outlined on Figure 1). The objective of the Open Houses was to introduce the study to the identified stakeholders and to the general public, to provide information about the study and process that will be used throughout, and to identify any initial public concerns or issues that should be addressed.

Prior to the Open Houses, the project was introduced to various stakeholders through a series of briefing presentations to municipal councils, meetings with elected representatives, and other interested parties such as the Medical Officer of Health, Atomic Energy of Canada Limited and the Canadian Nuclear Safety Commission (a detailed list is provided in Section 2.0). The project was announced to the local public in May through a newsletter delivered to all residents in the general Study Area. The Open Houses were advertised in the newsletter, local newspapers and by post card invitations that were delivered by post to the Kincardine area as well as in pick up locations at all the Municipal offices within the Study Area.

2.0 OPEN HOUSE NOTIFICATION

The public and other stakeholders were notified of the Open Houses in five different ways:

1. Letters introducing the project and inviting recipients to the Open Houses were sent to all stakeholders known to have an interest in the project at the time of mailing. A sample letter is attached in Appendix A.

2. Meetings were held or briefing presentations or contact made with the key stakeholder groups listed below during which they were notified of the upcoming Open Houses and invited to attend:
   - ❑ Chippewas of Nawash First Nation
   - ❑ Saugeen First Nation
   - ❑ Member of Parliament / Bruce-Grey
   - ❑ Member of Parliament / Huron-Bruce
   - ❑ Canadian Nuclear Safety Commission
   - ❑ Natural Resources Canada
   - ❑ Atomic Energy of Canada Limited
   - ❑ Member of Provincial Parliament / Bruce-Grey
   - ❑ Member of Provincial Parliament / Huron-Bruce
   - ❑ Ministry of Environment District Office
   - ❑ Ministry of Energy
   - ❑ Arran-Elderslie Municipal Council
   - ❑ Huron-Kinloss Municipal Council
   - ❑ Kincardine Municipal Council
   - ❑ Saugeen Shores Town Council
   - ❑ Brockton Municipal Council
   - ❑ Bruce County
   - ❑ Saugeen Valley Conservation Authority
   - ❑ Bruce Grey District Health Unit, Medical Officer of Health
   - ❑ Power Workers Union
   - ❑ The Society of Energy Professionals
   - ❑ Dr. Jim Cameron
   - ❑ OPG and Bruce Power employees

3. Advertisements announcing the June Open Houses were placed in the newspapers listed below on the dates indicated. Samples of the advertisements are attached in Appendix B.

   - ❑ Owen Sound Sun Times – June 6
   - ❑ Shorline Beacon – May 28 and June 4
   - ❑ Kincardine News – May 28 and June 4
   - ❑ Kincardine Independent – May 21, 28 and June 4
   - ❑ Lucknow Times – May 28 and June 4
   - ❑ Walkerton Herald Times – May 28 and June 4
   - ❑ Chesley Enterprise – May 28 and June 4

4. Approximately 22,000 newsletters with information on the Open Houses were distributed to all residents in the Study Area through Canada Post to the Canada Post Forward Sorting Areas listed below. A print-out of the newsletter is provided in Appendix E. All deliveries were completed at least two weeks before the Open House in each area.

   - Paisley N0G 2N0
   - Chesley N0G 1L0
   - Walkerton N0G 2V0
   - Ripley N0G 2R0
   - Southampton N0H 2L0
   - Port Elgin N0H 2C0
   - Tiverton N0G 2T0
   - Kincardine all N2Z postal codes
   - Tara N0H 2H0
   - Chepstow N0G 1K0
   - Lucknow N0G 2W0
   - Holyrood N0G 2B0
   - RR #5 Wiarton N0H 2T0 (Nawash First Nation)

5. Approximately 4,550 post card invitations were delivered to all residents in the Kincardine area through Canada Post (all Kincardine N2Z postal codes). Also, fifty post card invitations were sent to the Municipal offices for each Municipality within the Study Area for pick up. A copy of the post card is provided in Appendix C.

3.0 OPEN HOUSE PROGRAM

Open Houses were held between 3:00 p.m. and 8:00 p.m. during the week and 11:00 a.m. and 4:00 p.m. on the weekend, at the following locations on the dates indicated:

- June 5 – Kincardine, Legion Hall, 219 Lambton Street;
- June 10 – Lucknow, Legion Hall, 477 Inglis Street;
- June 13 – Port Elgin, Legion Hall, 630 Green Street;
- June 14 – Underwood, Community Hall, Concession 7; and
- June 16 – Chesley, Fire Hall, Bruce Road 10.

Visitors to the Open Houses were greeted by OPG and Kincardine representatives and Golder staff, invited to sign in and given a printed copy of the information on the display panels. Visitors were also provided with the opportunity to take printed copies of documents summarizing the Geotechnical Feasibility Study conducted by Golder, Preliminary Safety Assessment conducted by Quintessa, brochures on Centre de L'Aube, France, Forsmark, Sweden and Loviisa, Finland, a brochure describing the Western Waste Management Facility, brochures describing Kincardine and activities and events in the Kincardine Area, and the first study newsletter. Visitors were also invited to help themselves to refreshments as they perused the display material. Kincardine, OPG and Golder staff was on hand at each Open House to respond to questions.

The twenty-four display panels shown in Appendix D described the study and the process that will be used to carry out the activities associated with the study. In addition, OPG mounted a large display summarizing the processes involved in the storage of low and intermediate level wastes and differences from high level waste management at some Open Houses. A fifteen-minute continuous loop video was provided explaining OPG's current process of managing low and intermediate level wastes as well as the process of transferring used fuel from wet to dry storage. The Municipality of Kincardine also provided a three panel display featuring the Municipality of Kincardine.

4.0 ATTENDANCE

A total of 77 visitors signed in at the Open Houses at the following locations:

- June 9, 2001 – Kincardine: 35 visitors
- June 10, 2001 – Lucknow: 10 visitors
- June 13, 2001 – Port Elgin: 9 visitors
- June 14, 2001 – Underwood: 11 visitors
- June 16, 2001 – Chesley: 12 visitors

5.0 MEDIA COVERAGE

Three interviews were conducted with Kincardine, OPG and/or Golder staff by local media representatives during the Open Houses: the Kincardine Independent and Kincardine News at the Kincardine Open House on June 9, 2003 and by Pat Halpin, a freelance print and radio reporter with CKNX FM 102 radio station, during the Chesley Open House on June 16, 2003. There was also a general announcement on CKNX FM 102 radio station prior to the Port Elgin, Underwood and Chesley Open Houses on June 13, 14 and 16, 2003, respectively.

6.0 COMMENT SHEETS

Visitors were asked to complete a Comment Sheet and either deposit it in a box provided for that purpose prior to leaving the Open House, or mail or fax it in by June 20, 2003. A total of 37 completed comment sheets were received during the Open Houses. Two individuals indicated that they would mail completed comment sheets at a later date. These had not been received at the time of preparing this report. A sample comment sheet and summary analysis of comments received is presented in Appendix E.

The following presents an overview of the comments received from visitors in conversation with staff and consultants, or noted on the comment sheets.

- Several comments referred to the Deep Rock Cavern Vault, noting that the mining procedures and long-term stability of the rock would be the more feasible option of the three presented. One visitor mentioned this option is most preferable from a safety perspective.

- An area of concern frequently raised dealt with health and community issues. It was observed that the current study seems short-sighted and for the long-term facility to be feasible, everyone needs to participate, not just the scientific community. Several comments noted the risk to groundwater, flooding and location of aquifers associated with the Deep Rock Cavern Vault. One visitor felt that a supply of potassium iodide pills should be made available for everyone.

- The third area of interest to visitors related to the costs associated with construction and operation of the facility. One visitor was interested to know the number of employees associated with both long-term management options. Another visitor commented on the long-term costs of the facility and the risk of bankruptcy.

- Questions of a technical nature regarding the wastes were also raised. These included questions on the actual amount of radioactivity associated with low and intermediate level waste; recycling or incineration of the low level wastes; the differentiation between the low and intermediate level waste and the shipment of waste to the WWMF from Pickering and Darlington.

- Other questions pertained to the environmental and safety issues potentially associated with the long-term repositories. For example, what effects would the rainfall have on the Covered Above-Ground Concrete Vault, can groundwater infiltrate either of the long-term repositories and did the safety assessment consider human intruders or terrorists? One visitor commented that the best way to get people to take responsibility is to put the waste where people can see it.

- Some visitors came with comments related to the long-term management of high level waste: OPG and Kincardine should strongly consider the mining option for not only low and intermediate level waste, but also high level waste.

- Another area in which visitors had concerns was the level of involvement within the community. Specifically, who gets to vote, who will decide on the option and when will this decision take place, and how will the municipalities outside of Kincardine benefit or be involved?

- One negative comment concerned with the use of nuclear fuel as a power source. It was felt that nuclear waste is unnecessary as there are renewable forms of energy available. Another was that the study will also attract attention to the storage of high level waste.

- There were also several compliments on the layout of the presentation material and the newsletters delivered to the community. Most visitors were pleased with the level of effort involved in the study thus far and also felt they learned a lot from the staff and panels.

7.0 OPEN HOUSE EVALUATION

The comment sheets provided visitors an opportunity to provide feedback about the Open House itself. Of 37 evaluations received, all expressed satisfaction with the Open House venues and timing. On a scale from 1 to 5, where "1" represented "not at all helpful", "3" represented "somewhat helpful" and "5" represented "very helpful", the display material was given a rating between 4 and 5 with an average rating of 4.6. Ratings of the helpfulness of staff and consultants ranged from 4 to 5 with an overall average rating of 4.9. Details can be found in Appendix F.

8.0 CONCLUSION

Overall the Open Houses were considered a success in meeting the objectives of the Community Consultation Plan. The Open House advertisements and invitations were seen and received throughout all the communities involved. The Open House venues were centrally located, accessible and provided lots of space for displays and visitors. Attendance at locations other than Kincardine was disappointing but perhaps not unexpected considering the early stage of the study.

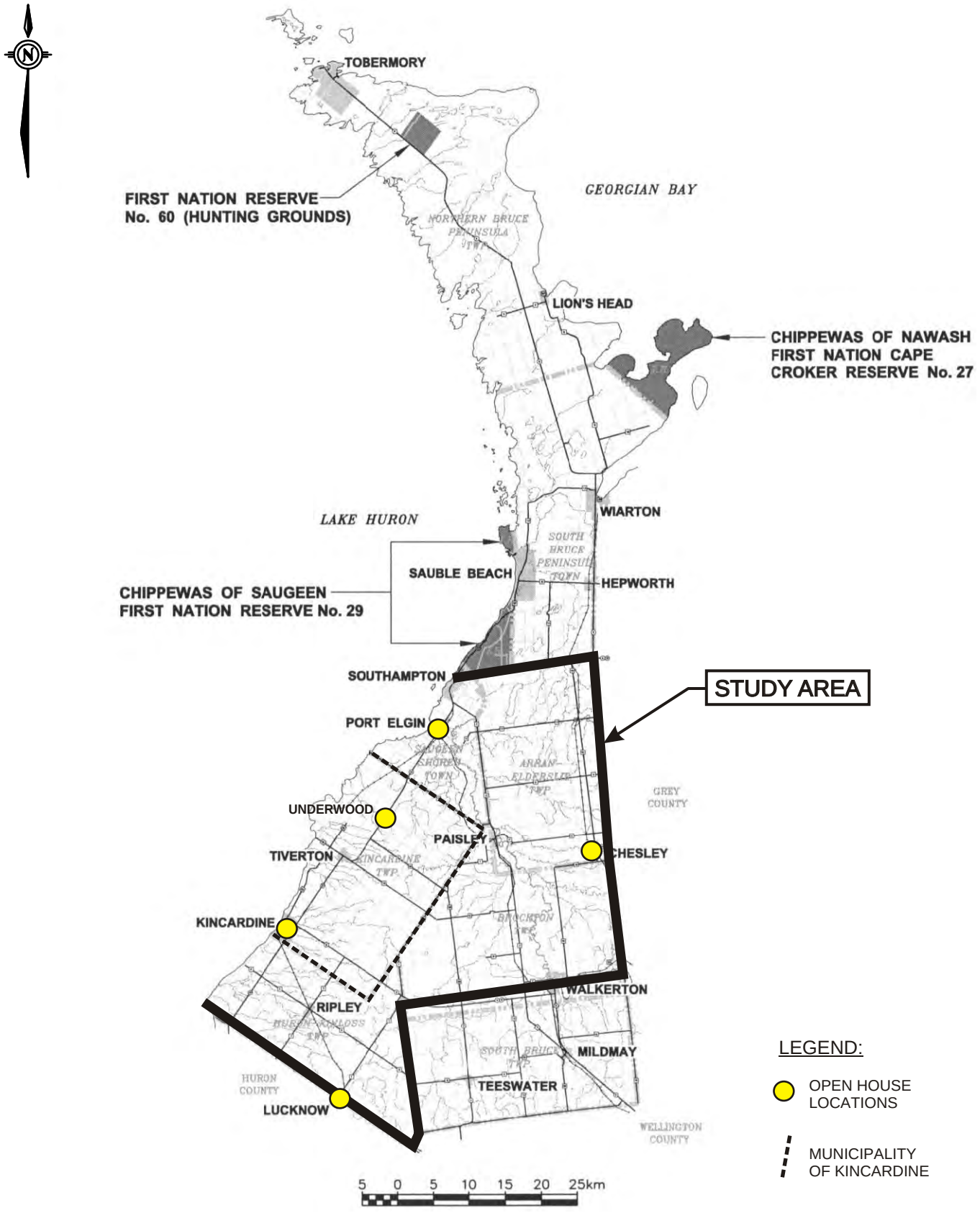
The vast majority of visitors wanted to obtain information about the project, ask questions about the project and learn how they or their community might be affected. All visitors who requested more information or asked specific questions on comment forms will receive a written reply. A few visitors (3-4) at the Chesley Open House on June 16 did register opposition to the production of nuclear waste. However, it was generally understood that wastes that have been produced must now be addressed for long-term storage. Based on personal discussions and the evaluations, the majority of visitors were satisfied with the information presented at the Open Houses and the helpfulness of Kincardine, OPG and Golder staff.

This report will be posted on the study website.

FIGURE

COMMUNITY CONSULTATION PROGRAM STUDY AREA

FIGURE 1



Date: JUNE 2003

Project: 031-115-012 (5600)

Golder Associates

Drawn: RJ

Chkd:

0311150125600001.cdr

APPENDIX A

Sample Notification Letter

May 29, 2003

Title First Name Last Name
Affiliation

Dear: Title Last Name

Subject: Open Houses on the Independent Assessment Study of Options for Long-term Management of Low and Intermediate Level Waste at OPG's Western Waste Management Facility

The Municipality of Kincardine and Ontario Power Generation (OPG) signed a Memorandum of Understanding in 2002 setting out the terms under which options for the long-term management of low and intermediate level waste will be studied and assessed for possible implementation at the Western Waste Management Facility within the Bruce Power site. Golder Associates has been hired to conduct a fact-based assessment of a number of long-term management options, including an examination of their technical feasibility, safety, and social and economic impacts and benefits. The results of this assessment will be documented in an Independent Assessment Study report to be issued in January 2004.

Enclosed is our first newsletter which introduces the study, outlines the long-term management options, describes the many steps in the decision-making process and how you can get involved. Copies of this newsletter are being distributed to all residents and businesses in the area, so you may have already seen a copy. However, to be sure that your group or organization receives a copy, we are sending a number of these newsletters to you directly.

Enclosed also please find a set of Fact Sheets which are designed to help answer common questions on low and intermediate level radioactive waste and on the Independent Assessment Study.

The Municipality of Kincardine and OPG are committed to an open and transparent consultation process as part of this study. The community consultation process will provide area residents and business owners with opportunities to gain knowledge about and to provide input to the study. We would like to invite you and members of your organization to attend one of our upcoming Open Houses. Representatives from Kincardine, OPG and Golder will be available at each of the Open Houses to answer your questions and hear your comments or concerns.

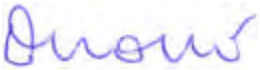
The Open Houses will be held in mid-June at the following locations:

- June 9 – Kincardine, Royal Canadian Legion, 219 Lambton Street
- June 10 – Lucknow, Royal Canadian Legion, 477 Inglis Street
- June 13 – Port Elgin, Royal Canadian Legion, 630 Green Street
- June 14 – Underwood, Community Hall, Concession 7
- June 16 – Chesley, Fire Hall, Bruce Road 10

We hope to see you at one of these venues.

As the study proceeds, we will keep you informed through newsletters, briefings and newspaper articles. You can also get more information from the study website http://ias.golder.com or by contacting me directly at 1-800-414-8314.

Yours truly,



Duncan Moffett, Ph. D
Principal
Golder Associates

APPENDIX B

Advertisement

you are invited

to participate in our

Open Houses On Long-Term Management Options For Low And Intermediate Level Waste

Golder Associates invites you to visit one of our upcoming Open Houses and comment on options being studied for long-term management of low and intermediate level waste at Ontario Power Generation's (OPG's) Western Waste Management Facility within the Bruce site.

Golder has been hired by the Municipality of Kincardine and OPG to conduct a fact-based assessment of the long-term management options being considered, including an examination of their technical feasibility, safety as well as social and economic impacts and benefits. We would like to meet with you to discuss our progress to date and to hear your opinions on our study.

We Want to Hear From You!

Your input will be included in the Independent Assessment Report Golder is preparing for Kincardine and OPG and will be a valuable contribution to the decision-making process.

Open Houses are being held at each of the locations listed below. Representatives from Kincardine, OPG and Golder will be available to answer your questions, so drop by one of our Open Houses and make your views known.

Dates and Locations:

We look forward to speaking with you.

Kincardine
Monday, June 9, 3 to 8 pm
Royal Canadian Legion
219 Lambton Street

Lucknow
Tuesday, June 10, 3 to 8 pm
Royal Canadian Legion
477 Inglis Street

Port Elgin
Friday, June 13, 3 to 8 pm
Royal Canadian Legion
630 Green Street

Underwood
Saturday, June 14, 11 am to 4 pm
Underwood Community Hall
Concession 7

Chesley
Monday, June 16, 3 to 8 pm
Fire Hall
North end of Chesley, Bruce Rd. 10

For more information, call us at 1-800-414-8314 or write to:
Golder Associates Ltd. 2390 Argentia Rd, Mississauga Ontario
L5N 5Z7 or email us at: dmoffett@golder.com
or visit our web site at http://ias.golder.com

Golder Associates

APPENDIX C

Invitation Post Card

you are invited

to participate in our

Open Houses On Long-Term Management Options For Low And Intermediate Level Waste

Golder Associates invites you to drop by one of our upcoming Open Houses and comment on options being studied for long-term management of low and intermediate level waste at Ontario Power Generation's (OPG's) Western Waste Management Facility within the Bruce site.

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Dates and Locations:

We look forward to speaking with you.

Lucknow
Tuesday, June 10, 3 to 8 pm
Royal Canadian Legion
477 Inglis Street

Underwood
Saturday, June 14, 11 am to 4 pm
Underwood Community Hall
Concession 7

Kincardine
Monday, June 9, 3 to 8 pm
Royal Canadian Legion
210 Lambton Street

Port Elgin
Friday, June 13, 3 to 8 pm
Royal Canadian Legion
630 Green Street

Chesley
Monday, June 16, 3 to 8 pm
Fire Hall
North end of Chesley, Bruce Rd. 10

For more information, call us at 1-800-414-8314 or write to: Golder Associates Ltd. 2390 Argentia Rd, Mississauga Ontario L5N 5Z7 or email us at: dmoffett@golder.com or visit our web site at http://ias.golder.com

Golder Associates

APPENDIX D

Open House Panels

Long-Term Management of Low and Intermediate Level Radioactive Waste

WELCOME!

TO OUR
OPEN HOUSE
ON THE

OPTIONS FOR THE LONG-TERM MANAGEMENT OF LOW AND INTERMEDIATE LEVEL WASTE

AT

OPG's WESTERN WASTE MANAGEMENT FACILITY

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

PURPOSE OF THE OPEN HOUSE

We have invited you here to:

- **Inform you** about our Independent Assessment Study and discuss the options being considered for the long-term management of low and intermediate level waste at OPG's Western Waste Management Facility within the Bruce site
- **Answer your questions** about the study or the options being considered
- **Obtain your comments** about the study and the options. Please speak to any of the Golder, Kincardine or OPG representatives on hand, and be sure to complete a comment form

Thank you for coming to our Open House

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

ROLES AND RESPONSIBILITIES

The Municipality of Kincardine

- Municipality in which OPG's Western Waste Management Facility is located ("host community")
- Potential host municipality for a long-term management facility
- Member of the joint Steering Committee overseeing the Independent Assessment Study

Ontario Power Generation

- Receives and manages low and intermediate level waste at the Western Waste Management Facility from all of Ontario's nuclear generating stations
- Responsible for long-term management of low and intermediate level waste
- Member of the joint Steering Committee

Golder Associates

- Conducting the Independent Assessment Study on the geotechnical feasibility, safety and economic impacts and benefits of the options on behalf of Kincardine and OPG

Consideration of long-term management options for used fuel is <u>not</u> part of the Independent Assessment Study

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

THE MEMORANDUM OF UNDERSTANDING

In 2002, the Municipality of Kincardine and Ontario Power Generation signed a Memorandum of Understanding (MOU)

The MOU sets out terms to develop a plan for the long-term management of low and intermediate level radioactive waste at the Western Waste Management Facility located within the Bruce site

- Under the MOU, Kincardine and OPG are conducting a fact-based assessment of the possible long-term management options for low and intermediate level waste
- The Independent Assessment Study will compare the options
- The study includes consultation with the local community and other stakeholders
- The results of the Independent Assessment Study will be documented in a report to be issued in January 2004

The MOU is concerned <u>only</u> with low and intermediate level waste

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

INDEPENDENT ASSESSMENT STUDY

Three options are being studied:

- Enhanced Processing, Treatment and Long-Term Storage
- Covered Above-Ground Concrete Vault
- Deep Rock Cavern Vault

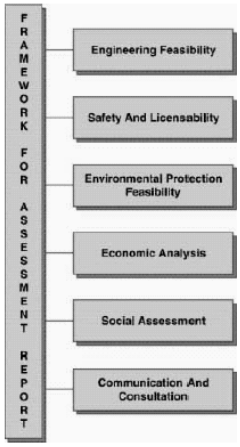
- Only those options that are technically feasible and safe are being considered in this Independent Assessment Study
- A geotechnical feasibility assessment and a safety assessment of the Covered Above-Ground Concrete Vault and the Deep Rock Cavern Vault were completed by firms specializing in such work
- Some members of the Steering Committee visited low and intermediate level waste management facilities in other countries
- An analysis of the potential social and economic impacts and benefits of the options is currently underway

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

INDEPENDENT ASSESSMENT STUDY

The Independent Assessment Study is considering these components:



INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

FACT-FINDING MISSION

Representatives from the Municipality of Kincardine and OPG visited long-term waste management facilities in Europe, including Forsmark in Sweden and Centre de L'Aube in France

- The purpose of the fact-finding mission was to see how other countries manage their low and intermediate level wastes
- Kincardine and OPG inspected operating facilities similar to those being considered within the Bruce site
- The representatives met with community leaders to gain an understanding to the local response to the presence of the long-term management facilities
- The information gathered from the mission will be used throughout the decision-making process

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

GEOTECHNICAL FEASIBILITY STUDY

Objectives

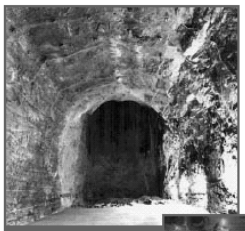
- Identify potential options for the long-term management of low and intermediate level waste
- Narrow list to options feasible for implementation at the Bruce site
- Provide information on the options to allow an assessment of their safety

Activities

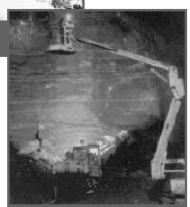
- Reviewed experience on mining caverns and constructing concrete buildings in conditions similar to those at the Bruce site
- Described the geological, hydrogeological and geotechnical conditions within the Bruce site as they apply to long-term repositories

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste



Cooling water tunnel at Darlington



Exploratory tunnel at Niagara Falls

Tunnels have been excavated in rocks similar to those underlying the Bruce site.

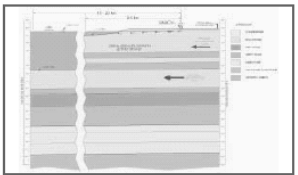
INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

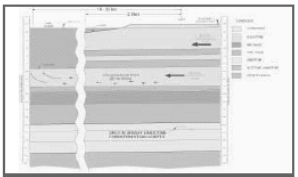
RESULTS OF GEOTECHNICAL FEASIBILITY STUDY

The study identified two feasible concepts for a long-term repository at the Bruce site:

- Covered Above-Ground Concrete Vault
- Deep Rock Cavern Vault



Hydrogeology for the Covered Above-Ground Concrete Vault



Hydrogeology for the Deep Rock Cavern Vault

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

PRELIMINARY SAFETY ASSESSMENT

The safety was examined for two long-term repository options considered geotechnically feasible within the Bruce site.

- Covered Above-Ground Concrete Vault
- Deep Rock Cavern Vault

Objectives

- How do the long-term repository options interact with the natural environment within the Bruce site over 1000s of years?
- How could radioactive contaminants move in the environment at the Bruce site?
- How could people be exposed to radiation?
- What radiation dose might they receive?

Activities

- Examined a number of engineering designs and potential exposure scenarios (including future human entry to repository)
- Modeled radiation exposures to people resulting from the movement of contaminants through air, soil and water
- Used standard approach recommended by the International Atomic Energy Agency
- Compared predicted radiation exposures to international safety criteria and naturally occurring levels

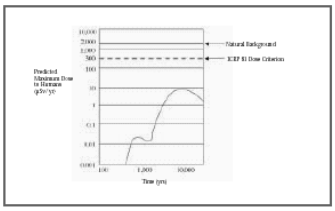
The study was done by Quintessa Limited, a consulting firm based in the UK, which specializes in safety assessments of waste management facilities

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

RESULTS OF PRELIMINARY SAFETY ASSESSMENT

- The Covered Above-Ground Concrete Vault option can and would be designed and constructed to meet the international dose criterion of 300 µSv per year for all low level waste and a range of intermediate level waste
- The Deep Rock Cavern Vault option can and would be designed and constructed to meet the international dose criterion of 300 µSv per year for all low and intermediate level waste



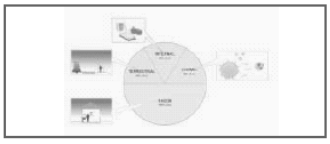
This graph shows the dose predictions for the Covered Above-Ground Concrete Vault option. Predicted doses for the Deep Rock Cavern Vault option are much lower. As you can see, predicted maximum doses to humans are well below both the international standard and natural background levels

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

RADIATION SAFETY BACKGROUND

- Sievert is a unit of measure used to describe the effective dose of ionizing radiation received by people. Dose is often expressed in millionths of a Sievert, or microSievert (µSv)
- Natural background radiation averages about 2,000 µSv per year. This represents the amount of radiation that the average person in Canada is exposed to, from all natural sources
- In Canada, the limit for public radiation exposure from nuclear facilities is 1,000 µSv per year
- The radiation received from a chest x-ray is 60 µSv
- For long-term repositories, the International Commission on Radiological Protection recommends a dose limit of 300 µSv per year



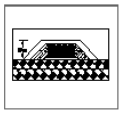
This diagram shows the range of sources of natural background radiation in Ontario. You can see that people are exposed to radiation from a number of natural sources such as the sun and the bedrock, and human activities such as medical examinations and power generation

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

THE OPTIONS

We are studying three options for the long-term management of low and intermediate level waste at the Western Waste Management Facility

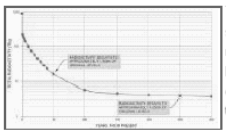
OPTIONS	EXAMPLES
• Enhanced Processing, Treatment and Long-Term Storage	 
• Covered Above-Ground Concrete Vault	 
• Deep Rock Cavern Vault	 

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

WHAT IS LOW LEVEL RADIOACTIVE WASTE?

- Low level waste consists of common industrial items that have become contaminated with low levels of radioactivity during routine clean-up and maintenance at the nuclear generating stations
- It includes mops, rags, paper towels, temporary floor coverings, floor sweepings, protective clothing and hardware items such as tools
- It consists of paper, plastics, metal, rubber, cotton and other miscellaneous materials
- Its radiation levels are such that it can be safely handled using normal industrial practices and equipment without any special radiation protection
- Approximately 6000 m^3 of low and intermediate level waste are received each year at the Western Waste Management Facility
- 95 % of all low and intermediate level waste received at the Western Waste Management Facility is low level waste



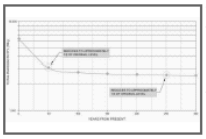
This figure shows how the radioactivity in low level waste decreases over time

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

WHAT IS INTERMEDIATE LEVEL RADIOACTIVE WASTE?

- Intermediate level waste has a higher level and broader range of radioactivity levels than low level waste
- Intermediate level wastes require shielding to protect workers during handling
- The radioactivity level of these wastes depends on where in the nuclear plants they come from
- For example, ion-exchange resins and filters used in water purification systems are lower in radicactivity, whereas resins, filters and components that have been removed from the reactors have higher radioactivity
- Approximately five per cent of all waste received at the Western Waste Management Facility is intermediate level waste
- Approximately 300 m^3 of intermediate level waste is received each year



This figure shows that some intermediate level waste can remain radioactive for thousands of years

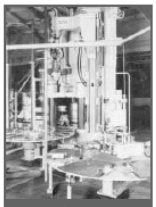
INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

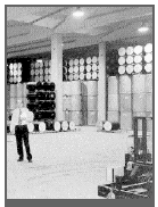
ENHANCED PROCESSING, TREATMENT AND LONG-TERM STORAGE

The Enhanced Processing, Treatment and Long-Term Storage option employs technology used in the Netherlands, Belgium, the US and the UK

- Uses a high-force super compactor to reduce waste to one tenth its original volume
- Compacted waste is placed in steel containers and any remaining spaces are filled with concrete
- Filled containers are placed in storage buildings
- Controlled atmosphere storage buildings provide high levels of safety to workers and isolate the waste from the natural environment
- Enhances the long-term stability of the waste.



Example of super compactor



Storage Building in the Netherlands

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

COVERED ABOVE-GROUND CONCRETE VAULT

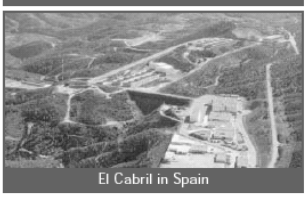
The Covered Above-Ground Concrete Vault option employs technology that is used in France and Spain

- Containers of low level waste are placed in concrete vaults and a concrete roof is poured once the vaults are full
- Finally, an earthen cap is placed over the vaults to protect the concrete from weathering
- The Centre de L'Aube facility in France began operating in 1992 and is designed for the long-term management of 1,000,000 m^3 of low level waste
- The El Cabril Centre in Spain also opened in 1992 and uses technology similar to that at the Centre de L'Aube
- Both these facilities have been operating successfully since their commencement and provide safe management of low level waste

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

Centre de L'Aube in France



El Cabril in Spain

France

Spain

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

DEEP ROCK CAVERN VAULT

The Deep Rock Cavern Vault option employs technology that is used in Sweden and Finland

- Facilities consist of surface administration buildings and an underground repository. Access to both facilities is via a ramp from the surface
- The Forsmark facility in Sweden opened in 1988 and is located at the Forsmark nuclear power station site
- The underground repository was excavated to a depth of 60 metres in bedrock below the bottom of the Baltic Sea
- The Loviisa facility in Finland began operation in 1997 and is located on Hästholmen Island near the Loviisa nuclear power station
- The underground repository was excavated to a depth of 110 metres below ground
- Regular monitoring of these facilities shows that the underground repositories provide safe management of low and intermediate level waste

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

Surface facilities of Forsmark facility in Sweden

Excavating the caverns for the Lovisa facility in Finland.

Sweden

Finland

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

YOUR INPUT COUNTS

- The Municipality of Kincardine and OPG are committed to transparency and openness during their review of long-term management options.
- The community will receive information on the options and on the progress of the study by means of:
  - *Newsletters*
  - *Advertisements*
- In addition, the community will have several opportunities to provide input to the selection of the preferred option for a long-term waste management facility at the Bruce site:
  - *Open Houses*
  - *One-on-one discussions*
  - *Web-Site http://ias.golder.com*
  - *Referendum on the acceptability of long-term waste management option(s) at the Western Waste Management Facility*
- In the event that a decision is made to proceed with one of these options, the community will have further opportunities to provide input, including:
  - *During the Environmental Assessment which would be required by the Canadian Environmental Assessment Act*
  - *During the Canadian Nuclear Safety Commission's licensing process*

Please see large display panel identifying each of the steps in the decision making process

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

NEED MORE INFORMATION?

Call, write or email any of the following or access the study web site at http://ias.golder.com

Municipality of Kincardine
Municipal Administration Centre
1475 Concession 5
R.R. #5
Kincardine, ONT
N2Z 2X6
Contact: John deRosenroll
Phone (519) 396-3018
Fax: (519) 396-8288
Email: cao@kincardine.net
http://www.kincardine.net

Ontario Power Generation
700 University Avenue
Toronto, ONT
M5G 1X6
Contact: Diane Barker
Phone: (416) 592-3842
Fax: (416) 592-6011
Email: diane.barker@opg.com
http://www.opg.com

Golder Associates
2390 Argentia Rd
Mississauga, ONT
L5N 5Z7
Contact: Duncan Moffett
Phone: 1-800-414-8314
Fax: (905) 567-6561
Email: dmoffett@golder.com
http://www.golder.com

INDEPENDENT ASSESSMENT STUDY

Long-Term Management of Low and Intermediate Level Radioactive Waste

WHAT'S HAPPENING THIS SUMMER?

- Over the next few months, Golder staff will be collecting information for the Independent Assessment Study and conducting surveys and interviews in the community
- Planned activities include:
  - *Telephone survey of Kincardine and Bruce County residents*
  - *Tourist questionnaires*
  - *Interviews of local businesses and farm owners and operators*
- An up-to-date description of what's planned over the coming months can be found on the Independent Assessment Study website at *http://ias.golder.com*
- Please respond if you are approached in our surveys or interviews. Your comments are important to us
- The results of the surveys and interviews will be included in the study report

We are available at any time to receive comments or answer any questions you may have

We would also welcome the opportunity to make a presentation to you or your community group on the study and the options being considered

Don't forget to check the study website to find out what's happening

INDEPENDENT ASSESSMENT STUDY

APPENDIX E

Newsletter

Long-Term Management of Low and Intermediate Level Radioactive Waste

Independent Assessment Study

newsletter

Issue No.1, May 2003

Kincardine and OPG Sign Memorandum of Understanding

The Municipality of Kincardine and Ontario Power Generation (OPG) have signed a Memorandum of Understanding (MOU) regarding the long-term management of low and intermediate level radioactive wastes. The purpose of the MOU is for OPG, in consultation with the Municipality of Kincardine, to develop a plan for the long-term management of low and intermediate level waste at the Western Waste Management Facility (WWMF) located on the Bruce site.

As a part of the agreed work plan for the MOU, Kincardine and OPG are conducting a fact-based assessment of the costs and benefits of the possible long-term management options for low and intermediate level waste at the WWMF. Golder Associates Ltd., an environmental consulting firm, is carrying out the assessment and will provide the results in an Independent Assessment Study report to be issued in January 2004.

Aerial view of the Western Waste Management Facility at the Bruce site.

Range of Options to be Reviewed

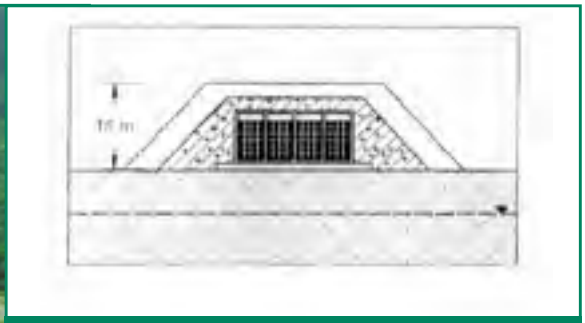
There are three options currently under consideration for the long-term management of low and intermediate level radioactive wastes. The first is an Enhanced Processing, Treatment and Long-Term Storage option, which relies on a high level of on-going control and facility management. The others are long-term repository options, which do not require the same degree of on-going control and maintenance. These long-term repository options employ Covered Above-Ground Concrete Vault or Deep Rock Cavern Vault designs.

What's Inside

Golder Associates

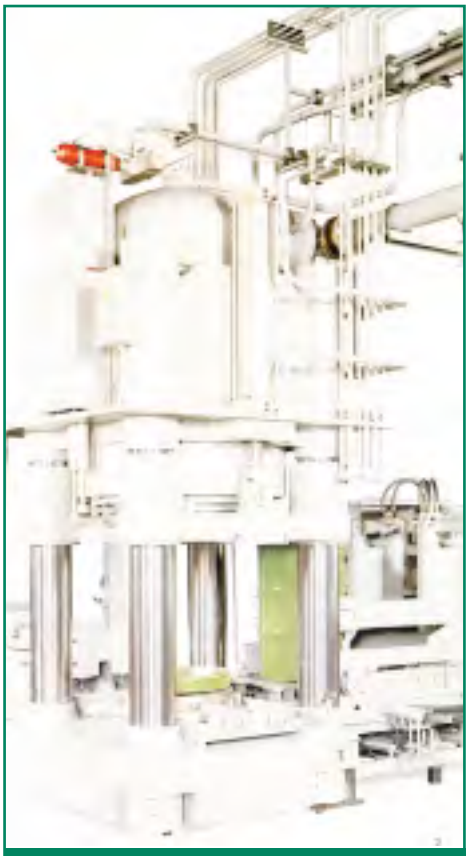
http://ias.golder.com

Aerial view of the long-term repository facility at the Centre de L'Aube, France. This facility was recently visited by Kincardine and Ontario Power Generation.



Schematic of the Covered Above-Ground Concrete Vault technology used at the facility at Centre de L'Aube, France. The vaults are located in the upper left corner of the photo at left.

Enhanced Processing, Treatment and Long-Term Storage involves the use of a high force super-compactor to achieve a maximum reduction in low level waste volume. The dense, compacted waste would then be placed in steel containers, filled with concrete and stored in new upgraded Low Level Storage Buildings. The Enhanced Processing, Treatment and Long-Term Storage option, which is currently used in the Netherlands, would be capable of safely managing low level waste for more than a century.



Super-compactor showing how much a drum (green) can be compacted.

The Covered Above-Ground Concrete Vault option involves the construction of concrete vaults at or slightly below the ground surface. After the vaults are full, they are covered with an engineered soil cover as much as 5 meters thick. The Covered Above-Ground Concrete Vault option is capable of storing all low level and some intermediate level waste.

The Deep Rock Cavern Vault option involves construction of a number of vaults within the low permeability bedrock using mining methods. It would be constructed within the stable rock formations located 425 to 750 meters below the Bruce site. It is capable of storing all low and all intermediate level waste.

Kincardine and Ontario Power Generation recently visited facilities in Europe and met with local community leaders.

Kincardine and OPG Conduct Fact Finding Mission

Representatives from the Municipality of Kincardine and OPG recently visited several long-term low and intermediate level waste management facilities in Europe. The purpose of the fact-finding mission was to see first hand how other countries manage their wastes. Specifically, Kincardine and OPG visited sites in Forsmark, Sweden, and Centre de L'Aube, France, which are similar in design to those being considered for the WWMF. Kincardine and OPG representatives also met with local community leaders to gain an understanding of the local response to the presence and activities at these facilities. Information gathered during the visits will be useful in the decision making process for a long-term waste management facility at the WWMF.

Safety of Options Reviewed

The first activities undertaken in the study of the long-term

Schematic of the underground works at the Forsmark repository in Sweden.

Aerial view of surface facilities for the long-term repository in Forsmark, Sweden. This facility was recently visited by Kincardine and Ontario Power Generation. Forsmark nuclear generating station is in the background.

management options were an examination of the geotechnical feasibility and an assessment of the safety of the options. Golder and another consultant, Quintessa, were retained by OPG to conduct the geotechnical feasibility study and the safety assessment, respectively. These assessments determined that two long-term repository options (the Covered Above-Ground Concrete Vault and the Deep Rock Cavern Vault) are geotechnically feasible for the Bruce site and would be designed to meet or exceed strict international safety criteria.

Independent Study One of Many Decision Steps

The Independent Assessment Study being undertaken by Golder will be completed before any decision is made with respect to the preferred option for long-term waste management. Subsequent major decision steps are illustrated on page 4 of this newsletter.

What Happens after the Independent Assessment Study is Completed?

Once the study is complete, the results of research on the technical feasibility, safety and licensability, environmental protection feasibility, and socio-economic costs and benefits of the options will be provided in an Independent Assessment Study report. The report will be reviewed by Kincardine and OPG and be made available to the community when it is issued in January 2004. The report will serve as the basis for discussions between Kincardine and OPG on a plan regarding offset costs and benefits. Only after these discussions will a decision be made on which, if any, of the long-term management options is to be implemented at the WWMF.

Your Input Counts

The community will have many opportunities to provide input to the selection and development of any long-term waste management option. These include during the preparation of the Independent Assessment Study report, during the referendum on the community benefits and offsets plan, during any future environmental assessment and as part of the Canadian Nuclear Safety Commission's licensing process. Notifications and advertisements regarding community events and open houses will be issued over the next few weeks.

Upcoming Open Houses:

The Municipality of Kincardine and Ontario Power Generation invite all interested persons to visit the following venues where the Independent Assessment Study will be explained:

Kincardine	**Lucknow**	**Port Elgin**	**Underwood**	**Chesley**
Monday June 9, 2003	Tuesday June 10, 2003	Friday June 13, 2003	Saturday June 14, 2003	Monday June 16, 2003
3:00 p.m. until 8:00 p.m.	3:00 p.m. until 8:00 p.m.	3:00 p.m. until 8:00 p.m.	11:00 a.m. until 4:00 p.m.	3:00 p.m. until 8:00 p.m.
Royal Canadian Legion	Royal Canadian Legion	Royal Canadian Legion	Community Hall	The Fire Hall

Decision Steps Towards Facility Operation

Completed ☑ *Underway* ☐ *Not Yet Begun* ○

Current Interim Storage of Low and Intermediate Level Waste

Kincardine and Ontario Power Generation Study of Long-Term Options

- ☑ Kincardine/Ontario Power Generation Sign Memorandum of Understanding
- ☑ Kincardine and Ontario Power Generation initiate Independent Assessment Study
- ☑ Conduct Geotechnical Feasibility Study
- ☑ Conduct Preliminary Safety Assessment
- ☐ *Conduct Social Assessment*
- ☐ *Conduct Economic Analysis*
- ☐ *Conduct Environmental Protection Feasibility*
- ☐ *Carry Out Consultation in Communities*

Independent Assessment Study Report

Seek Community Agreement

- ○ *Kincardine and Ontario Power Generation Develop Community Offsets and Benefits Plan*
- ○ *Community Discussions and Decision*

Positive Result in Referendum?

No → *OPG Considers Alternatives*

Yes

Conduct Environmental Assessment

- ○ *Design of Selected Option*
- ○ *Carry Out Environmental Assessment Studies and Consultation*
- ○ *Prepare and Submit Environmental Assessment Study Report*
- ○ *Public Review*

Environmental Assessment Accepted?

No → *OPG Considers Alternatives*

Yes

Seek Construction and Operating Approvals

- ○ *Prepare Facility Safety Report*
- ○ *Application to Canadian Nuclear Safety Commission for Site/Construction Approval*
- ○ *Application to Canadian Nuclear Safety Commission for Operating Licence*

Canadian Nuclear Safety Commission Issues Licence?

No → *OPG Considers Alternatives*

Yes

Operating Long-Term Waste Management Facility

APPENDIX F

Comment Sheet Summary

COMMENT SHEETS SUMMARY - JUNE 2001, OPEN HOUSES						
Question	**Kincardine June 9, 2003**	**Lucknow June 10, 2003**	**Port Elgin June 13, 2003**	**Underwood June 14, 2003**	**Chesley June 16, 2003**	**TOTALS ***
1. Comment Sheets Received	18	4	4	5	6	**37**
2. Status of Visitor						
a) Resident	15	4	4	5	6	**34**
b) Cottager				1		**1**
c) Tourist						
d) Other	3					**3**
2. Place of Residence						
a) Kincardine	14			2	1	**17**
b) Saugeen Shores			4	2		**6**
c) Arran-Elderslie					3	**3**
d) Brockton				1	1	**2**
e) Huron-Kinloss	2	3				**5**
f) Other	2	1			1	**4**
3. Place of Work						
a) Kincardine	8		1			**9**
b) Saugeen Shores			2			**2**
c) Arran-Elderslie					1	**1**
d) Brockton				1	1	**2**
e) Huron-Kinloss		2				**2**
f) Other	10	2	1	4	3	**20**
4. How did you hear about this public meeting?						
a) Newspaper ad	2	1	2	3		**8**
b) Notice in mail	12	1			3	**16**
c) Newsletter	5		1	2		**8**

COMMENT SHEETS SUMMARY - JUNE 2001, OPEN HOUSES												
d) Other	4		2		1		1		3		**11**	
5. Please indicate your satisfaction with the following:	**S = Satisfied** **N/S = If not satisfied, please specify your preference here**											
	Kincardine June 9, 2003		**Lucknow June 10, 2003**		**Port Elgin June 13, 2003**		**Underwood June 14, 2003**		**Chesley June 16, 2003**		**TOTALS***	
	S	**N/S**	**S**	**N/S**	**S**	**N/S**	**S**	**N/S**	**S**	**N/S**	**S**	**N/S**
a) Location of Meeting	18		4		4		5		6		**37**	
b) Time of Meeting	18		3		4		5		6		**36**	
c) Day of the Week	18		3		4		5		6		**36**	
6. On a scale from 1 to 5, please rate the following by circling the appropriate number:	**Average Ratings: Scale 1 (Not at all) 2, 3 and 4 (Somewhat) 5 (Very)**											
	Kincardine June 9, 2003		**Lucknow June 10, 2003**		**Port Elgin June 13, 2003**		**Underwood June 14, 2003**		**Chesley June 16, 2003**		**TOTALS***	
a) How informative were the display materials?	4.5		5		4.5		4.4		4.6		**4.6**	
b) How helpful were the staff and consultants in answering your questions?	4.9		5		5		5		4.8		**4.9**	

*Totals that do not add up indicate that responses were left blank on the comment form.

The following comments and questions form a complete list of all those received during the Open House.

COMMENTS SUMMARY

- We should strongly consider the mining option for not only low and intermediate waste but for high level wastes as well. We could bury all fuel at approximately 700 m below surface at reasonable cost.
- Your efforts are commendable. Your industry however is too short-sighted and needs a wider vision of its impact on life in general. This responsibility for a healthier

environment must be shared by all, not just the scientific tech's involved. My opinions were made very clear to your tolerant representative.

- Science is not long-term in this area.
- Future – can't trust government to not dump high level waste in future.
- Underground option would seem preferable from dose and security point of view.
- I would like to see a supply of potassium iodine pills kept for an emergency with publicly advertised locations to be easily available if needed.
- The staff was very nice and helpful.
- The web site is very informative.
- Long-term option should be safe and operated with minimal staff. It must be self-contained.
- I think you are on the right track with the Deep Rock Cavern Vault. It's much easier to secure and easy to protect.
- I like the Golder newsletter and the Bruce Power newsletters.
- I have two (2) groups that might like a presentation.

QUESTION SUMMARY

- How many persons would be employed in the building of the Covered Above-Ground Concrete Vault?
- How many would be employed after construction?
- How many square meters would the buildings be associated with each option?
- How would you cope with the possibility of long-term flooding?
- Long-term costs – are they covered if the facility is bankrupt?
- Deep storage – location of aquifer? Effect?

Public Attitudes Towards Long Term Management of Low and Intermediate Level Radioactive Wastes at the Western Waste Management Facility

Prepared for:
Golder Associates Limited
in association with
Gartner Lee Limited

By:
IntelliPulse Inc.

September, 2003

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1.0 RESEARCH OBJECTIVES AND KEY FINDINGS

1.1 Research Overview

The Municipality of Kincardine and Ontario Power Generation (OPG) are undertaking an Independent Assessment Study (IAS) on options for the long-term management of low and intermediate level radioactive waste at the Western Waste Management Facility (WWMF). A part of the IAS is a social and economic analysis. Public attitude research was undertaken to assist in this analysis by examining the potential for effects of OPG's plans for long term management of wastes at the WWMF on public attitudes and behaviours and various attributes of the local communities.

IntelliPulse Inc. is pleased to present the results of a telephone survey that has an overall objective of identifying the potential for future effects of the long term waste management options at the WWMF on people and their communities. The more detailed research objectives that form the basis of this report are to:

- Identify people's attitudes towards and perceptions of their community including: major community issues, key attributes of the Municipality of Kincardine and the Neighbouring Municipalities, people's feelings of personal security, and their commitment to the community and/or farming;

- Identify the activities and behaviours of the local residents that are conducted near the WWMF (e.g. park use, fishing activities);

- Gauge awareness of the existing WWMF and the long term waste management options under consideration; and

- Examine the potential for effects on people's daily life and any likely changes in attitudes towards their community, or behavioural intentions that may be attributable to the long term options for managing the low and intermediate level radioactive wastes at the WWMF.

In order to fulfill these research objectives a questionnaire was developed by IntelliPulse and Gartner Lee Limited for telephone administration. The survey took on average 17 minutes to administer and contained 55 questions, including 8 open-end questions. To qualify for an interview respondents needed to be an adult resident who is 18 years of age or older. The sample was split between men and women. Respondents who own a cottage and were interviewed at that residence are part of the sample. Perhaps as a result of the late spring, too few cottagers may have been available for interviewing, and hence the sample size is too small to examine their responses on their own.

Bruce County, excluding the North and South Bruce Peninsula, is the total study area with 751 interviews completed from June 9 – 14, 2003. However, two primary geographic areas were defined for sampling within the County and these two areas were used for identifying respondents to answer questions and analyzing results:

- The amalgamated Municipality of Kincardine is the focus of the study. A total of 400 interviews were completed within the municipal boundaries. This sample size was selected to obtain a strong degree of accuracy in the findings with an confidence interval of ±5%, 19 out of 20 times.

- The remainder of Bruce County (referred to as the Neighbouring Municipalities), excluding the North and South Bruce Peninsula, is a secondary focus. The sample size is 351 interviews, with the respondents selected in proportion to the population distribution for the 5 amalgamated municipalities. The confidence interval for the Neighbouring Municipalities is ±5.4%, 19 out of 20 times.

The Technical Appendix describes the sampling procedures and includes the questionnaire. They survey was registered with the Canadian Survey Research Council; the project leader (Margaret Buhlman) and the Field directors (Sam Pisani and Anthony Molinaro) are members of the Professional Marketing Research Society and abide by PMRS' standards for conducting the research.

1.2 Key Findings

- There are a number of community issues on the minds of respondents, one of which is the Bruce Power generating station. Overall, the top issues facing communities in the study areas are healthcare (27% Kincardine and 13% Neighbouring Municipalities) and the safety of the drinking water (19% Kincardine and 30% Neighbouring Municipalities). Four-in-ten (38% and 44% respectively) state that there is no issue in particular that affects their feelings of personal security. The top issues affecting people's feelings of personal security are economic development (13% and 11%), healthcare (9% and3%) and general public safety (9% each).

- The Bruce Power nuclear station, and indeed radioactive waste, are not a top-of-mind issues for the vast majority of people. Only six percent (6%) in Kincardine and 1% in the Neighbouring Municipalities name the Bruce Power nuclear station or radioactive waste as the most important issue facing the community. Only 10% of survey respondents in the Municipality of Kincardine and 3% in the Neighbouring Municipalities indicate that the station affects their feelings of personal security. Only 1% of respondents in Kincardine specifically identify radioactive waste as a thing or issue affecting their feelings of personal security. This may be in part due to the fact that almost all respondents have some level of confidence in the existing radioactive waste management technologies being used at the WWMF, with about half of the respondents indicating that they are "very confident" (53% Kincardine, 43% Neighbouring Municipalities).

- Lake Huron, the beaches, harbour and lighthouse are the key images that come to mind for 38% and 28% of the respondents respectively, followed by the ambiance of the area (18% Kincardine and 13% Neighbouring Municipalities). Notable is the finding that 12% and 19% respectively identify the Bruce Power nuclear station as one of the first images that comes to mind when thinking of Kincardine and the Neighbouring Municipalities. However, only 19% of these respondents think of the Bruce Power station consider this image to be a negative one. Clearly the station is seen as an integral part, and a more positive than negative component, of the character of Kincardine and the Neighbouring Municipalities.

- People's satisfaction with living in their community is high, with 77% of the respondents in both study areas being "very satisfied". Indeed, the same percentages (76% and 75%) are "very committed" to living in their community. Slightly fewer are "very committed" to continued farming (62% in each study area). There is a great deal of pride in the community in that over three-quarters of Kincardine respondents believe that the area is "very attractive" as a place to visit as a tourist (79%), and as a place to live (78%), although there are more reservations about the area as a place to establish and operate a business (35%). People outside of Kincardine have similar perceptions of Kincardine and the Neighbouring Municipalities as do residents of Kincardine.

- Area residents have varying levels of participation in activities, with the use of parks, beaches, and trails along the Lake Huron shoreline being the highest (54% and 36% "regularly"), and participate in fishing and boating on Lake Huron is lower (14% each).

- One-quarter of the Kincardine (25%) and fewer of the Neighbouring Municipalities (17%) respondents think about the fact that they live near the Bruce Power generation station "very often". Even fewer think about the fact that they live near the WWMF (18% and 13% "very often and "often").

- There is awareness of the existing WWMF among survey respondents. 61% of respondents from Kincardine and 39% of respondents from the Neighbouring Municipalities have heard at least "something" about the existing facility.

- Almost all of the respondents indicate that the presence of the existing WWMF does not affect their daily life (91% Kincardine, 94% Neighbouring Municipalities).

- There is also some level of awareness of the study regarding future long term management options at the WWMF among survey respondents. 38% of respondents from Kincardine and 24% of respondents from the Neighbouring Municipalities remember receiving a newsletter about the study. Of those people who recall receiving a newsletter from OPG regarding the study, the largest proportion indicate that on first impression, they are not concerned about the plans for long term management of low and intermediate level wastes at the WWMF or they support it (47% Kincardine, 40% Neighbouring Municipalities).

- The vast majority of respondents are not likely to change their attitudes, images or behaviours either positively or adversely as a result of the plans for long term management of low and intermediate level radioactive wastes at the WWMF.

  The vast majority of respondents do not expect to change their commitment to farming (90% Kincardine, 88% Neighbouring Municipalities), their satisfaction with their community (75% and 73% respectively) or their feelings of personal security (65% and 60% respectively). Of all those who indicate that they might be adversely by a long term waste management facility 16% and 18% state that their personal security will be affected adversely; 8% and 11% claim that they will experience decreased satisfaction with their community; 6% and 3% indicate that they will experience a decreased commitment to farming.

  The vast majority of respondents believe there will be no effect of long term waste management on the attractiveness of the Municipality of Kincardine as a place to visit as a tourist (77% Kincardine, 73% Neighbouring Municipalities), to establish and operate a business (67%, and 63%, respectively), and to live (67% and 65%, respectively). Of those who indicate that they might be adversely affected by a long term waste management facility, 19% of Kincardine respondents and 18% from Neighbouring Municipalities indicate that Kincardine and its Neighbouring Municipalities would be a less attractive place to live; as a place to establish and operate a business (15% and 17% respectively); and as a place for tourists to visit (14% and 12% respectively).

  The vast majority of respondents would not move from their community (92% Kincardine, 90% Neighbouring Municipalities), or change their fishing or boating activities (92% Kincardine, 89% Neighbouring Municipalities), or their use of parks, beaches, and trails near the Bruce site (89% Kincardine, 87% Neighbouring Municipalities).

- Those few people that indicated that their attitudes might change were asked to state which of the three options being considered would have the greatest effect. Overall about 40%, but as low as about 25%, of the respondents believe that the Deep Rock Cavern Vault is likely to have the most impact on satisfaction (41% Kincardine, 28% Neighbouring Municipalities), commitment to farming (40%, 26%), and feelings of personal security (47%, 40%). There is no consensus on which of the three long-term options will have the most impact on the attractiveness of the area as a place to visit, live or establish a business, with about one-quarter to one-third of the respondents naming each of the options. It is important to emphasize that because so few people indicate that their attitudes would change (both positively and negatively) there is considerable amount of uncertainty regarding the conclusions regarding which option would have the greatest effect. As such this data should be considered as a preliminary indicator only.

2.0 COMMUNITY ISSUES AND IMAGE

2.1 Most Important Issues

At the outset of the survey respondents were asked to name the most important issue(s) facing their community today; they were allowed to provide up to two responses. As noted in Table 1, only 6% of the respondents in Kincardine identify the Bruce Power nuclear generating station or radioactive waste as important issues facing the community. Only 1% identified these issues in the Neighbouring Municipalities.

The most frequently mentioned issues are healthcare and the safety of the drinking water. One-quarter (27%) of the respondents in Kincardine name healthcare, and fewer (19%) name safe drinking water. The importance of these issues is reversed in the Neighbouring Municipalities, where 30% name the safety of the drinking water and 13% name healthcare.

Environmental issues (11% Kincardine and 10% Neighbouring Municipalities) and economic development (10% and 9% respectively) follow by healthcare and safe drinking water as volunteered issues. A wide variety of other issues are named, from education to the need for sidewalks by fewer than 10% of the respondents each. This suggests that nuclear related issues are not top-of-mind issues in either Kincardine respondents or those from Neighbouring Municipalities, but rather one of many.

It is notable that within Kincardine respondents who themselves or someone in their household is employed by OPG, Bruce Power or AECL are more likely to name economic development as the top issue in the community. Within both study areas, respondents involved in the agriculture industry are more likely to name mad cow disease. Within the Neighbouring Municipalities younger respondents are more likely to name education issues, and those who have lived in the community for fewer years to name environmental issues.

TABLE 1: MOST IMPORTANT ISSUE FACING THE COMMUNITY

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
Healthcare - lack of facilities and doctors/ Cutbacks	27	*99*	13	*42*
Safety of drinking water	19	*69*	30	*95*
Environment/ Pollution/ Agricultural & industrial waste management	11	*39*	10	*31*
Economic development/ Employment/ Job security	10	*35*	9	*30*
No issues/ None	8	*30*	9	*29*
Educational issues/ School closures	7	*25*	6	*19*
Factory farmers/ Pig farmers	6	*21*	4	*14*
Bruce Power generating station – radioactive / nuclear waste	**6**	***23***	**1**	***3***
Mad Cow Disease - effects on the beef industry	4	*16*	7	*22*
Agricultural issues – general	4	*13*	5	*17*
Lack of community resources & facilities for adults & kids	4	*16*	4	*11*
High taxes	3	*10*	3	*10*
Issues with current council/ Government	3	*9*	2	*7*
SARS	2	*7*	2	*6*
Anti-amalgamation	2	*7*	2	*5*
Safety issues/ Understaffed police services	2	*6*	2	*6*
Lack of affordable housing	2	*7*	1	*3*
Alcohol and drug use	2	*6*	1	*3*
Road maintenance	2	*7*	1	*4*
Increases in tourism	2	*7*	1	*3*
Use of pesticides/ Fertilizer	1	*4*	2	*5*
Treatment of seniors	1	*3*	1	*4*
Hydro/ Power generation	1	*4*	1	*4*
Crime/ Violence	1	*5*	1	*4*
Lack of provincial & federal govt funding and support	1	*1*	1	*3*
For amalgamation	1	*2*		
West Nile Virus	1	*4*	1	*4*
Need a new sewer system in the community	*	*1*	2	*5*
Canada/ U.S. Border issues			1	*2*
Homosexual marriage laws introduced by government	*	*1*		
Influx in population	*	*1*		
The need for sidewalks	*	*1*		
Anti-abortion			1	*2*
Other	1	*2*	1	*3*

Note: Cases may not sum to 351 for the total of Neighbouring Municipalities or 400 for Kincardine where 'no opinion' is excluded. Percentages may not sum to 100% due to rounding. * indicates less than .5%. For this and all tables the numbers in italics are the numbers of respondents providing that answer. q1

2.2 Community Character

In order to gain insight into how people both inside and outside of Kincardine see their community, respondents were asked to volunteer the "thing or image that comes to mind" about the Municipality of Kincardine and the Neighbouring Municipalities. A variety of image attributes are mentioned. In order to understand the overall image, response categories are combined into the topics presented in Table 2. As noted in Table 2, 12% of Kincardine and 19% of the Neighbouring Municipalities respondents name the nuclear generating station as the thing or image that comes to mind. Responses include mention of the Bruce Power nuclear station, the Ontario Hydro plant, and nuclear waste (3 respondents in total name nuclear waste). Although nuclear related issues are not top-of-mind issues in either Kincardine or Neighbouring Municipalities, the nuclear station itself is a dominant feature of the community's character.

The attribute that appears to contribute most to the image of the community is Lake Huron, and its beaches, the harbour and the lighthouse (38% in the Municipality of Kincardine and 28% in the Neighbouring Municipalities). Respondents within Kincardine who are more likely to volunteer this image attribute are those who themselves or someone in their household is employed in the nuclear industry, have children, or are women.

The ambiance of the community (that is, a beautiful place to live, quiet and peaceful, the sunsets, small town, cottage country, and nice weather) is named by over one-in-ten respondents in Kincardine (18%) and (13%) Neighbouring Municipalities.

Fewer than 10% of Kincardine and Neighbouring Municipalities respondents name the remaining issues. Included in these response categories are:

- Agriculture – agriculture base, cattle and pig farms.
- Local community issues – amalgamation of the township, Scottish heritage / bag pipes, issues with current government/politicians, new roads needs / road construction needed, high rate of taxation, the downtown image.
- Community activities – community events / community involvement, fishing, conducive to seniors living, Chantery Island, retirement area.
- Personal security and health – water safety / e-coli/ the Walkerton water scandal, safe / secure, healthcare issues- lack of quality care, alcohol and drug use, un-clean neighborhoods.
- Economic / social conditions – standard of living, population growth, lack of shopping facilities, employment issues.

TABLE 2: IMAGE OF THE MUNICIPALITY OF KINCARDINE AND THE NEIGHBOURING MUNICIPALITIES

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
Lake Huron/ The beach/ Harbour/ Lighthouse	38	*152*	28	*98*
Ambiance	18	*73*	13	*46*
Bruce Power nuclear generating station	**12**	***47***	**19**	***66***
Tourist resort/ Tourism	9	*35*	7	*25*
Local community issues	6	*24*	4	*14*
Agriculture	4	*15*	8	*28*
Personal security and health	3	*13*	4	*12*
Community activities	3	*10*	3	*10*
Friendly people	2	*6*	2	*6*
Economic / social conditions	2	*8*	1	*4*
Other	1	*2*	2	*5*
Nothing/no opinion	4	*15*	11	*37*

Note: Cases may not sum to 351 for the total of Bruce County or 400 for Kincardine where 'no opinion' is excluded. Percentages may not sum to 100% due to rounding. Q6

As noted in Table 3, over eight-in-ten respondents (89% Kincardine, 88% Neighbouring Municipalities) state that the image they named is a positive one, with most people stating that it is "very positive". Kincardine respondents who themselves or someone in their family is employed in the nuclear industry, are older, or women are more likely to state that the image is positive. There are no segment differences in response within the Neighbouring Municipalities.

Table 3 also presents each issue by the percentage of respondents who state that it is a positive or negative attribute. It is notable that 81% of the respondents who name the Bruce Power nuclear generating station consider this to be a positive image. Ninety percent or more of the respondents state that community activities, the people, the lake, agriculture, the ambiance, and tourism are positive images.

TABLE 3: POSITIVE OR NEGATIVE IMAGE

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
Very positive	67	261	60	194
Somewhat positive	22	86	28	91
Somewhat negative	6	23	7	24
Very negative	5	21	5	17
	Positive		**Negative**	
Image	%	*n*	%	*n*
Community activities	100	21		
The people	100	13		
Lake Huron/ The beach/ Harbour/ Lighthouse	98	221	2	5
Agriculture	93	49	8	4
Ambiance	93	99	7	7
Tourist resort/ Tourism	91	51	9	5
Nuclear generating station	**81**	**100**	**19**	**23**
Other	78	7	22	2
Nothing/no opinion	76	25	24	8
Economic / social conditions	70	7	30	3
Personal security and health	60	15	40	10
Local community issues	41	13	59	19

Note that percentages for the Image by positive or negative response are for the total Bruce County and sum across to 100%. Q7

2.3 Potential for Stigma

Respondent's positive image of the Municipality of Kincardine and the Neighbouring Municipalities is further demonstrated in assessments of the attractiveness of the area for tourism and as a place to live, although assessments are not as strong in terms of attractiveness as a place to establish a business. As noted in Table 4, over 70% of the respondents state that the Municipality of Kincardine and the Neighbouring Municipalities is 'very attractive' as a place to visit as a tourist (79% Kincardine, 75% Neighbouring Municipalities) and as a place to live (78% Kincardine, 70% Neighbouring Municipalities). Significantly fewer respondents provide the same strong evaluation of Kincardine as a place to establish and operate a business (35% Kincardine, 41% Neighbouring Municipalities). Nonetheless, over 80% of the respondents state that the Municipality of Kincardine and the Neighbouring Municipalities are at least a 'somewhat' attractive area to establish a business.

TABLE 4: ATTRACTIVENESS OF THE MUNICIPALITY OF KINCARDINE AND THE NEIGHBOURING MUNICIPALITIES

	Kincardine		Neighbouring Municipalities	
Visit as a tourist	%	*n*	%	*n*
Very attractive	79	*312*	75	*255*
Somewhat attractive	19	*77*	24	*80*
Somewhat unattractive	1	*3*	1	*4*
Very unattractive	1	*4*	*	*1*
Place to live				
Very attractive	78	*312*	70	*239*
Somewhat attractive	20	*80*	28	*96*
Somewhat unattractive	1	*5*	2	*6*
Very unattractive	1	*3*	*	*1*
Place to establish and operate a business				
Very attractive	35	*134*	41	*132*
Somewhat attractive	50	*189*	47	*150*
Somewhat unattractive	12	*44*	9	*28*
Very unattractive	4	*14*	3	*10*

Note: Cases may not sum to 351 for the total of Bruce County or 400 for Kincardine where 'no opinion' is excluded. Percentages may not sum to 100% due to rounding. * denotes less that 1 percent. Q8,9,10

There are a few differences in assessment by respondent characteristics. Within Kincardine, older respondents provide a stronger positive opinion on the attractiveness of the area as a place to live and to visit as a tourist, and women provide a stronger opinion on all three measures, as a place to live, to visit, and to establish a business. Within the Neighbouring Municipalities, older respondents provide a stronger positive opinion on the attractiveness of the area as a place to live and to visit as a tourist; respondents who live in Saugeen Shores are less likely to state that the area is an attractive place to establish a business. It is also noteworthy that overall attitudes towards Kincardine as a place to live, visit or conduct business are similar both within and outside of the municipality.

3.0 COMMUNITY ATTITUDES AND LOCAL ACTIVITIES

3.1 Community Attitudes

Prior to questioning respondents about the existing WWMF facility or issues regarding low and intermediate level radioactive waste, respondents were asked to describe, "What things or issues in your community affect your feelings of personal security the most" (Table 5). Of the issues named, a higher percentage of respondents in Kincardine (11% in total) than in the Neighbouring Municipalities (3%) name the Bruce Power generating station, hydro/power generation, or radioactive waste.

Across Bruce County the most frequent individual response is that people have no particular issue that affects their feelings of personal security (38% Kincardine, 44% Neighbouring Municipalities). Economic development / employment / job security is the most frequently named issue in Kincardine (13%) and Neighbouring Municipalities (11%).

TABLE 5: THINGS OR ISSUES THAT MOST AFFECT FEELINGS OF PERSONAL SECURITY

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
No issues/ None	38	*130*	44	*133*
Economic development/ Employment/ Job security	13	*43*	11	*33*
Safety issues/ Understaffed police services	9	*32*	9	*28*
Healthcare - lack of facilities and doctors/ Cutbacks	9	*32*	3	*10*
Bruce Power generating station	**8**	***26***	**2**	***6***
Crime/ Violence	6	*19*	6	*19*
Environment/ Pollution/ Agricultural & industrial waste mgmt	4	*15*	4	*12*
Safety of drinking water	3	*11*	7	*20*
Lack of community resources & facilities for adults & kids	3	*10*	3	*9*
Issues with current council/ Government	3	*9*	2	*7*
Hydro/ Power generation	**2**	***6***	**1**	***2***
Factory farmers/ Pig farmers	2	*6*	1	*4*
Agricultural issues – general	1	*4*	2	*7*
Educational issues/ School closures	1	*4*	2	*5*
Use of pesticides/ Fertilizer	1	*3*	2	*5*
Alcohol and drug use	1	*2*	1	*4*
High taxes	1	*3*	1	*3*
Mad Cow Disease - effects on the beef industry	1	*2*	1	*4*

TABLE 5: THINGS OR ISSUES THAT MOST AFFECT FEELINGS OF PERSONAL SECURITY

	Kincardine		Neighbouring Municipalities	
Lack of affordable housing	1	*3*	*	*1*
Radioactive/ nuclear waste	**1**	***4***		
Treatment of seniors	1	*4*		
Anti-amalgamation	1	*4*	*	*1*
West Nile Virus			1	*2*
Need a new sewer system in the community			*	*1*
Canada/ U.S. Border issues	*	*1*	*	*1*
Road maintenance	*	*1*	1	*2*
SARS	*	*1*	1	*2*
Increases in tourism	*	*1*	1	*2*
Limited public transportation			*	*1*
Lack of proper armed forces	*	*1*		
Legislation to control gun ownership			*	*1*
Influx in population	*	*1*	*	*1*
Other	1	*4*	1	*2*

Note: Cases may not sum to 351 for the total of Bruce County or 400 for Kincardine where 'no opinion' is excluded. Percentages do not sum to 100% since 2 responses were accepted. Q5

Survey respondents were also asked to indicate their current level of satisfaction with living in their community.

Table 6 findings indicate that almost all respondents are satisfied with living in this area, and three-quarters of them (77% in Kincardine and Neighbouring Municipalities) are "very satisfied". While satisfaction levels are high across all municipalities, respondents within Kincardine who are older and those within the Neighbouring Municipalities who have resided in their community for a longer time are more likely to be very satisfied.

TABLE 6: SATISFACTION WITH LIVING IN THEIR COMMUNITY

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
Very satisfied	77	*310*	77	*267*
Somewhat satisfied	19	*77*	20	*70*
Not very satisfied	3	*11*	2	*8*
Not at all satisfied	1	*2*	1	*4*

Note: Cases may not sum to 351 for Bruce County or 400 for Kincardine where 'no opinion' is excluded. Percentages may not sum to 100% due to rounding. Q2

Regardless of how often respondents think about the fact that they live near the Bruce Power generating station or the existing WWMF, how much they have heard about the WWMF, or whether they or a member of their household is employed in the nuclear industry respondents in the Municipality of Kincardine and the rest of the county are satisfied with living in their community. However, a small number of respondents who are less satisfied than the average with their community are typically less confident in the radioactive waste management technologies used at the existing WWMF.

The strong level of satisfaction with their community is reflected in respondents' commitment to living and farming in the community. As noted in Table 7, three-quarters of the respondents (76% in Kincardine, 75% in Neighbouring Municipalities) state that they are "very committed" to living in their community. Two-thirds of the respondents (62% in Kincardine and Neighbouring Municipalities) who are farmers are committed to this activity in their community. These levels of commitment are consistent across all the municipalities, however respondents in Huron-Kinloss are more likely than the average to state that they are either very or somewhat committed to farming in their community.

TABLE 7: COMMITMENT TO THE COMMUNITY

	Kincardine		Neighbouring Municipalities	
Living in your community:	%	*n*	%	*n*
Very committed	76	*305*	75	*260*
Somewhat committed	18	*72*	19	*65*
Not very committed	4	*14*	5	*18*
Not at all committed	2	*9*	2	*6*
Farming in your community:				
Very committed	62	*36*	62	*46*
Somewhat committed	14	*8*	28	*21*
Not very committed	16	*9*	5	*4*
Not at all committed	9	*5*	5	*4*

Note: Cases may not sum to 351 for the total of Bruce County or 400 for Kincardine where 'no opinion' is excluded. Percentages may not sum to 100% due to rounding. Q3,4

It is noteworthy that a higher level of commitment to living in their community is evident among Kincardine respondents who are not employed in the nuclear industry, are older, and among respondents who have lived in their community for a longer time, or are older. There are too few farmers in the sample to examine subgroup differences in responses other than to note that women in the Neighbouring Municipalities have a higher level of commitment to farming than do men.

3.2 Residents' Activities

One of the objectives of the study was to investigate the degree to which future plans at the WWMF might have an effect on the behaviour of residents in terms of activities that might be conducted near the WWMF. It was hypothesized that if peoples' attitudes towards the WWMF change because a new option is implemented, peoples' behaviours might also changes as a result. Changes in peoples' behaviours and their implications on community are considered social and economic effects. The results presented in Table 8 indicate the following participation rates for respondents in the Municipality of Kincardine and the Neighbouring Municipalities.

- **Use of parks, beaches, trails along the Lake Huron shoreline** – 91% of Kincardine respondents and 83% of the Neighbouring Municipalities respondents use the parks, beaches and trails are least "occasionally". Kincardine respondents who have children, are younger, or have a higher household income have a higher participation rate, as do Neighbouring Municipalities respondents who have lived in the community for a short time period, have a higher household income, or reside in Saugeen Shores.

- **Fishing or boating on Lake Huron** – 42% of Kincardine respondents and 45% of the Neighbouring Municipalities respondents go fishing or boating on Lake Huron. Kincardine respondents who have children, are younger, or have a higher household income have a higher participation rate, as do Neighbouring Municipalities respondents who are themselves or someone in their household is employed in the nuclear industry, have children, are younger, have a higher household income, or reside in Saugeen Shores.

TABLE 8: PARTICIPATION IN ACTIVITIES

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
Used parks, beaches, trails along the Lake Huron shoreline				
Regularly	54	*215*	36	*127*
Occasionally	37	*148*	47	*164*
Never	9	*37*	17	*59*
Gone fishing or boating on Lake Huron				
Regularly	14	*55*	14	*50*
Occasionally	28	*110*	31	*107*
Never	59	*235*	55	*194*

Note: Cases may not sum to 351 for the total of Bruce County or 400 for Kincardine where 'no opinion' is excluded. Percentages may not sum to 100% due to rounding for the first 2 questions. Q11-13

4.0 THE EXISTING WWMF

4.1 Awareness of the Existing WWMF

Respondents were asked how often in their "day-to-day living" they "think about the fact that they live near the Bruce Power generating station site" and "near the Western Waste Management Facility". At this point in the survey a handful of people had already thought about the station and the radioactive waste through their own responses to the open-ended questions on issues in the community, issues that affect their feelings of personal security, and the image of the community. As an introduction to questions about the WWMF they were also read the following:

> I would like to read you a brief description of the Western Waste Management Facility.
>
> The Western Waste Management Facility currently stores low and intermediate level radioactive wastes produced by all of Ontario's nuclear generating stations. Low and intermediate level waste management is essential for the ongoing operation of the nuclear generation stations, including Bruce Power. The waste management facility is located on the Bruce Nuclear generating station site in the Municipality of Kincardine. The facility is regulated by the Canadian Nuclear Safety Commission and has been operated by Ontario Power Generation since the early 1970's. Wastes are stored in above-ground buildings and structures, and also within in-ground structures.

Overall, results indicate that few people think about the Bruce Power station, and even fewer think about the existing WWMF on a daily basis. One-quarter of Kincardine respondents (25%) and slightly less than one-fifth of the Neighbouring Municipalities respondents (17%) think about the station "very often" and even fewer think about it "often". A total of 18% of the Kincardine and 13% of the Neighbouring Municipalities respondents think about the WWMF "very often" or "often". There are no significant differences by where the respondents reside.

TABLE 9: THINK ABOUT LIVING NEAR THE FACILITIES

	Kincardine		Neighbouring Municipalities			Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*		%	*n*	%	*n*
Bruce Power Generating Station:					**WWMF:**				
Very often	25	*100*	17	*61*	Very often	9	*36*	5	*18*
Often	14	*54*	11	*40*	Often	9	*35*	8	*27*
Not very often	35	*140*	46	*160*	Not very often	42	*167*	42	*145*
Never	26	*102*	26	*90*	Never	40	*160*	44	*152*

Note: Cases may not sum to 351 for the total of Bruce County or 400 for Kincardine where 'no opinion' is excluded. Percentages may not sum to 100% due to rounding. Q14,16

Because 45% of Kincardine respondents and 23% of the Neighbouring Municipalities respondents had some ties to the nuclear industry (i.e. they indicated that Bruce Power, OPG or AECL employs a member of their household) these respondents think about the Bruce Power generating station more frequently than others.

Employment by the nuclear industry also drives other demographic attributes. Kincardine respondents that have ties to the nuclear industry are more likely than the average to be younger, have children, and have a higher household income. Therefore, these respondents tend think about the station more frequently than the average.

Responses to the question on frequency of thinking about the existing WWMF are more broadly based, that is, there are no significant differences in attitudes among respondents who have ties to the nuclear industry than others. Respondents who are older or live in Saugeen Shores think about the WWMF more frequently than others.

The findings reported in Table 10 indicate that 61% of Kincardine and 39% of the Neighbouring Municipalities respondents have heard at least "something" about the existing WWMF.. Awareness of the WWMF is much greater in the Municipality of Kincardine than elsewhere, Kincardine being the host municipality.

TABLE 10: AWARENESS OF THE EXISTING WWMF

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
A great deal	35	*140*	19	*66*
Something	26	*104*	20	*70*
Very little	26	*105*	38	*132*
Nothing	13	*50*	23	*80*

Note: Cases may not sum to 351 for the total of Bruce County or 400 for Kincardine where 'no opinion' is excluded. Percentages may not sum to 100% due to rounding. Q15

Awareness of the existing WWMF in Kincardine and Neighbouring Municipalities is highest among respondents with a household member employed in the nuclear industry. Respondents in both geographic areas who are men or have a higher household income, and residents in Saugeen Shores report a higher level of awareness of the WWMF.

Respondents in both study areas who are more aware of the existing WWMF tend to think more frequently about the fact that they live hear the Bruce Power nuclear station and the existing WWMF.

4.2 Confidence in Existing Technology at the WWMF

Overall, the majority of survey respondents have confidence in the existing radioactive waste management technologies used at the WWMF. As noted in Table 11, approximately half of Kincardine respondents (53%) and Neighbouring Municipalities (43%) respondents state that they are "very confident" in the technologies. Most of the remaining respondents are somewhat confident.

TABLE 11: CONFIDENCE IN EXISTING TECHNOLOGY

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
Very confident	53	*203*	43	*134*
Somewhat confident	37	*140*	42	*131*
Not very confident	7	*27*	12	*38*
Not at all confident	4	*14*	4	*12*

Note: Cases may not sum to 351 for the total of Bruce County or 400 for Kincardine where 'no opinion' is excluded. Percentages may not sum to 100% due to rounding. Q17

Respondents with a household member employed in the nuclear industry have a higher degree of confidence in the technologies. Within the Municipality of Kincardine, men and respondents with a higher household income have a higher level of confidence. Neighbouring Municipalities respondents who have lived in the community for a longer period of time also tend to have more confidence in the existing waste management technologies than the average. It is notable that in Kincardine and Neighbouring Municipalities, farmers express a lower level of confidence than the average.

Very few Kincardine (9%) or Neighbouring Municipality (6%) respondents indicate that the presence of the existing WWMF has had any effect on their daily life. Those that indicate that the facility has had an effect, identify more positive than negative effects:

- Positive effects of the existing WWMF (6% Kincardine and 3% Neighbouring Municipalities) – employment creation, improvements in the economy, population growth, feelings of safety or positive environment effects on ozone layer were noted.

- Negative effects of the existing WWMF (4% Kincardine and 3% Neighbouring Municipalities) – risk of illness/ high cancer rates, pollution, causes worry/ anxiety, and fear were noted.

TABLE 12: EFFECTS OF THE WWMF ON PEOPLE'S DAILY LIFE

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
No	91	*359*	94	*322*
Yes – Effect				
Positive effect	6	*22*	3	*11*
Negative effect	4	*15*	3	*9*
Other	1	*4*		

Note: Cases may not sum to 351 for the total of Bruce County or 400 for Kincardine where 'no opinion' is excluded. Percentages sum to more than 100% since 2 'effect' responses were accepted. Q18, 19

5 THE LONG TERM WASTE MANAGEMENT OPTIONS AT THE WWMF

5.1 Information about the Long Term Waste Management Plans

Following the introduction to the WWMF respondents were read the following:

> A number of future options for the management of low and intermediate level radioactive waste at the Western Waste Management Facility are being examined. They could keep operating the Western Waste Management Facility for the purposes of interim waste storage, or they could convert it to a long-term waste management operation, that would include a long-term waste storage facility or a long-term waste management facility.

In order to get people's initial impressions about OPG's plans for long term management of low and intermediate radioactive wastes at the WWMF, respondents were asked several questions on their recall of a newsletter about the plans for long term waste management at the WWMF.

One-third of Kincardine respondents (38%) and one-quarter of the Neighbouring Municipalities respondents (24%) remember "receiving a newsletter recently about the study to assess options for the long-term management of low and intermediate level radioactive waste". Indeed, respondents who remember the material are more likely than those who do not to have a higher awareness of the study and to have a higher level of confidence in the technologies. Men in Kincardine and those with a household member in the nuclear industry in the Neighbouring Municipalities have a higher recall level.

TABLE 13: RECALL OF THE NEWSLETTER

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
Yes	38	*146*	24	*81*
No	62	*243*	76	*260*

Note: Cases may not sum to 351 for the total of Bruce County or 400 for Kincardine where 'no opinion' is excluded. Percentages may not sum to 100% due to rounding. Q20, 21

Those respondents who remember receiving a newsletter regarding the plans for long term management of low and intermediate level radioactive wastes were asked, "What do

you think about it (the initiative)?" As noted in Table 14, 47% of Kincardine and 40% of the Neighbouring Municipalities respondents could not provide a specific response but tended to endorse the long term plans or express a lack of concern regarding the proposal for long term management of low and intermediate level waste. In the Neighbouring Municipalities respondents who have lived in the community for a longer time are more likely than the average to endorse OPG's plans.

Other initial impressions tend to focus on health and safety concerns (14% Kincardine, 10% Neighbouring Municipalities), or community involvement aspects of the current Independent Assessment Study (13% Kincardine, 11% Neighbouring Municipalities).

TABLE 14: INITIAL IMPRESSIONS OF THE PLANS FOR LONG TERM MANAGEMENT

	Kincardine		Neighbouring Municipalities	
	%	*N*	%	*n*
I am not concerned/ I support their policies	47	*60*	40	*28*
Community concerns/ Safety/ Health concerns	14	*18*	10	*7*
A proposal/ Public education & community involvement	13	*17*	11	*8*
I can not remember/ I did not read it	9	*12*	13	*9*
It is necessary	3	*4*	4	*3*
All options should be explored	3	*4*		
Nothing	2	*3*	7	*5*
Good for the community	2	*2*	1	*1*
Helps the economy/ Job creation	2	*2*	1	*1*
Involvement of government representatives	1	*1*		
Prefers temporary to long term storage	1	*1*	3	*2*
I need more information	1	*1*	2	*1*
Expenses incurred	1	*1*	1	*1*
I prefer above ground storage	1	*1*	1	*1*
Types of storage facilities/ Goals for long term storage			1	*1*
Other			3	*2*

Note: Asked of respondents who remember receiving a newsletter. Percentages may not sum to 100% due to rounding. Q22

In order to better understand how people view the future options for long term waste management at the WWMF and to test whether people understand the difference between storage and disposal, respondents who remember receiving the newsletter were asked, "What do you see as the major difference between an interim storage facility and a long-term management facility?"

The Table 15 findings indicate that most respondents who have read the newsletter understand the difference between storage and disposal of low and intermediate level radioactive waste. The most frequent response relates to the length of time the waste

would be present in the community if a disposal option were selected versus the interim storage option (38% Kincardine, 34% Neighbouring Municipalities).

One-in-five respondents state that there is no major difference between interim storage and a long-term management facility (26% Kincardine, 20% Neighbouring Municipalities). Some respondents (17% Kincardine, 20% Neighbouring Municipalities) express the opinion that long term management facilities would be safer than interim storage facilities.

TABLE 15: MAJOR DIFFERENCE BETWEEN AN INTERIM STORAGE AND A LONG-TERM MANAGEMENT FACILITY

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
Waste stored at long term facility longer than at interim	38	*45*	34	*22*
No major difference	26	*31*	20	*13*
Interim facilities are not as safe as long term facilities	17	*20*	20	*13*
Do not know enough to say	9	*10*	14	*9*
Interim facilities temporary - until better facility found	4	*5*	6	*4*
The method/handling of the waste is different	3	*3*	3	*2*
Long term facilities store more waste for longer	3	*4*	3	*2*
Size of the storage facility	3	*4*	2	*1*
Location of the storage facility – long term is more isolated			3	*2*
Currently there are only interim storage facilities			2	*1*

Note: Asked of respondents who remember receiving a newsletter. Percentages do not sum to 100% since more than one response was accepted. Q23

6.0 POTENTIAL FOR CHANGE

6.1 Potential for Changes to Residents' Attitudes

At this point in the survey respondents were read the following:

> There are three options currently being considered for long-term waste management. They are: (1) Enhanced Processing, Treatment and Long-Term Storage; (2) a long-term management facility using Covered Above-Ground Concrete Vault technology; and (3) a long-term management facility using Deep Rock Cavern Vault technology. All three can be safely constructed and operated at the Western Waste Management Facility.
>
> Option (1) involves minimizing waste volumes through the use of an enhanced super-compactor and the long-term storage of that waste in enhanced warehouse-like storage buildings. Option (2) involves emplacement of the waste in earth-covered concrete vaults at the surface. Option (3) involves emplacement of the wastes in a sealed rock cavern some 400-700 metres underground.

Respondents were asked to indicate the anticipated effects of the options on their attitudes, images of the area, and behaviours. They were asked three questions. The first asked whether implementing of any of these three long-term options will have any effect and if they responded in the affirmative, they were asked to indicate the degree to which their attitudes might change.

Tables 16 (attitudes), 18 (images) and 20 (behaviours) provide their response by combining the answers to these questions. Column one is the percentage of respondents who say they would not change; column two are those who are unsure whether they would change or could not state how their attitudes, images and behaviours might change, and the remaining columns are the percentages who indicate some positive or adverse change in their attitudes, images, or behaviours. The third question asked respondents who said their attitudes, images, or behaviours would change to indicate which of the three long-term options would affect them the most.

As noted in Table 16, a majority of respondents do not expect that long term management of low and intermediate level radioactive wastes at the WWMF will change their commitment to farming (90% Kincardine, 88% Neighbouring Municipalities), their satisfaction with their community (75% and 73% respectively) or their feelings of personal security (65% and 60% respectively).

The percentage of respondents who would change either positively and adversely are:

- **Feeling of personal security** – 16% of Kincardine respondents and 18% of Neighbouring Municipalities respondents state that their feelings of personal security would be affected adversely. About 8% and 9% respectively indicate that long term management of low and intermediate level radioactive wastes would improve their feelings of personal security.

- **Satisfaction with their community** – 8% of Kincardine respondents believe their satisfaction will decrease as a result of long term management of low and intermediate level radioactive wastes at the WWMF. About 9% indicate that this plan would result in a greater level of satisfaction with their community. . The comparable percentages for Neighbouring Municipalities respondents are 11% decrease and 7% increase.

- **Commitment to farming** – 6% of Kincardine and 3% of the Neighbouring Municipalities respondents anticipate that commitment to farming would decrease and 1% indicate a potential positive effect.

TABLE 16: POTENTIAL EFFECTS ON ATTITUDES

				Change Behaviour			
		No change	Not sure	Decrease Great deal	Decrease Somewhat	Increase Somewhat	Increase Great deal
Commitment to farming							
Kincardine	Percent	90	2	1	*5*		1
	n	*54*	*1*	*1*	*3*		*1*
Neighbouring Municipalities	Percent	88	7	3			1
	n	*67*	*6*	*2*			*1*
Satisfaction with your community							
Kincardine	Percent	75	9	3	5	6	3
	n	*299*	*37*	*10*	*18*	*24*	*12*
Neighbouring Municipalities	Percent	73	10	7	4	5	2
	n	*256*	*35*	*23*	*15*	*16*	*6*
Feeling of personal security							
Kincardine	Percent	65	11	5	11	6	2
	n	*259*	*42*	*21*	*45*	*24*	*9*
Neighbouring Municipalities	Percent	60	14	10	8	7	2
	n	*210*	*49*	*33*	*29*	*23*	*7*

Note: Percentages may not sum across to 100% due to rounding. Five point answer codes are anchored with: great deal less/more satisfied, great deal less/more attractive for farming, great deal less/more secure. 27/29, 39/41, Q24/26

Demographic differences in responses are noted, in particular:

- **Feeling of personal security** – Kincardine men or those with household ties to the nuclear industry, and Neighbouring Municipalities respondents with household ties to the nuclear industry are more likely to state that they will not be affected. Kincardine respondents who have a higher household income, and Neighbouring Municipalities men are more likely to state that they will be affected adversely.

- **Satisfaction with their community** – Kincardine respondents with household ties to the nuclear industry are more likely to state that they will not be affected. Kincardine respondents who have a higher household income, and Neighbouring Municipalities respondents who are men, have children, a higher household income and reside in Saugeen Shores are more to state that they will be affected adversely.

- **Commitment to farming** – While the sample size is small, findings suggest that respondents in Arran-Elderslie are least likely to believe they will be affected adversely by long term management of low and intermediate level wastes at the WWMF.

Kincardine respondents who think more frequently about living near the Bruce Power generating station or the existing WWMF, and have less confidence in the existing technologies are more likely to state that their feeling of personal security, and satisfaction with the community will change. The direction of their change in attitudes is correlated only with living near the Bruce Power site; those who think more frequently about it are more likely to state that their feeling of personal security or satisfaction with the community will decrease.

Neighbouring Municipalities respondents who think more frequently about living near the Bruce Power generating station are more likely to state that their feeling of personal security, and satisfaction with the community will change. Respondents who think more frequently about the Bruce Power site or the WWMF, or have lower confidence in the technologies are more likely to state that their satisfaction with the community will be affected adversely. Those who have less confidence in the technologies are also more likely to state that their feeling of personal security will be affected adversely.

The respondents who believe that their attitudes may change (either positively or negatively) were asked to state which of the three long-term options will have the greatest effect on them. It should be noted that the number of respondents to this question is small and hence results should be interpreted with caution. . It is important to emphasize that because so few people indicate that their attitudes would change (either positively or negatively) there is considerable amount of uncertainty regarding the conclusions regarding which option would have the greatest effect. As such this data should be considered as a preliminary indicator only.

Findings in Table 17 suggest that within Kincardine the Deep Rock Cavern Vault is the option that is most likely to generate a change in peoples' satisfaction with living in their community and feeling of personal security. Both the Deep Rock Cavern Vault and the Covered Above-ground Concrete are likely to have a similar effect on peoples'

commitment to farming. The Enhanced Treatment, Processing and Long Term Storage option is the least likely to generate a change in people's attitudes. Neighbouring Municipalities findings indicate a similar view that Deep Rock Cavern Vault is the option that is most likely to generate a change in peoples' commitment to farming and feeling of personal security, but there is no consensus of which option is most likely to generate a change in satisfaction with their community.

There is no clear relationship between a positive or adverse effect and specific options for low and intermediate level radioactive waste management. Whether respondents' attitude on personal security or satisfaction with their community changes positively or adversely they both tend towards naming Deep Rock Cavern Vault.

TABLE 17: OPTIONS WITH THE MOST POTENTIAL FOR IMPACT ON ATTITUDES

	Kincardine		Neighbouring Municipalities	
	%	*N*	%	*n*
Satisfaction with your community				
Enhanced Treatment Processing & Long-Term Storage	17	*13*	17	*12*
Covered Above-ground Concrete Vault	24	*18*	24	*17*
Deep Rock Cavern Vault	41	*31*	28	*20*
Don't know	17	*13*	32	*23*
Commitment to farming				
Enhanced Treatment Processing & Long-Term Storage	20	*1*	26	*1*
Covered Above-ground Concrete Vault	40	*2*	26	*1*
Deep Rock Cavern Vault	40	*2*	49	*2*
Feeling of personal security				
Enhanced Treatment Processing & Long-Term Storage	20	*24*	21	*22*
Covered Above-ground Concrete Vault	20	*24*	19	*20*
Deep Rock Cavern Vault	47	*55*	40	*42*
Don't know	13	*15*	19	*20*

Note: Bases of response are respondents who state that there would be an impact. Percentages may not sum to 100% due to rounding. Q25, 28, 40

6.2 Potential for Changes in the Attractiveness of the Area

The clear majority of respondents believe that the three long-term options will not have any effect on the attractiveness of the Municipality of Kincardine as a place to visit as a

tourist (77% Kincardine, 73% Neighbouring Municipalities), to establish and operate a business (67% and 63% respectively), or to live (67% Kincardine, 65% Neighbouring Municipalities).

A higher percentage of respondents believe that the attractiveness of the municipality will be affected adversely than positively; however the degree to which people's image of Kincardine would change is not likely to be great. The results indicate that more respondents indicate that their attitudes would change "somewhat" rather than "a great deal".

- **Place to live** – 19% of people in Kincardine and 18% in the Neighbouring Municipalities indicate that an adverse effect on their image would occur; while 6% and 5% respectively state that their image of Kincardine as a place to live would improve.

- **Place to establish and operate a business** – 15% of people in Kincardine and 17% of Neighbouring Municipalities indicate that an adverse effect on their image would occur; while 10% and 6% respectively state that their image of Kincardine as a place to establish and operate a business would improve..

- **Place to visit as a tourist** – 14% of people in Kincardine and 12% in the Neighbouring Municipalities indicate that an adverse effect on their image would occur; while 5% and 3% respectively state that their image of Kincardine as a place to visit as a tourist would improve.

TABLE 18: POTENTIAL EFFECTS ON ATTRACTIVENESS OF THE MUNICIPALITY OF KINCARDINE

		No change	Not sure	Change Attractiveness			
				Decrease		Increase	
				Great deal	Somewhat	Somewhat	Great deal
As a place to visit as a tourist							
Kincardine	%	77	5	4	10	3	2
	n	*306*	*20*	*17*	*38*	*13*	*6*
Neighbouring Municipalities	%	73	12	7	5	2	1
	n	*256*	*41*	*25*	*19*	*6*	*4*
As a place to establish and operate a business							
Kincardine	%	67	8	6	9	7	3
	n	*269*	*33*	*24*	*37*	*27*	*10*
Neighbouring Municipalities	%	63	15	7	10	5	1
	n	*221*	*51*	*23*	*36*	*16*	*4*
As a place to live							
Kincardine	%	67	9	8	11	4	2
	n	*266*	*36*	*31*	*44*	*15*	*8*
Neighbouring Municipalities	%	65	12	7	11	3	2
	n	*229*	*42*	*25*	*37*	*12*	*6*

Note: Percentages may not sum to 100% due to rounding. Five point answer codes are anchored with: great deal less / more attractive. 36/38, Q30/32, 33/35

Kincardine and Neighbouring Municipalities respondents who think more frequently about living near the Bruce Power generating station or the WWMF, and have less confidence in the technologies are more likely to state that the attractiveness of the Municipality of Kincardine as a place to establish a business, visit, or live will change. For Kincardine respondents who think more frequently about living near Bruce are more likely to state that there will be an adverse effect on tourism, establishing a business, and as a place to live. Neighbouring Municipalities respondents who think more frequently about living near the Bruce Power generating station or the existing WWMF, and have less confidence in the technologies are more likely to state that the attractiveness of the Municipality of Kincardine will be affected adversely.

The respondents who believe that the attractiveness of Kincardine may change were asked to state which of the three long-term options will have the greatest effect. As mentioned previously, because so few people indicate that their attitudes would change (either positively and negatively) there is considerable amount of uncertainty regarding the conclusions regarding which option would have the greatest effect. As such this data should be considered as a preliminary indicator only. Findings in Table 19 indicate there is no consensus on which option will have the most potential impact on attractiveness.

TABLE 19: OPTIONS WITH THE MOST POTENTIAL FOR IMPACT ON ATTRACTIVENESS

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
As a place to visit as a tourist				
Enhanced Treatment Processing & Long-Term Storage	24	*19*	22	*14*
Covered Above-ground Concrete Vault	28	*22*	32	*20*
Deep Rock Cavern Vault	34	*27*	21	*13*
Don't know	15	*12*	26	*16*
As a place to establish and operate a business				
Enhanced Treatment Processing & Long-Term Storage	20	*22*	15	*14*
Covered Above-ground Concrete Vault	30	*32*	27	*26*
Deep Rock Cavern Vault	25	*27*	26	*25*
Don't know	25	*27*	33	*32*
As a place to live				
Enhanced Treatment Processing & Long-Term Storage	19	*21*	22	*21*
Covered Above-ground Concrete Vault	32	*36*	31	*30*
Deep Rock Cavern Vault	26	*29*	20	*20*
Don't know	23	*25*	28	*27*

Note: Bases of response are respondents who state that there would be an impact. Percentages may not sum to 100% due to rounding. Q31, 34, 37

There are, however, differences in naming an option depending on whether respondents thought that the effect would be positive or adverse. Respondents who indicate that the Municipality will become more attractive as a place to visit or establish a business are more likely to name Enhanced Treatment Processing & Long-Term Storage or Deep Rock Cavern Vault. Those believe it will become more attractive as a place to live are more likely to name Enhanced Treatment Processing & Long-Term Storage. Respondents who indicate that the Municipality will become less attractive as a place to visit, establish a business, or live are more likely to name Covered Above-ground Concrete Vault. However, results must be interpreted with caution given the small sample sizes.

6.3 Potential for Changes in Residents' Behaviours

Respondents were also asked whether the three long-term options would change their behaviour. As noted in Table 20, the vast majority of respondents (i.e. well over eight-in-ten respondents) do not express any intention to move from their community, change their fishing or boating activities, or change their use of parks, beaches, trails near the Bruce Power site.

The few respondents who might change their activities are more likely anticipate an adverse change than a positive one.

- **Moving from their community** – 5% of people in Kincardine and 5% in the Neighbouring Municipalities indicate a greater intention to move from their community as a result of long term management of low and intermediate level radioactive wastes at the WWMF.

- **Fishing and boating on Lake Huron near the Bruce Power site** – 3% of people in Kincardine and 5% in the Neighbouring Municipalities indicate that an adverse effect on their fishing and boating activities might result from long term management of low and intermediate level radioactive wastes at the WWMF.

- **Use of parks, beaches, trails near the Bruce site** – 4% of people in Kincardine and 7% in the Neighbouring Municipalities indicate that an adverse effect on their use of parks, beaches and trails might result from long term management of low and intermediate level radioactive wastes at the WWMF.

TABLE 20: POTENTIAL EFFECTS ON BEHAVIOUR / ACTIVITIES

		No change	Not sure	Change Behaviour: Decrease Great deal	Decrease Somewhat	Increase Somewhat	Increase Great deal
Move from your community							
Kincardine	%	92	3		*	4	1
	n	*368*	*11*		*1*	*16*	*4*
Neighbouring Municipalities	%	90	4	*	1	3	2
	n	*317*	*13*	*1*	*3*	*10*	*7*
Fishing and boating on Lake Huron near the Bruce site							
Kincardine	%	92	5	2	1		1
	n	*367*	*18*	*7*	*5*		*3*
Neighbouring Municipalities	%	89	6	3	2		
	n	*312*	*21*	*11*	*7*		
Use of parks, beaches, trails near the Bruce site							
Kincardine	%	89	6	2	2	1	2
	n	*357*	*22*	*8*	*7*	*3*	*7*
Neighbouring Municipalities	%	87	5	4	3	*	*
	n	*305*	*18*	*15*	*11*	*1*	*1*

Note: Percentages may not sum across to 100% due to rounding. Five point answer codes are anchored with: decrease / increase a great deal for use of parks / fishing, not at all likely/ very likely to move. 46/47, 42/43, 44/45

7.0 TECHNICAL APPENDIX

7.1 Profile of Respondents

This section of the report provides a profile of the respondents that participated in the telephone survey.

A significant proportion of the respondents are long-term residents, with two-thirds having lived here for more than 20 years.

TABLE A: LIVED IN THE COMMUNITY

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
21 or more years	62	*249*	64	*225*
11 to 20 years	26	*102*	20	*70*
2 to 10 years	11	*44*	14	*48*
Less than 1 year	1	*5*	2	*7*

Note: Percentages may not sum across to 100% due to rounding.

One-third of the respondents have children in their household. This low percentage with children is reflected in the finding that two-thirds are 45 years of age or older.

TABLE B: PRESENCE OF CHILDREN AND AGE

	Kincardine		Neighbouring Municipalities	
Children	**%**	**n**	**%**	**n**
Yes	33	*132*	37	*131*
No	67	*268*	63	*219*
Respondents Age				
Under 25	6	*25*	5	*19*
25-34	5	*21*	13	*46*
35-44	20	*78*	24	*84*
45-54	31	*125*	22	*78*
55-64	21	*84*	18	*64*
65 or older	16	*65*	17	*59*

A significant proportion of the sample, particularly in Kincardine (45%) are themselves or have another member of the household employed by Bruce Power, OPG or AECL. Respondents in the Neighbouring Municipalities have lower household income than those in Kincardine. In particular, 35% have a household income of less than $40,000 compared to 22% in Kincardine.

TABLE C: OCCUPATION AND HOUSEHOLD INCOME

	Kincardine		Neighbouring Municipalities	
Employed OPG, Bruce Power, AECL	%	*n*	%	*n*
Yes	45	*179*	23	*79*
No	55	*221*	77	*271*
Household income				
Under $20,000	6	*17*	10	*24*
$21,000 - $39,999	16	*47*	25	*62*
$40,000 - $59,999	17	*49*	25	*63*
$60,000 - $79,999	19	*56*	11	*28*
$80,000 - $99,999	17	*51*	11	*27*
$100,000 or more	26	*77*	18	*46*

The following table indicates the municipalities in which the respondents and the members of their household tend to go shopping for household or personal times on a regular basis.

TABLE D: MUNICIPALITY FOR SHOPPING

	Kincardine		Neighbouring Municipalities	
	%	*n*	%	*n*
Kincardine	73	*285*	17	*58*
Saugeen Shores (Port Elgin)	3	*12*	22	*75*
Arran-Elderslie			3	*12*
Brockton	1	*4*	16	*57*
South Bruce	2	*7*	10	*34*
Huron-Kinloss	2	*8*	2	*7*
Other outside of Bruce County	27	*107*	42	*145*

Note: 'Shopping' sums to more than 100% since 3 responses were accepted.

7.2 Survey Overview

The study was undertaken by telephone among a random sample of residents in Bruce County excluding the North and South Bruce Peninsula. The sample was drawn disproportionately in order to complete 400 interviews in the Municipality of Kincardine. A total of 351 respondents were selected in proportion to the population of the Neighbouring Municipalities. A total of 751 interviews were completed from June 9 – 14, 2003. The following table provides the list of amalgamated communities, the actual number of interviews completed in each area, and the confidence intervals based on the actual sample size:

Municipality	Sample	Confidence Interval, 19 out of 20 times
Kincardine	400	±5.0
Neighbouring Municipalities:	*351*	*±5.4*
Saugeen Shores	101	±10.0
Arran-Elderslie	58	±13.7
Brockton	87	±11.0
South Bruce	52	±14.5
Huron-Kinloss	53	±14.5
Total	**702**	±3.8

The survey took approximately 17 minutes to administer.

The following table provides the final disposition of all attempts to contact respondents:

Total	8565	
No Answer	1278	14.9%
Busy	103	1.2%
Answering Machine	1280	14.9%
Callback	211	2.5%
Fax	103	1.2%
Not In Service	1218	14.2%
Business	79	0.9%
Language Barrier	64	0.7%
Refusal	2837	33.1%
Local / Long distance autodialer error	255	3.0%
QF - no one is of the appropriate gender	196	2.3%
Q A - Can't speak to someone 18+ and Ontario resident	65	0.8%
Q C - Not home/cottage phone number	14	0.2%
Refusal (Mid-survey)	49	0.6%
Call back later to finish the survey	14	0.2%
Quota full - gender	48	0.6%
Completed interview	751	8.8%

7.3 Questionnaire

Hello, I'm _____of IntelliPulse a Canadian survey research company. We're talking to people today about issues in your community on behalf of Golder Associates Ltd. We are not selling anything, and your responses are confidential to IntelliPulse.

A) Are you 18 years of age or older and an Ontario resident?
Yes (SKIP TO C) 1
No 2
WATCH FOR GENDER QUOTAS 50/50

B) IF NO ASK: May I please speak to someone in the household who is?
Yes REPEAT INTRODUCTION 1
No, not available, ASK; What would be a good time to call back? RECORD 2
Date:_____ Time: _____

IF NECESSARY: This survey is registered with the Canadian Survey Research Council who can confirm that it is a legitimate public attitude research survey. Their number is 1-800-xxxxx and the identification number of the study is _____.

C) Have I reached you at your home telephone number or your family-owned cottage telephone number, that is (READ TELEPHONE NUMBER)? **Record codes as a question**
NEITHER (THANK AND TERMINATE, RECORD INCIDENCE) ..... A
Home (CONTINUE) 1
Cottage 2

D) Are you currently involved in the agricultural industry in anyway? **Record codes as a question**
No (CONTINUE) 1
Yes (CONTINUE) 2

1. In your opinion, what is the most important issue facing your community today? (PROBE) Is there a second major issue? (ACCEPT UP TO TWO RESPONSES)

1. _____
2. _____

2. Generally speaking, how satisfied are you with living in your community? Are you very satisfied, somewhat satisfied, not very satisfied, or not at all satisfied?

Not at all satisfied 1
Not very satisfied 2
Somewhat satisfied 3
Very satisfied 4

3. Thinking about how satisfied you are with living in your community, how committed are you to living in this community well into the future? Are you very committed, somewhat committed, not very committed, or not at all committed?

Not at all committed 1
Not very committed 2
Somewhat committed 3
Very committed 4

4. If you are a farmer, how committed are you to continued farming in your community? Are you very committed, somewhat committed, not very committed, or not at all committed?

Not at all committed 1
Not very committed 2
Somewhat committed..... 3
Very committed 4
Not a farmer 5

5. In your opinion, what things or issues in your community affect your feelings of personal security the most? (PROBE) Is there a second thing or issue? (ACCEPT UP TO TWO RESPONSES)

1. _____
2. _____

6. Think about the Municipality of Kincardine and the South Bruce Area. What is the first thing or image that comes to mind? (ACCEPT ONLY ONE RESPONSE)

1. _____

7. Do you consider this image to be very positive, somewhat positive, somewhat negative or very negative?

Very negative..... 1
Somewhat negative 2
Somewhat positive 3
Very positive..... 4

8. Do you consider the Municipality of Kincardine and the South Bruce Area as a very attractive, somewhat attractive, somewhat unattractive or a very unattractive place to live? (ACCEPT ONLY ONE RESPONSE)

Very unattractive..... 1
Somewhat unattractive..... 2
Somewhat attractive..... 3
Very attractive..... 4

9. Do you consider the Municipality of Kincardine and the South Bruce Area as an very attractive, somewhat attractive, somewhat unattractive or a very unattractive place to visit as a tourist? (ACCEPT ONLY ONE RESPONSE)

Very unattractive..... 1
Somewhat unattractive..... 2
Somewhat attractive..... 3
Very attractive..... 4

10. Do you consider the Municipality of Kincardine and the South Bruce Area as a very attractive, somewhat attractive, somewhat unattractive or a very unattractive place to establish or conduct business? (ACCEPT ONLY ONE RESPONSE)

Very unattractive..... 1
Somewhat unattractive..... 2
Somewhat attractive..... 3
Very attractive..... 4

In the past year how often have you or members of your household done the following … never, occasionally, regularly? (ROTATE)

	Never	Occasionally	Regularly
11. Used the parks, beaches and trails along the Lake Huron Shoreline	1	2	3
12. Gone fishing or boating on Lake Huron	1	2	3

13. In which municipality would you say that you and members of your household tend to go shopping for household or personal items on a regular basis? (ACCEPT UP TO 3 RESPONSES)

1. _____
2. _____
3. _____

USE LIST AS PRELIMINARY PRE-CODE. NOT TO APPEAR ON THE QUESTIONNAIRE.

Kincardine 1
Saugeen Shores (Port Elgin) 2
Arran-Elderslie 3
Brockton 4
Northern Bruce Peninsula 5
South Bruce 6
South Bruce Peninsula 7
Huron-Kinloss 8
Other Outside of Bruce County 9

I would like to read you a brief description of the Western Waste Management Facility. READ SLOWLY … REPEAT IF NEEDED

The Western Waste Management Facility currently stores low and intermediate level radioactive wastes produced by all of Ontario's nuclear generating stations. Low and intermediate level waste management is essential for the ongoing operation of the nuclear generation stations, including Bruce Power. The waste management facility is located on the Bruce Nuclear generating station site in the Municipality of Kincardine. The facility is regulated by the Canadian Nuclear Safety Commission and has been operated by Ontario Power Generation since the early 1970's. Wastes are stored in above-ground buildings and structures, and also within in-ground structures.

14. In your day-to-day living, how often do you think about the fact that you live near the Bruce Nuclear Generating Station site… very often, often, not very often, or never?

Never 1
Not very often 2
Often 3
Very often 4
Does not consider themselves living near the facility (VOLUNTEERED) 5

15. Have you heard a great deal, something, very little, or nothing about the Western Waste Management Facility?

Nothing 1
Very little 2
Something 3
A great deal 4

16. In your day-to-day living, how often do you think about the fact that you live near the Western Waste Management Facility… very often, often, not very often, or never?

Never 1
Not very often 2
Often 3
Very often 4
Does not consider themselves living near the facility (VOLUNTEERED) 5

17. How confident are you in the radioactive waste management technologies used at the Western Waste Management Facility… very confident, somewhat confident, not very confident, or not at all confident?

Not at all confident 1
Not very confident 2
Somewhat confident..... 3
Very confident 4

18. Would you say that the presence of the Western Waste Management Facility has had any affect on your daily life?

No (SKIP TO INTRODUCTION BEFORE Q20)..... 1
Yes..... 2

19. If YES: What affect do you feel that it has had? (PROBE) Is there a second thing oraffect? (ACCEPT UP TO TWO RESPONSES)

1. _____
2. _____

A number of future options for the management of low and intermediate level radioactive waste at the Western Waste Management Facility are being examined. They could keep operating the Western Waste Management Facility for the purposes of interim waste storage, or they could convert it to a long-term waste management operation, that would include a long-term waste storage facility or a long-term waste management facility.

20. Do you remember receiving a newsletter recently about the initiative to assess options for the long-term management of low and intermediate level radioactive waste?

No (SKIP TO INTRODUCTION BEFORE Q24)..... 1
Yes..... 2

21. What do you remember about the initiative? (ACCEPT ONE RESPONSE)

1. _____

22. What do you think about it? (ACCEPT ONE RESPONSE)

1. _____

23. What do you see as the major difference between an interim storage facility and a long-term management facility (PROBE)? Is there a second major difference? (ACCEPT UP TO TWO RESPONSES)

1. _____
2. _____

There are three options currently being considered for long-term waste management. They are: (1) Enhanced Processing, Treatment and Long-Term Storage; (2) a long-term management facility using Covered Above-Ground Concrete Vault technology; and (3) a long-term management facility using Deep Rock Cavern Vault technology. All three can be safely constructed and operated at the Western Waste Management Facility.

Option (1) involves minimizing waste volumes through the use of an enhanced super-compactor and the long-term storage of that waste in enhanced warehouse-like storage buildings. Option (2) involves emplacement of the waste in earth-covered concrete vaults at the surface. Option (3) involves emplacement of the wastes in a sealed rock cavern some 400-700 metres underground.

24. Do you think that implementing any of these three long-term options will have an effect on your feelings of personal security?

No (SKIP TO Q27) 1
Yes 2

25. If YES: Which one would affect your feelings of personal security the most? READ LIST IF NECESSARY

Enhanced Treatment Processing and Long-Term Storage 1
Covered Above-Ground Concrete Vault 2
Deep Rock Cavern Vault 3

26. Would such a facility make you feel a great deal more secure, somewhat more secure, somewhat less secure, a great deal less secure or have no impact?

A great deal less secure 1
Somewhat less secure 2
Not sure (Volunteered) 3
Somewhat more secure 4
A great deal more secure 5
Have no impact 6

27. Do you think that implementing any of these three options will have an effect on your satisfaction with your community?

No (SKIP TO Q30) 1
Yes 2

28. If YES: Which one would affect your satisfaction with your community the most? READ LIST IF NECESSARY

Enhanced Treatment Processing and Long-Term Storage 1
Covered Above-Ground Concrete Vault 2
Deep Rock Cavern Vault 3

29. Would such a facility make you feel a great deal more satisfied, somewhat more satisfied, somewhat less satisfied, a great deal less satisfied or have no impact?

A great deal less satisfied 1
Somewhat less satisfied 2
Not sure (Volunteered) 3
Somewhat more satisfied 4
A great deal more satisfied 5
Have no impact 6

30. Do you think that implementing any of these three options will have an effect on the attractiveness of The Municipality of Kincardine as a place to establish and operate a business?

No (SKIP TO Q33) 1
Yes 2

31. If YES: Which one would affect the attractiveness of the Municipality of Kincardine as a place to establish and operate a business the most? READ LIST IF NECESSARY

Enhanced Treatment Processing and Long-Term Storage 1
Covered Above-Ground Concrete Vault 2
Deep Rock Cavern Vault 3

32. Would such a facility make the Municipality of Kincardine a great deal more attractive, somewhat more attractive, somewhat less attractive, a great deal less attractive or have no impact?

A great deal less attractive 1
Somewhat less attractive 2
Not sure (Volunteered) 3
Somewhat more attractive 4
A great deal more attractive 5
Have no impact 6

33. Do you think that implementing any of these three options will have an effect on the attractiveness of the Municipality of Kincardine as a place to live?

No (SKIP TO Q36) 1
Yes 2

34. If YES: Which one would affect the attractiveness of the Municipality of Kincardine as a place to live the most? READ LIST IF NECESSARY

Enhanced Treatment Processing and Long-Term Storage 1
Covered Above-Ground Concrete Vault 2
Deep Rock Cavern Vault 3

35. Would such a facility make the Municipality of Kincardine, a great deal more attractive, somewhat more attractive, somewhat less attractive, a great deal less attractive or have no impact?

A great deal less attractive 1
Somewhat less attractive 2
Not sure (Volunteered) 3
Somewhat more attractive 4
A great deal more attractive 5
Have no impact 6

36. Do you think that implementing any of these three options will have an effect on the attractiveness of the Municipality of Kincardine as a place to visit as a tourist?

No (SKIP TO Q40) 1
Yes 2

37. If YES: Which one would affect the attractiveness of the Municipality of Kincardine as a place to visit as a tourist the most? READ LIST IF NECESSARY

Enhanced Treatment Processing and Long-Term Storage 1
Covered Above-Ground Concrete Vault 2
Deep Rock Cavern Vault 3

38. Would such a facility make the Municipality of Kincardine, a great deal more attractive, somewhat more attractive, somewhat less attractive, a great deal less attractive or have no impact?

A great deal less attractive 1
Somewhat less attractive 2
Not sure (Volunteered) 3
Somewhat more attractive 4
A great deal more attractive 5
Have no impact 6

39. (IF Q4 CODE 5 SKIP TO Q 42) AS a farmer, do you think that implementing any of these three options will have an effect on your commitment to farming?

No (SKIP TO Q42) 1
Yes 2

40. If YES: Which one would affect your commitment to farming the most? READ LIST IF NECESSARY

Enhanced Treatment Processing and Long-Term Storage 1
Covered Above-Ground Concrete Vault 2
Deep Rock Cavern Vault 3

41. Would such a facility have a major positive, somewhat positive, somewhat negative, a major negative, or have no impact on your commitment to farming?

A great deal less attractive 1
Somewhat less attractive 2
Not sure (Volunteered) 3
Somewhat more attractive 4
A great deal more attractive 5
Have no impact 6

42. With respect to your current use of parks, beaches and trails near the Bruce site, do you foresee yourself doing anything differently in the future because of the presence of a new type of long-term storage or long-term management facility on the Bruce site?

No (SKIP TO Q44) 1
Not sure (Volunteered) (SKIP TO Q44) 2
Yes 3

43. IF YES: Are you likely to increase your use of parks, beaches, trails near the Bruce site a great deal, increase it somewhat, decrease your activities somewhat, decrease it a great deal or have no impact?

Decrease a great deal 1
Decrease somewhat 2
Not sure (Volunteered) 3
Increase somewhat 4
Increase a great deal 5
Have no impact 6

44. With respect to your fishing and boating activities on Lake Huron near the Bruce site, do you foresee yourself doing anything differently in the future because of the presence of a new type of long-term storage or long-term management facility on the Bruce site?

No (SKIP TO Q46) 1
Not sure (Volunteered) (SKIP TO Q46) 2
Yes 3

45. IF YES: Are you likely to increase your fishing and boating activities near the Bruce site a great deal, increase it somewhat, decrease your activities somewhat, decrease it a great deal or have no impact?

Decrease a great deal 1
Decrease somewhat 2
Not sure (Volunteered) 3
Increase somewhat 4
Increase a great deal 5
Have no impact 6

46. Do you foresee yourself deciding to move from your community because of the presence of a new type of long-term storage or long-term management facility on the Bruce site?

No (SKIP TO Q49) 1
Not sure (Volunteered) (SKIP TO Q49) 2
Yes 3

47. IF YES: Are you very likely to decide to move from your community, somewhat likely, not very likely, or not at all likely?

Very likely 1
Somewhat likely 2
Not sure (Volunteered) 3
Not very likely 4
Not at all likely 5

Now I have a few final questions for statistical purposes. Your responses are confidential and will be grouped with those of other people.

48. Are you or any other member of your immediate household employed by Ontario Power Generation, Bruce Power or Atomic Energy of Canada Limited?

No 1
Yes 2

49. How many years have you Q C …lived / owned a cottage … in this community?

Less than 1 year 1
2 to 10 years 2
11 to 20 years 3
21 or more years 4

50. Do you have any children 18 years of age or younger living at home with you?

No 1
Yes 2

51. What is your age please? Are you …?

Under 25 year of age 1
25 - 34 2
35 - 44 3
45 to 54 4
55 to 64 5
65 years of age or older 6

52. What is your total household income, before taxes from all sources for all members of your household? Is it …

Under $20,000 1
$21,000 - $39,999 2
$40,000 - $59,999 3
$60,000 - $79,999 4
$80,000 - $99,999 5
$100,000 or more 6

53. Gender (By Observation)

Male 1
Female 2

54. In which municipality do you … Q C live/own your cottage?

Kincardine 1
Saugeen Shores 2
Arran-Elderslie 3
Brockton 4
South Bruce 6
Huron-Kinloss 8

7.4 Verbatim Responses

Q1. Most Important Issue

Note that repetitive verbatim responses have been deleted.

In your opinion, what is the most important issue facing your community today? (PROBE) Is there a second major issue? (ACCEPT UP TO TWO RESPONSES)

1 “Agricultural issues- general”	2 “Factory farmers/ Pig farmers”
3 “Economic development/ Employment/ Job security”	4 “Educational issues/ School closures”
5 “Safety of drinking water”	6 “Environment/ Pollution/ Agricultural and industrial waste management”
7 “Healthcare- lack of facilities and doctors/ Cut backs”	8 “Bruce Nuclear Power Plant- radioactive and nuclear waste issues”
9 “Road maintenance”	10 “Alcohol and drug use”
11 “Safety issues/ Understaffed police services”	12 “High taxes”
13 “Lack of community resources and facilities for adults and children”	14 “Lack of affordable housing”
15 “Treatment of seniors”	16 “Hydro/ Power generation”
17 “Crime/ Violence”	18 “Increases in tourism”
19 “Lack of provincial and federal government funding and support”	20 “Use of pesticides/ Fertilizer”
21 “SARS”	22 “Mad Cow Disease- effects on the beef industry”
23 “West Nile Virus”	24 “No issues/ None”
25 “Need a new sewer system in the community”	26 “Anti-amalgamation”
27 “Issues with current council/ Government”	28 “For amalgamation”
29 “Canada/ U.S. Border issues”	30 “Homosexual marriage laws introduced by the government”
31 “Limited public transportation”	32 “Lack of proper armed forces”
33 “Legislation to control gun ownership”	34 “Influx in population”
36 “The need for sidewalks”	37 “Anti-abortion”

Code M1	Code M2	Open end
001	003	It is too expensive for the younger generation to enter agriculture; thus it is unattractive for them.
001		The most important issue to me is family farming.
001		The most important issue facing my community today is farming. I am unsure as to whether or not it is worth it money wise.
001		The agricultural situation is not economically good for the farmers.
001		Lack of respect for the agriculture community.
001		Probably nutrition management when regarding the agricultural industry.
001		Agriculture community, because there are many factories opening and people are changing jobs.
001		Agriculture.
001		PROBABLY ALL THE THINGS THAT THEY DO TO TRY TO BEAUTIFY THE TOWN. CUTTING DOWN TREES.
001	005	I suppose it would be the agriculture. By that I mean the water ways. The livestock have access to the waterways. Basically I'm getting at water contamination. So all in all the water purity.
001	006	THE FARMING NUTRIENTS. THERE IS TOO MUCH POLLUTION AROUND US TODAY.
001		Agricultural issues.
001		THE PROBLEMS FACING FARMERS
001		We need some sunshine. The environment. Soft soil for farming.
001		THE SURVIVAL OF THE FARMERS IN THIS AREA.
001	003	LOCALLY, THE DESTRUCTION OF FAMILY FARMS. SOCIALLY, THE LACK OF MORALS AND MORAL LEADERSHIP. THERE IS A VAST DIFFERENCE HERE WITH THE JOB SITUATION. EITHER YOU WORK WITH HYDRO, WHO PAY TOO MUCH, OR STORE OWNERS WHO PAY ALMOST NOTHING. THE PRICES ARE TOO HIGH ALSO.
001		THE LITTLE WATER FOR THE CATTLE. EXPENSIVE FUEL. CROPS ARE EXPENSIVE TO GROW.
001	005	I'll probably say it's related to the agricultural industry. The safety in water use for farming.
001		Possibly agricultural issues. There are a large number of factories moving in.
001		Our community is very small and the whole thing is revolved around agriculture.
001		The farming community. They're having a rough time. The weather isn't cooperating. Other countries and the government.
001		Agriculture. We need to grow more crops.
001		A climbing rural population and industrial agricultural pollution.
001	020	I would say agricultural problems. There's a lot of fertilizer that has run off and run into the lake. No other issues.
001		Farmers having problems as truckers are laying off staff.
001	002	Agricultural issues. I am concerned more about the issue of water not being provided to cattle. Also I am concerned about SARS and West Nile Virus issues.
002		Hog farming is taking over our farming industry.

002	005	Large corporate farms that affect the water supply. I want to see better water management.
002		Farmers.
002	006	Factory Hog farming, because there is too much manure production and it saturates the fields when they shouldn't be allowing it to happen.
002	005	Factory farms and water pollution.
002		Increasing number of hog farms.
002		Barns. Welfare of the animals.
002	005	Well I would say it is probably the proliferation about the farms. They are causing problems to the water supply. Also acres for regular farming are being taken away. Water quality.
002		Factory farms. They don't bring any money, they bring pollution. They are putting small operations out of business. They should be banned. They put pressure on smaller farmers.
002	006	They need to take control of the hog farms in the area. Because of the contamination to the lake.
002		FARMING ISSUES.
002		Pig farming.
002		Large industrial and agriculture farms like cattle farms.
002	006	Farmers disposing of their wastes. I think there's too many regulations.
002	005	Pig farms. The problem where we have to worry about run-off in the water and how it will affect everyone. The smell of it. The overall water quality and how it is going be handled in the future.
002	005	The farmers. Also Lake Huron and the pollution that goes into the water.
002		Hog farms.
002		Pig farming.
002	008	The factory and pig operation. 1000 gallons of manure is spread on the fields. The radiation of the nuclear plant. The fear of it.
002		Factory farming.
002	022	The farming problem with mad cow disease affecting the farmers. Nothing else.
002	005	The growth of factory farming and the contamination of the water because of the disposition from the factory farming.
002	006	Hog farm pollution. Also some important environmental issues.
003		I have no idea.
003		Financial distress.
003		We live in a very small village. Our village is losing a lot of business on the main street. We lost our Municipal offices and have joined with other communities. We have lost our identity and are losing our business sector.
003		Difficulty to find jobs.
003		The economic conditions.
003		There are not enough of jobs available.

003		High costs, and low revenues for farmers.
003		There is a lack of employment in this area as it is a very small community. There are not too many places to make a living around here
003		Employment, creating more jobs for people in the area.
003	007	Economical development and health care stability.
003		More jobs for the youth in the community.
003		The economy, more specifically employment.
003		Lack of business.
003		Ensuring that there is employment for the people living in our community.
003		EMPLOYMENT ISSUES
003		We need a department store very badly. More stores, more restaurants (Macdonald's) and a bigger grocery store.
003		The economy of the community.
003		Employment. It keeps everyone happy when they're working and making money.
003	007	Education, child care and medical.
003		Economic diversification.
003	002	I guess it would be the cost of making a living. This also includes the loss of revenue in the farming industry. All in all I would say the increase in the lack of farming success.
003	008	The down turn in the economy. It's a one industry town since the nuclear plant came and jobs were lost when the plant closed.
003		The national debt.
003	012	If the economy goes higher then interest rates should be lower. Taxes should be low. I am worried about SARS and West Nile Virus.
003	005	I WOULD HAVE TO SAY OUR INFRASTRUCTURE. THE WATER. THE EXPANSION OF THE SEWER SYSTEM OUT OF OUR COMMUNITY.
003		Financial difficulties. People moving to big towns.
003	007	Employment for the youth. We need to bring some sort of industry to bring jobs in to the community. We need more doctors. There aren't enough doctors here and one doctor has resigned and has left several patients out in the cold.
003		The economy. The cut backs are hurting some people.
003		The economy is the most important issue facing my community. Jobs and the job rate.
003	006	Employment. There's not to much employment here. Environmental issues. Because that's the future of the health of the community.
003		THE KEEPING OF JOBS.

003		There are a lot of hard-up people. There are a lot of people in this town that don't have a high income. There are a lot of people living on welfare.
003		Economic development.
003		Economic growth. The town I lived near is dead and my community needs to have more business going on.
003	015	The maintenance of small businesses. Problems with the care of the elderly in our area.
003	012	Economic development. No jobs. High taxes. Taxes.
003	006	Job security. Pollution.
003		Jobs.
003		Lack of income to cover costs.
003		Lack of employment.
003		The need for well paying jobs.
003		Economics. The economy of the community.
003	007	Employment. Probably the medical system.
003		Unemployment.
003		The economy is not in a good state.
003		I think sustainable employment.
003	007	Employment for young people is a problem. Medical care is an issue.
003		Jobs. The lack of them
003		Lack of jobs.
003		There should be more shops and the taxi's shouldn't cost so much. No further comments.
003	005	Lack of jobs. Lack of good water. The farmers in the community have lots of problems with the water. High bug killing like chemicals.
003		EMPLOYMENT. They cut back on work staff and moved people to other locations.
003		Unemployment
004		Education.
004	007	The education system and healthcare system. There are a lot of schools closing down in my community.
004		The schooling and lack of values being taught to students. Also the mentality regarding youth.
004	008	We live near a nuclear plant.
004		Education funding for tuition.
004	019	We need more school funding.
004		I think that the most important issue is the education that the children and teens are receiving. There are too many problems with teachers and contracts, talks of strikes.

004		Education.
004	007	Education and health concerns.
004		The education system is not looking after the community. I'm also worried about the water level decreasing, since I live at the shore of Lake Huron.
004	013	Work ethics and major teenage issues.
004		Education. They are closing schools all over.
004		Education. School closures. They need to keep the local schools open.
004		Schools.
004		The issue of education.
004	007	School and health issues need to be improved.
004		THE SCHOOLS.
004		When they closed the school in the township.
004		Education. Less extra curricular activities during school hours. More back to basic learning. Social outings during class time should be eliminated.
004		Education. The lack of funding.
004		The closure of the schools.
004		Education in general.
004		School closures. Kids have to move to bigger cities to go to schools.
004		THE CLOSURE OF THE SCHOOLS
004		Education.
005		Unavailable clean water.
005		The water; this is where we had the e-coli problem; thus that is a major concern for me.
005		Water supply.
005		Clean water, our community service workers are on strike, we need mowed parks and clean beaches.
005		Good quality water not available.
005	022	The water in our town is a major safety concern. Mad cow disease is another problem we face as a community. We have had to boil our water every since march in order to get clean drinking water.
005	012	The water crisis, keeping the taxes down, and rising hydro rates.
005		Water supply, we need to use bottled water because the one from the tap in unsafe.
005		Safe water.
005		Water, there is too much pressure to keep wells and sewers clean.
005		Water, we are still getting water from the lake not knowing if it has been tested.

005		Clean water. In the past the water has been clean now however there is all this junk in the water. Beaches get shut down due to high bacteria counts.
005		I am concerned about the water quality.
005		The water issue with e-coli.
005	008	Water and nuclear management. With municipality expenses almost unbearable, intensive livestock operations are a real concern because of the disposal of liquid manure.
005		The condition of the water.
005	006	Water pollution.
005		Water whether it is safe to drink.
005		The water quality, how clean it is.
005		Water quality.
005		The negotiation to clean the water.
005		The quality of drinking water.
005		We need to be able to deliver safe and clean water to the city for a fair rate.
005	013	Facilities for recreations and education have poor quality water.
005		The water pipelines, because they are going to cost a lot of money and we won't be allowed to use our wells.
005		Water quality, because I live two miles away from a town that has to boil their water due to bacteria.
005		The drinking water would be an issue because, I don't think they are trying to secure the safety of the water supply.
005		The present water quality. We can't drink our water because the purification system is not working.
005		I'm afraid of drinking water because of e – coli.
005		The safety of water and making sure that it's safe.
005	021	Water quality and SARS.
005		Maintaining the water quality. I don't live too far from Walkerton and I'm really concerned about that.
005	004	Drinking water quality. Installing a new pipeline water system. The public school system has been affected by provincial government regulations. The shortage of medical personnel.
005		The water and the weather if it's good or not.
005		Safe drinking water is not in Paisley.
005		Getting back to normal. I'm from Walkerton where that ecoli broke out. There is too much hatred in this town and no more trust in this town
005	003	Water, ,job crisis, health care.
005		GROUND WATER. I AM CONCERNED THAT WE DO NOT HAVE SAFE WATER TO DRINK. WE ARE AROUND WALKERTON AND SOME OF THE FARM WATER RUNS OFF INTO THE MAIN SOURCE OF DRINKING WATER AND ONE THING AND ANOTHER. THE DRINKING WATER IS UNSAFE.

005	002	The need for clean water. And I am equally worried about the pig farms.
005		We have a big water quality problem.
005		THE SAFETY OF WATER. I DON'T THINK PEOPLE ARE CONSIDERING THAT.
005	006	I guess it would be the safety of the water. That and also the amount of air pollution. I say this because of the increased number of health issues in the family.
005		Our water business. Our drinking water. The water may still be dangerous.
005	002	The water issue and pig farming.
005		I THINK THERE IS NOT ENOUGH FRESH WATER.
005		Drinking water. There is a boil water advisory currently in effect.
005		Water. The building of a pipeline.
005		The e-coli water infestation fear.
005	001	The water supply. Water management as it's an agricultural area.
005	002	The water quality. The beef industry.
005		The water. When you have to start buying water to drink that's amazing.
005		The development of our water front and landfill.
005		Drinking water. There is a boil water advisory currently in effect.
005		Clean water.
005		The water line from Kincardine. It's a pretty big deal for the farm beside the city.
005	007	Safe water. Health care. Specifically the lack of doctors and some hospitals have closed.
005	007	The water pipe line that runs underground. Even though we don't need it we have to pay for it. The concern about paying for parking at the hospital, doctors offices and at the pharmacy.
005		Water quality is poor.
005	022	I live in Walkerton so getting secure and clean water would be important. I live in a farming community so Mad Cow is hurting the farmers.
005	020	Water. We live in a rural area and I am concerned about pesticides and fertilizers getting into our water systems.
005		The safety of drinking water.
005	026	The water. Problem of amalgamation with another community.
005		CLEAN WATER. I CANT EVEN DRINK THE WATER IN MY COMMUNITY.
005		No idea. Probably water supply.
005	011	Drinking water. The lack of distilled water and police services.
005		Water. I'm from Walkerton and I am concerned about the cleanliness of the water.
005		Probably the water. Whether we are forced to install or not install the water lines.
005	021	Water. That it's good water and there's been a problem with e-coli in the neighboring community. SARS. We don't want it up

		here. Maybe it's not directly involving us, but it's here in Toronto.
005		The bad state of water pipelines. Old sewer pipes.
005		Water. E-coli.
005	006	Clean water. Drinking water. Make sure they keep everything up to standard in the community because we are not far from Walkerton. Making sure water services are doing everything they can to make everything clean and environmentally safe. Pig farming. They have something to do with polluting the area. Drainage seeps into ground and it is near the lake. It is the factory farmers not the small local farmers.
005	027	Water. There is not a clever and efficient government in this area.
005		The water supply.
005		Water. The ministry of Ontario guidelines and the impact on the community.
005	003	Right now it's finding security in safe water sources. Economics.
005		THERE IS NO CLEAN WATER.
005		Probably my biggest concern would have to be water. The quality of water.
005		Clean water. A lot of smaller communities regulations from the government. The government has had a hard time financially affording it.
005	022	The water treatment plant. The mad cow disease issue should be put to rest and they should start selling beef through the border.
005	011	I would say water quality and policing. We need a local police system whether or it's provincial or municipal.
005		The water quality.
005	007	Water issues. Making sure we have clean water. Healthcare. Make sure everybody has access to it.
005		I GUESS WE NEED CLEAN WATER.
005		The quality of water. I live near Walkerton where the water was contaminated and Paisley where they are on a boiled water advisory. It's not good enough to drink.
005	002	The drinking and lake water if it is clean. Intensive farming. If there should be or not be.
005		Lake Huron bypass. No other issues.
005		Water problems. Nothing else in particular besides these water problems.
005		Lake Huron. The water level is low, dirty and not safe. The value of our health means that we can not go into the water.
005	006	I am extremely concerned that by the time all the consultants in the industry wake up our water table will be permanently contaminated. There will be non repairable environmental damage. There is too much emphasis being put on managing nutrients and not on the use of liquid manure.
005	002	The water situation. A lot of pig farms are allowed here and drinking water conditions have become dangerous.
005		Water. I think things are settled and we have the best water now.
005		Clean water. No other comments.

005	004	Fresh water supply. Safety of the school system.
005		Water safety. I live beside Walkerton and I am concerned with the Walkerton crisis.
005		Water. We live in Walkerton.
005		Water quality. Runoff from agricultural and fertilizer. Lake water quality. No further comments.
005	007	Safe water drinking water not available and we have inadequate health care.
005		I have no idea. Water. Lower water levels and water quality. Harvesting of water.
005		The water issue. There's no clean water. No further comments.
005	025	Water. Sewage.
006	005	Providing clean water for the people.
006		The weather.
006	010	Too much pollution.
006	005	The polluted environment, there is a need for clean water.
006	027	Waste management, there are not enough blue boxes given to the public to use.
006		Spreading of liquid manure because it pollutes the lake.
006	005	The environment and the water.
006		Environmental issues, cleanliness of water.
006	005	The environment, water quality, and accessibility for people who are handicapped. Government should provide elevators for the handicapped.
006	005	It would be the management of agricultural waste, because it affects the purity of water.
006	003	Environmental issues like pollution and community prosperity.
006	012	Environmental problems and high taxes.
006		There are not any important issue so far as I think. I think global warming.
006		The environment.
006	005	Environmental issues. Because we're in a farming community and we have fertilizer run off and it can affect the water.
006		The environment.
006		Right now I would say the environment would be a major issue in the community. They just need to take proper care it.
006		The ozone layer. Pollution is out of control. No prevention is being done to protect individuals.
006		Pollution. Farm pollution.
006		The environment.
006	020	Stop polluting. Pesticides used in agriculture and contamination. Waste from the factory farms.
006		Industrial waste.

006	005	The environment. The water.
006	002	The environment. The pig farming runs off in to the streams and lake and causes pollution.
006	003	The environment. Job conditions.
006		Environmental issues. A lot of factories coming up.
006	001	Pollution of the environment. Agricultural. The use of pesticides and stuff like that.
006		The environment. Keeping it clean and free of pollution. To keep our health, crops and animals healthy.
006	005	Environmental issues and the quality of water.
006	005	Environmental issues in the community. Specifically water supply.
006	002	Pollution and the environment. Large scale factory farming.
006	022	THE WEATHER AND COWS. THE MAD COW DISEASE THAT IS GOING AROUND.
006	005	The environment affects the water and the people.
006		The environment. Well, we've got the atomic plant right next to us.
006	021	Waste management. A lot of waste goes to the dumps that could be used other ways. This situation that we have with Sars in Toronto is bad.
006	005	The disposal of manure. It's a big issue over here. They want to make sure that it doesn't get into the environment and in the water.
007	003	The unemployment rate is rising, as well as there are not enough doctors.
007		Insufficient funding for our health care system.
007		Not enough doctors.
007	005	Health care and the quality of drinking water.
007		The hospital and health care.
007		There is a shortage of doctors.
007		Healthcare.
007		Hospital is under funded.
007	018	The need for doctors. Also, tourism raises prices and the cost of living, as a result tourists go to different towns to shop.
007	005	Health care, water, and of course agriculture i.e. pig farms.
007		There are not enough doctors.
007	015	Healthcare cut backs affect seniors and cost them a lot of money.
007	015	There are too many cut backs in our healthcare system. As a result some people have died because of the inability to provide a proper treatment based on cutbacks.
007		The shortage of doctors.

007		Lack of hospitals.
007	015	Health care is really poor at the moment and a lot of seniors have problems treating their health problems.
007		In my opinion it would be the medical care, there are not enough doctors or money for them in the province. In addition we need better-trained employees.
007	005	Health care. The lack of doctors. The water line. There's a water line coming out of Kincardine and there's a lot of people that object to the water line because their water is fine. In my opinion it is not a problem because my well water is well taken care of.
007		Health status. I am concerned about the cost of being healthy and the cost of the service.
007	004	Healthcare. The lack of health professionals. Education. Funding cuts. Teachers without resources.
007	005	THE SHORTAGE OF DOCTORS. SAFE DRINKING WATER.
007	004	The healthcare situation and the school situation.
007		Health. The hospitals and the medical centre. I have no problems with them just in cutbacks and we don't have enough services.
007		Healthcare. The hospitals and the medical centre. I have no problems with them just in cutbacks and we don't have enough services.
007		I guess health care.
007		Healthcare. The hospitals and the medical centre. I have no problems with them just in cutbacks and we don't have enough services.
007	004	Rule issues. They affect everything from hospitals to education. Getting a fair shake across the board because we might not have the same population as some urban areas.
007	004	Hospitals. We're very short of doctors. They're building a new clinic but there are no doctors. There are cutbacks in the school system. They closed down a lot of schools. There are like 30 kids in each classroom.
007		Lack of doctors in our community.
007	004	Healthcare and education.
007		Health care. The lack of doctors.
007	008	Health care. We desperately need nurses and doctors in this area. Nuclear energy. Just whether or not its a good idea to store nuclear waste from other countries here.
007		I think we need doctors.
007	003	The healthcare center. They're building a new healthcare center and our community isn't in favour of the new structure because they are closing down the two other hospitals and many people are losing their employment.
007	005	The medical service wait time is too long. The safety of drinking water.
007		THE HEALTH CARE ISSUE.
007	021	I am not too sure. Healthcare in general. SARS. Lots of things going on in agricultural but I don't really know much about them.

007		Healthcare. The availability of practitioners. There aren't enough of them so the waits are long.
007	002	Getting good health care. Keeping out the hog farms because this is a holiday community and the smell of hogs is not very appealing.
007		Nutrient management. Hospital shortages and the shortage of doctors.
007		I think it's a health related problem.
007		Healthcare. We have got a population that is growing and we have more retired people. The doctors retire and the community can't grow with the shortage of doctors.
007	004	The most important issues in my community are medical concerns. The medical facilities in rural towns have a lack of medical personnel because doctors and nurses do not generally want to relocate to rural towns. They prefer big cities due to a lack of entertainment and post-secondary education facilities.
007		Health care. Access to an obstetrician was cut last fall but it needs an extension. There are questions if certain health services will be still available. We are without a good health care system. There is not a good development of infrastructure to maintain existence.
007		Fear of the possibility of service being unavailable at the hospital. Such as delivering babies is gone. You have to go to another area if you are in labour.
007		I would say the hospitals. Specifically, the under feeding of hospitals. That's my primary concern.
007	011	Probably the shortage of doctors. Policing and education. More funding for education.
007		The hospitals. They're cutting back on some services and now they have to go to other places to have babies, etc.
007		I honestly can't think right now. Probably medical doctors from the area. There is not enough. The elderly don't have doctors right now.
007	023	I would say our hospital is the most important issue. We've been amalgamated and the hospitals have been amalgamated with other hospitals as well. So, our hospital is becoming less and less important.
007		We need doctors. There is no other issue. It's a nice town.
007		Health care concerns. We have 11 nurses working here.
007	005	I don't know it's a fairly good community but the doctors and the hospitals. There is not enough for the community. Lots of people I know don't have a family doctor. The drinking water is good, but there is always a possibility because they have to keep on things. They are good here. They keep tabs on things.
007	009	Municipal and hospital funding. The shortage of doctors. The municipal roads are not being taken care of. No further comments.
007		Health is very important to me.
007	005	MEDICAL SERVICES. LOCAL POLITICS. NEW WATER LINE. STREET LIGHTS. PERFORMING CENTER FOR THE ARTS
008		The proximity of the nuclear plants and all the radioactive waste issues. I’m concern where and how to store the waste.
008		Nuclear or atomic waste management.

008	004	A nuclear power station, as well as education. There are too many school closures.
008		Nuclear power plant.
008		Bruce Power Plant.
008	003	It would be the restart of Bruce. They are a major employer in the area. It would mean a major boost to the economy.
008	006	The presence of the power station. Water pollution.
008		THE MOST IMPORTANT ISSUE FACING MY COMMUNITY IS THE NUCLEAR STATION AT TIVERTON.
008	005	The most important issue is the success of Bruce Power. For me personally it would be the running of the new water line.
008		Bruce Nuclear power plant. Keeping the community a cottage community.
008	003	The most important issue facing my community is nuclear power because we live near a facility. Jobs regarding the plant are also important due to safety issues.
008		Getting the nuclear plant running again.
008		The nuclear plant.
008	006	The storage of nuclear waste. The problem is that we've asked for an environmental assessment from Atomic Energy of Canada LTD and we've been turned down. We think, no actually, we KNOW we're receiving nuclear waste from the US and it's going to be stored near us and that's not how it should be. There should be an assessment first. Large amounts of manure on pig farms. Farmers are greedy and putting in 10 000 hogs and they expect people to put up with manure that gets into ground water.
008		Nuclear waste storage.
008		Nuclear power plants.
008		Everything hinges on everything else with the Bruce power plant. Because everything is interconnected it involves my business.
008	005	The restarting of Bruce Generation station A. Just the A station mainly. Water quality.
008		The Bruce Nuclear power development. They are trying to restart two units. Just the future of that station. It has a big impact on the economy.
009		A need for safer, well-constructed roads, and access to where we need to go.
009		They are doing our main street construction. We found some difficulty to go anywhere.
009		Actually I'm not sure. I guess road extensions. Windmills. They were planning to put it across the street but I'm happy they are in the fields now.
009		The roads need upgrading.
009		The transportation issues.
009		The roads are not in good shape and long grass is growing. Municipal work is not done properly.
009		THE ROADS ARE NOT VERY ENVIRONMENTALLY FRIENDLY.
009		There are a lot of potholes in the roads.

009		THE ROADS
010		There are too many people in my community who are alcoholics.
010		Too much drugs and alcohol available.
010		The most important issue facing my community today is teenage alcohol and drug use.
010		Drugs and alcohol. They have become very addictive among the younger people living here.
010	011	Underage drinking. The safety of homes at night.
010		All the things happening with young people. Drinking and drugs and so on. Young people are not going to church anymore or Sunday school and it bothers me. People up here are getting older. Nothing else.
011		Security.
011		Under staff of police officers.
011	007	Public safety and health care.
011		The loss of proper rules in the community.
011		Security and safety.
011	005	Police. Water.
011		Security. No other comments.
011		Safety. No other comments.
012		Taxes.
012		The taxes are too high.
012		Taxes. High property and commercial taxes.
012	007	Too much taxation and not enough health care. Lack of education. The poor condition of roads and we need more support for agriculture.
012		TAXES SHOULD BE LOWER.
012	007	Taxes are high. Improve health care. The education system.
012		Keeping taxes down. I'd have to think about it.
012		Taxes. They keep going up because the provincial government won't support it. Municipal taxes.
012		Taxes. The taxes went up 53 percent.
012	018	Keeping the taxes down but also keeping the parks in good condition. Trying to encourage tourists to come to Kincardine.
012		Taxes. Not as good as it used to be.
012		Taxes. Our taxes are too high in this area.
012	005	High taxes. Water issue. Water quality is another one.
012		Taxes.
012		Taxes to the township.

013		The neighborhood is not as good as it should be.
013	006	Child poverty and global warming.
013	002	Most important issues are alcohol, pregnancy, and education. The large corporate farms make it difficult for the family farms to operate. There is an increase in competition.
013		The youth need more youth programs to keep them away from the wrong things.
013		The under privileged children, they don't have money and food.
013		Overall improve things around town.
013		Lack of services.
013		Services in general.
013		The community needs volunteers.
013		The youth, because kids are too inactive and lazy.
013		We need something for the younger kids to do. Kids from 10-17. I am unsure of what though.
013		There are no activities for teens. No hang out joints.
013		The lack of growth in the community dealing with business and people moving in.
013		I really don't know. Too many teenagers hanging out in the area.
013		Relief care for mothers and kids is not there. They have to pay money and they can't afford it.
013	025	A lot of people shopping out of town and not shopping in the local stores. They're losing business and the town is getting in bad shape and they do need sewers because the septic tanks are getting too old and they supposedly can't replace them. If they replace them the taxes will go up and we can't pay for that.
013		Just being recognized.
013	001	I guess the lack of facilities in the community and resources. I would say farmers think there's more agricultural issues. Children's facilities are needed. We also need more healthcare and recreation facilities for seniors.
013		They should have more things for teenage children to do.
013		Something for the young people. Supervising them. Supervising them in the places where they go instead of letting them run around.
013	020	There are not enough things for children to do around here. Pesticide use.
013		Residents living in the community.
013	004	The biggest thing I'm worried about is things for kids and young adults to be involved in. The school zone.
014		Keeping up with new growth, as there are a lot of new people moving into our area.
014		Housing is a major issue in the community because there are not enough apartment buildings in the area and that could lead to a major problem.
014		I think housing is an issue in the community because there are not enough apartment buildings.

014		There are less buildings.
014	005	Housing and drinking water.
014		Housing. There's not enough housing for the low income people.
014		Housing. There is not enough housing.
014		In the next 10 to 15 years the housing for the baby boomers who are all going to be retiring.
014		Housing. There is not a lot of it.
014		Housing. There is a need for new housing developments and quality apartment rentals.
015		The treatment of the elderly. Nursing home standards are too low.
015	007	Seniors need healthcare. The situation is not good.
015	013	Everything. Things for seniors like playing cards. Things for the kids like safe parks and play grounds.
016	007	Hydro and power generation, as well as health care.
016		The cost of hydro and the gas prices.
016		Hydro rates are becoming very unaffordable.
016	022	The restart of the power generation. Mad Cow disease. It is a rural area and as the border is closed farmers are facing losses.
016	005	Electrical Prices. There are fair and cheap electrical prices in my area. Clean water. Walkerton is close and the government is not doing anything about water issues whatsoever. Gay marriages and disabled life. I do not think the government should not go against gay marriages. The government does not do the job for disabled people. Not enough money.
016		The heating cost is too high. No further comments.
016	018	I HAVE NO IDEA. PROBABLY THE PLANTS SHUTTING DOWN, LIKE HYDRO. TOURISM. WELL LIKE TOURISM ISN'T HIGH ENOUGH.
016		Keep hydro going. The only industry in kincardine. No further comments.
017		Keeping crime low.
017	010	Violence, drugs, and alcohol they are big problems with the majority of the youth.
017		Lowering crime.
017		Vandalism.
017		The most important issues would have to be child abductions. I was born in Toronto and grew up here. I recently came back and heard on the radio about child abductions. When I was there before we never had this so I'm concerned.
017		People are vandalizing too much. We are moving because of it.
017	006	THE MAIN ISSUE IS VIOLENCE AND ABUSE. THE SECOND MAJOR ISSUE IS RECYCLING AND IMPROVING THE ENVIRONMENT IN GENERAL.
017		Crime. Vandalism in particular.
017		A lot of young kids causing disturbances.

018		Increasing business in the small towns by encouraging tourism.
018		Tourism. We need tourism in our community.
018	003	I don't know. Maybe tourism and the economy.
018		To keep the tourists coming. It brings money into the community and makes everybody happy.
018	005	Attracting tourism. Water quality.
019	004	I would have to say the lack of provincial government funding. Education. There is a lack of funding there too.
019	007	The lack of the provincial and federal government support of the municipality. Total lack of leadership from the provincial and
020	006	Pesticides and general toxic waste. Pollution in the lake and in the environment.
020	006	PESTICIDE USE AND WASTE MANAGEMENT.
020	006	I would say the spraying of pesticides on the grass because it is dangerous to the environment.
020		The pesticide use and the effects it poses. It is dangerous.
020	005	The use of pesticides. Clean water.
021		SARS
021	023	The most important issues facing the community are SARS and West Nile virus.
021		SARS. A lot of people are nervous about it.
021		SARS
021	022	SARS. Mad cow disease. Anything that keeps tourists away from Canada.
021		SARS. THE VIRUS THAT IS GOING AROUND NOW.
022	021	The Mad Cow disease is on the mind of the farmers and tourism is affected because of SARS.
022		Mad cow disease.
022		The mad cow disease.
022		Cattle prices are falling because of mad cow disease.
022		The mad cow disease.
022		Mad cow disease.
022	021	Mad cow disease and SARS.
022		Mad cow disease is spreading.
022		Mad cow disease.
022		I think the most important is mad cow disease.
022	002	Mad cow disease. The prices of products for farmers. Large corporations are increasing and the number of farmers are going down.

022		The most important issue for me is beef. Just all the concerns they've had about it out West.
022	001	Probably with the disease of Mad cow. With the trouble out west and the farmer's not being able to plant because of the rain
022	005	Probably mad cow disease. I'm a beef farmer. We have had a loss of income because of mad cow disease. The water supply and the quality of the water.
022		The Mad Cow issue. The borders are closed. We can't get anything out and we are not making money.
022		Clearing the mad cow issue.
022		Mad Cow Disease. Better management throughout the community.
022		The beef scare. Mad Cow disease. The way the meat has been handled.
022		Mad Cow disease.
022	007	Around here we have the Mad Cow issue. Healthcare. A shortage of doctors.
022		Mad cow disease. The weather. The dairy department.
022	027	Mad cow disease. The strike of council workers in our area.
022	003	Mad cow disease and the price of commodities.
022		The mad cow disease. It's affected a lot of people because we are sending the beef to the USA and they are closing the borders to us.
022		CITY PEOPLE. MAD COW DISEASE.
022		I don't know. I guess probably the mad cow disease. The fact that it's around.
022		Mad cow disease.
022		THE MAD COW PROBLEM.
022		I can't think of anything. The Mad Cow disease. Just the financial impact of it. High interest rates.
022		Cattle prices. No other comments.
022		Mad cow disease. The weather. There has been too much rain. No other comments.
023	007	West Nile Virus and lack of doctors.
023		The West Nile Virus. It's something that I'm worried about and it is affecting my children.
023		West Nile Virus.
023		The West Nile Virus. Considering where we are there are a lot of mosquitoes around and nobody is doing anything about it.
023		THE WEST NILE VIRUS.
023	021	That's a tough one. West Nile, Sars and liquid Manure. How it affects the water. I'm really concerned about water.
023	008	I probably would say the West Nile virus. We have a lot of water sitting around in this area. Probably the nuclear plant. The way it's being operated and the way our money is wasted. I don't think it's safe although they say it is.

024		I don’t have any concerns.
024		There is really nothing bothering me.
024		There are no real issues that bother me.
024		We don’t have too many things to worry about.
024		None that I can think of at the moment.
024		Over development.
024		EVERYTHING IS PRETTY GOOD RIGHT NOW AND I AM NOT CONCERNED ABOUT ANY PARTICULAR ISSUE.
024		I HAVE NO MAJOR ISSUES.
024		Everything is fine in my community.
024		I have no issues; I’m very pleased with the community.
024		I don't know about any issue concerning my community. No issue that I know of
025		Right here we need sewers and we don't have any. They should be going in shortly. Maybe only the sewage system.
025	019	Probably the cut backs in everything. Right now in our community there is a need for sewer and water updates, yet there is no forthcoming money to do these things.
025		Sewage. We're all on septic systems here. Because of Walkerton they're trying to change everything.
025		Sewers. No other issues.
026		I don’t agree with amalgamation.
026	012	Amalgamation problems. Taxation.
026		The amalgamation. They should undue it because the other town's population outnumbers us. When there's a vote, ours doesn't mean anything. The cost of the living has increased for recipients with disabilities.
026		The regional government effects the community the most. We've been regionalized with two other communities which is causing many of the problems today in my estimation.
026		I think our community is growing.
026		The most important issue facing my community today is the downsizing of the cities and towns by the government.
026		Amalgamation issues. (could not elaborate on that)
026	004	What impacts me personally is all this downloading on the community and the amalgamation. It was formerly Bruce township and now it's the municipality of Kincardine, which we do not like. For the municipality education is a major issue. The cutbacks and the effects that they've had. I see programs being cut back. The government was spending lots of money. They've had different programs years ago and they've cut them.
026		I am concerned about the rate of expansion. I would like it to maintain a small town image with no high rise buildings.
026		THE AMALGAMATION.

027		The government, our politicians have no clue as to how to govern our country. They don't realize that whatever they do is incorrect.
027		Getting rid of the council that we have, they are useless and don't know anything. The mayor is ignorant.
027		It council is poorly run, as they do not listen to public concerns.
027		Poor government because they have not been doing a good job in the community
027		Government regulations.
027		Municipal strike.
027		I think it would be the strike, because it is putting the town on hold.
027		THE MOST IMPORTANT ISSUE FACING MY COMMUNITY TODAY WOULD HAVE TO BE THE FEDERAL AND PROVINCIAL GOVERNMENTS COST DOWNLOADING TO THE MUNICIPALITY.
027	007	I don't know. We don't really have any pressing problems rather than the government. Health care is an issue.
027		GOVERNMENT. They don't really mean anything anymore. They promise a lot of things but they do nothing.
027		To get rid of the Ontario government.
027		Strike. The strike undertaken by the town workers.
027		The segregation of society in general mostly in the hands of the government.
028	008	Nuclear power plant.
028		I think that the municipalities should be amalgamated.
029		Getting the markers open so the cattle can go to the states easily.
029		THE US. THE BORDERS THAT SURROUND US.
030		Government's approval to homosexual marriage.
034	005	I think maybe expansion is the most important issue. By expansion I mean the influx of population. Water is always an issue in this area.
036	018	Safety on the roads especially in the summer time when tourists come over here. There are people walking, biking, baby carrying mothers, no sidewalks on the streets, no place to get off the road.
037		Abortion.

037		I worry about issues like abortion as I am in favour of life.
888		Moral issue of the individual.
888		I'M ON THE BEACH COMMUNITY TO SAVE A BEACH HOUSE WITH A DANCE FLOOR. TO SAVE THE HERITAGE.
888		THE TRUST ISSUE.
888		The price of gas and regulations on wide load permits for transportation. I'm in the construction industry.
888		Planing. No other comments.

Q5 Feeling of Personal Security

In your opinion, what things or issues in your community affect your feelings of personal security the most? (PROBE) Is there a second thing or issue? (ACCEPT UP TO TWO RESPONSES)

1 “Agricultural issues- general”	2 “Factory farmers/ Pig farmers”
3 “Economic development/ Employment/ Job security”	4 “Educational issues/ School closures”
5 “Safety of drinking water”	6 “Environment/ Pollution/ Agricultural and industrial waste management”
7 “Healthcare- lack of facilities and doctors/ Cut backs”	8 “Bruce Nuclear Power Plant- radioactive and nuclear waste issues”
9 “Road maintenance”	10 “Alcohol and drug use”
11 “Safety issues/ Understaffed police services”	12 “High taxes”
13 “Lack of community resources and facilities for adults and children”	14 “Lack of affordable housing”
15 “Treatment of seniors”	16 “Hydro/ Power generation”
17 “Crime/ Violence”	18 “Increases in tourism”
19 “Lack of provincial and federal government funding and support”	20 “Use of pesticides/ Fertilizer”
21 “SARS”	22 “Mad Cow Disease- effects on the beef industry”
23 “West Nile Virus”	24 “No issues/ None”
25 “Need a new sewer system in the community”	26 “Anti-amalgamation”
27 “Issues with current council/ Government”	28 “For amalgamation”
29 “Canada/ U.S. Border issues”	30 “Homosexual marriage laws introduced by the government”
31 “Limited public transportation”	32 “Lack of proper armed forces”
33 “Legislation to control gun ownership”	34 “Influx in population”
36 “The need for sidewalks”	37 “Anti-abortion”

QUESTION 5

Code M1	Code M2	Open End
001	002	The agricultural community. Bigger and corporate farms will run small little family farms out of business. It will be hard for small families to survive.
001		They are not taking care of the farmers properly..
001		Conditions of farms. That's it.
001		The lack of farmers. They're all getting out of the business. Nothing else.
001		THE LAND. HAVING GOOD GROUND.
001		THE WEATHER CONDITIONS. NOTHING ELSE.
001		There is not much importance given to agriculture even though it is very essential for the economy.
001		The farming community. It's my income.
001	020	Agricultural issues. Using fertilizers in the field for growing crops. Safety concerns.
002	013	Chicken and pigs are battered in barns. l sorry for young people and children there's nothing for them to do.
002	006	A lot of these farmers, small and big farmers, are polluting. We have Mennonites here and they seem to get away with a lot of things. For example, they are not supposed to fertilize in January.
002	005	The building of the hog farms. Because it can contaminate the water and result in other health issues. Also the well treatment and raising of the hogs.
002		Pig farming as well.
002		The concern about the factory pig barn.
002		THE THING THAT MOSTLY AFFECTS MY FEELINGS OF PERSONAL SECURITY IS THE ISSUE OF THE PIG BARNS BEING BUILT ALL AROUND THE TOWN AND THE SMELL THAT COMES FROM THEM. NOTHING ELSE.
002		Pig farms. The lack of government control and they are not regulating the industry.
002	020	THE FACTORY FARMS. THE PESTICIDES THAT THEY USE THAT MAKES YOU ILL. IT KILLS THE FISHES AND ALSO INTOXICATES THEM.
003		Economic conditions.
003		We don't have enough jobs.
003		If there were more job opportunities available.
003		Employment in plants and factories.
003		Security of employment.
003		JOB STABILITY
003		I don't know. Spend money on the infrastructure.

003		Jobs. No job equals no security.
003		Financial security.
003		Commodity prices. Because we are cash farmers.
003		I guess my job. My job in general. If I don't have a job then I can not live here in this community.
003		Financial security and the beauty of the environment.
003		The start up of new businesses.
003		A steady income.
003		The issue that affects my feelings of personal security is job availability. Because I am unaware of how many jobs are available in my area.
003		General financial health.
003		Job security.
003		Unhappy people. That and the jobless people. Especially during summertime.
003		We have to drive 10 miles to Hanover to get to clothing and grocery stores. Like I said we need more stores and restaurants here.
003		Economic diversification. Nothing else.
003		Economics.
003	001	Finances. The right to farm. New laws we must follow. The prices are too low. High expenses. No further comments.
003	006	Worried about the business community and the environment. Because it's a very small town with close to 600 people.
003		MINIMUM WAGE SHOULD BE RAISED.
003		Interest rates gone down and I don't have money.
003		Industry. Our livelihood.
003		Job security.
003		My job. Income.
003		Corporate expansions.
003		The availability of jobs.
003		New industry in the community.
003		Job security.
003		Financial debt. I heard it's way too much.

003		Jobs, employment. Employment for young people in the area is harder so they're moving away.
003		Jobs. Job security in this area. There are not a lot of jobs in this area.
003	013	Job security. To make sure we have jobs for everyone. We need more sports and recreational activities because that's the reason why we live here.
003		Low job and employment rates.
003		FINANCIAL ISSUES.
003		Employment in this area.
003		My job.
003		There is no industry. Nothing further.
003		Cash. The economy.
003	006	My job. The environment.
003		There is a lack of jobs in our area.
003		Jobs.
003	006	Probably the lack of jobs. A safe environment.
003		Job security.
003		The employment issue. The amount of unemployment.
003		THE JOB MARKET IS UNSTABLE. NO FURTHER COMMENTS.
003		I am not feeling secure as the cost of living is going up very fast.
003		Jobs. Employment.
003		The shortage of jobs. Nothing else.
003		Unemployment problem.
003		THERE IS A HIGH RATE OF UNEMPLOYMENT. NO FURTHER COMMENTS.
003		Probably unemployment and security issues.
003		Jobs. Whether or not it's stable.
003		JOB RELATED. BEING LAID OFF.
003		If the BNPG shut down the nuclear power plant everything will come to a halt and a lot of businesses will go down.
003		The jobs. There is no industry. Only a few industries are here.
003		Job security. Nothing else.

003		We have to insure that the major employer stays profitable. There is only one employer here.
003	007	JOB SECURITY. HEALTH.
003		It's a one employer town and if the Bruce power plant is closed that would create a lot of problems.
003		The availability of jobs.
003		The stability of this facility that provides all the jobs.
003		Job security.
003	014	Having a job. Keeping employment. Affordable housing. Clear air. Environmental things.
003		Working. I was born and raised here and I do not have many concerns.
004		Well it would be education in rural schools. Getting children to read and write and have educated children. There needs to be more say from the tax payers and less from the educator.
004		The education system and concerns about teachers staying away from school for different issues
004		Probably keeping the school open. Our school has been under review for closing.
004	007	Education. Medical. Maintaining the family firm.
004	007	Probably the access to education and healthcare. The lack of medical help.
004		Issues of education. Inadequate funding to schools. Proper equipment not being provided to students like in labs
005		Well just the water supply affects my feelings. I don't think the water I receive is safe to consume.
005		The water level in the nearest place.
005		Again the water and it's cleanliness. No additional issues.
005		The municipality of Kinloss takes all the clean water away from our small community. Neither of us like it very much
005		I don't really know. If it were anything then it would be the water. Again just because of the treatment and cleanliness of it.
005		The water. The ecoli. We don't want to be getting any of that in our water again.
005		The water. With all that is going on here in Walkerton with e-coli I still don't drink the water. Nothing further.
005		Water quality.
005	012	Water. Taxes.
005		The water. They're using a lot of sprays and its not good for the water.
005		Water quality. To be sure that the water is clean at all times.
005	020	Our water is getting polluted by liquid manure and nothing is being done about it.

005		Drinking water.
005		Same thing. The quality of the drinking water.
005		Drinking water.
005	002	Water. Factory farming. Education.
005		THE SAFETY OF THE WATER. POLLUTION OF THE WATER.
005		The water is not clean. No further comments.
005	011	The quality of water that runs from the farms. Manure and herbicides. Public safety response time of the police. Their priorities are misdirected.
006	008	The condition of the environment in the area. The nuclear plant, fertilizer and sludge in the area may affect the health of people.
006	005	The air is not what it used to be. It is polluted. They ruined the water with chlorine. No further comments.
006		The safety of the environment.
006	020	Again pollution and toxic waste. Run off of farmers fields. When the farmers use pesticides for their crops it pollutes our drinking water and lake.
006		THE POLLUTION, THERE IS WAY TOO MUCH. NO FURTHER COMMENTS
006		Pollution on the lake. The destruction of the environment.
006		Industrial wastes.
006		The pollution problem.
006		Environmental issues. Its a huge issue here. We are 40 minutes north from Goderich.
006	010	The community doesn't understand the environment. They don't understand what they are doing to it. They don't connect what they do to the effects it has on the environment and they don't pay enough attention to the environment. They have their head in the sand when it comes to this issue. Alcohol abuse and drug abuse by youth in this community. Most people here think that things like drinking and driving are ok and are not concerned with the consequences.
006		The environment.
006	003	Waste management at the plant affects my feelings of personal security. How the waste is controlled if it is entering our environment and employee safety are my major concerns.
006		The environment.
006		THE ENVIRONMENT
006		Personally I fell very secure. Environmentally there are a lot of things to be secured.
006		Environment.

006		Pollution. Nothing else.
007	015	Health. My own personal health and keeping the hospital. The care that is given to us as seniors.
007	005	Lack of a medical facility and the poor quality of water.
007	011	Health care. The police force.
007		Lack of healthcare funding. Relationships with world issues and that all the nations get along well.
007		Emergency services. Hospital care and mainly healthcare in general.
007		Healthcare. Fear that there won't be good quality healthcare around.
007		I would have to say the medical situation. I don't feel that there are enough doctors and nurses to provide the adequate health care needed in the areas. Nothing else to add to that.
007		Inadequate medical facilities.
007	004	IMPROVEMENT OF HEALTH CARE AND EDUCATION.
007		The health care issues. About the coming of the big hog farm and the problems it will bring.
007		The healthcare. Safety. Emergency wards. Cutting back on healthcare costs.
007	003	Health. Job security.
007		CUT BACKS IN MEDICAL
007	006	Health care. Pollution. Garbage. All of this is affecting everybody's day to day life.
007		Again I would say healthcare because it should be more available to us in the community.
007		The new medical clinic. They're already charging parking at the hospital and we will have to pay for parking here too. One of the conditions of this clinic was not to pay for parking which means it will not be a real medical clinic. Nothing further.
007	025	Probably the health system and the fact that we might lose our hospitals. The need for the sewers and the cost of that.
007		Facilities available from health care
007		The lack of doctors
007	031	The lack of adequate health care. The limited choice in public transportation. There's no train and the buses are bad. No further comments.
007		I think that the issue that affects my feelings of personal security the most is health care. There isn't enough of it or enough staff. No additional comments.
007		I feel very well in my community. Just one concern is about doctors and health system issues.
007		Having enough doctors. We're short of doctors. Nothing else.
007		Health care is less effective. Lack of doctors. No other comments.

007	008	Access to emergency service. Need a good location because of the nuclear plant. Nuclear needs bigger storage. In general pretty secure.
007		Medical service problems in the area.
007	006	Shortage of medical people and downsizing of the hospital. Shrinking of medical. Waste management and water quality. That pig contamination.
007	015	Small hospital. Nursing beds for seniors. No other comments.
007	004	Government cutbacks in health care and education funding.
007	006	Health care and the environment.
008		Living next to a nuclear plant which I find brings great risks to my safety.
008		Bruce Nuclear. I think it's a concern just for anyone living near a nuclear plant. No other comments.
008		They built an atomic power plant near the Bruce area.
008		The nuclear station. I don't approve of any nuclear activities in Kincardine.
008	003	The future of the nuclear industry will determine the economical security.
008	003	Bruce power. Job security. No other reason.
008	003	It all stems back to the status of Bruce Power. A large portion of this economy is provided by Bruce Power. Nothing else.
008	021	Nuclear safety. I live near a nuclear plant. I believe it's safe but they have to maintain the plant to make sure it's safe. SARS. Because people travel a lot from Toronto to our community.
008		Things like the nuclear management plant. They have to be more aware. Nothing else.
008		The nuclear plant. If they could get rid of the plant it will be great.
008		A terrorist attack on the U.S. as well as the nuclear power generations in my community.
008		The nuclear plant and the storage of nuclear waste.
008	005	The nuclear industry again. If it's going to blow up. The second issue water quality.
008		Due to the nuclear power plant affecting our security. No other comments.
008	003	The nuclear plant. It provides employment for a lot of people.
008		The nuclear plant down the road. Nothing else.
008		I suppose the nuclear plant. Being that it is nuclear there might be a leakage or something.
008		The nuclear plant. It doesn't really affect me that much.
008		No more nuclear stations. I don't feel that it is very safe to the health of the people.
008		I don't have any opinions. Actually the risk factors at the nuclear plant.

008		Well, I live right near a nuclear power plant and I'm nervous of a terrorist strike on the nuclear power plant.
008		Having a nuclear plant 2 km away from my house.
008		Well, I guess the fact that we live so close to the nuclear plant. I don't think about it constantly, but it is in the back of my mind. Another issue is kind of about society in general. The lack of morality.
008		Nuclear waste again. Nothing else.
008		Nuclear waste storage.
008		Bruce power nuclear plant. No further comments.
008	006	The nuclear power plants. The waste management plants. Hog barns. Basically the water treatment plants near my community.
008		The nuclear plant nearby.
008		The impact that the power station will have on the area.
009		Traffic. On the main streets.
009	008	We have problems with our roads. The nuclear plant is other issue I have a concern with.
009		Funds are not available for roads and bridges.
010		Drinking and driving. A lot of teenage accidents due to drinking and driving.
010		Bad law passing. The marijuana laws need to be stricter instead of getting lenient.
010		Drugs that are easily available in the community.
010		Drug dealers in my community because I have a lot of them around the corner.
010	006	Large scale of farming operations. Pollution control.
010	003	Drug and alcohol use. The cost of living.
011		The policing. If they are going to be available when they are needed.
011		The policing. That is of serious concern.
011		There is very little police presence. The police are a joke. They don't do anything.
011		I don't really know. I suppose it would be the insufficient level of police in the area.
011		Law enforcement. Getting more cops on the street. No more issues.
011	008	POLICING. THE NUCLEAR PLANT.
011		Policing. Ensuring that there is enough to keep the community safe.
011		Policing issues. We need more adequate policing. That's it.
011		It would be policing because I don't feel secure enough by them.

011		The police service. It's not as great as it once was. There are not too many of them that are out and around.
011		The police force.
011		Safety
011		Police
011	017	An issue in my community that affects my feelings of personal security would be to establish a visible police force. This police force would act as a deterrent to cut down on crime to protect all citizens.
011		Security of police enforcement. Maintain a good police force. Nothing else.
011		Police force. I don't know some things that are going on. They're not the best police we can get and we could do better.
011		Policing. Having the funds available to have policing covered with a good support system.
011		The lack of punishment that is given to offenders. I can not go further with this answer.
011		What is going on in Toronto. Probation officers can't keep an eye on their people. No further comments.
011		We are in the process of a police battle. No other comments.
011		The issue in my community that affects my feelings of personal security is a lack of a town or city run police force because the citizens have no personal contact with a local police force.
011		We don't have any town police man. No other comments.
011		Cutbacks and policing. They have a wider area to police so therefore the response time isn't what it should be. Nothing else.
011		We used to have a local police force and now they are talking about going with the OPP. I prefer a local police force.
011		The lack of juvenile policing.
011		Our police force. I'm not happy with the way they handle things here. They target certain ages and kids. They do shady dealings and they think they are above the law. No further comments.
011		Police protection. There is not enough of it. The funding of the police is really poor and it shows on their job.
011		Marriage stuff. Because of problems in her marriage with her husband. She thinks that houses should be locked better and the police should take a shorter time than 45 minutes.
011	013	THE LACK OF LAW ENFORCEMENT. THE NEED FOR MORE WHEELCHAIR ACCESSIBLE BUILDINGS.
011		There are a limited number of police. No more comments.
011		The police. An adequate number of police are required.
011		The police service. This issue affects my security.
011		Police. There should be more of them.

011		We are a small community. We need more security. I would like to see a little bit more of the police force present on main streets.
011		Rural police. We get very little of it.
011	017	I don't have anything. Maybe the police force or like the danger of criminals.
011		The police. We are policed by OPP and we don't have our own policing anymore. There's not as many patrols as there used to be. Nothing else.
011		Policing. We need more.
011		We have enough police coverage. Nothing affects my security. Nothing else.
011		Just to have a continued police surveillance.
011		The police. No other comments.
011		Policing. The Young Offender's Act. The ineffectiveness of the Young Offender's Act.
011		The police are inadequate.
011		Better control by the police. They should work more shifts and keep our community safe.
011		Who your neighbors are. Police in your community.
011		The cops are retards. I had a stalker for 5 years and they just blew me off.
011		Law enforcement. The ability of it. Nothing else.
011		Our policing. We had our police and now we've changed over to the OPP. I think it is a bad thing. We should keep our police force.
011		I guess the police service. Nothing else.
011		The type of policing. Sometimes I wonder if we have enough.
011	026	Policing. The amalgamation of the police department. We are in a rural area. It is not as good as I wanted it to be.
011	004	Policing. Schooling. They are what make me feel secure. I think about it that way.
011		Probably there isn't enough police patrolling our area. No other issue.
011		I guess the police. No other comments.
011		Law enforcement. By law enforcement I mean, do we have good policing? No other issues.
011		THE CONTINUED PRESENCE OF THE FIRE DEPARTMENT, MEDICAL SERVICES AND POLICE.
012		The high increase of taxes.
012		The cost of taxation. No other comments.
012		We are paying enough money but there's no proper utilization.

012		I'm pretty well off financially. I am mostly concerned with the security of income with taxes being high.
012		TAXES ARE TOO HIGH. TAXES ARE WASTED ON THINGS LIKE THEATER INSTEAD OF SOMETHING MORE RELEVANT.
013		Keeping the kids off of the street and out of trouble.
013		Just the lack of services.
013		Living far from town.
013		In this community I don't think we have any problems but there aren't enough outlets for teenagers.
013		I am pretty secure. Teenager issues.
013	005	Again too many teenagers hanging out in the street. Water quality. It really sucks here.
013		There are not enough activities for children to make it unsafe for them. Children then become more prone to predators.
013		Lack of activities for the youth. Too many bars.
013		I don't know. The lack of things to do for kids which makes them vandalize and destroy property because they are bored. No further comments.
013		The young people make some trouble here.
013		I am worried about kids.
013		The lack of respect the younger people have. We have no control over them. Nothing else.
013		The lack of discipline.
013		Kids are bad. No other comments.
013	008	Safety of the children. The nuclear plant. No other comments.
013	015	I would like to see safety for the children. I will like to see more protection for the kids and for elderly people.
014		THE ISSUE OF MY PROPERTY VALUE. I DON'T KNOW IF I WILL BE ABLE TO SELL IT.
014		Real estate prices.
015	014	The municipality should work on looking after the seniors in the community. Have places for them to live because over 50% or 53% of the people in the community of Kincardine are seniors. Looking after them a little better and providing a place to go.
016		Hydro. If we didn't have hydro we would be in a big mess.
016		The hydro plant. Thetas it.
016	007	Hydro plant. Diseases.
016		The Hydro power plant.

016		Power generation plant needs to restart. A lot of people have to move as they are out of to jobs.
016	008	This area surrounds Ontario hydro business. If something happened to the nuclear plant it would affect the whole community.
016		I don't know. Like a power generation station.
016		I don't know. Hydro is the main issue here. No further comments.
017		People get away easy on crime.
017		Current events.
017		Crime. That's about it.
017		Vandalism. There are too many kids beginning to vandalize and destroy both public and private property.
017		Nothing special for me. There have been some robberies outside but not concerning me. I am ok.
017		Well its most likely the young people who are doing damage to the farms. 13 to 16 year olds damage buildings with spray paint.
017		Vandalism. There is a lot of unnecessary vandalism and it bothers me.
017		The crime rate and how to handle it.
017		Crime rates. Really I have no other issues.
017		BREAK INS IN SOME COTTAGES IN THE AREA.
017		Not much. I do not know. The level of violence.
017		The identity theft. No further comments.
017		Theft of my house and vandalism.
017		Due to banking storage we feel insecurity. We live in a small place. No other comments.
017		THE ISSUE THAT AFFECTS MY FEELINGS OF PERSONAL SECURITY THE MOST WOULD HAVE TO BE CRIME AND VIOLENCE. NOTHING ELSE.
017		I feel pretty safe in my community except that there is vandalism in our community which concerns me a little.
017		There's been a lot of break-ins recently. There has also been a lot more fighting in the area as well.
017	011	Breaking and entering. Where we are located is outside the town and there aren't a lot of police around. It gives people an opportunity to do what ever.
017		Vandalism. Nothing else really.
017		Trouble with youth breaking into houses and businesses. They have no respect.
017		CRIME AND VANDALISM.
017		Well there is a lot of queer looking strangers in town. They scare me and they do nothing but walk up and down.

017		THE LAX LAWS IN THE COUNTRY. LAX LAWS, I DON'T LIKE THEM. LIKE, FOR EXAMPLE, THEY DO NOT BELIEVE IN THE DEATH PENALTY. I LIVED IN THE STATES BEFORE TOO AND THEY HAVE IT THERE. HERE THEY CONSIDER LIFE CHEAP.
017		Crimes. Robberies, burglaries and drunken drivers.
017		Increasing vandalism.
017		Lots of things. Like, you know, stories in the news about crimes. No other comments.
017		Vandalism. We have a couple of locks on our door. That is the only bad thing here.
017		Reports of robbery within the community.
017		Bomb terrorism.
017		Well, the vandalism by the younger people. No other issues.
017		Low crime rate. No further comments.
017		The destruction by young people in the summertime concerns me. No further comments.
017		Years ago we could leave our doors open but you can't do that anymore because of stealing and so on.
017		Auto theft.
017	011	There is a lot more crime. Police should be doing more.
017		PEOPLE ROBBING. THERE'S JUST BEEN A LOT OF ROBBERIES AROUND HERE. MACHINERY AND MAILBOX.
018		Tourists. They come and some are fine but others you can't trust. Nothing else.
018		Tourism.
018		Its like a tourism town in the summer and a lot of people are coming from outside. We have to lock things.
020		The use of pesticides.
020	005	Pesticide use. The water quality.
020	008	Well the pesticide use and I guess the Bruce power plant affects my sense of security. To have a radiation leak or be a target for a terrorist.
021		I'M SCARED OF SARS COMING INTO THIS COMMUNITY. NO FURTHER COMMENTS.
022		Again, the mad cow disease.
022		I am not worried about my personal security. The only problem which we are concerned about these days is mad cow disease.
022		Mad cow disease. Prices for products for farmers and large corporations are increasing and a number of farmers are reducing.
022	023	I worry about Mad Cow disease and West Nile Virus.

022		Mad cow disease.
022		Madcow disease.
023	021	Well, we have West Nile, Sars and Mad Cow.
024		NOTHING I CAN THINK OF. I DON'T THINK THERE'S ANYTHING.
024		I don't have any problems with personal security. The community is well policed and looked after.
024		It's very small community and I don't have any personal security problem.
024		I DON'T THINK THERE ARE ANY ISSUES IN MY COMMUNITY THAT THREATEN MY FEELINGS OF PERSONAL SECURITY AT ALL. THE COMMUNITY IS A SAFE AREA TO LIVE WITH LITTLE TO NO DANGER.
024		It is pretty secure here. Very low crime and everyone is friendly.
024		Nothing really. It is quiet and it is fairly good.
024		I really don't have any feelings of personal insecurity. No further comments.
024		I am completely comfortable with no worries.
024		We're pretty remote so I don't think there is any security concern. No further comments.
024		I don't have any concerns of personal security at all. It's not an issue here. It's a safe place to live.
024		I don't know. I can't think of anything. The area we are in is very secure and doesn't get much trouble.
024		Nothing. I feel perfectly secure here. Maybe just the small issue of the black bears roaming around.
024		Can I skip that question. Nothing else.
024		I'm not worried about safety. It's a very safe place to live.
024		I have no concerns. I feel very secure.
024		It is relatively safe here. The roads are quiet and there aren't any safety issues here.
024		We have good neighbours that look out for each other.
024		Everyone knows everyone. It's a good community.
024		Life is safe. Currently no issues.
024		I think it's a safe community in which to live and raise a family.
024		My feelings of personal security are I really don't have any concerns.
024		Things are ok here. It's safe and there's not much traffic. We are happy.
024		I just moved to this area recently. It a small rural area. I feel secure.
024		I am quite satisfied with what is going on. No issue in particular.

024		Nothing really. It's a safe community. I have no problems. I'm happy with everything.
024		I live in a small town so I feel very secure. Nothing makes me feel insecure.
024		I haven't thought about it. I have never thought about it but I feel it is pretty safe to live in.
024		I feel secure here. I don't feel there is a problem at all.
024		I can't think of anything really. Nothing affects my personal security. Nothing else.
024		We're pretty happy here. We have done what we were supposed to do. We have organic people. They cause issues. It's difficult to explain.
024		We have enough police and OPP and I feel protected and secure. I have no second issue.
024		Good Policing. We have good police and I feel secure.
024		I live in a trailer park. It is very good and safe over here. So no security concerns in my opinion
024		I guess I haven't thought about it. My neighborhood is fairly proper. I have no concern to that effect.
024		I have no problems.
024		Well, actually I don't have any fear at all for my personal security. The police force is satisfactory. No other issue.
024		I don't talk with people much on security issues, but I am not sure about any security issue. I am trying to enjoy life. If the problems are solved in the agricultural industry than I don't see any personal security issues.
024		The problem is you are phoning a guy in the community who leads a quiet life. We have got no problems of safety.
026	003	Same issues. Amalgamation and the cost of living for the disabled. No further comments.
026		That the town doesn't get too big. I can't think of anything but with bigger size comes problems.
026		THE AMALGAMATION.
027		Anything the government has to do with.
027		JUST THAT WE HAVE A LOT OF DUMB PEOPLE ON OUR COUNCIL THAT ARE SPENDING MONEY FOOLISHLY. WE LIVE IN A HERITAGE HOME ON A STREET OF HERITAGE HOMES. IT HAS A HARBOR WHICH HAS BEEN DONE AND HAS BEEN DONE WELL. WE SHOULD BE PROMOTING OUR TOWN AND OUR OLD BUILDINGS. INSTEAD WE HAVE A COUNCIL THAT IS TRYING TO TEAR THEM ALL DOWN.
027		THE ISSUE THAT AFFECTS MY FEELINGS OF PERSONAL SECURITY THE MOST IS THE LACK OF DISCIPLINE AND THE FACT THAT THE WRONG PEOPLE HAVE AUTHORITY. NOTHING ELSE.
027	006	There is a lack of dedication by the politicians to protect the environment that we live in.
027		They spend too much money on things that are not important to the community. They need to spend the money on natural gas because we don't have any of that here.
027		The municipality is not secure enough.

027		The kind of government we have is not good.
027		THE WAY THE LEVELS OF GOVERNMENT ARE DOWNLOADING EVERYTHING ONTO MUNICIPALITIES.
027	026	THE GOVERNMENT. THEIR POLICIES AND THAT THEY ARE STEPPING IN WITH THE AMALGAMATION. NOTHING ELSE.
027		The government structure isn't good. Efficiency isn't there.
027		THE MUNICIPALITY STRIKE.
027	005	Lack of trust in our government. If everybody was following through with what they were supposed to do the water wouldn't be the way it is now. Nothing else.
027		The fact that the councilors don't listen to the people.
027		The government passing weird laws without consulting the people who live here. For example zoning bylaws. There is lots of government interference.
027		Some of the ways the municipal leaders are acting because of the type of person he is.
027	020	I don't know. Government regulations. My second issue is manure management, gun control, all that stuff.
029		Border and transportation problems.
029		Issues in the United States.
032		Lack of an army.
033		New legislation about control of gun ownership. We can't own a gun to protect ourselves and our property.
034		Immigration has degraded our life style and our people. It is trying to hurt the fabric of Canada. It has degraded the family law format with all of these immigrants coming in. No further comments.
034		People from the city are a threat to our security. We live in the country area so city people are a major threat to our peaceful living here.
888		Somebody responsible.
888		I am not really sure. There are too many hunters in the area. No more comments.
888		There is no number for individual houses. The community has one number for all houses. That's an issue I think.
888		Some people think they are better than others. People should be treated equal. No more comments.
888		Planing the most. No other comments.

Q6. Image of the Area

Think about the Municipality of Kincardine and the South Bruce Area. What is the first thing or image that comes to mind? (ACCEPT ONLY ONE RESPONSE)

1 “Lake Huron/ The beach/ Harbour/ Lighthouse”	2 “Agricultural based/ Rural area”
3 “Beautiful/ Nice place to live/ Scenery”	4 “Nothing”
5 “Nuclear power plant/ Bruce Nuclear Power Plant”	6 “Tourist resort/ Tourism”
7 “Amalgamation of the township”	8 “Farming- cattle and pigs”
9 “Clean”	10 “Community events/ Community involvement”
11 “Cottage country/ Country living”	12 “Ontario Hydro Plant”
13 “Quiet/ Peaceful/ Tranquil”	14 “Scottish heritage/ Bag pipes”
15 “Small town”	16 “Sunsets”
17 “Water safety/ E-coli/ The Walkerton water scandal”	18 “Standard of living”
19 “Safe/ Secure”	20 “Friendly people”
21 “Fishing”	22 “Conducive to seniors living”
23 “Chantery Island”	24 “Has potential”
25 “Interesting place”	26 “Okay”
27 “Nice weather”	28 “Retirement area”
29 “Growth of population”	30 “Issues with current government/Politicians”
31 “New roads needs/ Road construction needed”	32 “High rate of taxation”
33 “Healthcare issues- lack of quality care”	34 “Alcohol and drug use”
35 “Un-clean neighborhoods”	36 “Lack of shopping facilities”
37 “The downtown image”	38 “Employment issues”

Code Open End

001 It has a nice lake. The area is a nice quiet community.

001 Lake Huron. The lake is important to us as a natural resource and the simple fact is that it is beautiful. I worry about the pollution.

001 Our lake front.

001 The lake and the beaches. Good for tourists. Hydro.

001 Lake Huron.

001 The different beaches that are here.

001 The lakes. Just the fishing and boating. Generally all the water activities that can be done there.

001 The light house. It's a very beautiful site.

001 WELL PROBABLY THE FIRST THING WOULD BE THE LOW LAKE LEVEL. WE ARE HOPING WE CAN GET MORE INDUSTRIES IN THE AREA.

001 The lake I guess. It's great, a good place to get away and an attraction.

001 The Lake Huron tourism. Just the tourism.

001 The freedom. The water. They are going to be building a new pipe line.

001 The presence of lake Huron and tourism.

001 The light house and just a shoreline community.

001 The beach. I just like the communities because they're calm, beautiful and peaceful.

001 It is close to Lake Huron so the image of lots of water comes to the mind

001 The beaches. The sunset and swimming is very good here.

001 The lake and the beach. They've really beautified the area around the beach and the lake.

001 The lake. The sunset. People have told me that, out of all the places that they visited, Kincardine has the prettiest scenery.

001 White out. Winter storm white out. Blue waters of lake Huron. No further comments.

001 The view of water front.

001 The beaches. They are nice and are not congested.

001 Lake Huron would come to mind because of the view and the sunset.

001 The lake is the first thing that comes to my mind because I live close it.

001 The beaches come to my mind because it's always nice to go there to relax.

001 The lake. It dominates where we stay and that's our focus because we're on the water a lot.

001 It would have to be the beach. I would say the beach mostly because it's a cottage area around here. Around here the lake is a big hit.

001 The lake. It is a small town with friendly neighborhoods.

001 The waterfront. There is the beach, the waterfront and the outdoors.

001 The lake. It's very attractive and there are lots of things to do there.

001 The first thing that comes to mind when thinking about Kincardine and South Bruce is the fishing. Just all the lakes that you have to choose from to go fishing.

001 The lake. It means a lot to me and my family. Swimming. It's nice to have the lake right there and the tourism that is part of the lake. It gives a feeling of the fact that I can't wait for the summer, even in the winter time.

001 The lakeside. Most of the communities depend on the tourism of the lake.

001 The beautiful harbour. It's a wonderful tourist area.

001 The beach. It's wicked. The tourism.

001 The lake. It is a very good environment with picturesque places.

001 The lake. Because it's the major geographical feature of the area and has an impact on tourism here.

001 The lake. Everyone wants to go there. It's nice that the beach is there. In the summer time we have the Saturday night parade.

001 The lake. It attracts tourism in the area during the summer and boosts our local economy.

001 The beaches. They are popular and well maintained. There are activities in town like artists and theater groups and the festival in the summer.

001 I live on the lake so that would be the first thing that comes to mind.

001 The lake. The landscaping. The way the land is situated. We have lots of interesting things happening in the community and lots of things to do. We have many churches and many activities for adults and children. I think it's a well rounded community.

001 Beaches. Scottish heritage.

001 Beaches. Pure water and the beautiful sunset.

001 The lighthouse. Where it is and it's a symbol of Kincardine.

001 The lake. The most impressive part of Kincardine and South Bruce.

001 Lake Huron and an image of agriculture.

001 The light house. The nuclear power plant. The lake. No further comments.

001 Lake Huron. I love the clean water, the beaches, holiday atmosphere and the tourists visiting the lake.

001 The lake. The nuclear power station.

001 The first image that comes to my mind is the lake.

001 The lake and it is a natural resort.

001 Beaches and beautiful sunsets.

001 The lake. No further comments.

001 The beach.

002 THE LAND. NOTHING ELSE.

002 The image I get is that of farmland. That and a very open space. I guess you could say it's very pretty.

002 The agriculture. The factories.

002 Thinking of the people there, you have subways and cars all in the city. There is nothing here. If I wanted to go to the hospital or to the bank I have to use taxis or have to walk.

002 Too many people involved in farming. No other comments.

002 It's a rural area.

002 The agricultural area that is part of that community.

002 An agricultural based rural area.

002 THE FARM LAND AND FORESTRY.

002 I see it as a very rural place. There is that power development place. It's a place with lots of job opportunities.

002 Isolation. This area is isolated and too far from the city. No further comments.

002 The country area is a lot different than the city areas.

002 Small town in agriculture. Rural. No city. There's room and it is not crowded. Ever since I've been a small kid it's been a farming community.

002 Huge farms that have knocked down all the houses and are not family farms anymore. All farms are now over 1500 acres and now it's not a family farm anymore.

002 Farming.

002 THE AGRICULTURAL INDUSTRY THERE.

002 Beef farmers. Cash crops.

002 I think about terrorism. Good farm land and the open space.

002 It's a farming community.

002 Rural living.

002 We don't live there but we shop there often. We don't have any traffic jams. Rural life is nice.

002 Rural. It is a small town in rural Ontario.

002 Rural Ontario. A beautiful beach line.

002 Beef cattle.

002 Farming.

002 It is a farming community. I grew up on a dairy farm. Nothing else.

002 It is a rural setting. Quiet and nice to live in.

003 The beautiful area, the beach and so forth.

003 It is a very beautiful area.

003 It is a very beautiful area. People come here in the summer time from the cities. It is such a beautiful land and suitable for crops.

003 A beautiful place to live in. A nice environment.

003 HOW BEAUTIFUL IT IS

003 Great place to live and clean air.

003 Great recreational area and a good place to live.

003 It is a beautiful place.

003 A nice place.
003 It's beautiful. Nice homes, nice lake.
003 It's a good town. No other comments.
003 Happiness, security and friends. Work and working conditions.
003 A GOOD PLACE TO LIVE. THE LAKE SHORE, THE LAKE.
003 The scenery.
003 I think it's well governed and attractive. It's comfortable.
003 My place here. My home.
003 Beautiful lake and outdoor activities. I love the trails along the lake.
003 THE GREAT OUTDOORS. NO FURTHER COMMENTS.
003 It's a very nice community. No other comments.
003 The highways. They are wonderful.
003 Attractiveness.
003 Just how beautiful it is.
003 White horses.
003 My home town. I was born here. I enjoy the environment.
003 It's an area with more money. A nice place. Ecological place. A lot of water.
003 A beautiful place. Water. Tourism.
003 Scenery. Beautiful nights.
003 It's a nice community. A really nice retirement place.
003 Nice environment.
003 It's a beautiful place to live. It's well kept by the people who live there.
003 Beauty of the whole area.
003 A Good community to live in
003 I don't know. Well, it is a very nice place to live in. Everything seems to fine out here. We have nice concerts in August on Saturdays and parades on Saturdays and the people over here are very nice.
003 It's a nice place.
003 It's a pretty darn nice place and we have a beautiful police force. We're busy with hospitals and health care systems today. Hydro was privatized and our bills have gone way up.
003 Cool summer breeze.

004 I have been here for a few months here so nothing comes into my mind yet.
004 Nothing really stands out. Everything seems to go fairly good. No major problems. No other comments.
004 Not very many problems that I can think of. I grew up here. No more comments.
004 NOTHING REALLY. I do not live in the Kincardine and South Bruce Area.
005 BRUCE POWER
005 The nuclear plant.
005 The nuclear plant.
005 I don't know. Well, it has a power plant.
005 Nuclear stations.
005 The nuclear plant.
005 Bruce Nuclear station.
005 Bruce Nuclear power. It's the biggest industry in that area and it's a vital industry to everyone.
005 Bruce Nuclear. It is one of the biggest industries in that area. It employs a lot of people.
005 Bruce Power Corporation.
005 Bruce Nuclear. No other comments.
005 Nuclear. Electricity. No further comments.
005 The Bruce Power Plant. The plant over in our community.
005 Bruce power. The most dominant industry in the area.
005 Nuclear plant.
005 The Bruce power plant. The sunset and scenery.
005 Bruce Power. Bruce Power is working half of the community. It is just a tourist resort.
005 The first image that comes to mind is Bruce Power. Nothing specific. I just thought of it because I don't really like it all that much.
005 The plant. It gives people employment.
005 BNPD. It's actually the first nuclear power station. You know power, like hydro.
005 There is the nuclear plant. Hydro one. No other comments.
005 The Bruce Nuclear power development.
005 The nuclear plant
005 THE NUCLEAR PLANT.
005 I spent all my summers in Kincardine. I think number one, the future of the Bruce power plant. The safety of water. Lake levels. What can you do about that?

005 There is a nuclear power plant and so many people are employed over there.

005 Bruce energy center. Anything that has to do with providing energy to the center.

005 It's a nuclear energy area. No other comments.

005 The Nuclear Power Plant.

005 Bruce power. Because it's the biggest industry around there which attracts all the people, job wise.

005 Bruce Nuclear Energy Plant. Windmills. Great farmland.

005 I don't support nuclear power.

005 The importance of Bruce power.

005 The power plant. No other comments.

005 The nuclear plant. That's the plant about 12 kms down. It's dominating the businesses and people are attached to the plant.

005 I think about the nuclear plant.

005 Probably an image of the power plant.

005 They have nuclear plant. No other comments.

005 The atomic plant.

005 Most likely Bruce Power. No other comments.

005 Bruce Power

005 Bruce power generating station and the associated industry. Agriculture like farming. Also, I think of small Kincardine community of about 7000 to 8000. It is a friendly community where everyone knows each other.

005 The Nuclear Bruce Power and the lake area. It's a nice place to raise your family and it's a small town.

006 Big tourist area and the farming community.

006 Flowers to attract tourists.

006 I guess the tourist area. Well we have the problems with hospitals but I guess they have problems everywhere.

006 Tourism. It's really nice to visit in the summer time.

006 Tourism and it seems like a close community.

006 The tourism. The condition of the water. Nothing else.

006 The level of tourism in the area. The number of people coming in for the beaches and lakes.

006 Tourism. We're constantly upgrading the town to make it more beautiful and having more events to attract people to Kincardine. All the volunteering that is put toward tourism too. No further comments.

006 That it is a tourist area. There are nice beaches and cottages. The place involves tourist business.

006 Tourism. Tourism has been here as long as I can remember.

006 Sewers. A big part of this area is tourists.
006 Vacations. Nuclear power.
006 I guess tourism.
006 Kinkardine is where my husband grew up and it is a really nice tourist place. It has really expanded with the nuclear plant.
006 Tourists. I don't know much about Kincardine.
006 Tourists. During the summer there is a lot of tourists in the area.
006 Tourism and the Scottish pipe band.
006 What keeps the area going is the tourism.
006 Townships. There are a lot of small townships around.
006 Tourism. The community I've lived in for 23 years. The water issue is important and proper drinking water.
006 The water brings tourists.
006 Tourism.
006 Tourism and the lake. No further comments.
006 Vacation area.
006 Tourism.
006 Something to do with vacations.
006 Vacation area.
007 I DON'T AGREE WITH IT BEING CALLED THE MUNICIPALITY OF KINCARDINE.
007 I didn't like the amalgamation of the town. No other comments.
007 Amalgamation.
007 Undoing the amalgamation.
007 Amalgamation. People didn't gain anything and taxes went up. Nothing else.
007 They amalgamated us. I don't want to be a municipality.
007 Too much bickering of amalgamation. To progress stop bickering and develop the ward system.
007 Well, I don't know. They shouldn't have amalgamated.
007 I think I'm disappointed that we had to go through the Ward system. It's unfortunate that we had to amalgamate. On the other hand, now that we have it, we have to accept it and try to cooperate.
007 Amalgamation of two towns and two townships in the South Bruce Area - Myomi. The amalgamation didn't help as other places take from us.
007 Amalgamation of the township.

007 Health. All of Bruce Health is amalgamated.
007 The problems with amalgamation.
007 Amalgamation of small towns within Kincardine municipality which creates many issues and never resolves.
008 Cattle country.
008 Farming.
008 Farmland. Trees and a great deal of food.
008 Cattle.
008 I would say the farm fields.
008 Farms. Nothing else.
008 Farm land.
008 Dairy farming. Tourism. Hydro.
008 Pig farming. Mainly for the environment.
008 Good old farmland.
009 Nice, clean and green. Well maintained. Friendly people.
010 COMMUNITY EVENTS. NOTHING ELSE.
010 Community involvement.
010 Recreation.
010 Summer theater.
011 Cottages.
011 It's a country living style. No other comments.
011 Cottage country. Tourism. Scottish festival. The salmon derby.
011 Cottages. No that is all.
011 Country living. It's a country touristy area. A nice place to live.
011 All of the cottages. The area is known for the large lake. The area is also known for the tourists in the summer time.
011 It's a cottage community as well as a retirement community. It is not an industrial area. No other comments.
011 The countryside. Nothing else.
011 Cottages
012 The power generation company, tourism, cattle farming and fishing debris.
012 The power plant. It is the biggest employer in the area. No further comments.
012 The hydro. Just in general. No further comments.

012 There is a hydro plant. No other comments.
012 The power plant is close to the lake.
012 The power plants. The impact they have on the community.
012 The power plant. I wish they would get it going so we can get the power going. There's a lot of money spent there.
012 The power plant. The light house.
012 The power development. It's a big employer and a big part of the community.
012 Ontario hydro.
012 The power development.
012 Hydro plant, tourism and farmers.
012 Hydro and agriculture.
012 The power plant in the area.
012 It's much like our own. The hydro plant. That's very important in our community. It brings a lot of jobs.
012 THE HYDRO POWER
012 Ontario hydro and the power development.
012 The Point. The Gliss Point. The Hydro plant. It's always there. The smoke that comes from it is terrible.
012 The hydro plant. No further comments.
013 This a quiet community. A close nit community.
013 Serenity and peacefulness. The town is very quiet and peaceful with very little traffic.
013 Tranquillity.
013 The first image that comes to mind when thinking about the Municipality of Kincardine is that it is a peaceful and beautiful area.
013 Pleasant place to live.
014 Pipe bands
014 The pipe band on Saturday night. They march every Saturday night up the main street and back.
014 The Scottish festival. It's very popular and there is a lot of advertising about it.
014 Scottish heritage.
014 Bag pipes.
014 Scottish pipe bands. Because there are parades every Saturday in the summer.
014 Scotsman. Kinkardine is a Scotsman place. No comments.
014 The Scottish pipe band every Saturday.
015 A small town. The lakeshore and recreational areas.

015 The small town lakeshore setting.
016 Beautiful sunsets.
016 The sunset.
016 Sunsets. The natural environment that surrounds the sunsets.
017 WATER. SAME ISSUE AS PREVIOUSLY. I DON'T EQUATE FARMING WITH WATER POLLUTION.
017 The Walkerton water scandal.
017 Water. E-coli. No others.
017 Walkerton. I don't know why, but it was the first thing that popped into my mind. Nice and close to the lakeshore.
017 Water. The Bruce Trail.
017 Non-availability of funds for safe drinking water.
017 Clean water. It is important to us all. Also it is essential to our overall survival.
018 The quality of life in this area. It's a very good life here.
018 The standard of living and the lake view.
018 The easy way of life in the community because you don't have to worry about traffic like in the city.
018 Healthy living.
018 The first thing that comes in the mind is the life style is better and good quality. Actually it is reasonably better for recreational purposes.
019 Safety.
019 The quality of life. A safe environment.
019 Very secure and safe.
020 Good friends. Nuclear power.
020 Comfortable and friendly with lots of things to do.
020 The people are very good here.
020 A small town with a friendly attitude. That's how most of the people are in the community, friendly.
020 Friendly people.
020 I guess just the small town camaraderie. Everybody knows everybody. And we have a beautiful country.
020 The first thing that comes to my mind is how friendly the people here are.
021 Fishing and boating.
022 The area is conducive to seniors living and it should stay that way. No further comments.
023 Chantery Island. Because that is the only thing I can think of.

024 I think it has a lot to offer. That's all.
025 It is an interesting place to go.
026 It is okay.
027 The weather. The power generation plant. Tourism.
027 The sunny Sunday morning weather. Because I love the weather.
027 BEAUTIFUL SUMMER WEATHER AND BEACHES.
028 The first thing that comes to mind when I think about Kincardine is retirement. It just seems like there are a lot of retired people in the area.
029 Negroes and Taiwanese people. No further comments.
029 We are growing. There's going to be a lot more people in this area. Nothing further.
029 I don't like it. It's crowded.
029 It shouldn't exist because there is not enough money to support larger communities. No further comments.
030 The first thing that comes to mind is the politicians. They're all too stuffy.
030 The first thing comes to my mind is poor government.
030 THE POLITICAL SCENE.
030 Cut backs. They have a personal affect on me and my health related problems.
030 Corruption. I don't like the way they manage their money.
030 The mayor of the town.
030 There are rigid rules on getting building permits. It's really tough to get them. Nothing more.
030 The lack of progress in this area.
030 Their resistance to what peoples concerns on issues are. They don't listen and meet the needs of the people.
030 There is not appropriate government management of our area.
030 They shouldn't pass laws so easily. They should negotiate and look at what they're doing more seriously.
030 Getting rid of the mayors.
030 We don't live in Kincardine. There is a dissatisfaction with the town fathers, the mayor. They don't hold well together as a team.
030 I am living in a village and everything we are paying goes to Kincardine.
030 THEY SPEND TOO MUCH MONEY.
030 THEY DON'T LISTEN TO THE PEOPLE.
030 Get a new mayor. No further comments.
030 They are doing a good job.

030 The government has made changes here.

031 The roads. They haven't kept them up as they should.

031 We need a better highway coming up north here. It seems to be under construction now. There is only one highway now and we need more roads.

031 The roads are not good.

032 High taxes.

032 THE TAXES THAT ARE BEING ENFORCED AFFECTS ME A LOT.

033 We still have a hospital.

033 I guess it would be the provincial health and the overall provincial attention. That and environmental protection in the immediate area. The government is not taking the environment into account in the area.

033 Expanding our hospital facility. Promoting tourism along with the Bruce Nuclear plant. No other comments.

033 Health care. The shortage of doctors. No other comments.

034 Alcohol. People drink a lot of alcohol.

034 Drug usage. With the legalization of marihuana we will be more able to continue our way of life free of persecution.

035 They could do a better job beautifying the neighborhood. Too much garbage. People don't clean the neighborhood. The garbage just sits there.

035 You don't want to know because I think of dusty-dirty streets. This is my thought of Kincardine before but now it's improved. Nothing else.

035 It's very dirty. No further comments.

036 The lack of shopping facilities. If we want to shop we have to go to Hanover or Owen Sound. For serious shopping we would have to go to the main cities.

037 The downtown image.

038 They should pay their employees more.

038 Work.

039 It's a negative thought because of the negligence in storing their nuclear waste. I'm upset about the fact that they are always making little deals with the other communities of Kincardine to promote there their employer. Conflicts of interest with Kincardine and Saugeen Shores councils.

039 Nuclear waste storage.

039 The nuclear plants. The proximity of the plants. The levels of radioactive waste and how it is being stored.

888 Kincardine

888 Just the fact that it's the next area. It's like it's still part of my background cause I grew up there.

888 HOW THEY ROBBED US.

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Q19. Affect of the WWMF

If YES: What affect do you feel that it has had? (PROBE) Is there a second thing or affect? (ACCEPT UP TO TWO RESPONSES)

1 “Employment creation”
2 “Risk of illness/ High cancer rates”
3 “Pollution”
4 “Causes worry/ Anxiety”
5 “Will improve the economy”
6 “I am currently employed there”
7 “Growth of population”
9 “I feel safe/ No affects”
10 “An independent environment assessment is needed”
11 “Has no environment affects on the ozone layer/ A green option”
12 “Centralized medium and low level waste management”
13 “I am moving to a different area/ My neighbors have moved out of fear

Code M1	Code M2	Open End
001		It has brought employment to the area and affluence. It was a depressed area until Ontario Power built the nuclear power station.
001		That is what her husbands job is. He is with the emergency services.
001		Employment. It created a lot of jobs. Even I used to work there at one point.
001		It was positive. It generated work for the people. Good for the community. It is a good thing.
001		More work. More work for us at construction labour. We get to build stuff.
001		Provided a way to make a living.
001	005	SPREAD A LOT OF INDUSTRY. MORE POPULATION AND MONEY IN THE AREA . VERY GOOD AND BENEFICIAL THE COMMUNITY.
002		I think it is causing people to get sick. The gardening is getting better.
002		It's a concern because we have a high cancer rate in the area. We're wondering if that has anything to do with it.
002		We've got more abortions then any other regions.
002		The effect I feel it has had is large. I believe there are many unrecognized health issues due to the waste. I feel it may be in our environment and my children may be at risk.

		My husband had an accident at the radioactive waste facility when it was Ontario Hydro. We went through stress and we think that it had contributed to him having a heart attack at an early age but we never could prove it. He is 42 and had a heart
002		attack.
		People in Kincardine have the greatest rate of leukemia in the province and it makes you wonder if that is because of the
002		atomic plant. Nothing else.
002		Well, if there is something in the air causing cancer.
002		I don't know. I would say I would be worried about my safety and health.
002	003	NO IMPACT PHYSICALLY. THE RISK OF GETTING CANCER AND GETTING ILL FROM THE POLLUTION.
002		There is too much cancer around this area. There is also a lot of asthma and illnesses that can't be explained.
003		We've stopped swimming. Because we don't want to take any chances of exposure to radioactive waste.
004		My stress level is high because I am more concerned about the environment.
004		Anxiety and worries.
004		I don't have to worry about the fact of living by the nuclear site. But I can't help thinking about it sometimes.
		It has cost me a lot of money and it is causing me a lot of problems. I lost my summer cottage. I have anxiety and extreme
004	002	health concerns and problems. The waste storage is leaking into the ground water and lake and endangering Lake Huron.
004		Major concern since September 11. The tragedy in New York. Tourists coming to the area.
004		I'm more cautious. I don't go near there.
		It has created uncertainty in my mind that, if there is nothing to hide, then why didn't we get an environmental assessment? I
004	010	think if there's nothing to hide then there should be a forum for people to explain to us exactly what happened.
004		It's been adverse.
005		Because of the fact that a lot of people work there. I have a lot of clients. I'm in financial planning.
005	001	The economy. It's boosted the economy by providing jobs in the municipality throughout the year.
005		The economic benefit and serving a social purpose.
005		Financially everyone is affected. No other comments.
		We need to be aware and create awareness. There is a personal effect but not a business effect. The number of tourists would decrease if the nuclear plant expanded. There will be more economical progress because it will be Canada's central
005		energy supplier.
005		It cost me $100,000. I just lost my shares in Integrated Energy when Bruce Energy centre was put there. No other issue.
005		Because nuclear improves economies.
005	002	EMPLOYED JOBS. I ALSO HEARD THAT IT MAY BE CAUSING BIRTH DEFECTS.
006		Quite a bit because I work there.
006		It has provided a good living for me for 33 years. It has had a good effect because I have worked there.

006		I work there.
006		It has given me employment and a secure job.
006		It pays me. I work there.
006		It has given me a job.
006		I am employed there.
006	005	I work there, so it would be my income. Nothing else. Even if I didn't work there, I wouldn't be concerned about it.
007		Kincardine wouldn't be as populated now if it wasn't for Bruce Power. No further comments.
009		NOT VERY MUCH. NOTHING ELSE.
009		It's probably keeping us safe from the materials they're storing.
009		It makes me feel safe. Still I question about high way safety.
009		I think that they must know what they are doing and take care of it in a safe manner.
010		I believe they don't have a proper storage facility because they never had the independent environment assessment.
010	011	It allows the stations to operate and to provide a future. It has no environmental effects on the ozone layer in Canada and it's the only green option.
012		It has centralized the medium and low level waste from other centers at the Bruce center.
013		I am moving to a different area.
013		Very positive. We have a very private backyard because I don't have too many neighbours. People are scared and I'm not.
888		My father had agriculture here before.

Q21. Remember about the Initiative

What do you remember about the initiative? (ACCEPT ONE RESPONSE)

1 “Don’t remember anything about the initiative”
2 “Public discussions/Meetings – learn about program/committee”
3 “Options/Dealing with waste”
4 “No concerns/does not bother me/support the initiative”
5 “Long term storage”
6 “Remember the package but did not read/pay attention/do not remember”
7 “Information about the sites – general”
8 “Regulated/Safety”
9 “Waste from other areas/Increase size”
10 “Personal negative impact”
11 “Study/Environmental assessment”
999 “Don’t know/Refused”

Code	Open End
001	I'm afraid not very much.
001	I don't really remember anything about it.
001	I DON'T KNOW
001	NOT THAT MUCH. NO.
001	Well I only read it. It was a while ago so I really don't remember much of it.
001	I would have to look at it again. I don't quite remember any of the details.
001	I don't remember anything about it because none of it makes sense.
001	Not really all too much. I didn't really pay close attention to it.
001	Nothing in particular. There was just some general knowledge on the newsletter. Nothing else.
001	I read this information but don't remember much.
001	I have no specific recollection of any details regarding the initiative. Because I can not remember any information from reading.
001	I can not recall anything right now.
001	I didn't have time to read it. I just remember it coming in.

001 Nothing. There was something in the mail but I thought it was junk mail.

001 Not really much. It was a long time ago.

001 I can't really recall what it said. But I did read it.

001 Nothing specific. Let's put it this way: I know it's there (the plant), I don't like the fact that it's there but I chose not to think about it.

001 Nothing. I just looked at it and threw it away.

001 I can't really remember too much about it but I do remember that I received it. I can't remember.

001 Periodic newsletters.

001 I think its good to involve the public. The community has been well involved in the choices and to my knowledge the community had supported these changes.

001 I didn't believe what they were saying. Well, they don't explain it very well and they just talk like politicians.

002 Talk about open form discussion about issues. What things are going on here and how to protect the community.

002 A number of open houses invited in various towns.

002 The newsletter encouraged people to learn more about it.

002 It mentioned about the people who are against the Waste Management Facility. The pros and cons on the facility. What the Government says about the issue and that it is ok. People are pretty much involved in it.

002 Open meeting. They talk about their concerns about the radio active and waste facility.

002 IT TALKED ABOUT SERIOUS PUBLIC MEETINGS AND IT TALKED ABOUT THE THREE OPTIONS FOR THE SAFE WASTE MANAGEMENT FACILITY. NOTHING ELSE.

002 How to store it and how they were going to do it.

002 Well, they wanted to educate the public about what's coming down the line as far as nuclear waste goes, which is good.

002 All I know is that I have to go to a public meeting on June 14th.

002 Not a lot. They are holding a public forum for public input.

002 They sent a letter with some information about it and an invitation to the open house.

002 There were going to be talks and hearings about the proposals for the Bruce Power site. That's about all I can remember about it.

002 Just explaining what they are doing. And they are trying to educate people about it.

002 The presentation with Liz Dowswell.

002 The main thing is that they are going to decide what is the best way to go about it, but I won't be participating in it.

002 We were kept up on issues. Before I was a member of a committee and we were informed about their actions all of the time.

002 Government representatives fighting about their positions, it's like a war.

003 I just remember that it was very positive in trying to come up with ways to deal with the waste facility.

003 I just remember the listings and the options. Also they listed the plans to go ahead with it but I didn't get really into it.

003 It laid out the options and the safety measures.

003 The different steps that they are taking in getting it ready. I remember seeing the maps of the different areas that they were seeking to build before they decided to build here.

003 It laid all the options in layman's terms and talked about safety measures and the risks

003 THEY HAVE NOT SATISFACTORILY DECIDED WHAT THEY ARE GOING TO DO WITH IT. THEY HAVE NO COMMITTEE AND THEY DON'T HAVE A QUALIFIED HEALTH PROFESSIONAL ON IT.

003 The three kinds of facilities.

003 There's been four. They are still storing it in there.

003 Some consideration for below ground or deep ground storage.

003 They were considering three options for long term storage. Above ground and below ground storage are the two I remember. I can't remember the last one.

003 They were discussing needs. Information about storage.

003 The municipal government and Ontario Power made some statements about the storage of wastes. Actually it's a memorandum of underintentions concerning future utilization of wastes.

003 The newsletter discussed options suggested to transport the waste a long distance. The newsletter made it clear that using any of these options would make it a better investment for our economy.

003 Very well put together. Very informative.

003 To send it to an abandoned mine.

003 It outlined the options.

003 Issues in regards to the safety of the disposal of waste. An explanation of how they are going to do their waste management.

003 There was some opinions they were looking at.

003 There were three options outlined.

004 Well I don't remember that much. I have been there and toured it and it doesn't seem to bother me at all.

004 Well, it didn't bother me.

004 We are in support of the waste management. I received the newsletter when I was at work.

004 I can't remember much but I fully support the issue.

004 I read all of it. I think it's a good idea, you have to start somewhere.

004 I agreed with their policies. No more comments.

004 I can't remember. Everything looked okay it was not a problem for concern.

004 Since I looked in it generally I am agreeing with what they want to do but I don't recall any particular details.

004 It is not a concern.

004 I remember that they said things were okay.

They were talking about in-ground storage and I back it up 100%. I got info on 2 of the tests sites and both are fantastic. They seem to
004 be safe.

005 It describes the long term goals for the storage of radioactive material.

005 Well, it mentioned about the facility. How the wastes are currently being stored.
They show pictures of European facilities and also some facilities down here. Info about the facility and how they would store it there.
005 In Europe and here.

005 I know the long term is eventually going to be there.

005 Storing the radioactive wastes in mines up north. That's what they talked about and that is what I remember in the letter.

005 They are conducting special operations for long term management.

005 About different types of storage facilities. Something like storage over the ground, etc.

005 ITS AN INITIATIVE TO INSURE THAT WE HAVE THE FACILITY TO STORE LONG TERM WASTE SAFELY. NOTHING ELSE.

005 THERE GOING TO LOOK AFTER IT FOR A LONG TIME.
I didn't know that it was about a long term management. I've read that they were looking to change from a short term management to a
005 long term.

005 They are looking at long-term storage for nuclear waste, working with municipalities and OPD.

006 I haven't read the initiative. I don't remember anything from it.

005 The storage of the used fuel. Nothing else.
Not too much right off the top of my head. They have been searching for a permanent storage facility for a long time. I have a lot of
005 confidence in them and I know many people that work there.

006 It was a nice glossy publication but I didn't really read it.

006 I NEVER GOT TO READ IT. NOTHING ELSE.

006 NOTHING, I DIDN'T READ THE NEWSLETTER.
I have not paid any attention to it, to be honest. It is because of some medical problem in my family, my husband's mother's been sick
006 so I have been taking care of her.

006 We probably didn't read it and we probably threw it in the garbage.

006 I don't remember very much. I just glanced at the newsletter and threw it away.

006 I don't remember. I remember that I read it but I don't recall what it said.

006 I remember reading it. They were thinking about doing it.

006 I received the newsletter but I can not recall it properly.

006 I didn't get the time to read it as yet.

006 I just gleamed over it. Nothing really stuck out. I don't recall any particular details.

006 I didn't read it, I just remember receiving it. Nothing else.

006 Not a lot. There was a lot of tension in the community over it. Nothing else.

006 I knew everything about it before the letter. The diagrams in it were not very clear.

006 I remember that there were some options about deep storage.

006 Very little. I don't remember any specific details.

006 They didn't mention the word radioactive.

006 Specifically I can't remember much and I work near there so I hear all this stuff and I don't know what I heard where.

006 I didn't pay much attention to it.

007 It had information about the containment site.

007 No, I don't remember. It was about the waste management site. No further comments.

007 IT WAS BEING PROPOSED, THAT'S ALL.

007 I thought that it was a high level PR. I read it and understood what was tried to be accomplished and I was not upset by the possibilities.

007 They described what they were hoping to do. I don't remember what they said. Something about long term. Nothing else.

007 Just an overview of what they were doing up there. I'm not very concerned about that, even though I'm an ex worker from there.

007 I just got a lot of information in it.

007 They had given an outline of what they were planning to do and other plants they had visited in Europe. Nothing else.

007 It was a very good idea about what they were going into and what they were thinking. I was very satisfied about what I was reading.

007 They are looking at 3 options and there is an open house and study to determine the economical effects. 2004 public referendum to choose the option.

007 It was informative.

007 Studying some other sites. Norway and France or Italy. They looked at structures and how they storage their waste.

007 Extra support for reactors, creating jobs, boosting the economy.

007 The idea that waste is being stored at the hydro plant.

008 I remember it to be highly regulated and it will always be alert to the public about the changes.

008 The safety of the program. It's not a rushed job and there is some serious thinking going into the program.

008 JUST ABOUT REGULATION OF OUTCOMING AND POTENTIAL OPTIONS OF THE STORAGE.

008 THEY'RE TRYING TO ENSURE THE COMMUNITY THAT ALL IS WELL. NO FURTHER COMMENT.

008 I DON'T THINK IT WILL AFFECT US IF IT IS DONE SAFELY. NOTHING ELSE.

008 That it was basically saying it was safe. There would be no effect to residents.

008 To construct bunkers and above the ground concrete is not a good idea. We will not be able to monitor if anything goes wrong inside.

009 As long as they don't import from anywhere else I'm happy with them storing the waste here. That's what they basically said in the newsletter. Nothing else.

009 They are bringing nuclear for the storage. No other comments.

009 Primarily that it is centralizing all of the nuclear waste from all of Ontario and it should be stored above ground not below ground.

009 THEY WANTED TO INCREASE WASTE.

010 The local community tried to get an independent hearing council and it failed because it went against the government and I lost my money. It ruined my cottage life at the beach next to the waste management facility.

010 I just don't like it. Nothing else.

010 I know I don't like it.

011 It was an environmental issue assessment.

011 They are doing a study. I don't know the result of the study. No other comments.

011 I remember the high environmental effect it would have on my area. I am aware of the facility and the storing object too. It's high polluting. The nature of the building.

011 It was a proposal.

011 THE STUDY OF IT.

011 They talked about how they are going to control the waste management and the environmental assessment.

011 They are working hard to clean up everything around here.

888 I don't really understand about the storage's and what uses they have. I think if you look at our city at night you see the city lights on. Using all the electricity in night you can't see the stars. Why won't they turn off the lights in the city at night?

Q22. Think about the Initiative

What do you think about it? (ACCEPT ONE RESPONSE)

1 “I can not remember/ I did not read it”	2 “Different types of storage facilities/ Goals for long term storage”
3 “Outlined options and safety measures”	4 “Helps the economy/ Job creation”
5 “Environmental effects- general”	6 “A proposal/ Public education and community involvement/ Informative”
7 “Community concerns/ Safety/ Health concerns”	8 “I am not concerned/ I support their policies”
9 “Involvement of government representatives”	10 “Expenses incurred”
11 “Good for the community”	12 “Nothing”
13 “I need more information”	14 “I prefer above ground storage”
15 “Prefers temporary to long term storage”	16 “It is necessary”
17 “All options should be explored”	

Code Open End

001 I had no real opinion. I just skimmed the newsletter.

001 I haven't read it. My husband read it.

001 I don't remember.

002 This is the initiative to manage wastes in special constructions.

004 It provides employment to people.

004 If it helps brings some more economy to the area I'm all for it. My main and secondary jobs as a result of the program will help boost the economy.

004 The potential benefits of it economically and not to worry about it.

006 IT WAS A GOOD IDEA AND VERY EDUCATIONAL.

006 I think that open communication is good. That brought some solution about this kind of problem.

006 I thought that it was great. They were letting people in the community know what was going on. Keeping them informed of the progress and things like that. Lots of community involvement possibilities.

006 I think it's a good way to get information out to the public.

006 I thought it was put together well.

006 I found it to be very informative.

006 It necessary to do or conduct that type of open forum.

006 Long term management plans. It was an open forum.

006 IT WAS VERY VALUABLE.

006 I have no major concern regarding the mailing because I work in the facility. I believe the mailing gave good information to the uninformed citizens.

006 IT'S A COMPREHENSIVE LOOK AT THE OPTIONS AND THEY DID A GOOD JOB. NOTHING ELSE.

006 I thought it was well presented.

006 It made people aware of the options.

006 They're trying to keep the public informed and they're trying not to hide behind the bushes. They're using local facilities, natural stuff and it's fine. Nothing else.

006 It was very good and very informative. Nothing else.

006 It was good. A good way of communicating and educating the uneducated on the issue.

006 It's a good thing. Communication is good. They should communicate with public.

006 I like the fact that the process is very public. The municipality is involved.

006 They're trying make the community aware of what they plan to do and how.

006 It was informative.

006 It was informative on the whole outlay of the storage plant.

006 It was well presented.

006 The newsletter was an excellent presentation and was informative.

006 It was informative but I did not agree with any of the options. The community should explore more options.

006 I think it's very important that they have done this. That the community has been involved.

007 Well, I was disappointed when I heard that they are bringing waste from other areas. They are not fair by bringing the wastes of other areas over here.

007 It's a high risk and I wish they would put windows up first because it's very dangerous for our health.

007 I'm not too happy about the facilities. I sure hope we don't have to take fuel.

007 I am suspicious. Nobody knows the long term effects from doing things like that.

007 Enough work has done. We don' t want any more.

007 I don't think it's a good idea. No other comments.

007 As long as they manage it well. We can't afford to get careless.

007 That is not the way to go.

007 I am disgusted with the government's blindness about the facility. It is unsafe and has always been unsafe. It's caused anxiety for all the local residents and healthcare problems as well.

007 I hope they implement the right one.

007 I think it would be fine but I worry about how they transport it. No further comments.

007 I think negatively upon it. I think we shouldn't have this close to home. My children should not be close to it.

007 It's a good place to start but I don't think that it will do any good in the near future.

007 I PERSONALLY DON'T BELIEVE EVERYTHING I HEAR, SO I DON'T THINK THAT IT IS RIGHT.

007 I don't like it.

007 I wish they never put the nuclear power station in that place. I don't think the people are being told the truth about what they put into the waste.

007 They better monitor it very closely. Through ground water, air emissions, radioactivity into the ground and into wildlife.

007 It has got to be done. It's safe.

007 I don't think about it much. I hope that it's safe. No other comments.

007 I hope the people handling it know what they are doing.

007 I'm very concerned.

007 I am concerned about the cancer part.

007 I don't think about it very often. But I don't like the idea of adding more to what is already there.

007 It's very negative.

007 Well it's obviously necessary for the radioactive waste. They need a permanent storage space and they should do it in the safest manner possible.

008 Well since they have the Nuclear facility here we might as well store the waste here as well. Everything is already in place and they have the land so they might as well carry on as long as they don't import the waste from other countries.

008 I think that they are studying the best action. They will come up with the safest option because I work there and I know that they are good and reliable and care about safety.

008 Well, I think its a good way to make electricity.

008 It's use is necessary.

008 Well, I think they are definitely moving forward.

008 I DON'T THINK IT IS ANY CONCERN OF MINE.

008 I think it's one of those things where they have to have it or they don't. It is highly regulated and controlled so there are no problems with it.

008 It doesn't concern me.

008 It looks like it should work well.

008 It's a good idea.

008 I put in a lot of confidence in people and on the engineers who supposedly come to the site.

008 A necessary evil. The waste needs to be stored somewhere so why not here. They have a handle on things and I'm confident. No further comments.

008 I think it's a good process. It is well managed and it's solving the problems of waste management at this moment.

008 It's well controlled.

008 I THINK IF THE MUNICIPALITY COMPLIES WITH IT PROPERLY IT COULD BE POSITIVE. LONG TERM STORAGE NEEDS TO BE EXAMINED IN ALL ASPECTS.

008 It is safe. Nothing much to worry about it.

008 It was a good idea. You have to start somewhere and as long as it is kept under control it is all good.

008 It is a good idea.

008 I HAVEN'T GOT A PROBLEM WITH THE SAFETY OUT THERE.

008 I think it's being run under excellent conditions. I have no problems with it.

008 It was fine I suppose. It didn't cause any alarm.

008 The people that are working and making the decisions are going to do the right thing. In terms of the safety and everything like that.

008 I have no problem with the expansion.

008 What ever they do they do and it's ok. Because I trust in their technology.

008 It doesn't bother me.

008 They have got to store it somewhere. As long as they store it safely, I don't see any problem.

008 I don't have a problem with that.

008 I THINK IT WAS GOOD AND IT WOULD BE FINE.

008 I don't think I have any problem with it.

008 It's fine and I don't think I will have any issues or concerns.

008 I suppose it's a fair attempt. I would say that I am very confident with it's success. I can only imagine that it will have a warm reception

008 I'm fine. I don't see it as a problem because we also have a nuclear station. One is impossible without the other.

008 I am not concerned about it.

008 IF THE TECHNOLOGY IS THERE AND THEY HAVE SOMEWHERE TO IMPLEMENT IT I HAVE NO PROBLEM WITH IT.

008 It's okay.

008 It was fine.

008 It's a good idea.

008 I have no problems. I am very confident in what they are doing.

008 I don't really remember much about it but I am confident in what they're doing. I used to work at Bruce power since 1972 so I know what's going on in the company and I trust them.

008 Its fine. They have got the stuff in it's place. I am sure they have taken all precautions on the safety aspect.

008 I don't really have an opinion about it. I don't see anything wrong with it.

008 I THINK IT IS QUITE ACCEPTABLE TO STAY THERE.

008 It's a good idea.

008 IM COMFORTABLE WITH IT. I HAVE NO CONCERNS WITH IT WHAT SO EVER.

008 I didn't have a problem with it.

008 It doesn't bother me in any way. If it is going to bother people then they aren't well informed about the issue.

008 When 9/11 happened I was worried about it but after I was fine.

008 I think they are doing good job with their technology. More research is needed.

008 It's a pretty safe facility. They know what they are doing.

008 I agree with it. I support what they're doing.

008 I think they're doing well.

008 I am not worried about it.

008 They are handling that all right.

008 They are interesting people that know what they are doing.

008 I don't have a problem with it. I just don't have a problem with it.

008 I think it's been handled professionally. I don't have any concern against them. They should have a long term management. Because the level of radioactive wastes will be accumulated whether it's low or high.

008 It's a fine idea. They are doing a great job.

008 I am not very excited about it. I don't mind short or medium term storage plans however, long-term storage is of more concern. Only the waste from local and near by municipalities should be stored in this storage facility.

008 If they can come up with good storage I think it'd be great.

008 They are so well regulated that the options are very viable.

008 They are doing it properly because they are keeping us informed.

008 I think they will manage it very well and I don't have any concern.

008 AS LONG AS THEY CAN KEEP IT SAFELY RUNNING IT'S GOOD FOR THE AREA. VERY BENEFICIAL.

008 I think it's a very good idea. With all the things that are happening around us it's sort of a protection for us.

008 I don't think about it. I just trust the people that look after it.

008 I think it's a good initiative. It's important. Nothing else.

008 I don't think about it much as I trust them fully.

008 Everything can be safer and I think it's a good thing.

008 I have no problems with it at all. I've been here for long time. I have no concerns for it.

008 Fantastic. I am completely faithful with it being underground and above ground. I believe that it's safe and the people living here don't have anything to fear.

008 I think it's great. Very positive stuff.

008 I'm glad they're pursuing it. They need to find a solution to the waste disposal problem.

008 If they have to expand, as long as it's done safely, then they should do it. If not they will have to bury it up north and that will affect the water safety.

008 I think it would be all right.

008 I THINK WHY NOT.

008 I THINK IT'S GOOD AND THAT EVERYONE SHOULD BE INFORMED.

009 It's a social issue and concerns provincial government.

010 I don't know. With the money they spend they can come up with something more. They come and pick up the garbage and dump it. They should come with a way to save it.

010 THERE GOING TO SPEND A LOT OF MONEY.

011 I think it's good for the community.

011 It is good for the community.

011 I think it's a very positive thing for the community.

012 Nothing really about the newsletter because I work in the nuclear power industry.

012 With the guidance that they have they are looking out for the communities well being.

013 I would like to know more about it.

013 I guess the newsletter could have been a bit better.

014 I would be happy to see it go somewhere else but if I had a preference it would be the above ground storage.

014 As long as they store the radioactive waste above the ground.

015 I JUST THOUGHT IT WILL BE TEMPORARY. I PREFER IT TO BE TEMPORARY MORE THAN LONG TERM.

015 They should not be considering long term. They will pay a lot of money to place their waste in our area and the lake.

015 Short-term solutions are fine for the moment. I'm still undecided about the long-term solution yet.

016 I don't think much one way or the other. If they have to do it, then they will have to do it.

016 It has to be stored somewhere.

016 It's something that has to be pursued but we need to know all the issues before they make any changes to what they are doing now.

016 I think they should develop it into long term storage. Because they need to do something with the waste and I don't see anything

wrong with it.

016 The reason for it is extremely high. The availability of cheap electric power.

016 I wondered if it was really necessary. But I guess we need to store the waste somewhere.

016 I guess my thoughts are that I understand that it's necessary to have a place to store the waste. I'm not sure this is the best place to store it on a long term basis.

017 If I had my way I'd like each nuclear generating station to look after and store their own low and intermediate level waste at their own sites.

017 I think they have to keep working on it.

017 Depends on how well it's tested. If the preliminary work shows that it tests well, then they should go ahead.

017 I think that Ontario Power Generation has to explore all the options concerning storing interim and long term storage of radioactive waste.

888 Part of the land. When I look through my window I see it as the part of the land that has been always there.

888 You pay now or you pay later.

Q23. Difference Between Interim Storage and a Long-Term Management Facility

What do you see as the major difference between an interim storage facility and a long-term management facility (PROBE)? Is there a second major difference? (ACCEPT UP TO TWO RESPONSES)

1 “No major difference”	2 “Do not know enough to say”
3 “Waste is stored at long term facility longer than at an interim facility”	4 “Currently there are only interim storage facilities:
5 “The method/handling of the waste is different at both types of facilities”	6 “Interim facilities are not as safe/as well monitored as long term facilities”
7 “Long term facilities store more waste for longer periods of time”	8 “Location of the storage facility – long term is more isolated”
9 “Size of the storage facility”	10 “Interim facilities are temporary until a better facility can be found”
999 “Don’t know/No response”	

Code M1	Code M2	Open End
001		I don't think there is a major difference in the facilities.
001		I don't see any difference. They have to monitor whether its short term or long-term to see if it leaks into the environment. It doesn't bother me at all which ever one they choose.
001		For my point of view there is no difference whether it is interim storage or long term.
001		There is no major difference. It is still a storage facility.
001		I don't see any major difference it's all the same thing to me.
001		I think there is no difference in the facilities. It's the same to me. However other people who are closer to the plants may have a different opinion.
001		Probably one in the same.
001		I DON'T SEE A DIFFERENCE BECAUSE THEY ARE GOING TO BE HERE FOREVER. WAY LONGER THAN ME ANYWAY.
001		As long as it's managed correctly I don't any see problems with it.
001		I see no major difference really between an interim storage facility and a long term management facility. There may be a slight difference in safety procedures used. It would probably improve because of a long term commitment.
001		I don't think you can differentiate but I understand it. Interim is the political word.
001		There is not much difference. Whether they store it on a long-term or interim basis. Both should be managed with the same scrutiny.

001	I'm not really an expert in this matter. If it's long term then the environment needs to be protected. To me, there is no real difference between interim and long term storage. Everything will be properly confined and free from contaminating the area around it.
001	I don't see a big deal with it. I see very little difference in them both. The long term management facility is used with uranium and nuclear waste.
001	I think both are equally a concern. I couldn't tell you which one I would prefer.
001	Nothing. I just think that they should always monitor it to maintain its own level of standards properly.
001	LONG TERM AND SHORT TERMS ARE NOT VERY IMPORTANT.
002	I wouldn't be capable of knowing anything.
002	I really don't know right now about that but the long-term sound be better.
002	No idea on that issue. No other comments.
002	They never had it before. They don't know what they are working with.
002	What ever. Which is most feasible. I don't mind.
002	I am not sure. I don't know too much about it to make an opinion.
002	I did not read it thoroughly enough to have a view about it.
002	I don't know enough about it to say anything.
002	I can not say anything.
002	I did not read it thoroughly to have an opinion about it.
002	I did not read it thoroughly to form an opinion.
002	I don't know enough about it. "Long term" means they are going to be there until I'm dead. I don't have much faith in the word "interim."
003	Well, in the interim storage facilities, they usually truck the waste away somewhere else. I think that it is better if they were to keep it in one site and manage it like that from a single site.
003	LONG TERM. IT'S ALWAYS GOING TO BE THERE FOREVER AND THE TEMPORARY WILL BE THERE FOR AWHILE.
003	Interim relates to short storage methods and long-term is for extensive use.
003	Well one is short time and the other is here for a number of years. The long term one will have to be looked after for a long time.
003	Leakage.
003	Short term, it's one thing and long term. Nobody seems to be able to answer all the questions people have about what is a long term and how it works.
003	Long term is for generations to come.
003	One is interim and one is long term. They put it there for the time being.

003	The time frame for both is different for long term. They should take into consideration the risks that might come up in the future.
003	PRESENT OPERATION POWER PLANT. CONCERNS IF THE CONDUCTOR LEAVES AND THE STORAGE IS STILL HERE. LONG TERM IS FIVE YEARS OR SEVEN.
003	The long term may be for 500 years.. or so. The short term could result in contamination which is also going to harm the environment.
003	Permanency.
003	They have their long term storage very well. They are thinking into the future, which is very good.
003	Interim is the short term plan. The long term is the future plan and I agree about the plan.
003	One is permanent and long term. They would not have to look for another site.
003	Interim means it would be sent elsewhere and the other means it would be here.
003	Not much other than it would be permanent.
003	The intermediate waste isn't there as long as the long term waste.
003	Long term will create more jobs. Because they'll need people to look after it.
003	Just the time commitment.
003	The difference is that the interim storage facility is more of a short term plan and the other is more a long term plan.
003	The interim storage facility is always going to be there. In the case of the long term management facility, you have to look at it for awhile.
003	With the long term management facility. The waste is here to stay with the intermediate waste. It is not there forever.
003	The long-term one will be for a life time.
003	THE LONG-TERM MANAGEMENT FACILITY IS STORAGE FOR A LONG TIME. UNTIL THEY FIND OUT WHAT THEY ARE GOING TO DO WITH THE WASTE.
003	Long term definitely could be decades and they're going to have to have a permanent solution.
003	The interim's term will probably be around 25 years but the long term will take a very long time to process the waste.
003	Interim means short term and long term means for long term or for ever.
003	ONE IS SHORT TERM AND THE OTHER IS LONG TERM.
003	Long. It means that it is going to be there for a long time storage. Short. It is going to be there for a short time.
003	Job security in that the site could remain operational much longer if they have a long-term management facility. Also they would need higher security in a long-term facility which is also job security.
003	One is a long term and the other one is a short one, that's it.
003	ONE IS FOR GOOD AND ONE IS NOT.
003	Interim is temporary and long term is forever.

003	The time it takes to store the waste.
003	Interim would be temporary and long term would be permanent.
003	Interim is short term and the other one is long term.
003	Long-term is going to be there for a longer period of time compared to interim storage.
003	The major differences will be that radioactive materials will be kept for a long time and more jobs will be created in this area due to this type of facility.
003	Interim is only short form and has to be moved soon and long term, if its done right, will work.
003	The one interim we have now has been there 50 years and long term is 100 years and more. Well, interim 20 years and less and long term is 20 and more.
003	Short term or interim is 10-25 years and long term is 100 years or longer.
003	I assume that interim is short term and the other is going to be longer.
003	I'd think, just the terms in themselves. Interim storage means that they will store it and later move it to another permanent site.
003	A long term storage creates more jobs in the community.
003	Interim is short term and long-term is permanent.
003	It is going to be for another 30 years. There will be larger facilities.
003	Long term would be here for ever.
003	Absolutely. Long term will stay for a while and storage facilities should be long term so it can last.
003	Interim is placed for a while, then moved to under ground.
003	The need for insurance that the management will still be in place in the long-run
003	Interim is temporary. The long term is forever.
003	The fact is that if they know for sure what results there will be.
003	I hope they would use the facility only for short term storage and management of radioactive waste and not for long term purposes.
003	Interim is temporary storage and the long term facility is there forever.
003	Jobs for the community. From my understanding, if it was going to be a long term site, they would need ongoing monitoring.
003	Short term is only for the near future and long term takes into consideration a lot of details because it is for a long term purpose.
003	Long term management would make major assumptions on the effects on the natural environment.
003	Short term isn't going to help anything and long term means thousands of years and that's going to destroy the planet.
003	LOTS OF JOBS FOR LONG TERM.
003	The long term one would be more permanent, therefore worse. Interim would mean that they would store it for a short term

		or a little while. There is no other difference.
003	006	An interim will be transferred out. With it being one of these hold over places there would be movement of the waste so there would be a safety concern. Interim will be less safe than a long term facility.
003	006	The long-term is going to take a long time to keep it safe. If they find the short term will work then it's fine. Concerned with safety.
003	006	I guess it means that they will make a commitment. It will increase safety in the management of waste.
003	006	Interim means temporary and long term is permanent. I'm more comfortable with long term because I have concerns with better safety. If the long term can be done within the same area it's also better in regards to transportation and that sort of thing.
003	010	Just the fact that, if they store it on an interim basis, at some point the waste will be taken to another site. Permanent means that it will be stored permanently on this site. There are no other differences.
003	010	About long term. If it's done right they don't have to do it somewhere else. About interim, to start moving it around, it doesn't make sense.
004		Interim. It's what we have now and a long term management facility is supposed to be implemented.
005		The way handle it or the better method to store the waste material.
005		If they get too much in the storage they might have trouble handling it as a long term management facility.
005		How they are going to store it.
005		Interim is okay and long term sucks.
005		That it is properly stored.
006		As with everything, I suppose cost is a factor. Not only the cost but the safety over a longer period of time.
006		I don't know. The long term management facility might provide more protection.
006		Better management for long term.
006		THE LONG TERM FACILITY WOULD BE MONITORED ON A REGULAR BASIS AND IT CAN BE DONE SUCCESSFULLY.
006		I GUESS THERE'S SOME DIFFERENCE IN RISK. IN LONG TERM IT'S DIFFICULT TO PREDICT WHAT'S GOING TO HAPPEN IN 20-30 YEARS.
006		I WOULD SAY WITH LONG TERM YOU KNOW IT WILL BE THERE FOR DECADES AND IT WILL BE MONITORED.
006		I HAVE CONCERNS WITH SAFETY AND PEACE OF MIND.
006		My concern would be that the safeguards are in place to protect us. As long as we locally don't have to pay for protection and the ongoing operation, I don't see any major differences.
006		I WOULD HAVE TO SAY THE MAJOR DIFFERENCE IS THAT THE PROTECTION IS BEING BUILT INTO A LONG TERM FACILITY TO HELP MAINTAIN IT PROPERLY.
006		There will be more stuff there probably.

006 MORE SECURITY
006 They're both dangerous facilities. The long term facility is going to affect the population later on.
006 It will be more secure if it was a long-term facility.
006 I think there will be more thought and planning and engineering going into the long term facility.
006 A long term facility is a lot safer
006 One is that you don't have to worry about it and the other one you have to worry about it. Long term and short term.
006 I'm not sure if long-term would be as safe as a short term.
006 Long term is more thought of in terms of safety. There should be no difference as far as safety goes. Nothing else.
006 I think if it is a long term management facility, the security will be better and it would provide jobs for the community.
006 Accountability. Location and types of radioactive wastes whether it's liquid or solid, etc. Future consideration.
006 If there is a commitment there as a long term storage. If they can maintain it in long term with maximum efficiency and safety.
006 It is better to go with the long term storage to place the waste there and not have to go through the steps in moving it again.
006 In a long term, they have to have protection to store waste for over 50 years.
006 Security. Long term facilities will need better security.
006 How it will be constructed and will they take safety measures into consideration.
006 It is better security for the long term one.
006 Long term tends to be more secure and more contained. It's required for all things to keep working. It's needed.
006 LONG TERM. YOU NEED MORE PERMANENTS BUILT IN IT. INTERIM DOESN'T HAVE PERMANENT.
006 009 Long term management. There would be more planning involved and they would be continually expanding. There would be less concern about what to do with the waste in the future.
007 Long term would have larger waste so it is a potential danger. They should have it in an isolated area.
007 The long term facility will have more long term plants for the community.
007 How long and how deep the facility will be. Space is available in the ground.
007 In interim you wouldn't be thinking down the road if you're going to run out of storage facilities. The opposite for long term.
007 Interim will either evolve or devolve into the permanent management facility.
007 The major difference would be that the plant would be getting more waste. I am unsure as to whether or not it can handle or sustain more waste for a long period.
008 If it was long term it would be further away from our town. That would be better for the health of people in our area.
008 The major difference of it being underground is it conceals the valve. There is no fear of it breaking open since it's about 800 meters into the ground. It is very safe.

009	The size would be the difference. No further comments.
009	The volume accumulated. I don't know.
009	The high level waste storage would be just for the interim for the next 20 or 30 years. They're going to have to come up with something after that and later ship it somewhere else. That's why they're storing in it concrete containers.
009	THEY MIGHT NOT PUT AS MUCH MONEY IN INTERIM. THEY SHOULD EXPAND LONG-TERM MANAGEMENT FACILITIES.
010	An interim facility means that there is nowhere to store the material now. In the case of long term, I don't want my children being exposed to the long term effects of such a project.
010	Whatever is best for the area. If it is interim storage go for it. If it is a long-term management facility then let it be. They are all a good thing. I am for it all.
010	One, they storage the waste and the other they manage it for long term.
010	Interim would be held until the level of radioactive decay becomes ready for long term storage.
010	Interim means it may be moved. For now it's a temporary place. Long term meant it will be permanently here.
010	Something else can be done with this waste.
010	The difference is a permanent solution.

APPENDIX D3: MATERIALS RELATED TO 2004-2005 CONSULTATIONS WITH THE MUNICIPALITY OF KINCARDINE

- Minutes of Council Meeting (April 21, 2004)
- Presentation to the Municipality of Kincardine — Consultation Methodology and Response Rates (February 16, 2005) by the Strategic Counsel
- DGR Hosting Agreement Between Ontario Power Generation and Muncipality of Kincardine (October 2004)
- Update on OPG's Proposed Deep Geologic Repository — Walkerton Herald-Times (May 4, 2005)
- Getting Your Views on an Important Issue — Kincardine Independent (November 24, 2004)
- Facts about OPG's Proposed Deep Geologic Repository — Shoreline Beacon (April 27, 2005)
- A Geoscientist's Perspective on the Proposed Deep Geologic Repository — Kincardine Independent (December 8, 2004)
- Long Term Solution to Managing Nuclear Waste — Kincardine Independent (November 10, 2004)
- Myths and Facts About the Proposed Deep Geologic Repository — Kincardine News (January 5, 2005)
- A Public Health Official's Perspective on the Proposed Deep Geologic Repository — Kincardine Independent (January 5, 2005)
- Safety Assessment of the Proposed Deep Geologic Repository — Kincardine News (December 22, 2004)
- Deep Geologic Repository Proposal Update, Working Together with Some of the World's Most Experienced People — Shoreline Beacon (November 9, 2005)

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10.6 Nuclear Waste Steering Committee Study Option re Deep Rock Vaults for the Management of Low and Intermediate Level Radioactive Waste

Resolution #2004 - 232
Moved by: Barry Schmidt
Seconded by: A.R. (Sandy) Donald

THAT Council endorse the opinion of the Nuclear Waste Steering Committee and select the "Deep Rock Vault" option as the preferred course of study in regards to the management of low and intermediate level radioactive waste.

Recorded Vote	**Yes**	**No**
Anderson		X
Campbell		X
Couture	X	
Hewitt	X	
Ribey	X	
Roppel	X	
Schmidt	X	
Donald	X	
Sutton	X	

Carried.

The Strategic Counsel

Presentation to the Municipality of Kincardine

Consultation Methodology and Response Rates

February 16, 2005

Gregg, Kelly, Sullivan & Woolstencroft:
The Strategic Counsel

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Objective and Methodology

Objective

- An independent consultation with residents, 18 years of age and older in the community about their views regarding OPG's proposed plan to store low and medium level nuclear waste at the WWMF site adjacent to the Bruce Power Generating station.

Methodology

- Telephone consultations with mail follow-up to no contact households and seasonal residents

Telephone Consultation Process

- Households telephoned between January 6th and 25th, 2005
- A minimum of ten calls were made to households in order to maximize the number of households and residents responding
- Messages were left after 5/6 calls asking residents who wished to participate to call back on a dedicated toll free 1-866#
- Half page ads were published in the Kincardine News, The Kincardine Independent and Shoreline Beacon instructing residents in households with unlisted telephone numbers and those who did not have access to a phone to call the 1-866# if they wanted to participate
- Households where at least 1 person responded by the end of the telephone consultation period considered complete and were not included in the follow-up mail consultation
- All households in the telephone directories where no contact was made were mailed the preamble and question

Mail Consultation Process

Seasonal Households

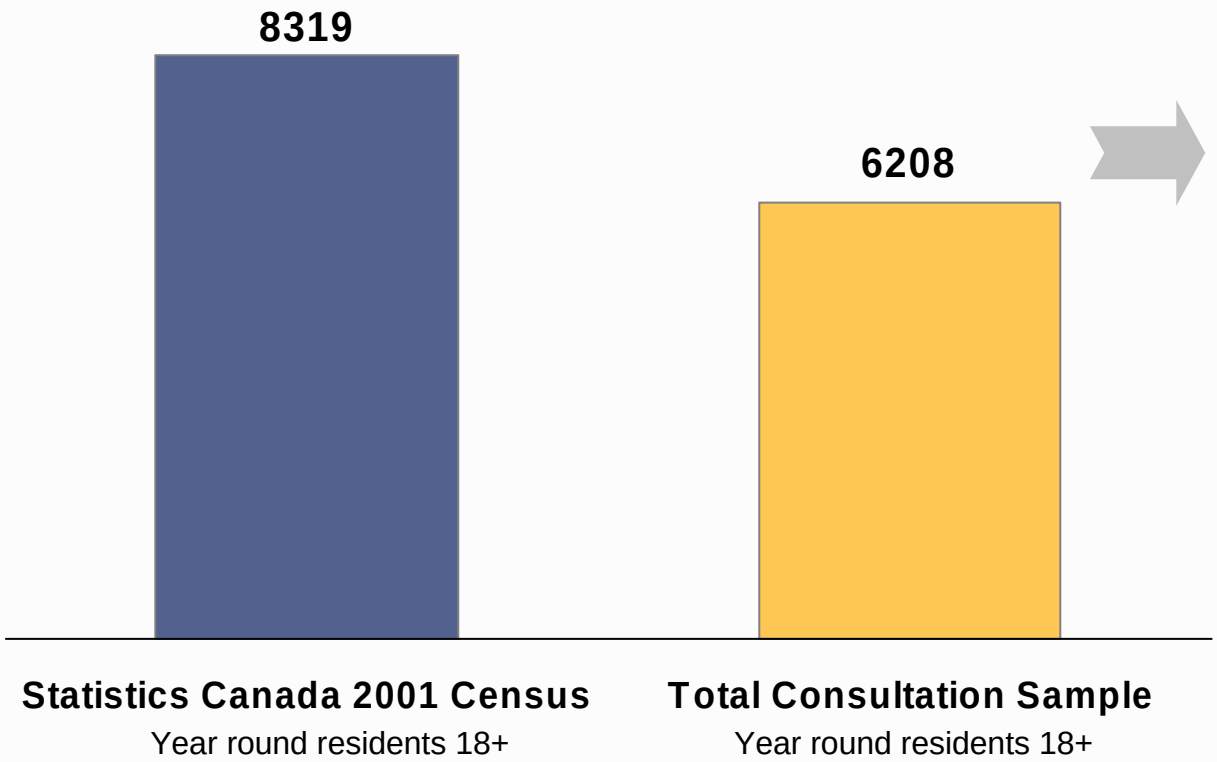
- Households listed in the telephone directory with permanent addresses outside of the Municipality were mailed the preamble and question
- Seasonal households which were not in the telephone directory, but were in the Assessment Roll were also mailed a package
- Seasonal households identified in the Assessment Roll consisted of:
  - Owners who did not have a phone # listed
  - Multiple property owners
  - Owners of vacant land

No Contact Household

- All households not successfully contacted after at least 10 attempts at the end of the telephone consultation period were sent a mail package

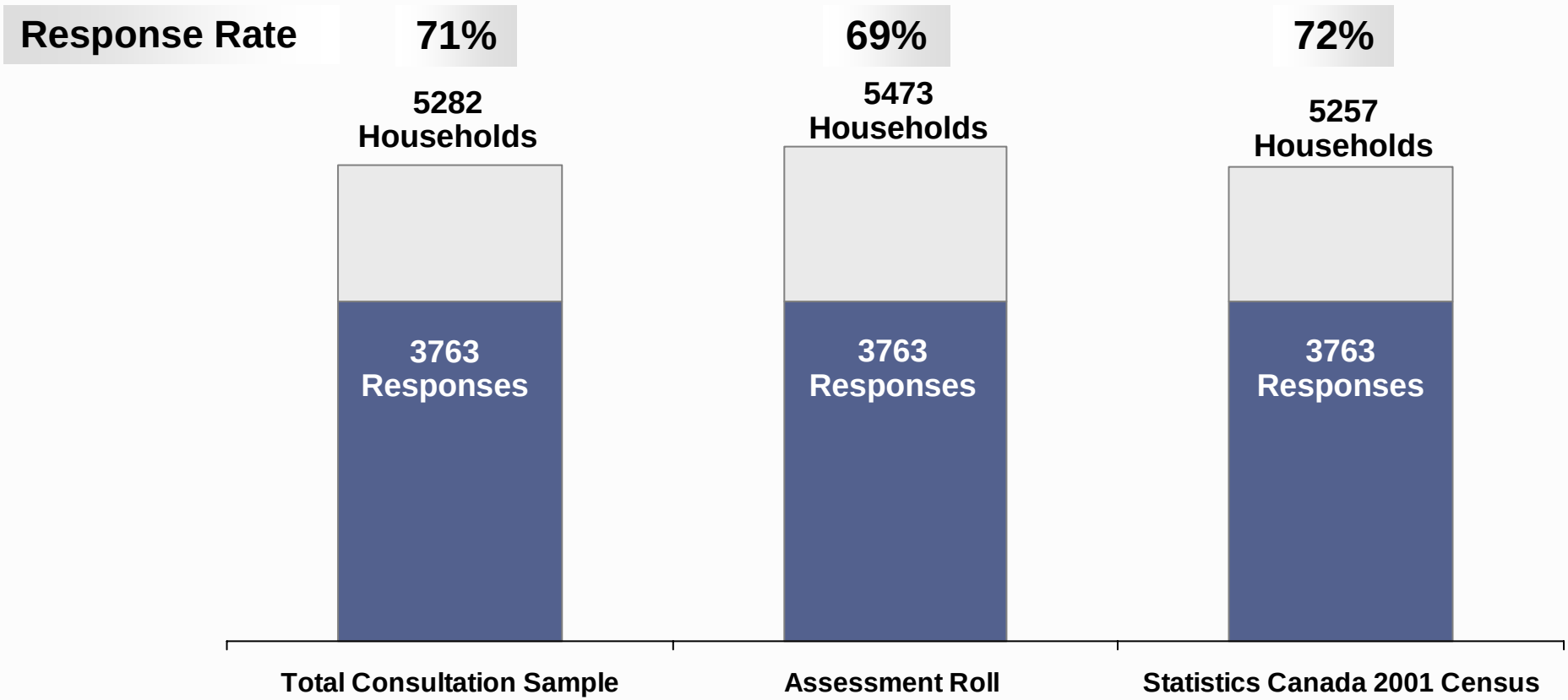
Year Round Resident Response Rate

Total Year Round Residents (18+) in Kincardine



Year Round and Seasonal Household Response Rate

Total Year Round and Seasonal Households in Kincardine



Consultation Question

Do you support the establishment of a facility for the long-term management of low and intermediate level waste at the Western Waste Management Facility?

Total Consultation Results

% Among All Municipal Residents 18+ (n=6778)

Yes	**60%**
No	**22%**
Neutral	**13%**
Don’t know/Refused	**5%**

Proportions Who Support/Oppose the Plan*

% Among Municipal Residents 18+ who Support or Oppose the Plan (n=5531)

Yes	**73%**
No	**27%**

* Proportions shown exclude all “neutral” and “don’t know/refused” responses

DGR Hosting Agreement

Between

Ontario Power Generation

And

Municipality of Kincardine

October 2004

TABLE OF CONTENTS

THIS AGREEMENT made this 13th day of October, 2004.

B E T W E E N:

ONTARIO POWER GENERATION INC.,
a corporation existing under the laws of Ontario

(hereinafter called "**OPG**")

AND

The Corporation of the Municipality of Kincardine,
a corporation existing under the laws of Ontario

(hereinafter called "**Kincardine**")

RECITALS:

A. Whereas OPG has operated a facility within Kincardine at the Western Waste Management Facility ("**WWMF**") for interim centralized storage of Low and Intermediate Level Waste ("**L&ILW**") from the Pickering, Darlington and Bruce nuclear generating stations for over thirty years;

B. Whereas nuclear generating stations and associated facilities will need to be Decommissioned, resulting in Decommissioning Waste;

C. Whereas it is foreseeable that additional nuclear generating facilities may be established in Ontario, with associated production of L&ILW;

D. Whereas on April 16, 2002 Kincardine and OPG signed a memorandum of understanding which set out the terms under which OPG, in consultation with Kincardine, would develop a plan for the long-term management of L&ILW at the WWMF. An independent assessment of long- term management of L&ILW options was conducted by Golder Associates and concluded in an Independent Assessment Report ("IAR") in early 2004 that all three of the options considered i.e. enhanced processing and storage, surface concrete vaults and a Deep Geologic Repository ("**DGR**") were technically feasible, safe and would ultimately have no significant adverse environmental, social or economic effects;

E. Whereas the IAR concluded that DGR would have the largest safety margin of all the three options for long-term management of L&ILW which were considered. The IAR further stated that Kincardine and the Adjacent Municipalities would receive direct and indirect economic benefits from DGR such as additional employment and an increase in business and investment;

F. Whereas the Council of Kincardine, by resolution dated April 21, 2004, endorsed advancing DGR for long-term management of L&ILW in Kincardine;

G. Whereas the Council of Kincardine is responsible to act in the interest of the general health, safety and welfare of its inhabitants and the protection of the environment;

H. Whereas the construction and operation of the DGR by OPG must meet legally imposed environmental, health, safety and security standards and Canada's international obligations, the interpretation and scope of which fall primarily under the jurisdiction of the Canadian Nuclear Safety Commission ("**CNSC**");

I. Whereas Kincardine is recognized as the host municipality and the Corporation of the Town of Saugeen Shores, the Corporation of the Township of Huron-Kinloss, the Corporation of the Municipality of Arran-Elderslie and the Municipality of Brockton are adjacent municipalities;

J. Whereas the Parties wish to ensure that Kincardine and adjacent municipalities receive compensation relating to construction and operation of the DGR;

K. Whereas OPG acknowledges that local community support is desirable for the success of the long-term waste management of L&ILW;

L. Whereas Kincardine acknowledges the potential benefits of the DGR project to its residents;

M. Whereas OPG and its predecessors historically had a community agreement with Bruce Township;

N. Whereas there have been ongoing discussions between OPG and Kincardine about the DGR leading to signing of a non-binding term sheet dated September 28, 2004; and

O. Whereas OPG recognizes and acknowledges the value of having a permanent storage facility for L&ILW in Kincardine.

THEREFORE IN CONSIDERATION OF the covenants hereinafter contained and for value received, the parties agree as follows:

SECTION 1 INTENT AND INTERPRETATION

1.1 Definitions.

In this Agreement the following terms have the respective meanings set out below:

(a) "**Adjacent Municipalities**" means collectively, the Corporation of the Town of Saugeen Shores, the Corporation of the Township of Huron-Kinloss, the Corporation of Arran-Elderslie and the Municipality of Brockton;

(b) "**Agreement**" means this agreement, including any recitals and schedules thereto, as amended or restated from time to time by Amendment;

(c) "**Arbitrator**" means a single arbitrator who must be a retired judge of the Supreme Court of Canada, the Superior Court of Justice (Ontario) or of any court of a Canadian province having jurisdiction comparable to, or higher than that, of such court or such person as the Parties mutually agree upon;

(d) "**Amendment**" means a written amendment signed by the parties which makes any change to this Agreement or an amended or restated agreement. "Amend", "Amends" and "Amended" shall have similar meanings;

(e) "**Business Day**" means any day other than a Saturday, Sunday, New Year's Day, Good Friday, Easter Monday, Victoria Day, Canada Day, Civic Holiday, Labour Day, Thanksgiving Day, Christmas Day and Boxing Day or any other public holiday declared by the federal or provincial government. Each Business Day will end at 3 p.m. on that day;

(f) "**CNSC**" means the Canadian Nuclear Safety Commission established under the *Nuclear Safety and Control Act (Canada)* and any successor agency, board, or commission;

(g) **"Community Consultation"** means the public consultation relating to the construction and operation of DGR, conducted by Kincardine in consultation with OPG in accordance with SECTION 3 of this Agreement;

(h) "**CPI (Ontario)**" means for a calendar year the historical consumer price index for the Province of Ontario (time base = 100), or the price index most nearly corresponding thereto should the said consumer price index not be published for any time during the period in question, as published by Statistics Canada or any successor or other body which may assume responsibility for the preparation and publishing of the said consumer price index or corresponding index, as the case may be;

(i) "**Decommissioning Waste**" means L&ILW derived from removing a nuclear generating station, or nuclear waste facility, or any part thereof, from service and "Decommissioning" and "Decommissioned" shall have a similar meaning;

(j) "**Deep Geologic Repository**" or "**DGR**" means deep rock vaults excavated at depths below ground surface, capable of permanently accommodating L&ILW including Decommissioning Waste exclusively derived from nuclear generating facilities and associated facilities located in the Province of Ontario and is synonymous with a facility for deep geological disposal of L&ILW;

(k) "**IAR**" means the Final Report on Independent Assessment of Long-Term Management Options for Low and Intermediate Level Wastes at OPG's Western Waste Management Facility, prepared by Golder Associates Ltd., Revision 3, February 2004;

(l) "**Inflation Rate**" means the rate of change in CPI (Ontario) in one year compared to CPI (Ontario) for the previous year expressed as a percentage. For example, if the consumer price index was 105 for one year and 107 for the next year, the Inflation Rate for that next year would equal 1.90% [(107-105)/105x 100];

(m) "**Interest**" means 3.25% plus the Inflation Rate compounded annually;

(n) "**Low and Intermediate Level Waste**" or "**L&ILW**" means material containing nuclides emitting alpha, beta or gamma radiation, in concentrations or quantities that exceed any federal or provincial laws, policies, guidelines, orders, directives, certifications, approvals and licences for unrestricted release to the environment, other than irradiated fuel and refers to L&ILW:

- derived from the operation or decommissioning of CNSC licensed facilities owned by OPG or its subsidiaries as of the execution of this Agreement on the Bruce, Darlington and Pickering nuclear sites;
- produced by or stored at facilities in Ontario associated with the operation of the Bruce, Darlington or Pickering nuclear generating stations;
- stored by OPG at the WWMF;
- stored at the Radioactive Waste Operations Site #1 in Kincardine;
- stored at the research laboratories located at 800 Kipling Avenue (Toronto);
- derived from new nuclear generation facilities described in SECTION 5; and
- any other L&ILW which the Parties agree by amendment to include in this Agreement;

(o) "**Notice**" means any notice, required or permitted to be given under this Agreement and "**Notify**" has a similar meaning;

(p) "**Parties**" means Kincardine and OPG and "Party" means either Kincardine or OPG, depending upon the context;

(q) **"PVPP"** means the Property Value Protection Plan as set out in SECTION 7;

(r) "**Section**" means a section including all subsections of this Agreement;

(s) "**Schedule A**" to this Agreement lists the schedule of payments from OPG to the Municipalities from 2005 through 2034 inclusive with listed sharing by Kincardine and the Adjacent Municipalities;

(t) "**WWMF**" means the facility located in Kincardine and currently licensed by the CNSC.

1.2 Method of Payment

Amounts to be paid under this Agreement are to be paid in Canadian Dollars or, for greater certainty, the lawful currency of Canada.

1.3 Including

The term "**including**" means including without limitation and the term "**include**," "**includes**," and "**included**" have similar meanings.

SECTION 2 TERM AND TERMINATION

2.1 Term.

This Agreement is effective as of the 13th day of October, 2004.

With respect to the provisions relating to Decommissioning Waste from the Bruce, Darlington and Pickering nuclear generating stations and CNSC licensed facilities associated with the operation of such stations, this Agreement shall continue until such time as the WWMF including the DGR is no longer needed for long-term management of such waste. With respect to L&ILW other than Decommissioning Waste, this Agreement shall continue up to and including the 31st day of December 2035, unless this Agreement terminates earlier as provided herein, or in the event that the DGR continues to receive such waste, the terms of this Agreement, including payment obligations, will be extended and continued in full force until the Parties negotiate an amended or alternative agreement.

2.2 Termination.

Notwithstanding anything to the contrary, herein,

(a) Subject to the Notice required in this Section 2.2(a), this Agreement shall terminate immediately with no further obligation on either of the Parties if the Community Consultation is not completed by February 28, 2005 or such other date as is agreed to by the Parties, or if completed by then, the Community Consultation is not acceptable for any reason to either or both of the Parties. If either Party determines that the Community Consultation is not acceptable then it shall give the other Party Notice of that decision within forty-five (45) days of February 28, 2005.

(b) This Agreement shall terminate immediately with no further obligation on either Party and any funds held by OPG, in trust in a separate bank account, to be applied in accordance with this Agreement, shall be immediately returned to OPG, including any accumulated Interest, if the DGR cannot be advanced, constructed, or there is no reasonable prospect thereof, because of events outside of the reasonable or actual control of the Parties. For example, such an event shall include denial by the CNSC or other competent authority of a required licence for such construction or the conditions associated with obtaining any such licence are unreasonable or unduly onerous as determined by OPG. The issues of whether the DGR can be advanced, constructed, or there is no reasonable prospect thereof, due to events outside the control of the Parties, may be submitted to arbitration in accordance with this Agreement.

SECTION 3 COMMUNITY CONSULTATION

3.1 Community Consultation.

(a) Kincardine shall conduct and complete a Community Consultation agreeable to the Parties no later than February 28, 2005 or such other date as is agreed to by the Parties.

(b) The question asked in the Community Consultation shall be clear, concise, neutral and capable of being answered affirmatively or negatively by a yes or no.

SECTION 4 PAYMENTS

4.1 OPG Fees Payable to Kincardine and Adjacent Municipalities.

OPG shall pay fees by way of lump sums, and annual payments to Kincardine and the Adjacent Municipalities in accordance with the following terms and conditions and in the amounts set out in Schedule A:

(1) Lump sum payments:

(A) By June 30th, 2005 and provided that OPG is satisfied that the Community Consultation represents a clear mandate from the population of Kincardine to Kincardine Council in favour of the DGR, OPG shall pay to Kincardine and the Adjacent Municipalities the sum of 2.1 million dollars for future undetermined community projects. The sum shall be paid by OPG to Kincardine and the Adjacent Municipalities in accordance with Schedule A to this Agreement in the amounts stipulated in the "one-time payment" column assigned to each of the municipalities for the year 2005. Further, OPG shall make a separate one-time lump sum payment to only Kincardine in the sum of 1.6 million dollars.

(B) The amounts paid to Kincardine and the Adjacent Municipalities shall be adjusted for the Inflation Rate from the date the Agreement is executed to the date the payment is made.

(C) A further 2.1 million dollars shall be paid by OPG to Kincardine and the Adjacent Municipalities within ninety (90) days of the CNSC granting DGR construction licence approval to OPG, determined to be acceptable to OPG acting reasonably and provided OPG is satisfied there are no other approvals required to construct the DGR and that there is no legal challenge to the issuance of such construction licence for which OPG has received notice in writing, which could prevent OPG from proceeding with construction or operation of the DGR, all of which issues may be submitted to arbitration. Subject to the foregoing, OPG shall provide written notice to Kincardine of its determination within ninety (90) days of receipt from the CNSC of such licence. The said 2.1 million dollars

shall be paid by OPG to Kincardine and the Adjacent Municipalities in amounts set out in accordance with Schedule A to this Agreement in the amounts stipulated under the "one-time payment" column assigned to each of Kincardine or the Adjacent Municipalities for the year 2013 which is the general time frame anticipated for receipt of such licence and which is not intended to be a commitment of the time for payment. OPG may, in its sole discretion, acting reasonably, decline to make such lump sum payment to any or all of the municipalities, should any of such municipalities have failed to exercise best efforts to support the construction of DGR in which case the affected municipality will not have any right to receive or recover that payment. Kincardine has the right to submit the issues of whether it has exercised best efforts to support DGR construction and is thereby entitled to its one-time lump sum payment to arbitration in accordance with this Agreement. OPG shall pay half of any lump sum payment not paid to an Adjacent Municipality under this Section to local community projects and/or local charities agreeable to both OPG and Kincardine.

(D) The amounts paid to Kincardine and the Adjacent Municipalities shall be adjusted for the Inflation Rate from the date the Agreement is executed to the date the payment is made.

(2) Annual Payments:

(A) Subject to the terms hereof, commencing in 2005, OPG shall pay to Kincardine and the Adjacent Municipalities on or before December 31st of each year, the sum of 1.05 million dollars. This annual sum shall be paid by OPG to Kincardine and the Adjacent Municipalities in accordance with Schedule A to this Agreement in the amounts set out in Schedule A stipulated under the column headed "annual" payment which are assigned for each year to each of Kincardine and the Adjacent Municipalities.

(B) The amounts paid to Kincardine and the Adjacent Municipalities shall be adjusted for the Inflation Rate from the date the Agreement is executed to the date the payment is made.

(3) Milestones and their Impact on Payments:

(A) The Parties acknowledge that a reasonable time-frame for the achievement of the following milestones is:

(i) **2007** – Issuance of the necessary terms of reference or guidelines for the preparation of the environmental assessment undertaken under the *Canadian Environmental Assessment Act* as amended, consolidated, supplemented, or replaced from time to time.

(ii) **2010** – Approval of the environmental assessment undertaken under the *Canadian Environmental Assessment Act* as amended, consolidated, supplemented, or replaced from time to time.

(iii) **2013** – Approval of the licence to construct the DGR under the *Canadian Nuclear Safety & Control Act* as amended, consolidated, supplemented, or replaced from time to time.

(iv) **2017** – Approval of the licence to operate the DGR under the *Canadian Nuclear Safety & Control Act* as amended, consolidated, supplemented, or replaced from time to time.

(B) The Parties shall, in good faith, exercise their best efforts to achieve these milestones. Without limiting the generality of the foregoing and in accordance with any legal responsibilities either Party may have, the Parties shall provide their cooperation in support of the environmental approvals and licensing applications sought as well as any other approvals or licences required to construct or operate the DGR. Further, Kincardine shall give due consideration to providing OPG with all approvals within its jurisdiction to grant in order to permit the construction and operation of the DGR and will expeditiously process applications in this regard. Kincardine shall also respond in a timely fashion to all requests by the CNSC, or other competent authority, for information and make appearances at all CNSC hearings relating to DGR. OPG shall process its applications for the requisite regulatory approvals with due diligence.

(C) Notwithstanding anything to the contrary in this SECTION 4 if at any time OPG determines that the Adjacent Municipalities are not, in good faith, exercising best efforts to achieve any of these milestones, OPG may, in its sole discretion, acting reasonably, decline to make further annual payments or any further one-time lump sum payments set out in Schedule A for any or all of the aforementioned municipalities, as the case may be, which OPG has determined is failing to exercise best efforts, in which case the affected municipality will not have any right to receive or recover that payment. OPG shall pay half of any annual or one-time lump sum payment not paid to the affected municipality to local community projects and/or local charities agreeable to both OPG and Kincardine.

(D) Notwithstanding anything to the contrary in this SECTION 4, if, at any time, OPG determines in its sole discretion, acting reasonably, that Kincardine is not, in good faith, exercising best efforts to achieve any of these milestones, OPG may in its sole discretion, acting reasonably, make further one-time lump sum payments or any further annual payments set out in Schedule A for Kincardine, in which case Kincardine will not have any right to receive or recover such payment, subject to Kincardine's right to demand that the issue

of whether Kincardine is exercising best efforts to support any such milestones be submitted to an Arbitrator in accordance with the arbitration SECTION 10 of this Agreement. OPG shall Notify Kincardine of its decision not to make such payments. If the Parties are not able to resolve the dispute within thirty (30) days of such Notice or such longer period as agreed to, the dispute shall be submitted to arbitration in accordance with SECTION 10.

(E) Should any of the milestones cited above not be achieved by the end of the year following the year in which they are anticipated to occur and Sections 4.1(1)(C), 4.1(3)(C) or (D) do not apply, the annual payment for each of Kincardine and the Adjacent Municipalities due for that year and any year thereafter until the milestone is met, as provided for in Schedule A, shall be held by OPG in trust in a separate bank account to be applied in accordance with this Agreement. OPG shall not use such funds for any purpose other than those stipulated in this Agreement.

(F) Upon the reaching of the missed milestone the money then held in trust under this Section shall be paid to Kincardine and the Adjacent Municipalities in accordance with Schedule A.

(G) Aside from the failure of Kincardine and/or the Adjacent Municipalities to exercise best efforts, which shall be governed by Section 4.1(1)(C), 4.1(3)(C) or (D) if, for any other reason, the milestone for licence approval of DGR operation is not reached in 2017, the Parties shall endeavour to Amend this Agreement to account for this missed milestone and any others outstanding and, in particular, the Parties shall address in the Amended Agreement the manner in which the money held in trust in accordance with this Section, is to be distributed, whether the annual payments to Kincardine and the Adjacent Municipalities as provided for in Schedule A should continue to be required, or whether some reduced sum should be substituted for that amount. If an Amendment satisfactory to the Parties is not reached by June 30th 2018, and the 2017 milestone and any others, as the case may be, has (have) still yet to be achieved, the Parties shall thereupon immediately submit the issue of a suitable Amendment of the Agreement to accommodate the missed milestone(s) to binding arbitration in accordance with the arbitration SECTION 10 of this Agreement.

(H) In determining a suitable Amendment to the Agreement, including whether money held in trust in accordance with this Section should be returned to OPG and whether OPG should be required to make any further annual payments to Kincardine or the Adjacent Municipalities following the missed milestone(s), the Parties or the Arbitrator, as the case may be, shall consider the following:

(i) ***The reason for the failure to reach the milestone***. For greater certainty, if, for example, the reason for failing to reach the milestone has, in whole or in part, been caused by the conduct of Kincardine or the Adjacent Municipalities, that conduct and any other facts or circumstances attributed to Kincardine and/or the Adjacent Municipalities should weigh in favour of irrevocably returning some or all of the money held in trust to OPG and eliminating or reducing any obligation to make further annual payments, depending upon the extent to which the conduct or other attributed facts or circumstances contributed to the missed milestone. Conversely, if the reason for the missed milestone involves, in whole or in part, OPG's failure to exercise best efforts to meet the requisite approval requirements, depending upon the extent to which OPG's failure contributed to the missed milestone, such failure should weigh in favour of releasing all or part of the money held in trust to Kincardine and the Adjacent Municipalities and retaining all or part of the obligation to make the remaining annual payments under the Agreement.

(I) Notwithstanding CNSC licence approval to operate the DGR in 2017, should the DGR not be in service by 2018, or should OPG for any reason be prevented from operating the DGR at any time after 2018, annual payments to be made for the calendar year following 2018, or the year in which OPG was prevented from operating the DGR, as the case may be, shall be held by OPG in trust in a separate bank account to be applied in accordance with this Agreement. OPG shall not use the said money for any purpose other than those stipulated in this Agreement. The Parties shall endeavour to amend the Agreement to provide for the manner in which the money held in trust will be distributed, whether the annual payments to Kincardine and the Adjacent Municipalities as provided for in Schedule A should continue to be required, or whether some reduced sum should be substituted for that amount. If an Amendment cannot be reached within a year of the failure of the DGR to commence to operate, or cease to operate as the case may be, the Parties shall immediately thereafter submit the Amendment of the Agreement to binding arbitration in accordance with SECTION 10 of this Agreement. In determining how the Agreement should be Amended, the Parties or the Arbitrator, as the case may be, shall consider:

(i) The reason for the failure to commence or continue the operation of the DGR. For greater certainty, the extent to which any of these results from either Party, not supporting DGR shall be the determinative factor in releasing OPG from any further financial obligations in the case of Kincardine withdrawing support for the facility, or in continuing such obligations in the case of OPG's abandonment of DGR.

(J) If OPG determines that the Adjacent Municipalities are not, in good faith, exercising best efforts to support the operation of the DGR and the failure of one or more of them has contributed to the failure of the DGR to commence operation despite CNSC licence approval or the failure of the DGR to continue operation thereafter, OPG may, in its discretion, decline to make the annual payment set out in Schedule A for any or all of the said municipalities, as the case may be, which OPG has determined is failing to exercise best efforts in which case the affected municipality will not have any right to receive or recover that payment. OPG shall pay half of any annual payment not paid to the affected municipality to local community projects and/or local charities agreeable to both OPG and Kincardine.

(K) When monies held in trust in accordance with this Agreement are released to Kincardine and the Adjacent Municipalities pursuant to this Agreement, the Interest shall accrue on any such monies from the time that the money was placed in trust and such accrued interest shall be payable to the municipalities at the time the money in trust is released to the municipalities.

4.2 Continuing Waste Management Rights

Nothing in this Agreement shall be construed as limiting, in any manner, OPG's right, and that of any relevant subsidiary, to continue to store L&ILW, including Decommissioning Waste, at the WWMF and the Radioactive Waste Operations Site #1 in Kincardine and to further bring onto the WWMF L&ILW, including Decommissioning Waste derived from the Bruce, Darlington or Pickering nuclear generation stations and any CNSC licensed facilities associated with the operation of those stations, owned or operated by OPG as of the time of the execution of this Agreement, whether or not such facilities or any of the reactors in such stations are in service as of such date. Nevertheless, if the Agreement is terminated or DGR does not advance, the Parties agree to negotiate a new agreement to address the storage of such L&ILW.

SECTION 5 L&ILW DERIVED FROM NEW NUCLEAR GENERATION FACILITIES

5.1 Waste from New Facilities.

OPG is entitled to use the DGR for L&ILW including Decommissioning Waste, derived from nuclear generating stations located in the Province of Ontario, in addition to the 20 nuclear reactors units and associated facilities which are, as of the date of the execution of this Agreement, at the Darlington, Bruce and Pickering nuclear generation stations. Kincardine and the Adjacent Municipalities are collectively entitled to a fee for waste from any such additional reactors. The Parties shall amend the Agreement in the event that such L&ILW derived from new nuclear generation is to be accommodated in the DGR to provide a Community fee payable by OPG to Kincardine and the Adjacent Municipalities, calculated in accordance with Section 5.2.

5.2 Calculation of The Community Fee.

Kincardine and the Adjacent Municipalities are entitled, in such an Amended Agreement, to one-time lump sum and annual payments made during the in-service life of the new nuclear generation

facilities. The calculation of the payments and the manner of payment shall be as follows:

(1) For each new nuclear generation unit, a lump sum payment equal to one twentieth of the payments stipulated in the "One-Time Payment" column assigned to each of Kincardine and the Adjacent Municipality shall be made to each municipality on the in-service date of each new generation unit. Such payment shall be adjusted for the Inflation Rate as of the year this Agreement is executed.

(2) For each new nuclear generation unit the annual payment to each of Kincardine and the Adjacent Municipalities shall be one twentieth of the amount assigned to each under the column "Annual" in Schedule A. The full annual payment shall be adjusted for the Inflation Rate as of the year that this Agreement is executed and shall continue to be paid for the in-service life of the unit.

(3) OPG may, in its sole discretion, acting reasonably, decline to make the increased payments provided for in this Section 5.2(1) and (2) to any of the Adjacent Municipalities should OPG determine that any or all of the said municipalities, as the case may be, is not, in good faith, exercising best efforts to support the receipt of the L&ILW including Decommissioning Waste derived from new nuclear generation stations and associated facilities. OPG shall pay half of any one-time lump sum payment or annual payment not paid to an Adjacent Municipality under this Section to local community projects and/or charities agreeable to both OPG and Kincardine;

(4) With respect to Kincardine's share of the increased payments provided for in this Section 5.2(1) and (2), OPG may in it's discretion, withhold those payments, should OPG determine that Kincardine is not in good faith, exercising best efforts to support the receipt of the L&ILW including Decommissioning Waste derived from new nuclear generation stations and associated facilities, subject to Kincardine's right to demand that the issue of whether Kincardine is exercising best efforts to support such receipt, be submitted to an Arbitrator in accordance with the arbitration SECTION 10 of this Agreement.

SECTION 6 MUNICIPAL TAXES AND ADDITIONAL FEES

6.1 Municipal Taxes.

For tax purposes, Kincardine and OPG will support the assessment of the value of the DGR on a basis equivalent to that on which Municipal Property Assessment Corporation assesses the value of the commercial waste storage facilities at the WWMF as of the date of this Agreement and will collect taxes on the basis of that assessment. Both parties agree to undertake a joint review of the assessment methodologies and assumptions to be utilized in this undertaking. If the method of assessment of the DGR requires any change to the *Assessment Act (Ontario)*, the *Municipal Act (Ontario)* or any other legislation, Kincardine and OPG will seek to have the legislation changed to fix the assessed value of the DGR using this method of assessment, and Kincardine will cooperate with OPG to effect the necessary changes. Kincardine constitutes OPG as trustee for OPG Waste

Inc. and any other legal entities which own the lands upon which the DGR is to be constructed, of the benefits of this section and acknowledges that OPG may enforce such benefits on behalf of OPG Waste Inc., or any such other legal entity.

6.2 Building Permits.

OPG will continue to make payments to Kincardine in lieu of the cost of building permits for both the WWMF and the DGR, such payments not to exceed the building permit fee that would otherwise apply for the applicable facility as provided for in the applicable general fee schedule.

SECTION 7 PROPERTY VALUE PROTECTION PLAN

7.1 The Plan.

The IAR concluded in early 2004 that DGR is technically feasible, safe and would ultimately have no significant adverse environmental effects. Nevertheless, OPG shall have a PVPP to compensate property owners for the actual economic losses suffered, or that would be suffered, as a result of the diminution of property values.

Upon OPG receiving approval from the CNSC to operate the DGR, OPG shall have in place a PVPP ready to provide compensation to property owners for any such actual economic losses suffered when the following conditions have been met:

(1) Proof of Causation

(A) The diminution of property value is occasioned by contamination resulting from radioactivity at the DGR site or beyond the site's boundaries, caused by the operation of DGR.

(2) The Minimum Qualification Requirements – Time and Place

(A) The diminution of property values occurs at any time during the period from the day that licensing approval to operate the DGR is granted up to and including the first anniversary following the day upon which information disclosing contamination for which a claim may be brought by a property owner would have first come to the attention of such property owner and the claim is brought within twelve (12) months of such date and in no event shall any such claim be brought after a licence to abandon the DGR is obtained from the CNSC.

(B) Diminution of property value, demonstrated in accordance with this SECTION 7 for property located within an eight (8) kilometre radius from the centre of the DGR is a prerequisite to a valid claim under PVPP. Once this prerequisite is met other property owners within Kincardine and the Adjacent Municipalities who can demonstrate actual loss occasioned by diminution of property value in accordance with this SECTION 7 are qualified to apply under PVPP.

(3) The Minimum Application Requirements

(A) *Proof of causation* All compensation claims must contain sufficient detail to allow OPG and any independent assessor it may retain to verify whether the diminution in value claimed has been caused by the operation of the DGR during the period of time and within the relevant location required under this SECTION 7.

(B) *Proof of the Amount of Diminution in Value* All compensation claims must contain sufficient detail to allow OPG and any independent assessor it may retain to verify the alleged diminution in value. The claim must include sufficient information on how the claimant arrived at the fair market value of the property and the basis upon which the claimant contends that the value has been diminished by the amount claimed. Claims of less than $5,000 adjusted for Inflation, as of the execution of this Agreement, are ineligible under PVPP. In no event shall the amounts paid out on any claim exceed the market value price of the property but for the diminution in value meeting the conditions under this Section.

(C) *Confirmation by Qualified Assessor* All compensation claims must be confirmed in writing by a qualified local realtor or appraiser.

(D) *Proof of Title* All compensation claims, must be accompanied by supporting documentation establishing the claimant's legal ownership of property within Kincardine and the Adjacent Municipalities and within the period of time stipulated in this provision.

(4) The Claimants Remedies.

(A) OPG, at its discretion, may choose to pay the compensation claimed, a lesser amount which it believes is the true diminution in value, deny the claim, or offer to purchase the property for either the amount claimed or the lesser amount which reflects the value of the property.

(B) If the claimant and OPG do not agree on the appropriate remedy, the matter shall proceed to arbitration in accordance with the arbitration procedure in this Agreement with such modifications as are necessary to have such procedure apply to the claimants.

(C) OPG shall have received a signed, full and final release from the property owner as a condition precedent to a payment under the PVPP.

SECTION 8 NUCLEAR WASTE MANAGEMENT JOBS

8.1 Staffing.

(a) Staffing of the DGR shall be conducted in accordance with an OPG human resources plan.

(b) Full time OPG employees at the DGR shall be governed by the collective bargaining agreements to which OPG is a party, where applicable.

(c) Beyond the day-to-day DGR construction and operation jobs which, by their nature are located at the WWMF in Kincardine, new full time OPG employees hired exclusively for DGR shall be located at the WWMF.

(d) For greater certainty, jobs existing as of the time of execution of this Agreement are not subject to relocation to WWMF.

SECTION 9 SUPPORTING A CENTRE OF ENERGY EXCELLENCE: TOURS, VOCATIONAL SCHOOLS

9.1 Educational Tours.

Subject to compliance with all regulatory requirements and in particular and without limiting the foregoing, regulations, guidelines, standards and licensing conditions relating to security and radiation protection, the Parties shall accommodate local and international tours of the DGR facility in support of education.

9.2 Vocational Schools.

The Parties recognize that trades vocational schools within the municipalities are a means of further increasing Kincardine and the Adjacent Municipalities' educational opportunities and presence as a centre of energy excellence and support this concept.

9.3 Centre of Energy Excellence

OPG and Kincardine agree to each use commercially reasonable efforts to support the concept of a centre of energy excellence.

SECTION 10 ARBITRATION

10.1 Disputes Referred to Arbitration.

Any matter referred to arbitration under this Agreement shall be governed by the *Arbitration Act, 1991 (Ontario)*.

10.2 Notice of Arbitration and Appointment of Arbitrator.

Should either of the Parties submit an issue to arbitration, the Party shall give fifteen (15) Business Days Notice to the other Party. If the Parties fail to appoint an Arbitrator within fifteen (15) Business Days of the expiry of the Notice of arbitration, a Party may apply to a judge of the Superior Court of Justice of Ontario, on Notice to the other Party, for the appointment of the Arbitrator.

10.3 Powers of Arbitrator.

The Arbitrator may determine all questions of law, fact and jurisdiction regarding the arbitration (including questions as to whether the matter at issue is arbitrable) and all matters of procedure relating to the arbitration. The Arbitrator may grant legal and equitable relief (including injunctive relief), award costs (including legal fees and the costs of the arbitration) and award Interest. Without limiting the generality of the foregoing or the Arbitrator's jurisdiction at law, the Arbitrator may:

(1) determine any question of good faith, dishonesty or fraud arising in the matter at issue

(2) order either Party to furnish further details of that Party's case, in fact or in law;

(3) proceed in the arbitration notwithstanding the failure or refusal of either Party to comply with this Section 10.3(3) or with the Arbitrator's orders or directions, or to attend any meeting or hearing, but only after giving that party Notice that the Arbitrator intends to do so;

(4) receive and take into account written or oral evidence tendered by the Parties that the Arbitrator determines is relevant, whether or not strictly admissible in law;

(5) make interlocutory determinations or interim orders or awards;

(6) hold meetings and hearings and make a decision (including a final decision) in Kincardine (or elsewhere with the concurrence of the Parties); and

(7) order the Party to provide to the Arbitrator, and to the opposing Party for inspection, and to supply copies of, any documents or classes of documents in its possession or control that the Arbitrator determines to be relevant;

10.4 Arbitration Procedure.

The arbitration will take place in Kincardine at such place and time as the Arbitrator may fix. The arbitration will be conducted in English. Within 10 Business Days of the appointment of the Arbitrator, the Parties will either agree on the procedure to be followed for the arbitration or the Arbitrator will determine the appropriate procedure, in accordance with the principles of natural justice, to be followed. The Parties will keep confidential and not disclose to any other person, the arbitration and all matters arising directly or indirectly from the matter(s) at issue (including all documents exchanged, the evidence and the award), except as set out in this Section 10.4. A Party may disclose any such information to the extent required:

(1) to obtain assistance from persons to conduct the matters under arbitration;

(2) by law or securities exchange rules; or

(3) by a disclosure requirement with a shareholder, lender or potential lender (including any advisor to any such recipient person), so long as such person is

informed of the confidential nature of such information and such person agrees to be bound, subject to law, by such confidentiality obligation.

10.5 Arbitrator's Decision.

No later than 20 Business Days after hearing the representations and evidence of the Parties, the Arbitrator will make the Arbitrator's determination in writing, with reasons, and deliver one copy to each of the Parties. The Arbitrator may only interpret and apply the terms of this Agreement and, except as expressly permitted, may not change this Agreement in any manner. The decision of the Arbitrator will be final and binding upon the Parties regarding all matters relating to the arbitration, the conduct of the Parties during the proceedings and the final determination of the matter at issue.

10.6 No Appeal and Enforcement.

Subject to section 44 of the *Arbitration Act, 1991 (Ontario)*, the Parties may not appeal from the determination of the Arbitrator to any court. The Parties may enter any judgment upon any award rendered by the Arbitrator in any court having jurisdiction.

10.7 Costs of Arbitration.

Subject to the terms of this Agreement, the Parties will bear the costs of any arbitration in the manner specified by the Arbitrator. Subject to the terms of this Agreement, if the Arbitrator does not specify the costs, each Party will bear its own costs and will share the costs of the Arbitrator equally.

SECTION 11 COMPENSATION FOR COMMUNITY CONSULTATION & LEGAL SERVICES

11.1 OPG to Compensate Kincardine.

OPG will compensate Kincardine for all reasonable expenses agreed in advance that are incurred in holding the Community Consultation in SECTION 3 engaging consultants or peer reviewers and with respect to legal services, such services as are required in connection with this Agreement up to and including December 31st, 2005. Additional financial support thereafter shall be mutually agreed to by both Parties.

SECTION 12 GENERAL TERMS AND CONDITIONS

12.1 Entire Agreement.

This Agreement and all documents contemplated by or delivered under or in connection with this Agreement, constitute[s] the entire agreement between the Parties with respect to the subject matter and supersede[s] all prior agreements, negotiations, discussions, undertakings, representations, warranties and understandings, whether written or oral.

12.2 Schedules:

The following Schedules are attached to and form part of this Agreement:

(1) Schedule A Municipal Sharing Schedule of one–time and annual payments to be made by OPG to Kincardine and the Adjacent Municipalities from 2005 to 2035 inclusive.

12.3 Notice:

Every Notice required or permitted under this Agreement must be in writing and may be delivered in person, by courier or by fax to the applicable Party, as follow:

if to **OPG,** Ontario Power Generation Inc. 700 University Avenue, H16 Toronto, Ontario M5G 1X6 **Attention:** Vice-President, Nuclear Waste Management Division **Fax:** 416-592-7051 **Copy To:** Vice-President Law and General Counsel **Fax:** 416-592-1466	if to **Kincardine,** Municipality of Kincardine Municipal Administration Centre 1475 Concession 5, R.R.#5 Kincardine, Ontario N2Z 2X6 **Attention:** Chief Administrative Officer of Municipality **Fax:** 519-396-8288

or to any other address, fax number or individual that a party designates by Notice. Any Notice under this Agreement, if delivered personally or by courier will be deemed to have been given when actually received, if delivered by fax before 3:00 p.m. on a Business Day will be deemed to have been delivered on that Business Day and if delivered by fax after 3:00 p.m. on a Business Day or on a day which is not a Business Day will be deemed to be delivered on the next Business Day.

12.4 Amendments:

Except as expressly provided in this Agreement, no amendment, supplement, restatement or termination of this Agreement in whole or in part is binding unless it is in writing and signed by each Party.

12.5 Waivers:

No waiver of any term of this Agreement is binding unless it is in writing and signed by all the Parties entitled to grant the waiver. No failure to exercise, and no delay in exercising, any right or remedy, under this Agreement will be deemed to be a waiver of that right or remedy. No waiver of any breach of any term of this Agreement will be deemed to be a waiver of any subsequent breach of that term.

12.6 Further Assurances:

Each of the Parties will, from time to time and promptly upon request, sign and deliver all further documents and take all further action reasonably necessary or appropriate to give effect to the terms

of this Agreement and to complete the transactions contemplated by this Agreement.

12.7 Jurisdiction and Governing Law:

Except as otherwise expressly provided in this Agreement, each of the Parties irrevocably submits to the exclusive jurisdiction of the courts of Ontario. This Agreement and any arbitration conducted under this Agreement, are governed by and are to be construed and interpreted in accordance with the laws of Ontario and the laws of Canada applicable in Ontario.

12.8 Liability:

The Parties acknowledge that the precise amount of actual damages, loss, expense, or claims, would be extremely difficult to calculate and that the compensation provisions in this Agreement coupled with the adjustment mechanism of Amendment and if necessary, binding arbitration, represent a reasonable, genuine and comprehensive pre-estimate of the actual damages which may be reasonably incurred and are not a penalty. The Parties therefore release each other, their council members, directors, officers, shareholders, employees, agents and representatives, as the case may be, from all claims, damages, losses, liabilities and expenses of any nature whatsoever arising in respect of this Agreement, aside from such claims as are brought for compensation under the specific terms of this Agreement.

12.9 Survival:

The obligations set out under the Property Value Protection Plan (PVPP) will survive the termination or expiration of this Agreement up until such time as the licence to abandon the DGR is obtained from the CNSC.

12.10 Assignment and Benefit:

This Agreement enures to the benefit of and binds the Parties and their respective successors and assigns. Each Party shall be entitled to thirty (30) Business Days Notice of an assignment by the other Party. Upon an assignment, no amount shall be required to be paid nor any other term imposed. On the agreement of the assignee to assume the obligations of the assignor under this Agreement, the assignor will, without the necessity of any other documentation, be released from all its obligations under this Agreement.

IN WITNESS WHEREOF the parties have affixed their signatures as of the year and date first above written.

ONTARIO POWER GENERATION INC.

Name: Richard Dicerni
Title: President and Chief Executive Officer (Acting)

I have authority to bind the corporation

Name: Ken Nash
Title: Vice President
Nuclear Waste Management Division

THE CORPORATION OF THE MUNICIPALITY OF KINCARDINE

Name: Glenn Sutton
Title: Mayor

I have authority to bind the corporation

Name: John deRosenroll
Title: Chief Administrative Officer

SCHEDULE "A"
DATED **October 13, 2004**
- BETWEEN -
ONTARIO POWER GENERATION INC. AND THE CORPORATION OF THE MUNICIPALITY OF KINCARDINE
MUNICIPAL SHARING SCHEDULE

Expressed in thousands of dollars. Sharing below is in constant dollars but actual payments will be indexed to Inflation Rate.

Year	Kincardine		Saugeen Shores		Huron Kinloss		Arran-Elderslie		Brockton	
	One Time Payment	Annual Payment	One Time Payment	Annual Payment	One Time Payment	Annual Payment	One Time Payment	Annual Payment	One Time Payment	Annual Payment
2005	1,300	650	500	250	140	70	80	40	80	40
2006		650		250		70		40		40
2007		650		250		70		40		40
2008		650		250		70		40		40
2009		650		250		70		40		40
2010		650		250		70		40		40
2011		650		250		70		40		40
2012		650		250		70		40		40
2013	1,300	650	500	250	140	70	80	40	80	40
2014		650		250		70		40		40
2015		650		250		70		40		40
2016		650		250		70		40		40
2017		650		250		70		40		40
2018		650		250		70		40		40
2019		650		250		70		40		40
2020		650		250		70		40		40
2021		650		250		70		40		40
2022		650		250		70		40		40
2023		650		250		70		40		40
2024		650		250		70		40		40
2025		650		250		70		40		40
2026		650		250		70		40		40
2027		650		250		70		40		40
2028		650		250		70		40		40
2029		650		250		70		40		40
2030		650		250		70		40		40
2031		650		250		70		40		40
2032		650		250		70		40		40
2033		650		250		70		40		40
2034		650		250		70		40		40

Share Units					
	25	25	7	4	4
	Host Community -40				
	Total-105				

UPDATE ON OPG'S PROPOSED DEEP GEOLOGIC REPOSITORY

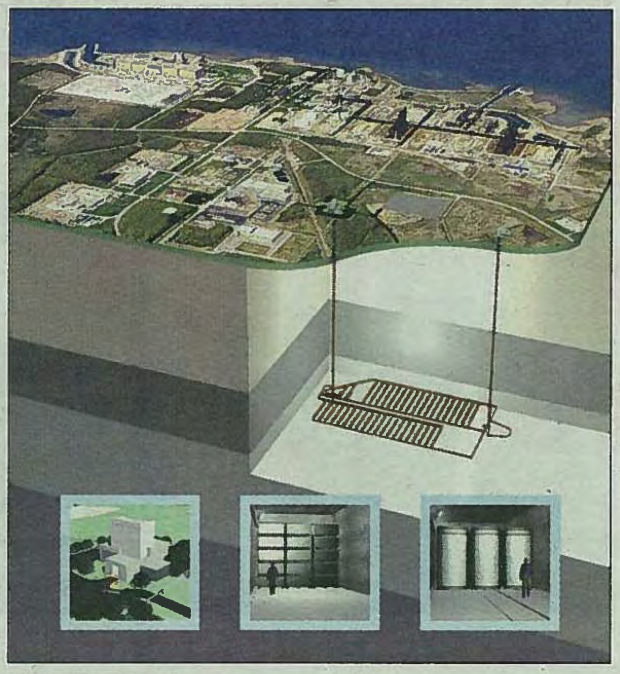
ONTARIO POWER GENERATION'S DEEP GEOLOGIC REPOSITORY FOR LOW-LEVEL AND INTERMEDIATE-LEVEL NUCLEAR WASTE WILL BE APPROXIMATELY 660 METRES (2150 FEET) BELOW THE EXISTING WASTE MANAGEMENT FACILITY AT THE BRUCE NUCLEAR SITE.

DEPTH

Under OPG's proposal, low-level and intermediate-level waste would be stored in large vaults carved into the limestone layer of earth, 660 metres (or 2150 feet) below ground level.

While it is important, it isn't just the depth that is crucial to the integrity and safety in the long term of the waste repository. Here are several other considerations that have gone into the proposal.

- ✔ At 660 metres, the repository would be at a depth that isolates the wastes from groundwater resources and Lake Huron.
- ✔ The bottom of Lake Huron is at least 400 metres (1300 feet) above the level of the proposed site, which is approximately a kilometre and a half from the Lake Huron shoreline.
- ✔ The groundwater at the proposed repository depth is three times the salinity of sea water, indicating that it has been isolated at that depth for approximately one million years and is not mixing readily with the fresh water above it, evidence that the waste can be safely isolated for generations to come.



Artist illustration of the DGR

GEOLOGY

The Deep Geologic Repository would be carved out of the limestone layer found at between 600 and 800 metres underground. Some of the characteristics of this limestone are:

- ✔ The limestone is 450 million years old and is seismically stable
- ✔ During that time, the rock has survived intact through major climate changes, glaciation periods and earthquakes, indicating that the limestone is expected to remain very stable long into the future.
- ✔ Low permeability – water moves at one millimetre per year through this limestone. It would take 1000 years to move one metre. This is an extremely effective factor in containing radioactive material.
- ✔ The limestone layer is overlain with 200 metres of low permeability shale which provides an additional barrier to isolate the waste.

HOW DO WE KNOW?

Of course, no human has been down there to check out the limestone and shale layers at the proposed location of the repository. Our proposal at this stage is based on an extensive body of knowledge of the geology across southern Ontario, our experience with the same rock in other parts of the Province, scientific modelling and some data from existing test bore holes. The next step is to verify the assumptions in our proposal by further studies to confirm the geology of the site, starting in 2006.

These studies will all be part of the Environmental Assessment of the project that must be undertaken as part of the federal government approvals process.

As we proceed with these studies and prepare our submission to the Canadian Nuclear Safety Commission, we will keep our neighbouring municipalities and residents fully informed at each step along the way.

To learn more visit our Web site at **www.opg.com/ops/Nwaste1AS1.asp**

ONTARIO POWER GENERATION

GETTING YOUR VIEWS
on an Important Issue

MY NAME IS DUNCAN MOFFETT. **I'm Senior Principal with Golder Associates, a leading international group of companies specialising in ground engineering and environmental science.**

On behalf of the Municipality of Kincardine and Ontario Power Generation, I managed and conducted the Independent Assessment Study that examined options for the safe storage of low and intermediate level nuclear waste. Our study led to a proposal to build a deep geologic waste repository in Kincardine, which is now before the community for approval.

In conducting and preparing our study, we followed a process of extensive and early community consultation. Our goal was to reach as many people as possible so that they could have an opportunity to give us their views on this important subject and be part of the decision-making process.

Our communications initiatives consisted of:

> Two newsletters sent to over 22,000 households in Kincardine and neighbouring municipalities;
> Five open houses held in the summer of 2003 at Kincardine, Chesley, Underwood, Port Elgin and Lucknow; and
> A dedicated website containing complete information on the project.

In addition, OPG took extraordinary efforts to inform and involve the community both early in the process and after the study was completed. These efforts included: ongoing newsletters; open houses; and the creation and staffing of the Community Consultation Centre on Queen Street, in Kincardine.

When it comes to an issue as important as the safe storage of nuclear waste, my first commitment, as well as that of OPG and of the Municipality of Kincardine, is to make sure that people in the community have the chance to express their views and concerns *before* decisions are made – not after. I am confident we fulfilled that commitment in developing the Independent Assessment Study.

Additional information on the Independent Assessment Study, including the full text of the report, can be found at www.opg.com/ops/NwasteIAS1.asp.

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ONTARIO POWER GENERATION

FACTS ABOUT OPG'S PROPOSED DEEP GEOLOGIC REPOSITORY

MY NAME IS PAULINE WITZKE. I WORK IN PROJECT ENGINEERING AT ONTARIO POWER GENERATION'S WESTERN WASTE MANAGEMENT FACILITY AND I AM A RESIDENT OF HURON-KINLOSS. OVER THE PAST COUPLE OF MONTHS, I'VE HEARD MANY COMMENTS FROM FRIENDS AND NEIGHBOURS ABOUT OPG'S PROPOSAL TO CREATE A DEEP GEOLOGIC REPOSITORY AT THE BRUCE SITE. SOME OF THE INFORMATION I'VE HEARD IS ACCURATE AND SOME IS NOT. HERE ARE THE FACTS ON THE DEEP GEOLOGIC REPOSITORY.

My background as a geologist helps me to understand the facts on the Deep Geologic Repository.

WHAT IT WILL BE

The DGR will be the long-term storage repository for low-level and intermediate-level nuclear waste from OPG's nuclear generating stations, including the reactors leased to Bruce Power.

Ninety-five per cent of the material to be stored in the repository is low-level radioactive waste such as mops, rags and used protective clothing.

Intermediate-level waste – about five per cent of the total – will include items such as resins and filters used to clean reactor systems and small reactor components.

OPG has been safely storing low-level and intermediate-level waste in interim facilities at the Bruce site for over 30 years. In fact, about 60 per cent of the operational waste that will eventually be stored in the repository is currently at the Western Waste Management Facility.

The repository will be located approximately 660 metres or 2150 feet below ground in 450-million-year-old, low permeability limestone which has remained stable through major climate changes, several glaciations and earthquakes, indicating that it would remain stable well into the future.

WHAT IT WON'T BE

The DGR at Kincardine has never been considered – and will never be used – for the storage of high level used nuclear fuel. The agreement reached with the Municipality of Kincardine explicitly excludes high level or used nuclear fuel from the material to be stored in the Deep Geologic Repository.

Neither the Environmental Assessment for the repository project nor the licensing process with the Canadian Nuclear Safety Commission will consider high level nuclear waste storage because this type of waste is not – and will never be – stored at this facility.

MOVING FORWARD

The repository proposal will now undergo a six to eight-year period of study, including a formal Environmental Assessment, before a formal submission can be placed before the Canadian Nuclear Safety Commission for a construction licence, currently planned for 2012.

As the process moves forward there will be many opportunities for public participation in the process. OPG is committed to keeping residents of the host and nearby communities fully informed on the progress of the proposal. Open Houses are scheduled in various communities.

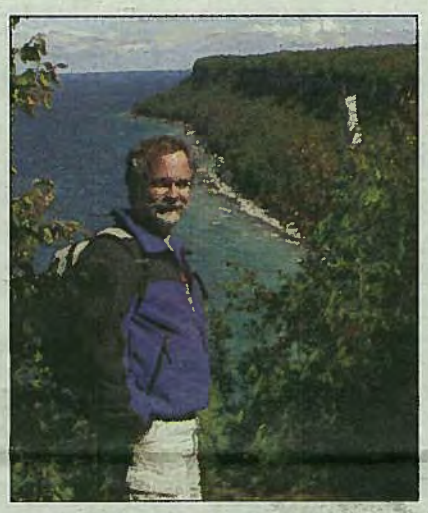
As we move ahead, my colleagues and I look forward to meeting residents face to face to discuss this proposal.

To learn more visit our website at **www.opg.com/ops/Nwaste1AS1.asp**

ONTARIO POWER GENERATION

A GEOSCIENTIST'S PERSPECTIVE

on the Proposed Deep Geologic Repository



MY NAME IS MARK JENSEN. I'm a professional geoscientist at Ontario Power Generation's Nuclear Waste Management Group. I was part of the Geotechnical Feasibility Study that examined the suitability of the geotechnical characteristics of the area around the Western Waste Management Facility to host the proposed deep geologic radioactive waste repository (DGR). The proposal is before the community for approval.

Work during this study found that there are many sound geologic factors that make this area particularly well-suited for the safe and long-term management of low and intermediate level nuclear waste.

LOW PERMEABILITY: The horizontally-layered rock formations within which the proposed DGR would be excavated have extremely low permeabilities such that groundwater flow is expected to be stagnant – an extremely effective factor in containing radioactive material.

AGE AND STABILITY: The rock formations at the site of the proposed DGR are hundreds of millions of years old and through geologic time have remained intact and undeformed – even after being subjected to repeated periods of glaciation which saw the site covered by 1500 metres of ice. The ability of these formations to withstand such force testifies to their stability, solidity and permanence.

THICKNESS AND DEPTH: The sedimentary rock formations beneath the proposed DGR site occur in predictable near-horizontal layers that "blanket" one another and extend for hundreds of kilometres. The DGR would be located in this "layer-cake" pile of sedimentary rock at a depth of 660 metres, in low permeability limestone directly overlain by 200 metres of shale. The configuration and thickness of these sedimentary rock units offer a natural barrier, isolating the repository and protecting close-to-the-surface groundwater.

PRECEDENTS AND EXPERIENCE: Over the years, underground openings such as mines and tunnels have been excavated through some of the same rock formations being proposed for the DGR. These facilities, some as far away as Cleveland, provide practical evidence of deep underground openings in limestone formations remaining dry and stable. The geologic parallels between these openings and the geologic setting beneath the Bruce site indicates that similar favourable repository conditions exist at the proposed DGR.

Based on my experience in studying the geology of the Bruce area, I believe that the proposed DGR is a viable option for providing a safe, long-term solution to the management of low and intermediate level nuclear waste.

Drop by and talk to us at our new Community Consultation Centre on Thursday, Friday or Saturday from 10:00 am to 4:00 pm at 759 Queen Street (next to Scotiabank). Or visit our web site at www.opg.com/ops/NwasteIAS1.asp and www.kincardine.net

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ONTARIO POWER GENERATION

LONG TERM SOLUTION
to Managing Nuclear Waste

MY NAME IS JOHN DAVIS. I'm a professional engineer and senior consultant with Golder Associates, a leading international group of companies specialising in ground engineering and environmental science.

I headed up the GEOTECHNICAL FEASIBILITY STUDY for the proposed deep geologic radioactive waste repository at the Western Waste Management Facility (WWMF) site here in Kincardine. Our study was conducted over a six month period and drew on more than 20 years of experience and knowledge by Ontario Power Generation (OPG) and other experts in safely managing and storing low and intermediate level nuclear waste.

THE RIGHT GEOLOGICAL CONDITIONS

The study found that the geological conditions at the WWMF site are well suited for the placement of a deep geologic repository.

> The site has strong, very old rock formations, at a depth of 600-700 metres below the surface. It's within these formations that the low and intermediate level nuclear waste would be buried.

> The formations have very low permeability, which means there is little or no ground water movement. This is effective in containing radioactive material.

> Situated above these formations, adding an extra measure of protection, is a deep layer of low permeability shale. Clay minerals in the shale act as a further chemical barrier to any potential contaminants.

> In addition, the area is noted for having very low seismic activity and as such the facility would not be threatened by an earthquake.

LONG TERM, SAFE SOLUTION

I am confident the site of the proposed deep geologic repository is an excellent location and will provide a long-term and safe solution for the storage of low and intermediate level nuclear waste.

Additional information on the GEOTECHNICAL FEASIBILITY STUDY, including the full text of the study, can be found at: www.opg.com/ops/NwasteIAS1.asp and www.kincardine.net. Or visit us at our new Community Consultation Centre on Thursday, Friday or Saturday from10 am to 4 pm.

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MYTHS AND FACTS

About the Proposed Deep Geological Repository

For the past several weeks, representatives of the Municipality of Kincardine and Ontario Power Generation have been available to answer questions and provide information to community residents on Kincardine's proposed Deep Geologic Repository for the safe storage of low and intermediate level nuclear waste. We've met with hundreds of people at the Community Consultation Centre who wanted to know more about the project and its impact. As part of our commitment to keep you informed, we've put together the following list of myths and facts that you may find useful in helping you to better understand the DGR and what it means to you.

MYTH: The DGR will be used to store high level used nuclear fuel.

FACT: The Hosting Agreement signed by the Municipality of Kincardine and OPG specifically **excludes** used nuclear fuel. The DGR would only be used to store low and intermediate level nuclear waste.

MYTH: The DGR will be built on or near the Lake Huron shoreline.

FACT: The DGR will be located about one and a half kilometres from the shoreline of Lake Huron, at the current site of OPG's Western Waste Management Facility (WWMF). The waste will be stored 660 metres below the surface in low permeability rock to ensure it is isolated from the environment for future generations.

MYTH: The DGR will contaminate local groundwater and lake water.

FACT: At a depth of 660 metres, groundwater at the proposed DGR site moves about one millimetre a year. Studies by geoscientists show that water found at this depth has up to six times the salt content of sea water and has been trapped in this rock for millions of years. This indicates the waste can be isolated from local water sources and the lake.

MYTH: The hosting fee is a "pay-back" to the community for agreeing to allow the DGR to be built here.

FACT: "Pay-back" implies the existence of environmental or safety risk. Studies show that the proposed DGR is safe for the community and the environment. Hosting agreements, similar to this one, are an international practice and have been used by a number of communities that support the location of a long-term waste management facility. One of the models for the Kincardine Hosting Agreement was the Port Hope Agreement for the storage of historic radioactive waste, which was negotiated between the federal government and the Ontario communities of Port Hope and Clarington.

MYTH: Once the community gives its approval to the proposed DGR, construction will begin within a year, and there will be no further opportunity for community input.

FACT: Before construction begins, an environmental assessment must be completed and a construction licence obtained from the Canadian Nuclear Safety Commission. These processes will take a number of years and will provide further opportunities to examine the project in detail and for additional community input and comment.

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ONTARIO POWER GENERATION

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A PUBLIC HEALTH OFFICIAL'S PERSPECTIVE

on the Proposed Deep Geologic Repository

MY NAME IS DR. HAZEL LYNN.

I am a physician and the Medical Officer of Health for Grey Bruce Health Unit.

I've been a doctor for 28 years and have specialized training in epidemiology and radiological health. As Medical Officer of Health, I implement public health programs and work with our communities on disease prevention and health promotion. Day in and day out, I put the health and well-being of all the residents of Grey Bruce first and foremost.

Based on my experience as a doctor, a specialist in radiological health and a public health officer, I believe the proposed Deep Geologic Repository (DGR) currently before the community for approval is a safe, long-term solution for the storage of low and intermediate nuclear waste. The isolation and great depth of this facility, located 660 metres below the surface, means that there is virtually no possibility of radiation leaks.

The proposed DGR will also bring tangible economic benefits to our community. As a doctor and public health officer, I know the important role that economic prosperity plays in advancing the health of both communities and individuals. By contributing to the local economy, the proposed DGR will contribute directly and indirectly to a healthy Kincardine and surrounding communities.

While I'm very satisfied that the existing nuclear waste storage facilities at the Bruce site are safe and secure from a public health perspective, I believe that the proposed DGR is an even safer and more secure option.

Visit our website at www.opg.com/ops/NwastelAS1.asp and www.kincardine.net

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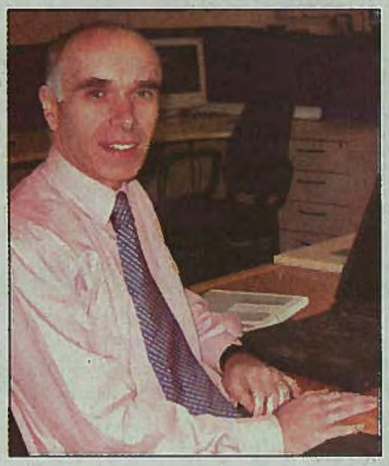
ONTARIO POWER GENERATION

SAFETY ASSESSMENT

of the Proposed Deep Geologic Repository



MY NAME IS RICHARD LITTLE (BSc, MSc). I'm an Earth Scientist and Principal Consultant with Quintessa Limited – a leading scientific consulting firm with international experience in assessing the safety of radioactive waste disposal facilities. I led a team of experts who developed the Preliminary Safety Assessment for the proposed Deep Geologic Repository (DGR) at the Bruce site here in Kincardine.

Based on our extensive analysis of the geologic evidence and other relevant site data, our team concluded that the proposed DGR will meet Canadian and International safety standards and will provide a high degree of safety for the disposal and long-term management of low and intermediate level nuclear waste.

Our assessment followed procedures consistent with the International Atomic Energy Agency's internationally recognized approach to safety assessment. Using this approach, we developed scenarios to estimate the evolution of the repository and its surroundings over many thousands of years.

These scenarios have enabled us to conclude that the effects of any radiation releases from the DGR would be minimal and significantly below what Kincardine residents receive every year from natural sources.

Based on our findings, my colleagues and I at Quintessa are confident that the proposed DGR offers a safe option for the long-term management of low and intermediate level nuclear waste.

Visit our website at www.opg.com/ops/NwastelAS1.asp and www.kincardine.net

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ONTARIO POWER GENERATION

Deep Geologic Repository Proposal Update

WORKING TOGETHER WITH SOME OF THE WORLD'S MOST EXPERIENCED PEOPLE

THE PROPOSAL

Ontario Power Generation (OPG) is proposing a Deep Geologic Repository (DGR) for low-level and intermediate-level nuclear waste 660 metres or 2150 feet directly below the existing Waste Management Facility at the Bruce Nuclear site.

Before any actual work can begin, it will take 6 to 8 years of further review, confirmation of facts and the preparation of an Environmental Assessment. Only at that point will an application to construct the facility be submitted to the Canadian Nuclear Safety Commission. At that time there will be another extensive round of reviews and public hearings before any approval is given.

INTERNATIONAL EXPERTISE

As part of this process, OPG is pleased to announce that INTERA Engineering Ltd. of Ottawa, Ont., has been selected to develop a Site Characterization Plan for the DGR.

The preparation of a Site Characterization Plan represents the first phase in the planning of a multi-year site-specific geoscientific investigation necessary to confirm the suitability of the Bruce Nuclear site for implementation of the DGR concept.

The INTERA Project Team is comprised of a multi-disciplinary group of geoscientists and geotechnical engineers with decades of experience in national and international long-term radioactive waste management programs in Sweden, Finland, Switzerland, France, United States, UK, and Japan.

PROJECT OVERSIGHT

In conjunction with the awarding of this contract, OPG has established a Geoscience Review Group to provide independent oversight and peer review of the Site Charactization Plan through its various stages of development.

The members of this group include:

- ✔ **Dr. Derek Martin,** P. GEO., P. ENG. Dr. Martin is a Professor in Geotechnical Engineering at the University of Alberta in Edmonton and has 30 years experience in site characterization for the design and construction of underground facilities. He is internationally recognized for his expertise in rock engineering.
- ✔ **Dr. Joseph Pearson,** P. GEOL. Dr. Pearson, of New Bern, North Carolina, is a consultant in groundwater geochemistry with more than 30 years of professional experience in groundwater dating, geochemistry and hydrogeology.
- ✔ **Dr. Andreas Gautschi** is the Geoscience section head at Nagra, the Swiss National Cooperative for the Disposal of Radioactive Waste. He has more than 20 years experience related to management of geoscientific work programs relevant to long-term radioactive waste management.

For more information call: 519-361-3675
or visit our Web site: **www.opg.com/dgr**

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APPENDIX D4: OPEN HOUSE REPORTS (INCLUDING PANELS)

- OPG's Deep Geologic Repository Project, Communications and Consultation Report, Community Open Houses October 2007 (Gartner Lee Ltd., 2008)
- OPG's Deep Geologic Repository Project, Communications and Consultation Report, Community Open Houses December 2008 (AECOM Canada Ltd., 2008)
- OPG's Deep Geologic Repository Project, Communications and Consultation Report, Community Open Houses November 2009 (AECOM Canada Ltd., 2009)
- OPG's Deep Geologic Repository Project, Communications and Consultation Report, Community Open Houses 2010 (AECOM Canada Ltd., 2011)

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OPG's Deep Geologic Repository Project

Communications and Consultation Report

Community Open Houses
October 2007

Prepared for

Ontario Power Generation (OPG)

Submitted by

Gartner Lee Limited

January 2008

OPG's Deep Geologic Repository Project

Communications & Consultation Report

Community Open Houses October 2007

Prepared for

Ontario Power Generation (OPG)

January 2008

Reference: **GLL 60743**

Distribution:

- **Ontario Power Generation**
- **Gartner Lee Limited**

Table of Contents

Appendices

1. Introduction

This report documents a series of seven Community Open Houses hosted by Ontario Power Generation (OPG) in October 2007. The report was prepared by Gartner Lee Limited and contains materials prepared by OPG and Gartner Lee Limited, and local newspaper reports.

2. Community Open House Topics

The community open houses were held to provide interested community members with an opportunity to learn about and provide input on the following topics:

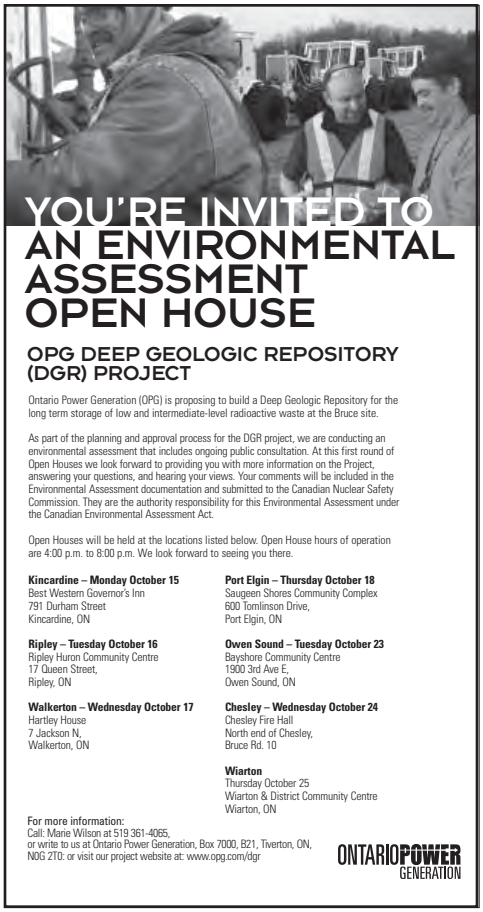
- the proposed OPG Deep Geologic Repository (DGR) project,
- the Environmental Assessment undertaken as an integral part of the planning and approval process, and
- the science and technology behind safe storage of low, intermediate and high-level waste.

The open houses also encouraged community members to play an active role in the identification of “valued ecosystem components” (VECs), and to provide comments on the open houses and the proposed project (discussed below).

3. Notification

Notification to community members was provided by the following:

- A postcard format letter of invitation delivered by Canada Post's Unaddressed Admail to nearly 50,000 households in surrounding communities, including Kincardine, Ripley, Walkerton, Port Elgin, Owen Sound, Chesley and Wiarton where the open houses were held (see Appendix A for a list of community distribution).
- A newspaper announcement published as an insert in the Kincardine News, Kincardine Independent, Lucknow Sentinel, Walkerton Herald Times, Owen Sound Sun Times, Port Elgin Shoreline Beacon, and the Wiarton Echo, prior to the open houses (Appendix A).
- Letters sent to local elected officials, City and County municipal staff leaders (including police, fire and emergency services), local and regional non-governmental organizations with a potential interest, and local and regional media outlets. Invitations were sent to a number of organizations in the United States as well (see Appendix A for the mailing list).
- Radio spots were purchased for four local radio stations that serve the open house communities. Five different announcements, specific to each open house were prepared (Appendix A).



4. Dates and Venues

The community open houses were held at the following locations:

Kincardine – Monday October 15
Best Western Governor's Inn
791 Durhyam Street
Kincardine, ON

Ripley – Tuesday October 16
Ripley Huron Community Centre
17 Queen Street
Ripley, ON

Walkerton – Wednesday October 17
Hartley House
7 Jackson N.
Walkerton, ON

Port Elgin – Thursday October 18
Saugeen Shores Community Complex
600 Tomlinson Drive
Port Elgin, ON

Owen Sound – Tuesday October 23
Bayshore Community Centre
1900 3rd Ave. E.
Owen Sound, ON

Chesley – Wednesday October 24
Chesley Fire Hall
Bruce Road 10
Chesley, ON

Wiarton – Thursday October 25
Wiarton & District Community Centre
Wiarton, ON

5. Number of Participants

A total of 191 persons registered their names as attendees of the community open houses:

Kincardine - 40
Ripley - 13
Walkerton - 16
Port Elgin - 32
Owen Sound - 42
Chesley - 26
Wiarton - 22

It is estimated that 90% of attendees signed in. Newspaper reports estimated the number of participants at more than 40 in Kincardine, 15 in Ripley, 18 in Walkerton and over 100 in Owen Sound.

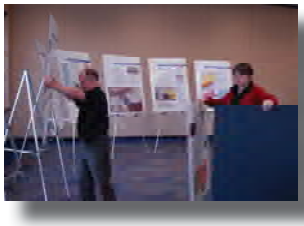
Sign-in lists are provided in Appendix E. Newspaper reports are provided in Appendix B.

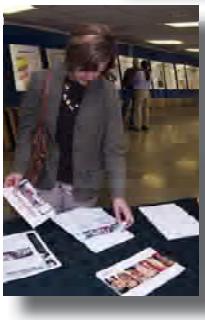
6. Community Open House Format

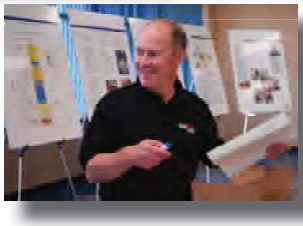
The community open houses provided an informal opportunity for community members to learn about the proposed project and to have their questions answered. Participants viewed display materials, had discussions with OPG representatives and enjoyed light refreshments.

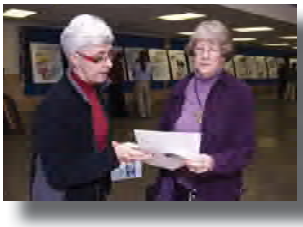
The open houses ran from 4 pm to 8 pm. Take-home copies of recent OPG newsletters, brochures describing the DGR project as well as copies of the open house display panels were available (Appendix C).

Participants were encouraged to fill out comment cards and to provide input on VECs that were important to them (see page 9 for details).



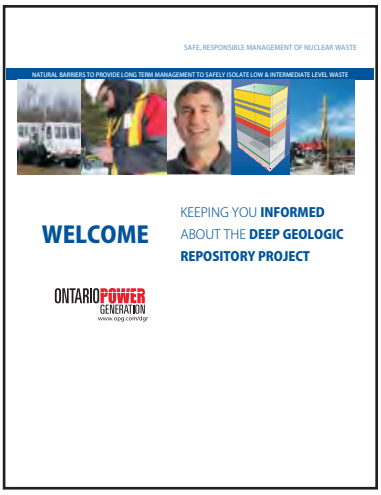


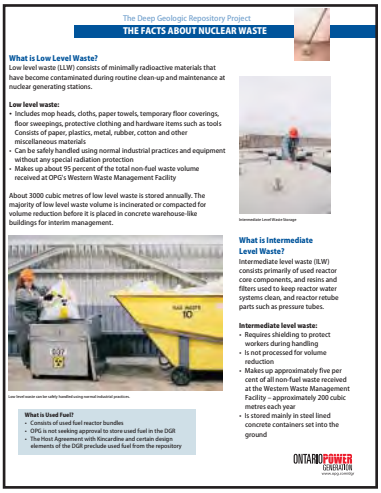



Display Panels

Nineteen 3’x5’ display panels provided the following information:

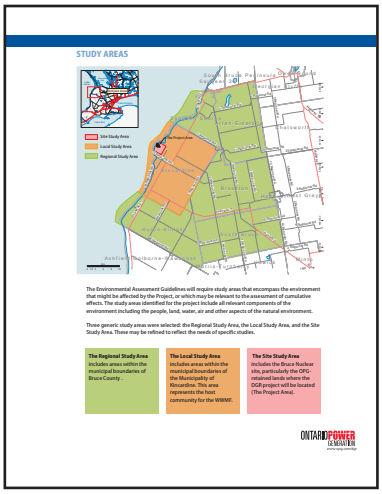
- “Welcome” – illustrating OPG employees expressing a welcoming smile, and technical photos and illustrations
- “An Overview of the Proposed Deep Geological Repository” – illustrating key features of the proposed construction and operation of a DGR
- “The Facts About Waste” – illustrating and explaining low level and intermediate level nuclear waste
- “The Steps to Move Forward” – describing and illustrating the decision and approval process
- “Scientific Investigations” – explaining the Geoscientific Site Characterization Program
- “Geoscience Studies to Date” – two panels illustrating the methodology and results of drilled borehole explorations; a 2D seismic study; and a seismology study.
- “What is Radiation?” – a description of sources of radiation in the environment, and radiation exposure regulations
- “The Safety Case for the DGR” – a description of natural barriers to protect the public, and groundwater
- “Safety Scenario Review: Malfunctions and Accidents”– an outline of safety assessments for normal operation and accidents; during Pre-Closure and Post-Closure; and the potential effects on humans and on biota
- “Environmental Assessment Activities” – an outline of the current schedule moving forward
- “Study Area” – a map delineating the Regional Study Area, the Local Study Area, and the Site Study Area
- “Baseline Environmental Studies” – a list and illustrations of the environmental activities underway
- “Choosing the Valued Ecosystem Components (VECs)” – an explanation of the term VEC, and how these environmental features are selected and evaluated during an environmental assessment





- “Proposed Valued Ecosystem Components” – two panels listing proposed specific environmental features
- “Have Your Say” – a panel listing the proposed VECs, with check boxes for participants to select those VECs they consider important
- “An International Perspective” – an overview of international experiences in the long-term management of nuclear waste
- “The Western Waste Management Facility (WWMF)” – an aerial photo mapping the current OPG Bruce site

See Appendix D for images of each of the display panels.



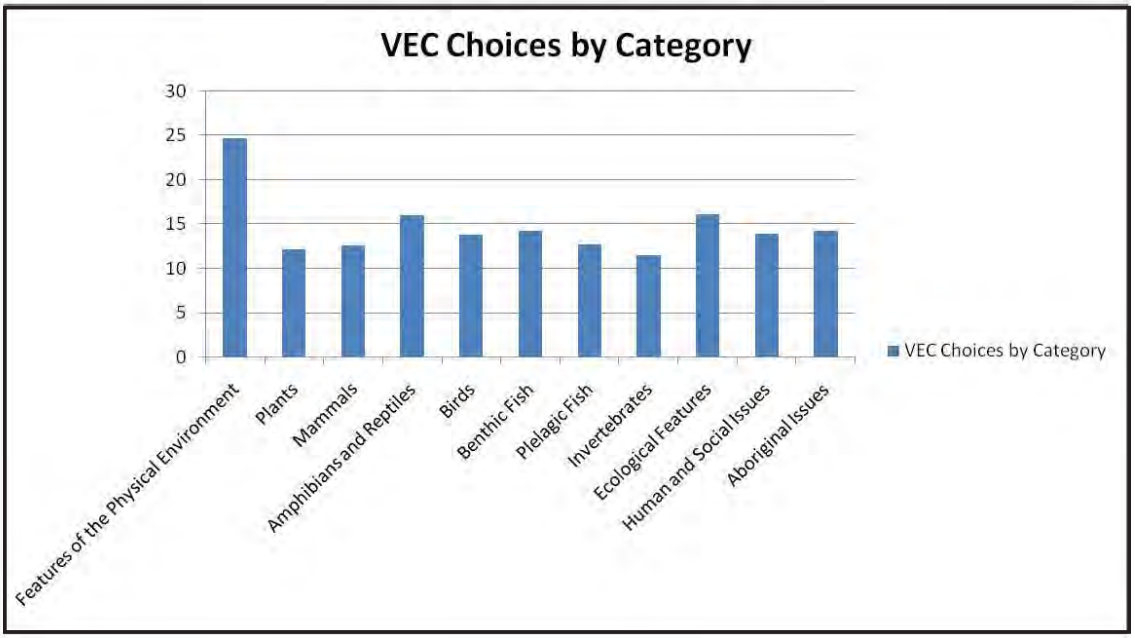
7. Opportunities for Input

VEC panels

The open houses also encouraged community members to play an active role in the identification of “valued ecosystem components” (VECs). Laminated poster boards listed a variety of proposed VECs, which included

- Features of the physical environment
- Plants
- Mammals
- Amphibians and reptiles
- Birds
- Benthic fish
- Pelagic fish
- Invertebrates
- Ecological features
- Human and social issues
- Aboriginal issues

Using markers, up to fifteen per cent of Open House attendees chose to participate in the selection of those specific VECs they considered important to them. They were also invited to add any VECs missing. The following graph summarizes VEC choices by category. A full list of the proposed VECs, the poster boards, and a bar graph of detailed VEC choices by category are included in Appendix D.



Comment Cards

Comment cards in the style of large sized postcards provided the opportunity for participants to rate their experience at the open house, and to write comments. Cards could be filled out at the open house, or mailed in afterwards.

In total, 45 comment cards were returned. Of those, 29 included written comments, and 38 responded to the questions evaluating the open house. All comment card feedback, as well as graphs showing the cumulative question responses, are provided in Appendix E.

Comments/Questions?
Let us know.

PLACE STAMP HERE

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

Name:
Address:
Phone:
Email:

www.opg.com/dgr email: nwmd@opg.com Phone: 519-361-6414 ext. 4065

Please leave this card with our open house staff, or mail it back to us at your convenience. You can also email us with your comments at nwmd@opg.com or visit our website for more information at www.opg.com/dgr

Open House Evaluation
Please rank the following statements on a scale of 1 to 5 where "1" is "strongly disagree","3" is neutral or "no opinion" and "5" is "strongly agree".

a. The open house panels helped me to understand the deep geological repository (DGR) proposal.
1 2 3 4 5

b. The open house location and hours were convenient for me.
1 2 3 4 5

c. The open house staff were helpful.
1 2 3 4 5

d. Overall, the open house helped me to satisfy the information needs I had.
1 2 3 4 5

e. I will recommend to my friends and family members that they should come to a future DGR open house.
1 2 3 4 5

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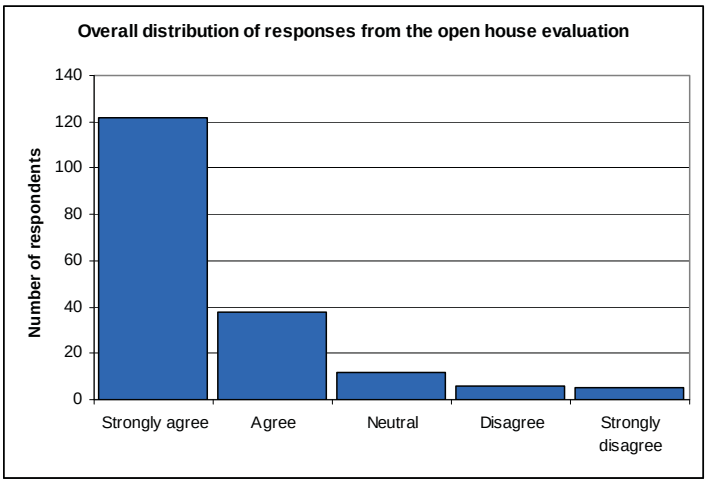
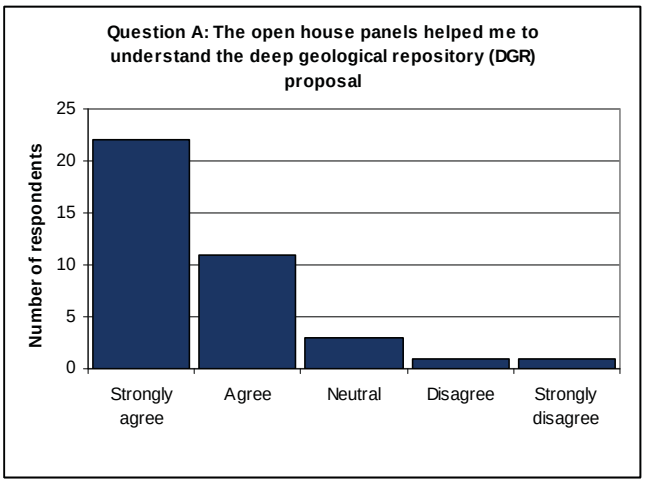
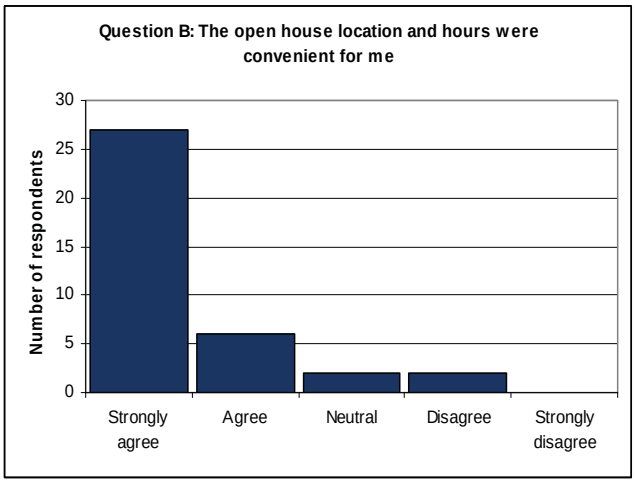
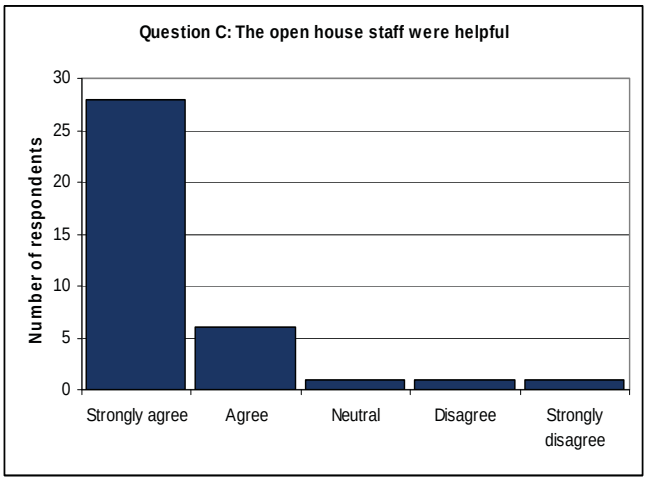
Cumulative Responses to Comment Card Questions

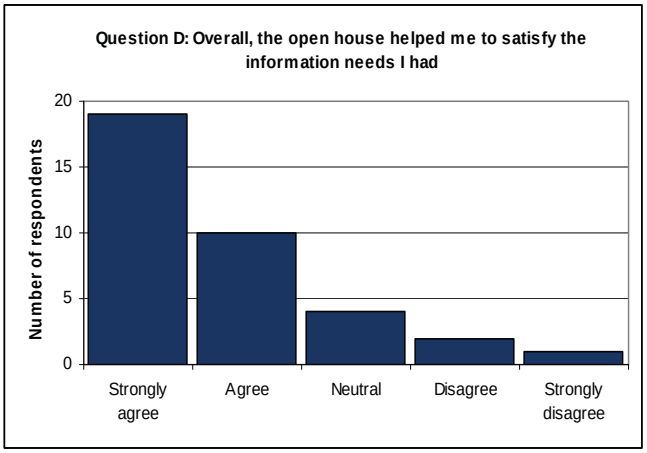
- **Total number of cards returned: 45**
- **38 respondents answered questions evaluating open houses**
- **29 respondents wrote comments**

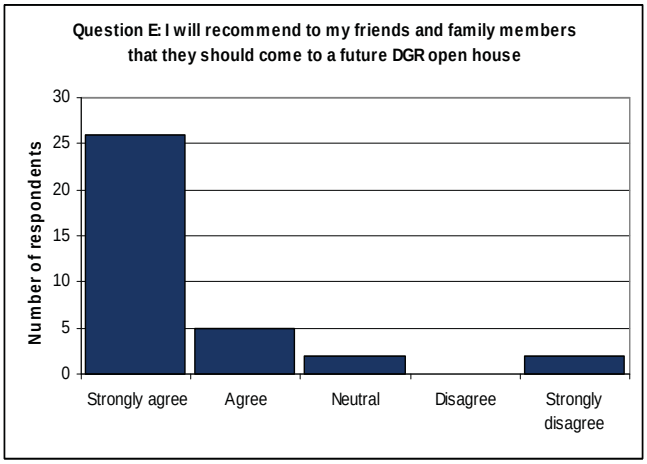










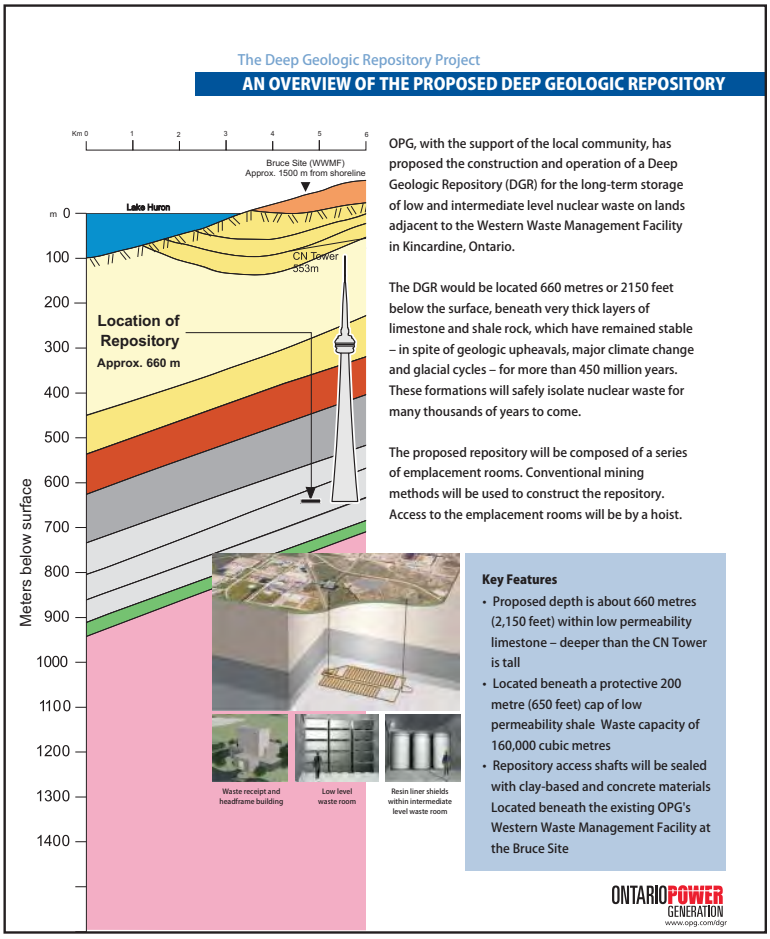


8. Key Areas of Discussion

Many Open House attendees were already familiar with the proposed DGR project, having participated in other stakeholder communications events. The majority of those who attended the Open Houses supported the project. One of the primary reasons for attending the Open Houses was to obtain an update on the progress of the project and the studies associated with it. Visitors tended to stay for about an hour – reading panels and talking to OPG resource people.

The discussions tended to revolve around a few key issues:

- Proximity of the proposed DGR to Lake Huron
- Transportation of waste
- Understanding the difference between levels of waste
- Suspicion that "the door is open" for high level waste disposal
- Security and the nature of rock: limestone vs granite gneiss
- Potential for groundwater contamination
- Effects on wildlife
- Effects of earthquakes on the proposed DGR
- Whether there are similar sites elsewhere



9. Media Coverage of the Open Houses

Journalists interviewed OPG representatives and guests during the open houses.

Following the community open houses, the following articles, editorials and letters-to-the-editor appeared in local newspapers and radio stations (see Appendix B):

- The Post (Hanover) – Friday October 19, 2007: "No More Open Houses" Letter to the Editor from Frank Barningham, R.R.1 Durham. (Note: Barningham is an outspoken anti-nuclear advocate, and member of Citizens for Renewable Energy)
- Owen Sound Sun Times – Thursday October 25, 2007: "Nuclear meetings are chance to be heard," Letter to the Editor, in response to letter from Frank Barningham, by Brent Williams, Vice President, North American Young Generation in Nuclear. The letter disputes Barningham's opinion, and encourages people to come out to open houses, learn about the project and have their concerns heard.
- The Kincardine Independent – Wednesday, October 24, 2007: "DGR Project's Success Hinges on Keeping People Well Informed," by reporter Kiel Edge
- Shoreline Beacon (Port Elgin) – Wednesday October 24, 2007: "OPG Waste Storage Vault to be in Service by 2017," by reporter Liz Dadson
- Bayshore Broadcasting Centre (Owen Sound) – Wednesday October 24, 2007: "Ontario Power Generation's DGR Open House Making a Stop in Owen Sound," by reporter Ken Hashizume
- Radio CKNX AM (Walkerton) – Thursday October 18, 2007: "More OPG Waste Talk in Walkerton"
- Bayshore Broadcasting News Centre (Owen Sound) – "More Information on Nuclear Waste," by reporter Ken Hashizume

10. Appendices

Appendix A: Notification Materials

- Letter of Invitation (addressed mail)
- Mailing List for Invitation Letters
- Postcard Invitation (unaddressed admail)
- Distribution Breakdown for postcard Invitation
- Newspaper announcement
- Placement of newspaper announcements
- Radio Scripts
- Distribution of Radio Scripts

Appendix B: Newspaper Coverage

- The Post (Hanover) – Friday October 19, 2007: "No More Open Houses" Letter to the Editor from Frank Barningham, R.R.1 Durham. (Note: Barningham is an outspoken anti-nuclear advocate, and member of Citizens for Renewable Energy)
- Owen Sound Sun Times – Thursday October 25, 2007: "Nuclear meetings are chance to be heard," Letter to the Editor, in response to letter from Frank Barningham, by Brent Williams, Vice President, North American Young Generation in Nuclear. The letter disputes Barningham's opinion, and encourages people to come out to open houses, learn about the project and have their concerns heard.
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- Radio CKNX AM (Walkerton) – Thursday October 18, 2007: "More OPG Waste Talk in Walkerton"
- Bayshore Broadcasting News Centre (Owen Sound) – "More Information on Nuclear Waste," by reporter Ken Hashizume

Appendix C: Open House Handouts

- OPG Fact Sheet: Western Waste Management Facility

"Neighbours: News from OPG's Western Waste Management Facility", October 2007

Appendix D: Open House Display Panels

- Display Panels
- VEC Panels
- Detailed VEC Choices (bar graph)

Appendix E: Open House Sign-in Sheets and Comment Cards

News from OPG's Western Waste Management Facility

SPECIAL EDITION: Keeping you informed about the Deep Geologic Repository

Neighbours

A part of the community for more than 40 years • NOVEMBER 2007

The above collage depicts several scenes from OPG's recent round of seven DGR open houses.

Public invited to talk DGR at series of open houses

Ontario Power Generation (OPG) hosted a series of seven open houses recently to give the public another opportunity to gain more information and provide feedback about the progress of the company's proposed Deep Geologic Repository (DGR) project for the long-term management of low and intermediate nuclear waste. Open houses were held in the Municipality of Kincardine, host of the DGR, Huron-Kinloss, Brockton, Saugeen Shores, Owen Sound, Chesley and Wiarton.

Public consultation for the DGR project has been ongoing within the host municipality as well as neighbouring communities, and will continue at a high level as the project moves into 2008. However, the more formal open house opportunities allow participants to have their concerns and responses documented as part of the Environmental Assessment process as mandated under the Canadian Environmental Assessment Act.

The majority of those in attendance at the open houses came to learn more about the project, while some members of the public had specific concerns with factors such as seismic activity, the protection of water and whether or not the DGR would accept used fuel. OPG's DGR team, comprised of representatives from environmental assessment, geoscience and public affairs, was more than happy to answer questions, use the panels provided to explain the safety case and to assure people that the DGR, proposed for the Bruce site, will not be used to manage used fuel.

"We are pleased that about 200 residents attended our public open houses to raise questions and share their perspectives on the DGR with us," Terry Squire, Director of Public Affairs for OPG's Nuclear Waste Management Division (NWMD), said.

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Appendix A

Notification Materials

(list of recipients removed)

ONTARIO POWER GENERATION

W-00216-07722.05-T10

October 5, 2007

Murray Elston
President
Canadian Nuclear Association
130 Albert Street, Suite 1610
Ottawa, ON K1P 5G4

Dear ~~Murray Elston~~,

Subject: Community Consultation for OPG's Deep Geologic Repository

Consistent with the requirements of the Canadian Environmental Assessment Act, OPG is pursuing completion and acceptance of an environmental impact statement for the proposed Deep Geologic Repository (DGR) for Low and Intermediate Level Radioactive Waste at the Bruce site.

As a part of that environmental assessment process, OPG is seeking opportunities to continue its communications with interested publics on the proposed DGR project. To further our communications efforts, Open Houses have been scheduled in communities in the vicinity of the Bruce site during the last half of October, 2007. At these Open Houses we look forward to providing additional information, answering your questions, and hearing your views, on the proposed project. Your views will be included in the environmental impact statement submitted to the Review Panel.

Open Houses are being held at the locations listed below and will be open between the hours of 4 p.m. and 8 p.m. each evening.

Kincardine
Monday October 15
Best Western Governor's Inn
791 Durham Street

Ripley
Tuesday October 16
Ripley Huron Community Centre
17 Queen Street

Walkerton
Wednesday October 17
Hartley House
7 Jackson N

Port Elgin
Thursday October 18
Saugeen Shores Community Complex
600 Tomlinson Drive

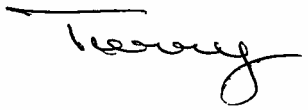
Owen Sound
Tuesday October 23
Bayshore Community Centre
1900 3rd Ave E

Chesley
Wednesday October 24
Chesley Fire Hall
North end of Chesley, Bruce Rd. 10

Wiarton
Thursday October 25
Wiarton & District Community Centre
531 Scott Street

We look forward to seeing you at one or more of the Open Houses. If you would like further information on the proposed DGR project please refer to our web site at www.opg.com/dgr or call Marie Wilson at 519-361-4065.

Sincerely,



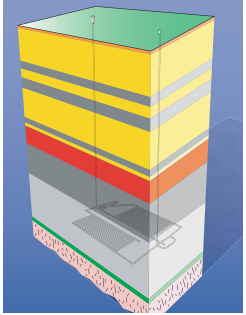
Terry Squire
Director, Public Affairs
Nuclear Waste Management Division

YOU ARE INVITED

to participate in our Open Houses on the Deep Geologic Repository (DGR) Project. Ontario Power Generation (OPG) is proposing to build a Deep Geologic Repository for the long term storage of low and intermediate level radioactive waste at the Bruce site.

At this first round of Open Houses we look forward to providing you with more information on the DGR Project, to answering your questions, and hearing your views. Your views will be included in the environmental impact statement submitted under the Canadian Environmental Assessment Act for the DGR Project .

KEEPING YOU INFORMED ABOUT THE DEEP GEOLOGIC REPOSITORY PROJECT



ONTARIO POWER GENERATION

Open Houses will be held at the locations listed below. Open House hours of operation are 4:00 p.m. to 8:00 p.m. We look forward to seeing you there.

DATES AND LOCATIONS

Kincardine
Monday October 15
Best Western Governor's Inn
791 Durham Street

Ripley
Tuesday October 16
Ripley Huron Community Centre
17 Queen Street

Walkerton
Wednesday October 17
Hartley House
7 Jackson N

Port Elgin
Thursday October 18
Saugeen Shores Community Complex
600 Tomlinson Drive

Owen Sound
Tuesday October 23
Bayshore Community Centre
1900 3rd Ave E

Chesley
Wednesday October 24
Chesley Fire Hall
North end of Chesley, Bruce Rd. 10

Wiarton
Thursday October 25
Wiarton & District Community Centre
531 Scott Street

FOR MORE INFORMATION

- Please call Marie Wilson at 519-361-4065
- Write to us at OPG, Box 7000, B21, Tiverton, ON, N0G 2T0
- Visit our project website at: **www.opg.com/dgr**

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Post Card Mailing for October 2007 Open Houses		
Kincardine P.O.	All Postal Codes	4000
Owen Sound P.O.	All Postal Codes	13901
Chepstow P.O.	N0G 1L0	1400
Clifford P.O.	N0G 1M0	842
Elmwood P.O.	N0G 1S0	702
Formosa P.O.	N0G 1W0	258
Holyrood P.O.	N0G 2B0	192
Mildmay P.O.	N0G 2J0	992
Chesley P.O.	**N0G 1L0**	**1467**
Neustadt P.O.	N0G 2M0	434
Paisley P.O.	N0G 2N0	933
Ripley P.O.	N0G 2R0	726
Teeswater P.O.	N0G 2S0	747
Tiverton P.O.	N0G 2T0	1315
Walkerton P.O.	N0G 2V0	3343
Wingham P.O.	N0G 2W0 R.R. #1 Lucknow, R.R. #2 Lucknow, R.R. #3 Lucknow, R.R. #5 Lucknow, R.R. #7 Lucknow, LB0001 Lucknow	1357
Allenford P.O.	N0H 1A0	480
Annan P.O.	N0H 1B0	449
Bognor P.O.	N0H 1E0	202
Kemble P.O.	N0H 1S0	446
Leith P.O.	N0H 1V0	100
Lions Head P.O.	N0H 1W0	1023
Mar P.O.	N0H 1X0	458
Miller Lake P.O.	N0H 1Z0	256
Port Elgin P.O.	N0H 2C0	3974
Shallow Lake P.O.	N0H 2K0	625
Southampton P.O.	N0H 2L0	2127
Stokes Bay P.O.	N0H 2M0	90
Tara P.O.	N0H 2N0	1329
Tobermory P.O.	N0H 2R0	735
Wiarton P.O.	N0H 2T0	4742
TOTAL		49645

YOU'RE INVITED TO AN ENVIRONMENTAL ASSESSMENT OPEN HOUSE

OPG DEEP GEOLOGIC REPOSITORY (DGR) PROJECT

Ontario Power Generation (OPG) is proposing to build a Deep Geologic Repository for the long term storage of low and intermediate-level radioactive waste at the Bruce site.

As part of the planning and approval process for the DGR project, we are conducting an environmental assessment that includes ongoing public consultation. At this first round of Open Houses we look forward to providing you with more information on the Project, answering your questions, and hearing your views. Your comments will be included in the Environmental Assessment documentation and submitted to the Canadian Nuclear Safety Commission. They are the authority responsibility for this Environmental Assessment under the Canadian Environmental Assessment Act.

Open Houses will be held at the locations listed below. Open House hours of operation are 4:00 p.m. to 8:00 p.m. We look forward to seeing you there.

Kincardine – Monday October 15
Best Western Governor's Inn
791 Durham Street
Kincardine, ON

Ripley – Tuesday October 16
Ripley Huron Community Centre
17 Queen Street,
Ripley, ON

Walkerton – Wednesday October 17
Hartley House
7 Jackson N,
Walkerton, ON

Port Elgin – Thursday October 18
Saugeen Shores Community Complex
600 Tomlinson Drive,
Port Elgin, ON

Owen Sound – Tuesday October 23
Bayshore Community Centre
1900 3rd Ave E,
Owen Sound, ON

Chesley – Wednesday October 24
Chesley Fire Hall
North end of Chesley,
Bruce Rd. 10

Wiarton
Thursday October 25
Wiarton & District Community Centre
Wiarton, ON

For more information:
Call: Marie Wilson at 519 361-4065,
or write to us at Ontario Power Generation, Box 7000, B21, Tiverton, ON, N0G 2T0: or visit our project website at: www.opg.com/dgr

ONTARIO POWER GENERATION

MEDIA PURCHASE AUTHORIZATION
OPG 2007 DGR Open Houses - Newspaper Campaign

Gaggi Fax: 416-482-9672

Signatures here acknowledge the release of funds for the following purchase as authorized by Ontario Power Generation and partnersandedell. This booking will be made through Gaggi Media Commuications, but will be billed directly to Ontario Power Generation c/o partnersandedell. This holds Ontario Power Generation and partnersandedell fully responsible for the payment of all invoices. These invoices will be sent first to Gaggi Media Communications for authorization and verification and then sent to partnersandedell for final payment.

Release the following funds:

Publication	Insertion Dates
Kincardine News	Oct. 3, 10
Kincardine Independent	Oct. 3, 10
The Lucknow Sentinel	Oct. 3, 10
Walkerton Herald Times	Oct. 3, 10, 17
Owen Sound Sun Times	Oct. 12, 13, 19, 22, 23
Port Elgin Shoreline Beacon	Oct. 10, 17
Wiarton Echo	Oct. 17, 24

Cindy Kaye
Ontario Power Generation

Date

Dennis Edell
Partners & Edell

Date

partners +edell

Liberating promise.

radio copy

client OPG

date September 10, 2007

product/service DGR Environmental Assessment Open House

commercial # n/a – Announcer-read

title DGR EA Open House Invitation

rev# 1

Length :30

ANNCR: radio script for the following dates: October, 13, 14, 19, 20, 21, 22, You're invited. Ontario Power Generation is hosting an Environmental Assessment Open House to review plans for the Deep Geologic Repository proposed for the safe, long-term management of low and intermediate-level nuclear waste at the Bruce site. This is your opportunity to ask questions and get information. For details of where and when look in your local paper or visit the DGR project website at OPG.com/dgr

October 15 – The Coast, CKNX, CFOS

You're invited. Ontario Power Generation is hosting an Environmental Assessment Open House to review plans for its Deep Geologic Repository proposed for the safe, long-term management of low and intermediate-level nuclear waste at the Bruce site. This is your opportunity to ask questions and get information. Visit OPG's open house **today** in Kincardine at the Best Western Governor's Inn from 4PM to 8PM. To learn more visit opg.com/dgr

October 16 – The Coast, CKNX, CFOS

You're invited. OPG is hosting an Environmental Assessment Open House to review plans for its Deep Geologic Repository proposed for the safe, long-term management of low and intermediate-level nuclear waste at the Bruce site. This is your opportunity to ask questions and get information. Visit our open house **today in Ripley at the Ripley Huron Community Centre** from 4PM to 8PM. To learn more visit opg.com/dgr

October 17 - The Beach, CFOS, CKNX
You're invited. Ontario Power Generation is hosting an Environmental Assessment Open House to review plans for its Deep Geologic Repository proposed for the safe, long-term management of low and intermediate-level nuclear waste at the Bruce site. This is your opportunity to ask questions and get information. Visit OPG's open house **today** in **Walkerton at the Hartley House** from 4PM to 8PM. To learn more visit opg.com/dgr

October 18 – The Beach, CFOS, CKNX
You're invited. Ontario Power Generation is hosting an Environmental Assessment Open House to review plans for its Deep Geologic Repository proposed for the safe, long-term management of low and intermediate-level nuclear waste at the Bruce site. This is your opportunity to ask questions and get information. Visit OPG's open house **today in Port Elgin at the Saugeen Shores Community Complex** from 4PM to 8PM. To learn more visit opg.com/dgr

October 23 - CKNX, CFOS
You're invited. Ontario Power Generation is hosting an Environmental Assessment Open House to review plans for its Deep Geologic Repository proposed for the safe, long-term management of low and intermediate-level nuclear waste at the Bruce site. This is your opportunity to ask questions and get information. Visit OPG's open house **today** in **Owen Sound at the Bayshore Community Centre** from 4PM to 8PM. To learn more visit opg.com/dgr

October 24 – CKNX, CFOS
You're invited. Ontario Power Generation is hosting an Environmental Assessment Open House to review plans for its Deep Geologic Repository proposed for the safe, long-term management of low and intermediate-level nuclear waste at the Bruce site. This is your opportunity to ask questions and get information. Visit OPG's open house **today in Chesley at the Chesley Fire Hall** from 4PM to 8PM. To learn more visit opg.com/dgr

radio copy

October 25 – CKNX, CFOS

You're invited. Ontario Power Generation is hosting an Environmental Assessment Open House to review plans for its Deep Geologic Repository proposed for the safe, long-term management of low and intermediate-level nuclear waste at the Bruce site. This is your opportunity to ask questions and get information. Visit OPG's open house **today in Wiarton at the Wiarton and Community District Community Centre** from 4PM to 8PM. To learn more visit opg.com/dgr

FAX TO: 416-482-9672

MEDIA PURCHASE AUTHORIZATION
OPG 2007 DRG Open Houses - Radio Campaign
October 13th - October 25th

Gaggi Fax: 416-482-9672

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Release the following funds:

Medium/Markets	Spot Length	Dates	# of Days	Space	Material
Kincardine/Ripley	:30 seconds	Oct. 13, 14, 15, 16th	4	ASAP	4 days prior
(CIYN FM, CKNX AM, CKNX FM, CFOS AM - 6 spots per station/day)					
Port Elgin/Walkerton	:30 seconds	Oct. 15, 16, 17, 18th	4	ASAP	4 days prior
(CFPS FM, CKNX AM, CKNX FM, CFOS AM - 6 spots per station/day)					
Owen Sound	:30 seconds	Oct. 19, 20, 21, 22, 23rd	5	ASAP	4 days prior
(CKNX AM, CKNX FM, CFOS AM - 6 spots per station/day)					
Chesley	:30 seconds	Oct. 21, 22, 23, 24th	4	ASAP	4 days prior
(CKNX AM, CKNX FM, CFOS AM - 6 spots per station/day)					
Wiarton	:30 seconds	Oct. 22, 23, 24, 25th	4	ASAP	4 days prior
(CKNX AM, CKNX FM, CFOS AM - 6 spots per station/day)					
				TOTAL OPG COST:	**$18,180.16**

Cindy Kaye
Ontario Power Generation

Date

Meagan Crichton
Partners & Edell

Date

OPG information sessions to outline Bruce Power nuclear waste storage site

Program:	CKNX-AM News	**Air Time:**	12:00PM - 12:05PM	**Date:**	2007-Oct-16 12:00PM
Station:	CKNX AM (Country 920)	**Network:**	Blackburn Group Inc.	**City:**	Wingham
Reporter:	Announcer copy	**Length:**	45 seconds	**Province:**	Ontario
Interview:	Terry Squire, OPG spokesman				
Synopsis:	Ontario Power Generation officials hope to have a new storage facility for low and intermediate level nuclear waste at the Bruce Power site by 2017. OPG is hosting information sessions to outline the projects and what it means for the community.				
Log ID:	20071016R-0242				

Appendix B

Newspaper Coverage

BARKER Diane -NUC WS MGMT

Subject: FW: Hanover Post 19 10 2007

No more open houses
The Post (Hanover, ON)
Fri 19 Oct 2007
Page: A6
Section: Editorial

Dear Editor:

Over a period of several years, I have attended Open Houses and a variety of workshops at the invitation of Ontario Power Generation, the Nuclear Waste Management Organization, the Canadian Nuclear Safety Commission and Bruce Power. Some of these have been costly affairs, sometimes with high priced officials brought in from Toronto for a meeting with only a handful of people.

Despite all their best efforts, I have yet to be convinced of the necessity, efficiency or safety of nuclear power. A safe decommissioning of a nuclear power plant has not yet taken place anywhere on the planet. Vast quantities of toxic nuclear waste continue to accumulate without a safe means of disposal. The building of a nuclear plant is hugely expensive in energy and materials and money, yet they run for such a short time before being "refurbished" or "mothballed" because nobody knows how to decommission them. I wonder how many members of the general public are aware that, in these days of terrorism paranoia, a standing army is maintained at the Bruce Nuclear Facility equipped with the latest in sophisticated weaponry, vehicles etc. This is a bigger force than the police force of Sarnia and much more expensive.

I know that many local people are employed by Bruce Power, OPG etc., but I feel that Ontario is missing a wonderful opportunity for retraining and diversifying into the burgeoning, lucrative and safe field of renewables.

I have attended these many workshops and open houses because I felt it was important to bear witness to what is happening, to ask questions and for at least a lone voice of concern to be heard. I have, however, now decided to decline any further invitations, not to attend the open houses where there are as many representatives of the nuclear industry as there are members of the public.

I do not wish these representatives of the nuclear industry to be able to count my attendance at their functions as proof of their having engaged and consulted with the public. I regret that so much of our tax money (yours and mine) is being squandered on a private army in our midst, glossy paper handouts, a vast blight on the shores of Lake Huron and the storing up of an everlasting unsolvable problem for our grandchildren. And why is all this happening? So that, as a society, we can continue to consume more, allow ourselves to be persuaded by the myth that nuclear energy is "clean" or "low cost." Not me - I shall continue enjoying the billions of years of uninterrupted service of my major power supplier - the sun!

Thank you to Ontario Power Generation, the Nuclear Waste Management Organization, the Canadian Nuclear Safety Commission and to Bruce Power for all your invitations, for the refreshments in non-recyclable poly cups, but please don't send me any more. I have chosen not to participate in a process which may legitimize a contribution to the destruction of our environment for your grandchildren.

Frank Barningham,

RR 1, Durham

Idnumber: 200710190023
Length: 506 words

From: VAN DEN ENDEN Maggie -PUBLIC AFF
Sent: Thursday, November 01, 2007 11:20 AM
To: BARKER Diane -NUC WS MGMT
Subject: Owen Sound Sun Times, 25 10 2007 "Nuclear meetings are chance to be heard"

-----Original Message-----
From: FIFE-MARCHEGGIA Sharon -REAL EST & SRVC
Sent: Thursday, November 01, 2007 11:17 AM
To: VAN DEN ENDEN Maggie -PUBLIC AFF
Subject: Is this the one?

Nuclear meetings are chance to be heard
Owen Sound Sun Times (ON)
Thu 25 Oct 2007
Page: A5
Section: Opinion & Letters

Editor:

Re: Opting out of Nuclear Meetings Oct. 16 2007, letter from Frank Barningham

Dear Mr. Barningham:

I am as concerned as you are about the fact that fewer than 40 people (including my four-year-old son and I) showed up to the Deep Geological Repository Open House in Kincardine on Oct. 15.

There are a couple of things that we could do about this.

We could do what you've done: encourage people to walk away, and pass their judgment on nuclear power without taking the time to learn the facts.

Or, we could take action to get people to come out, learn about the project and have their concerns heard.

This would make the process of choosing the best mix of power generation technologies one where all options are considered on the basis of safety, environmental impact, economics, sustainability and ability to deliver power when needed.

But you have decided that's a bad idea, haven't you?

Brent Williams

Vice President

North American Young Generation in Nuclear

Idnumber: 200710250016
Edition: Final
Length: 166 words

Sharon Fife-Marcheggiani, M.L.S I library specialist I **library** I 4 1 6 . 5 9 2. 3787 I
sharon.fife@opg.com

No easy answers with algae problem

(continued from page 1)
tion programs in the upcoming budget deliberations. He said the township won't be prepared to cut existing programs to fund new work, but new funding strategies will be looked at. Until a permanent solution can be hammered out, councillor Anne Eadie said residents should be patient and understand it's a long process.

"(We've done some good things) and more good things are coming," she said. "It just takes time."

Facade program will boost Queen Street

(continued from page 1)
ing styles to paint colours, showed the project's overall vision for the tone and look of the revamped downtown.

Using information collected at a series of public meetings, Kelly and the economic development committee, produced an information package that gives storeowners an idea of the type of improvements the municipality wants.

"People always have ideas for (fixing) their buildings," Kelly said. "They just don't know how to do it. They know they need changes, they just don't have the information."

Using the guidelines, each business can apply for a grant to help it is a five-year committment from the EDC, and more money will be provided for grants in the committee's next operating budget.

Kelly said there has been some interest in the program already, but it usually takes a few successful renovations before things really get going. Anderson said they hope to have two or three businesses done this fall, but want the majority of the street completed in time for next summer's Old Boys and Girls Reunion.

"The water is always cold at the beginning (of the process)," said Kelly, who has worked on numerous other facade projects. "But once people see a couple of successes, everyone

DGR project's success hinges on keeping people well informed

By Kiel Edge

Kincardine residents got an updated look at Ontario Power Generation's Deep Geological Repository project at a public open house Oct. 15.

OPG staff and officials displayed maps, photos and information while answering questions from interested residents during the four-hour event at the Best Western Governor's Inn.

Mark Jensen, manager of geoscience for the project, said the DGR's success hinges on keeping the public informed of the work being done.

"The most important thing for us is that the public stays informed," he said. "(This event lets them) question us and give us suggestions. It's extremely important for this project to be successful and we're doing everything we can to keep people (up-to-date)."

OPG's Mark Jensen highlights some of the new information on display at the Deep Geological Repository open house at the Governor's Inn Oct. 15. (Kiel Edge photo)

Jensen said the DGR project has been moving along well and the first phase of the work is almost complete. Teams of geoscientists have been drilling more than 800 metres into the ground to better explore potential storage sites.

The rock formations, thickness and permeability, as well as the age and quality of water found deep below the surface is consistent with what project scientists expected to find, which Jensen believes is a positive step forward.

"There were no surprises," he said. "There is still work to be done, but the information coming out now is positive."

OPG expects to begin work on the second phase of the DGR, sometime next year, or by 2009. The work is currently in the planning phase and Jensen said public forums like Kincardine's event can help steer the company in the right direction.

"We like to see what people have to say," he said. "We take their suggestions (and implement some of the things in our own plans)."

School window broken

Sometime Sunday, a rock was thrown through a window at St. Anthony's School.

South Bruce OPP say a rock broke the window

OPG waste storage vault to be in service by 2017

By Liz Dadson

Ontario Power Generation (OPG) is on schedule to have its proposed deep geologic repository in service by 2017.

The underground storage vault for low-level and intermediate-level nuclear waste is currently being studied through an Environmental Assessment and the information is being shuttled throughout Bruce County to keep the public informed about the project. The unit will be located at the Bruce site near OPG's Western Waste Management Facility.

Terry Squire, director of public affairs for nuclear waste management, said the open houses drew small crowds. In Kincardine, more than 40 people came to view the information boards and have their questions answered. About 15 came to Ripley's open house, while 18 were in Walkerton.

The open house in Port Elgin Thursday night attracted a small crowd. There was one in Owen Sound last night, one in Chesley today, and there will be one in Wiarton tomorrow.

Squire said OPG initially held similar open houses to introduce the deep geologic repository project to the public. This time, it's to show the studies being done to meet the requirements of the Environmental Assessment.

Photo by Liz Dadson

OPG senior geoscientist Jim McLay, right, discusses with Jacquie Lam of Southampton the merits of the deep geologic repository project during an open house in Port Elgin Thursday night.

This work is set to go to a review panel by 2010, followed by public hearings in 2011, a construction licence in 2012, and the facility in service by 2017.

So far, the studies are looking good, said Squire. "We're studying the kind of rock and the strength of the rock in the area. We're also studying the water and the salinity of the rock. That will tell us if we're doing the right thing."

According to results of 2D seismic reflection studies, the rock formations would allow water movement of about one millimetre per year, said Squire.

"It's important to protect the ground water," he said. "Many of the public's concerns have been about the affect of this project on the Great Lakes."

Squire said the repository is being built 660 metres or 2,150 feet under the ground which is about 2,000 feet below the lake. It is also located 1.5 kilometres inland.

It will have a capacity of 160,000 cubic metres of waste, he said, noting that the above-ground facility at the Bruce has been storing waste since 1975 and has amassed about 80,000 cubic metres on site.

"It will take about 10 years to move all the waste currently in storage into the new facility," said Squire. "We expect to operate it (deep geologic repository) for 30-40 years after it's built."

As for the open houses, he said people are interested and come in and ask questions about the project.

"They want to know why it's safe and why it's being located here," said Squire. "And the answers are that the rock geology is good here and that Kincardine approached OPG about putting the facility here."

Board signs deal with support staff

By Pat Halpin

The Bluewater District School Board has a one-year contract with its office, professional and technical staff.

The deal is retroactive to Sept. 1 and includes 149 people in the finance, plant, transportation, purchasing, student services, curriculum and information technology departments. Those employees are members of the Ontario Secondary School Teachers' Federation.

The new contract allows a 1.8-per-cent wage increase retroactive to Sept. 1 and 1.4 per cent on March 1, plus improvements to vacations and benefits.

The deal also includes a letter of agreement stating that school office employees are not required to be responsible for students sent to the office for discipline reasons - a job the agreement says belongs to school principals.

Open House on Nuke waste
Written by Ken Hashizume
Bayshore Broadcasting Centre
October 24, 2007

Ontario Power Generation's DGR open house making a stop in Owen Sound.

Over a hundred passed through the doors of the Harry Lumley Bayshore Community Centre last night.

OPG staff were on hand to answer questions and to guide visitors through a series of visuals describing the proposed Deep Geological Repository at the Bruce site for low and intermediate level waste.

Hepworth resident Gail Gvinter says she came down to the open house because she worries about the effects of nuclear waste being stored deep under the limestone.

She says people may forget about the waste after keeping it there for about a hundred years.

Darlene Bond of Chesley says the information was quite interesting especially about the effects on wildlife and what would happen in the event of an earthquake.

While she is concerned about nuclear waste, Bond doesn't feel there is much she can do about it.

Owen Sound resident Bill Chnarr says he didn't realize that nuclear waste is being brought in from Pickering and Darlington reactors to be store at the Bruce until he came to the open house.

Chnarr says he is satisfied with what he learned about the DGR but is troubled by the lack of people showing up.

He says people should be informed about nuclear waste adding it is important for his children's future.

There is another open house tonight at the Chesley Fire Hall and tomorrow at the Wiarton and District Community Centre.

Both run from 4 P.M. until 8 P.M..

The open houses are part of an environmental assessment to determine the suitability of a DGR at the Bruce site.

Local
CKNX AM,

October 18, 2007

More OPG Waste Talk in Walkerton

Residents at an open house in Walkerton wanted reassurance on the environmental safety of the proposed Deep Geologic Repository plan to store nuclear waste under the Bruce site.

Ontario Power Generation is holding public information session on the plan to put low and intermediate level nuclear waste into rock caverns 660 metres underground.

Distance from the lake and reassurance that there will be no used fuel stored in the site were high on the list of residents concerns.

Those comments and others gathered at the open houses will be part of the environmental assessment on the Deep Geologic Repository project.

Open houses will be held in Port Elgin, Owen Sound, Chesley and Wiarton this week and next.

News for Tuesday, October 16th, 2007
Bayshore Broadcasting News Centre
More information on Nuclear waste
Written by Ken Hashizume

People want to know more about the Deep Geological Repository.

Ontario Power Generation held the first of seven open houses in Kincardine last night on the proposed Deep Geological Repository for low and intermediate level waste.

Visitors were shown a series of visuals describing the DGR and OPG officials were on hand to answer any questions.

Director of Public Affairs for the Nuclear Waste Management Organization Terry Squire says the purpose of the open house is to get the public to engage in discussion.

He says people are asking how the rock formation can protect ground water, what type of waste will go into the DGR, and whether there are similar sites in other countries.

Squire says people are getting a straight forward explanation of why the Bruce site is a suitable location and the measures they are taking to ensure public safety.

Squire says the response from the public has been overwhelmingly good -- adding the more people know about the DGR the better they will be in understanding it.

Squire says the open houses are only being offered in communities within a close proximity of the Bruce site.

He suggests Goderich and Wingham residents can go the Ripley open house at the Community Centre tonight and people in Hanover and Mildmay can go the one in Walkerton at the Hartley House tomorrow night .

Both open houses go from 4 P.M. to 8 P.M..

Squire says people can also go to their website at www.opg.com/dgr and they can email or phone in their questions and they will be answered.

The open houses are part of the environmental assessment in determining the suitability of the DGR at the Bruce site.

Local

OPG Shares Information on Waste Storage

Ontario Power Generation are opening the lines of communication about the proposed waste management site going into Bruce Power.
Officials held an open house to talk about the facility that would store low and intermediate level nuclear waste 660 metres below rock located at the Bruce Site.
The rock is about 450 million years old and according to the OPG's Terry Spyer-- water-- if found there-- would move one millimeter every thousand years.
Spyer feels that's a good indication that waste would be safe and could not affect the environment because it couldn't leak out.

News for Monday, October 15th, 2007

Open house on Nuclear waste
Written by Ken Hashizume

Ontario Power Generation is inviting the public to a series of open houses.

The first open house goes tonight from 4 until 8 at the Best Western Governors Inn in Kincardine.

This is part of an environmental assessment of the proposed Deep Geological Repository for low and intermediate level waste near the Bruce site in Tiverton.

OPG Spokesperson Marie Wilson says they are encouraging people in Kincardine and in neighbouring municipalities to come to these open houses.

She says there will be experts at every open house who will provide information on the project and answer any questions the public may have.

Wilson says OPG just completed the first year of a five-year geo-scientific site characterization plan to determine if the Bruce site is a suitable location for the DGR.

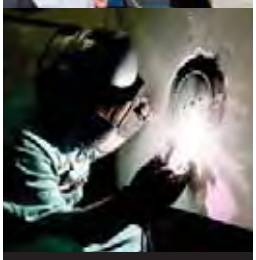
Other open houses are scheduled for Ripley tomorrow at the Ripley Huron Community Centre, at the Hartley House in Walkerton on Wednesday , and Thursday they'll be at the Plex in Port Elgin.

They will continue next week with open houses in Owen Sound at the Harry Lumley Bayshore Community Centre on the 23rd, at the Chesley Fire Hall on the 24th, and the Wiarton and District Community Centre on the 26th.

All open houses run from 4 P.M. to 8 P.M.

Appendix C

Open House Hand-outs



Western Waste Management Facility

Ontario Power Generation (OPG) has been safely managing radioactive waste from the Bruce, Pickering and Darlington generating stations for over 40 years. At OPG's Western Waste Management Facility (WWMF), waste is received from the stations and is processed and stored. About 165 staff work at the WWMF and they ensure that the public, workers and the environment are protected from the hazards associated with the radioactive wastes that they manage.

Highlights

- OPG has been safely managing radioactive waste for over 40 years
- The WWMF manages the low and intermediate level waste from OPG's Pickering and Darlington nuclear stations and the Bruce Power stations
- The WWMF's Western Used Fuel Dry Storage Facility is used to store used fuel from the Bruce site only

Safety and Environment

WWMF staff are well trained and regard safety for staff, the public and the environment as their top priority. They have accomplished significant milestones in these areas, such as achieving a long-standing record of no "Lost Time Accidents" and excellent environmental performance. Safe work planning, following safe work practices and paying particular attention to detail, along with a safety conscientious work attitude, has led to this excellent safety performance.

The WWMF has in place an Environmental Management System (EMS) that establishes strategies, objectives and targets for the facility to improve environmental performance. The EMS is based on the ISO 14001 Standard, which provides a tool for ensuring and demonstrating a high standard of environmental responsibility. The WWMF was initially certified to the ISO standard in 1999 and has successfully re-certified every year since.

Through employing highly qualified staff, careful planning, development of technology and equipment and the use of sound operating procedures, OPG has ensured that radioactive waste is managed safely and poses no significant risk to employees, the public or the environment.

ONTARIO POWER GENERATION

Western Waste Management Facility

During the operation of nuclear generating stations, waste is produced much like any other industry. Some of this waste becomes radioactive and must be handled using special procedures. OPG categorizes the radioactive waste into low, intermediate and high level waste.

Low Level Waste

Low level waste consists of minimally radioactive materials that have become contaminated during routine clean-up and maintenance such as mop heads, cloths, paper towels, floor sweepings and protective clothing. These items make up about 95 percent of the total non-fuel waste volume.

Low level waste from the Bruce, Pickering and Darlington nuclear generating stations is received at the Waste Volume Reduction Building at the WWMF where it may be processed through either incineration or compaction to reduce its volume. Following volume reduction the low level waste is placed into above ground concrete warehouse-like structures called Low Level Storage Buildings. About 3000 m^3 of low level waste is stored annually. The WWMF has about 70,000 m^3 of low level waste in storage as of 2007.

Low level waste at the WWMF is handled by trained personnel before processing by either incineration or compaction.

Ontario Power Generation staff carefully lower intermediate level waste into an in-ground storage container.

Intermediate Level Waste

Intermediate level waste consists primarily of used reactor core components and resins and filters used to keep reactor water systems clean. Intermediate level waste is more radioactive than low level waste and requires shielding to protect workers during handling.

Intermediate level waste, because of its radiological and physical properties, is not processed for volume reduction. It is stored mainly in steel lined concrete containers that have been set into the ground. About 290 m^3 of intermediate level waste is stored annually and in total about 9000 m^3 is in storage as of 2007. Intermediate level waste makes up about five percent of the total volume of non-fuel waste produced from the nuclear generating stations.

Low and intermediate level waste stored at the WWMF is continually monitored to ensure the integrity of the storage containers and can be retrieved at some future date for disposal. The WWMF will continue to add storage structures as required (subject to applicable regulatory approvals). OPG is currently in the planning stages of a Deep Geologic Repository for the long-term storage of low and intermediate level waste at the Bruce site.

High Level Waste

High level waste is used nuclear fuel. It is stored at the nuclear generating site where it was generated. It can be stored in the station's spent fuel bay or after a period of at least 10 years it can be transferred to above ground storage containers.

At the WWMF, only used fuel from the Bruce Power stations is stored at the used fuel dry storage facility called the Western Used Fuel Dry Storage Facility (WUFDSF). The WUFDSF consists of a processing building and storage buildings. This facility is

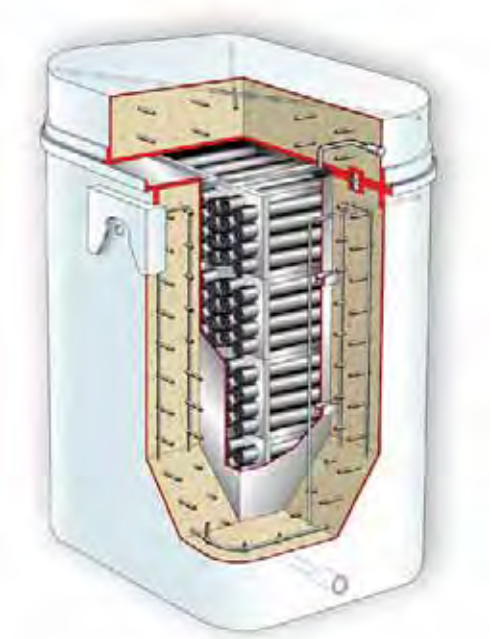
designed to provide storage space for about 2000 Dry Storage Containers (DSC). The overall WUFDSF design includes four DSC storage buildings, each having the capacity to store about 500 DSCs. Construction of DSC storage buildings will be staged as additional storage space is required, with a new storage building built about every five to seven years.

Dry storage is a proven technology in use around the world. In Canada, dry storage is used by Hydro Quebec at Gentilly, New Brunswick Power at Point Lepreau and Atomic Energy of Canada at Chalk River and Douglas Point. In addition to the WUFDSF, OPG also operates dry storage facilities at the Pickering and Darlington nuclear sites.

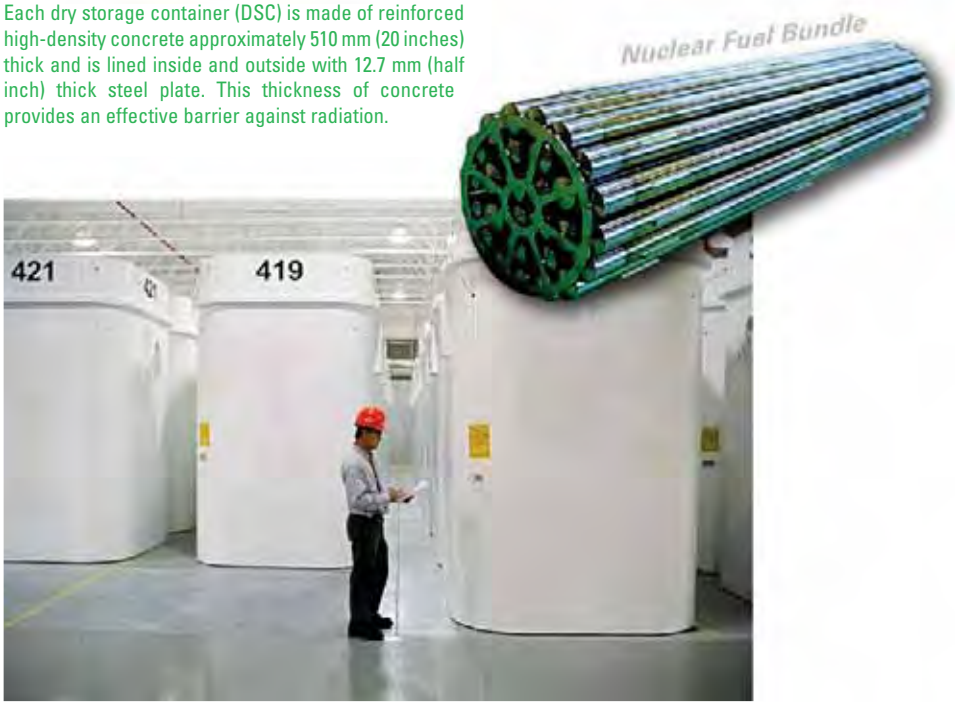
Dry Storage Process

The process of loading a dry storage container with used nuclear fuel begins first by submerging a 63-tonne container into one of Bruce Power's water-filled used fuel storage bays. Once in the storage bay, four modules each containing 96 used fuel bundles are loaded into the container under water. The used fuel bundles have been stored in the water-filled bay for at least 10 years, during which time they have cooled and become less radioactive.

The container, now holding 384 used fuel bundles, is removed from the bay and drained, decontaminated and vacuum dried. The container is moved under a self-contained vacuum to the WUFDSF with a large transport vehicle. Once received at the WUFDSF, the lid is welded to the container's base and the vent port is seal-welded. After the inside of the container has been vacuum dried, it is filled with helium gas. The remaining drain port is then seal-welded. The helium gas provides a means of leak detection for the sealed container and creates an inert atmosphere for the storage of used fuel. Before being placed into storage, the container undergoes rigorous testing to ensure that it is absolutely leak tight and lastly, safeguard seals are applied by an inspector from the International Atomic Energy Agency (IAEA).



Each dry storage container (DSC) is made of reinforced high-density concrete approximately 510 mm (20 inches) thick and is lined inside and outside with 12.7 mm (half inch) thick steel plate. This thickness of concrete provides an effective barrier against radiation.



After weld-sealing, painting and installation of the International Atomic Energy Agency safeguard seals, the dry storage containers are placed in the storage building.

Regulatory Authority

The overall regulation of nuclear reactor operation and waste management in Canada is the responsibility of the Canadian Nuclear Safety Commission (CNSC). Every aspect of the management of low and intermediate level waste and used nuclear fuel is regulated by the CNSC.

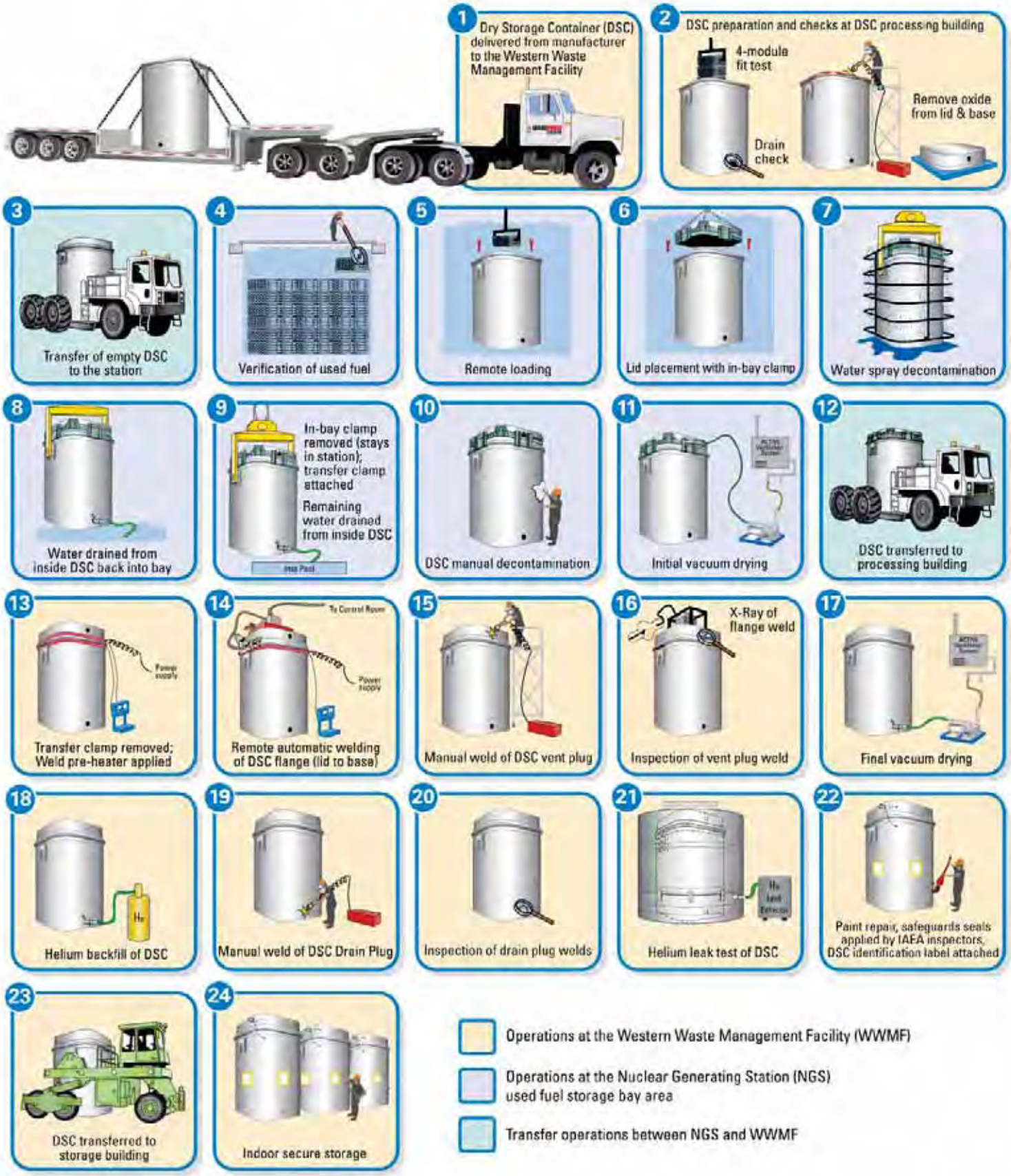
The CNSC oversees the application of stringent safety standards to ensure the management of nuclear waste is without adverse impact to the public and the environment.

To ensure that all used nuclear fuel can be accounted for, Canada participates in the nuclear non-proliferation treaty, an international treaty developed to prevent the spread of nuclear weapons, promote the co-operation in the peaceful uses of nuclear energy and to eventually achieve nuclear disarmament. The WUFDSF is also monitored on an ongoing basis by the IAEA.

This transport vehicle is used to move the DSCs on site, between the Bruce A and Bruce B stations and the Used Fuel Dry Storage Facility.

Western Waste Management Facility

The Used Fuel Dry Storage Process



Western Waste Management Facility

Radioactive Material Transportation

OPG has an exceptional safety record in the transportation of radioactive materials by road. In almost 35 years, there has never been a release of radioactive materials during transportation. Our drivers are some of the best trained in their field. OPG ensures that they have a high level of defensive driving skill through internal and external training which includes classroom sessions and advanced behind-the-wheel vehicle control skills training.

In a typical year OPG makes about 1000 radioactive material shipments, covering about 500,000 kilometres. Some of these shipments (roughly 23 percent) involve the transportation of low and intermediate level waste from the Pickering and Darlington nuclear generating sites to the WWMF. A smaller number of shipments (roughly 13 percent) involve transporting quantities of tritiated heavy water from Bruce and Pickering to the Darlington Tritium Removal Facility for processing. About one third of all radioactive material shipments made by OPG include the transportation of empty packages to and from different nuclear stations.

All of these shipments are logged into an OPG computerized database. This program logs information about the type of material being transported, point of origin, destination, etc.

Many different types of packagings are used to transport radioactive materials. All of the transport packagings are built to requirements specified by the CNSC. For example, the intermediate level waste transportation packagings used for shipping spent resins in bulk and for tritiated heavy water are built to Type B standards. According to federal regulations all Type B packages must be able to withstand a nine-metre drop onto an unyielding surface; a one-metre drop onto a steel pin; 30 minutes in an 800 degree celsius fire; and eight hours immersed in 15 metres of water. Only after field testing and/or computer analysis has demonstrated the packages can survive these tests will a licence to use the packaging be issued by the CNSC.

Radioactive materials transportation is also regulated by Transport Canada's "Transportation of Dangerous Goods Regulation". These regulations specify the documentation and administrative requirements in order to transport radioactive material on public roadways. The documentation must include specification of the contents on the shipping document, the labeling and placarding requirements, driver training requirements and an approved transportation emergency response plan.

OPG's radioactive material transportation program is supported by:

- Packages designed, fabricated and tested in accordance with applicable regulations and standards
- Regular audits and safety assessments of transportation practices
- An ongoing training program
- Routine package inspection and maintenance, and
- A transportation emergency response plan that is audited both internally and externally by authorities like Transport Canada.

Deep Geologic Repository

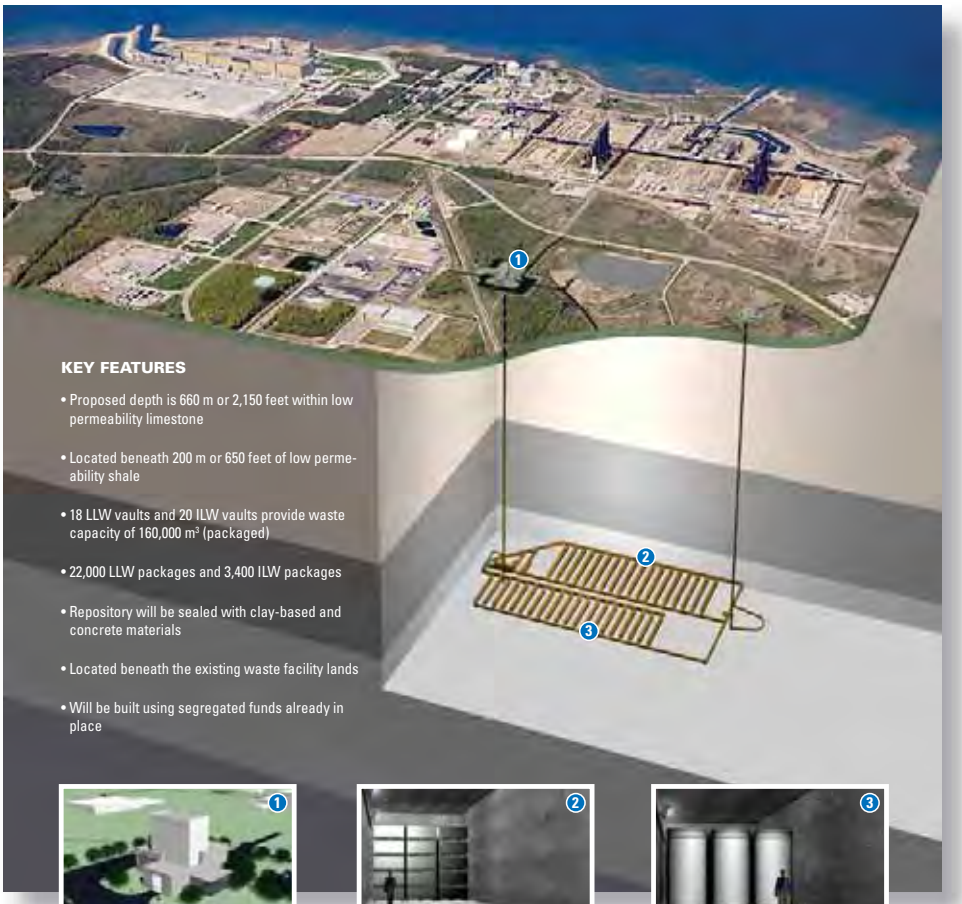
Background

For over 40 years the WWMF has safely stored low and intermediate level waste from the Bruce, Pickering and Darlington sites on an interim basis. In 2002 the Municipality of Kincardine approached OPG about developing a long-term storage facility for low and intermediate level waste at the Bruce site.

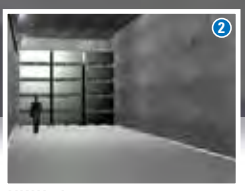
An Independent Assessment Study identified three options deemed to be technically feasible and capable of safely storing the waste: the Deep Geologic Repository (DGR), the Enhanced Processing, Treatment and Long-Term Storage Facility and the Covered Above-Ground Concrete Vault. In 2004 the Municipality of Kincardine endorsed, by resolution, the DGR because of its higher margins of safety.

The proposed DGR will contain seperate vaults for low and intermediate level waste which will store about 160,000 m^3 of waste.

Only low and intermediate waste from the Bruce, Pickering and Darlington generating stations will be accepted for storage in the DGR. Used fuel will not be stored in the DGR. The federal government, by law, has jurisdiction over used fuel and is currently working towards a long-term storage facility in conjunction with the Nuclear Waste Management Organization (NWMO).



Waste Receipt & Headframe Building



LLW Vault

Resin Liner Shields within ILW Vault

Safety Case

The proposed DGR location, 660m (2,150 ft.) underneath the Bruce site, will be constructed in low permeability limestone capped by 200m of low permeability shale. These rock formations, thought to be in excess of 450 million years, have remained intact and without major faults or fractures through many geologic events.

The stability and predictability of the rock formations, along with their isolating capabilities, make an ideal setting where the waste can be safely stored while the radioactivity decays. In addition, the DGR is extremely isolated from all sources of groundwater, and the pore water at the level of the repository has a salt content three to six times that of sea water indicating that it has been trapped at this level in excess of one million years. The salt content is also an indication that the pore water isn't mixing with the groundwater above.

A detailed five-year Geoscientific Site Characterization Program (GSCP) began in 2006 to verify the suitability of the DGR site. The scientific investigation from the GSCP, along with the information gained through an environmental assessment, will assist OPG in obtaining the necessary construction and operating licences from the CNSC.

Formal environmental assessment and licensing processes began in 2005 and are expected to take six to eight years. Throughout this time period, there will be many opportunities for all Canadians, including those in Kincardine and surrounding communities, to gain information and express their views on the DGR proposal.

For more information please visit www.opg.com/dgr.

ONTARIO POWER GENERATION

WWMF hosts visitor from Australia

Scientist Kapila Fernando is on a quest to learn as much as he can about international best practices for nuclear waste management. Here, he tours the low and intermediate level nuclear waste management facilities at the WWMF in early September.

"I am very impressed with how you do things"

Kapila Fernando, a scientist from the Australian Nuclear Science and Technology Organization (ANSTO) located about 40 km southwest of Sydney, was in Canada to observe how nuclear waste is managed here. He has also visited nuclear waste management facilities in Germany, Belgium, Spain and Japan. Recently, he spent three weeks at OPG's head office and the WWMF, where he came to the conclusion that "OPG's nuclear waste management programs are right up there with the best international practices."

"I am very impressed with how you do things," he said. "Your nuclear waste management programs are very mature, based on many years of experience with a large operation," he said.

In contrast to OPG with its fleet of 20 nuclear reactors that range from 540 MW to 935 MW each, Kapila said that ANSTO has a much smaller operation. "From 1950s to 2007 ANSTO operated a 10 MW research reactor which was recently replaced by the larger 20 MW OPAL Reactor. ANSTO's reactor isn't a power reactor; it is used primarily for research and production of radiopharmaceuticals." Like all reactors, radioactive waste is produced from ANSTO's operations – mainly Low Level Waste (LLW) with small quantities of Intermediate Level Waste (ILW).

In the big picture, ANSTO safely manages about 1400m^3 of LLW compared to the 70,000m^3 managed at the WWMF. In terms of ILW, ANSTO manages about 300 – 400m^3 of ILW compared to the WWMF with about 9,000m^3 in safe management. Annually, ANSTO only produces around two truckloads of radioactive waste. Nevertheless, when it comes to the safe management of nuclear waste, quantity isn't a factor that is allowed to trump or compromise quality – one m^3 of waste must be managed just as safely and responsibly as 70,000m^3.

"The point of my trip is to learn from others and I have certainly done that from my visit to this (WWMF) facility," Kapila said. "ANSTO's waste management program is extremely good but is constantly developing, so we have lots to learn from your systems."

Kapila, who toured the WWMF several times and job shadowed technical, operations and project staff, said he was very impressed with the waste management systems he found, particularly with volume reduction techniques, which allow the facilities to maintain a small environmental footprint.

"You have learned from your efforts over the years and systems have been developed until they are at a stage where they are done the same way over and over, systematically and repeatedly. Your experience helps others learn," he said.

Citing the hosting agreement between the Municipality of Kincardine and OPG for the construction of a Deep Geologic Repository (DGR) as an example of the public trust in OPG, Kapila said the company has obviously done a good job of communicating how well it does things. "Positive public opinion for operations and the DGR is underpinned by confidence in your sophisticated, mature, technical expertise," he said. "That's a significant achievement worthy of international note and is a testimony to the effectiveness of OPG's nuclear waste management program.

Australian scientist Kapila Fernando and Brad Elsworth, senior technical engineer at the WWMF, share a joke during a tour of the control room for the incinerator at the WWMF. Kapila not only enjoyed seeing our management systems in action, but he also enjoyed meeting WWMF staff, as is obvious here.

Neighbours

WWMF is published for the neighbours of Ontario Power Generation's Western Waste Management Facility.

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ONTARIO POWER GENERATION

News from OPG's Western Waste Management Facility

Neighbours

A part of the community for more than 40 years • OCTOBER 2007

Port Elgin Saugeen Central students (left, Taylor Ferguson, Thomas MacDonald, Kaitlin Ferguson and Lauren MacDonald) show their thanks for OPG's contribution to their playground naturalization program. OPG has also assisted Huron Heights Public School in Kincardine and Bruce Peninsula District School with similar playground naturalization programs.

Jim Hankinson

OPG President named leader of the year

Employees at Ontario Power Generation's (OPG) Western Waste Management Facility (WWMF), along with all of OPG, were pleased to learn of OPG President Jim Hankinson's recent honour of being named "Leader of the Year" by the Ontario Energy Association (OEA).

The OEA is considered one of Ontario's most important energy trade organizations, whose 190 members collectively employ about 32,000 Ontarians. Last year, these groups accounted for about $35 billion in market revenues.

The Leader of the Year award recognizes "outstanding individuals acknowledged by their peers within the Ontario energy industry." Candidates are judged on the ability to establish a clear corporate vision, achieve success in meeting goals, stay the course, and earn the respect of stakeholders among other things. Jake Epp, Chairman of OPG's Board of Directors, noted that "the selection of Jim as Leader of the Year is a testimony to Jim's capabilities in these and other areas."

In accepting the award at the OEA's annual conference on Sept. 5, held in Niagara Falls this year, Hankinson paid tribute to the support from his peers.

"It's an honour to be selected for this award because it represents the recognition and respect of one's peers in the industry. There is no higher honour than that, in my opinion."

Hankinson also acknowledged the support of OPG's neighbours throughout the various communities in Ontario where the company operates.

"The progress we have made as a company we have made because of many people. These include residents and leaders in the communities where we operate – who have been so supportive of OPG in recent years."

ONTARIO POWER GENERATION

Staff from the Western Used Fuel Dry Storage Facility (WUFDSF) reached a major milestone on July 30, 2007 with the transfer of a loaded Used Fuel Dry Storage Container from Bruce A. Prior to this, used fuel bundles were loaded only from Bruce B for transfer to the WUFDSF. The construction of facilities for the loading and transfer of fuel form the Bruce A Fuel Bay to DSCs was completed this summer, facilitating the process. The transfer team includes: back left, Jan Hill, Keith Galbraith, Garnet Reid, Kevin Bourne, Karl Haferer, David Bezpaiko, Kevin Klages, Bob Moss, Randy Smith, Al Cowan, Steve Ambeau and in the very back are Harold Hisey, Jeff Horning and Carmen Dumitra. Front left, Brian Hachey, Wayne Swann, Dwayne Johnston, John Verhoeven.

Another opportunity to talk DGR

Ontario Power Generation (OPG) is proposing to build a Deep Geologic Repository for the long term storage of low and intermediate level radioactive waste at the Bruce site.

As part of the planning and approval process for the DGR project, we are conducting an environmental assessment that includes this first round of Open Houses. They will be held at the locations listed below from 4-8p.m. We look forward to seeing you.

Kincardine
Monday October 15
Best Western Governor's Inn
791 Durham Street

Ripley
Tuesday October 16
Ripley Huron Community Centre
17 Queen Street

Walkerton
Wednesday October 17
Hartley House
7 Jackson N

Port Elgin
Thursday October 18
Saugeen Shores Community Complex
600 Tomlinson Drive

Owen Sound
Tuesday October 23
Bayshore Community Centre
1900 3rd Ave E

Chesley
Wednesday October 24
Chesley Fire Hall
North end of Chesley,
Bruce Rd. 10

Wiarton
Thursday October 25
Wiarton & District Community Centre
531 Scott St.

For more information, please call Marie Wilson at 519 361-4065, or write to us at Ontario Power Generation, Box 7000, B21, Tiverton, ON, N0G 2T0: or visit our project website at: www.opg.com/dgr

OPG helps foster environmental stewards of the future

Grey/Bruce Rangers spent a day and a half in July checking out various aspects of the habitat at Baie du Dore. The day was all about getting close and personal with specific habitats and their inhabitants and that's exactly what these three Rangers did with this slithering fellow, who contrary to popular opinion is dry and soft to the touch.

A group of 17-year olds taking part in the Ontario Stewardship Ranger Program, sponsored by the Ministry of Natural Resources, had their eyes opened not only to the who, what, why and where of nuclear waste management at the Western Waste Management Facility (WWMF) this summer, but they also learned a lot more about environmental stewardship from WWMF employees.

Bryan Yule, who works in environment and safety at the WWMF, said it was a prime opportunity to introduce the students to Baie du Dore and the research that OPG is currently undertaking, in conjunction with Laurentian University, into the habitat of an endangered species. While there, the group also spent half a day performing a clean-up of the area.

"Not only did they enjoy an educational opportunity, but they were also involved in habitat improvement," Yule said. "Part of our environmental management policy is to promote education about environmental stewardship. Fostering students to become such stewards through these types of initiatives helps us to accomplish some of our environmental goals."

> *The Ranger program provides educational opportunities and valuable work experience in natural resource management.*

Wildlife Habitat Canada certifies WWMF's biodiversity plan

Ontario Power Generation's (OPG) Western Waste Mangement Facility (WWMF) is pleased to announce its biodiversity initiative plan has been certified as part of the Wildlife Habitat Council's (WHC) Corporate Wildlife Habitat Certification program.

The WHC is a non-profit, non-lobbying group of conservation organizations and individuals dedicated to restoring and enhancing habitat. Created in 1988, the WHC helps landowners, particularly corporations, manage their unused lands in an ecologically sensitive manner for the benefit of wildlife. Certified wildlife habitat programs focus on restoration, creation, protection and enhancement of habitat and individual species management.

By applying and receiving WHC certification, the WWMF has publicly stated its commitment to entrenching its biodiversity initiatives within a specific program, which is above and beyond what would normally be expected. Specifically, the WWMF is interested in improving the habitat on OPG retained lands within the Baie du Dore area. In order to be certified, there had to be at least one site visit by a biologist, submission of an application form with references, a management plan supported by photographs and documentation of program monitoring and maintenance.

Although the WWMF has an entrenched environmental management plan in place, which specifies biodiversity initiatives in the business plan, WHC certification puts the plan under greater scrutiny and makes it much more visible.

Appendix D

Open House Display Materials

NATURAL BARRIERS TO PROVIDE LONG TERM MANAGEMENT TO SAFELY ISOLATE LOW & INTERMEDIATE LEVEL WASTE

WELCOME

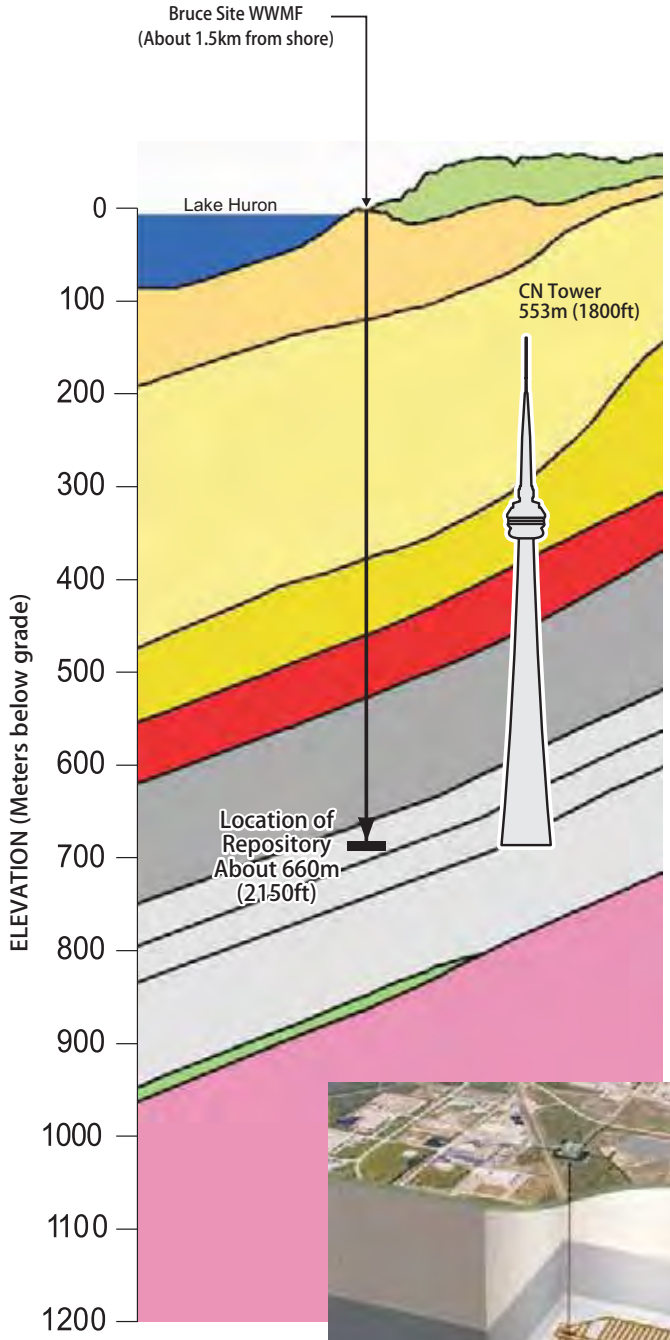
KEEPING YOU **INFORMED** ABOUT THE **DEEP GEOLOGIC REPOSITORY PROJECT**

ONTARIO POWER GENERATION

www.opg.com/dgr

The Deep Geologic Repository Project

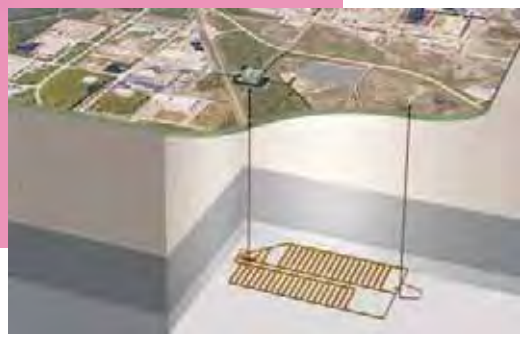
AN OVERVIEW OF THE PROPOSED DEEP GEOLOGIC REPOSITORY



OPG, with the support of the local community, has proposed the construction and operation of a Deep Geologic Repository (DGR) for the long-term management of low and intermediate level nuclear waste on lands adjacent to the Western Waste Management Facility in Kincardine, Ontario.

The DGR would be located about 660 metres or 2150 feet below ground surface in very low permeability limestone, beneath a very thick layer of low permeability shale rock, which have remained stable – for more than 450 million years – in spite of geologic upheavals, major climate change and glacial cycles. These sedimentary bedrock formations will safely isolate nuclear waste for many thousands of years and beyond.

The proposed repository will be composed of a series of emplacement rooms. Conventional mining methods will be used to construct the repository. Access to the DGR and emplacement rooms will be by vertical shafts.



Waste receipt and headframe building

Low level waste room

Resin liner shields within intermediate level waste room

Key Features

- Proposed depth is about 660 metres (2,150 feet) within low permeability limestone – deeper than the CN Tower is tall
- Capacity of 160,000 cubic metres of waste
- Located beneath a protective 200 metre (650 feet) cap of low permeability shale.
- Repository access shafts will be sealed with clay-based and concrete materials
- Located adjacent to OPG's existing Western Waste Management Facility on the Bruce site

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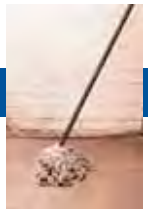
The Deep Geologic Repository Project

THE FACTS ABOUT NUCLEAR WASTE



What is Low Level Waste?

Low level waste (LLW) consists of minimally radioactive materials that have become contaminated during routine clean-up and maintenance at nuclear generating stations.

Low level waste:

- Includes mop heads, cloths, paper towels, temporary floor coverings, floor sweepings, protective clothing and hardware items such as tools Consists of paper, plastics, metal, rubber, cotton and other miscellaneous materials
- Can be safely handled using normal industrial practices and equipment without any special radiation protection
- Makes up about 95 percent of the total non-fuel waste volume received at OPG's Western Waste Management Facility

About 3000 cubic metres of low level waste is stored annually. The majority of low level waste volume is incinerated or compacted for volume reduction before it is placed in concrete warehouse-like buildings for interim management.

Low level waste can be safely handled using normal industrial practices.

What is Used Fuel?

- Consists of used fuel reactor bundles
- OPG is not seeking approval to store used fuel in the DGR
- The Host Agreement with Kincardine and certain design elements of the DGR preclude used fuel from the repository

Intermediate Level Waste Storage

What is Intermediate Level Waste?

Intermediate level waste (ILW) consists primarily of used reactor core components, and resins and filters used to keep reactor water systems clean, and reactor retube parts such as pressure tubes.

Intermediate level waste:

- Requires shielding to protect workers during handling
- Is not processed for volume reduction
- Makes up approximately five per cent of all non-fuel waste received at the Western Waste Management Facility – approximately 200 cubic metres each year
- Is stored mainly in steel lined concrete containers set into the ground

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The Deep Geologic Repository Project

THE STEPS TO MOVE FORWARD

DECISION AND APPROVAL PROCESS

- Formal environmental assessment and licensing processes for the DGR project began in 2005 and are expected to take six to eight years
- Throughout the process, there will be many opportunities for people to express their views on the DGR proposal
- A stepwise five-year Geoscientific Site Characterization Program (GSCP) began in 2006 to confirm the suitability of the Bruce Site for the DGR concept
- The GSCP, along with an Environmental Assessment and a Safety Assessment, will assist OPG in applying for a construction license from the Canadian Nuclear Safety Commission (CNSC)

Complete Regulatory Compliance

As one of the most closely regulated industries in Canada, OPG is in full compliance and will continue to adhere to the very strict rules of the CNSC and other agencies that oversee our activities – Natural Resources Canada, Transport Canada, the Canadian Environmental Assessment Agency, the Provincial Ministry of the Environment, etc.

Keeping You Informed

At OPG, we understand the importance of working together with Ontario communities to help assure Ontario's energy future. We realize that transparency, dialogue, and easy access to information are vital to the success of the DGR project.

To provide you with more information and to obtain your feedback on the proposal, OPG will continue to provide opportunities for you to meet with us at trade shows, open houses, community events and through community speaking engagements.

Please visit our web site at www.opg.com/dgr, call OPG at 519 361-6414 ext. 4065, or email us at nwmd@opg.com for information on upcoming events or to provide comments.

ONTARIO POWER GENERATION
www.opg.com/dgr

The Deep Geologic Repository Project

SCIENTIFIC INVESTIGATIONS

GEOSCIENTIFIC SITE CHARACTERIZATION PROGRAM

Site-Specific Knowledge: The Geoscientific Site Characterization Program (GSCP)

To add to the body of information that already exists, additional scientific investigations are underway to confirm the suitability of the Bruce site for DGR implementation.

Various studies will investigate a number of factors, including:

- The physical and chemical properties of the sedimentary bedrock formations occurring directly beneath the site
- The influence of seismic activity on repository safety
- The presence of viable oil and gas reserves
- The capacity of the rock formations to protect surface and groundwater resources for many thousands of years and beyond

Gathering the Geological Evidence

Background geoscientific studies and consultation with external scientists provided strong evidence that the Bruce site was well-suited to host the DGR. This included a Geotechnical Feasibility Study that considered the geologic, hydrogeologic, seismic and geomechanical characteristics of the bedrock formations beneath the site that, in part, was supported by information from decades of drilling for oil and gas in Southwestern Ontario.

GSCP studies include the following:

- A 2D seismic reflection survey that will enable imaging of the horizontally layered sedimentary bedrock formations and their undisturbed lateral extent beneath the site
- Installation and monitoring of a new borehole seismograph network to allow an improved regional understanding of low-level seismic activity
- Installation of a network of shallow (100m) bedrock monitoring wells
- Drilling of six deep boreholes to extract site-specific knowledge of the bedrock layers

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GEOSCIENCE STUDIES TO DATE

Boreholes

Drilling deep boreholes will provide site-specific knowledge of the sedimentary bedrock layers beneath Bruce site.

Our method

Using a drilling rig similar to those used for oil and gas exploration, two deep boreholes were drilled to investigate the 860 metre sedimentary sequence underlying the site. The boreholes (16 cm or 6 inch diameter) were cored such that a cylindrical sample of the rock (7.5 cm or 3 inch diameter) is collected every 3 meters and brought to surface where it is photographed, sampled and sent for storage at an on-site Core Storage Facility.

The rock core samples obtained from the various bedrock layers are sent to Canadian and International laboratories for testing to determine specific properties, including:

- rock strength
- rock porosity and permeability
- mineralogy
- porewater fluid compositions

Upon completion of drilling, instruments are lowered into the open bore to characterize 'in-situ' bedrock properties including density, clay content, bedrock formation contacts, fracturing, and groundwater pressures and permeability. Once the borehole testing is complete a hydrogeologic monitoring system is installed in the borehole to allow long-term monitoring of groundwater conditions.

2D Seismic Reflection Study

The 2D seismic reflection study creates a picture of what the bedrock layers look like over the study area, to verify that the underground layers are intact and continuous.

Our method

Specialized vibrating trucks generate seismic waves that travel into the earth. These waves reflect off the various layers of rock, depending on the rock characteristics. Listening devices called geophones – which are used around the world in oil and gas exploration – collect the waves to allow a profile of the rock layers to be created.

Vibroseis trucks.

Seismology Study

A study of existing data and the installation of a borehole seismograph network will improve our understanding of low-level seismic activity in the region.

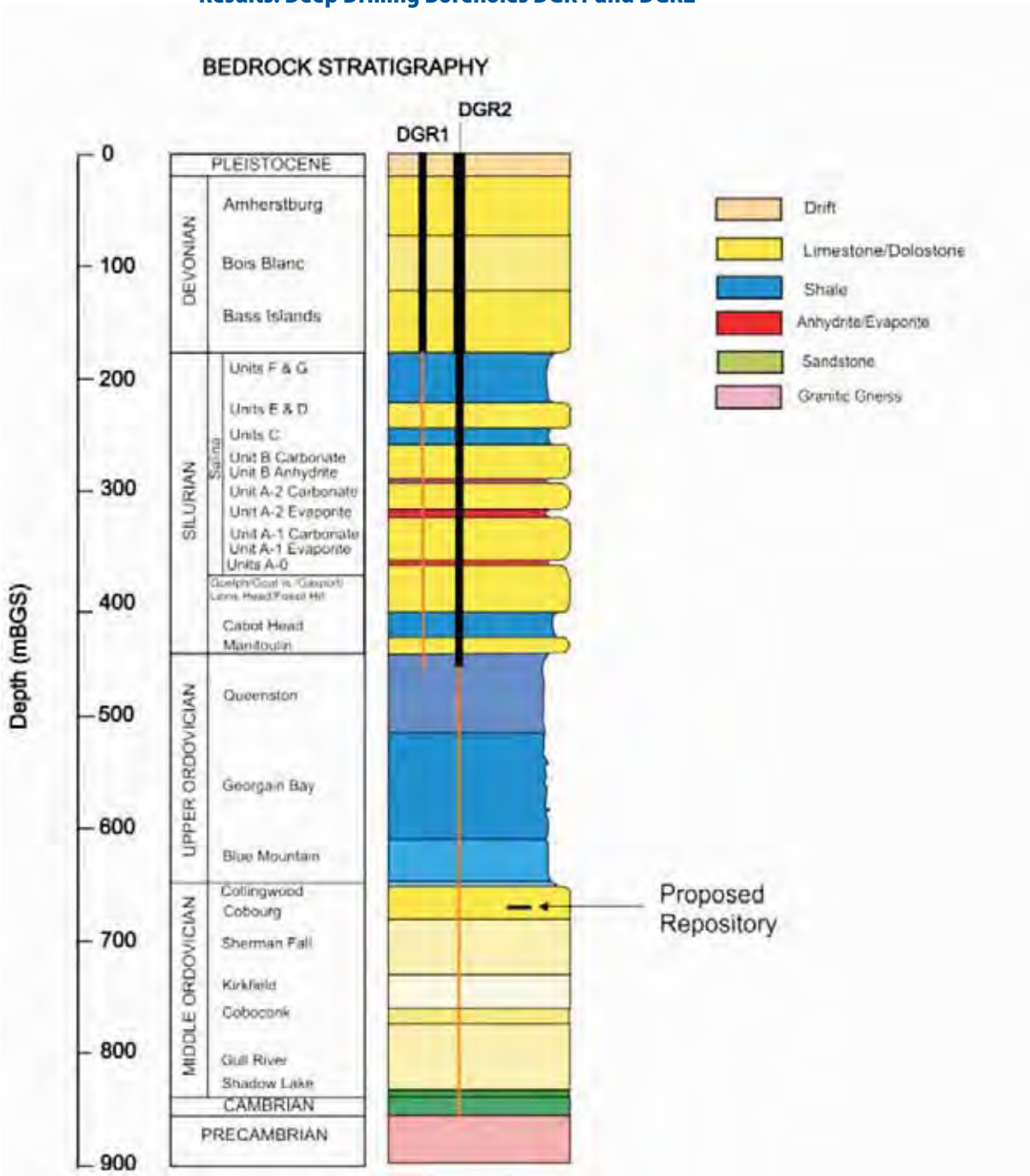
University of Western Ontario - Borehole Seismometer.

University of Ottawa - Environmental Isotopes.

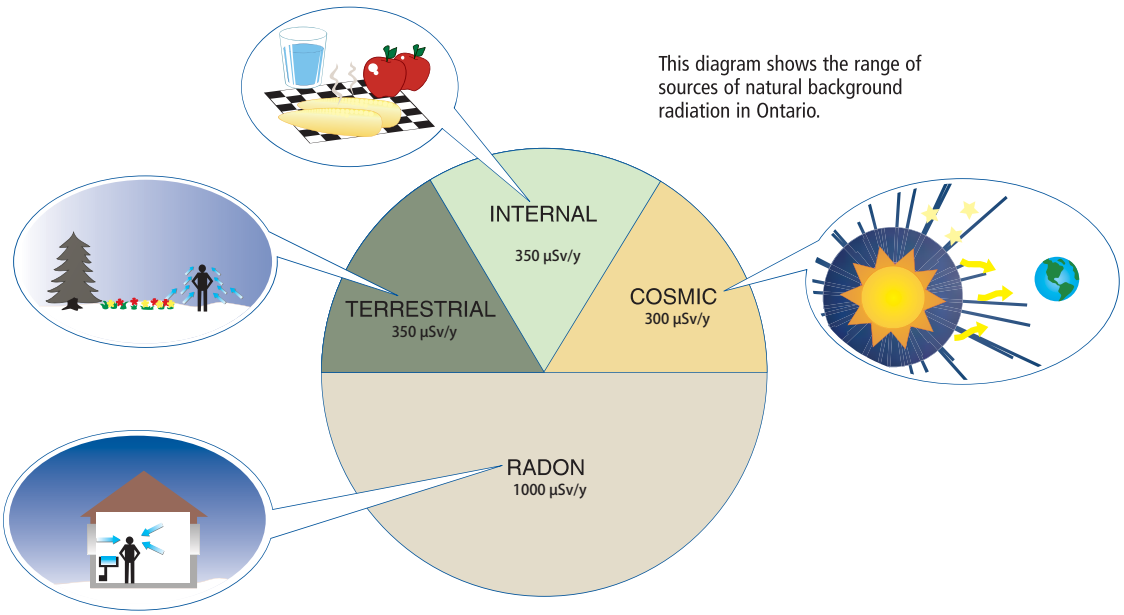
Sample of rock core from beneath Bruce site.

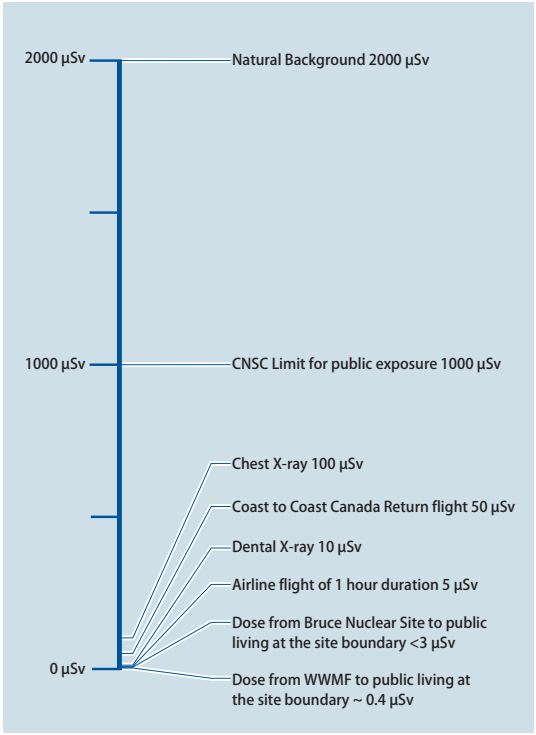
GEOSCIENCE STUDIES TO DATE

Results: Deep Drilling Boreholes DGR1 and DGR2



WHAT IS RADIATION?





Sources of Radiation in Our Environment

People are exposed to radiation from a number of natural sources such as the bedrock, and also from human activities such as medical examinations, smoke detectors and power generation.

Radiation dose is measured in Sieverts, and the dose of radiation received by people is often expressed in millionths of a Sievert, or microSievert (µSv). The amount of radiation that the average person in Canada is exposed to, from all natural sources, is about 2,000 µSv per year. A chest x-ray gives you about 100 µSv, a dental x-ray set about 10 µSv.

Radiation Exposure Regulations

The nuclear industry adheres to both national regulations and international recommendations. The limit for public radiation exposure from nuclear facilities is 1,000 µSv per year. For nuclear waste repositories, the International Commission on Radiological Protection recommends a dose constraint of 300 µSv per year.

Readings from careful monitoring of all nuclear activities at the Bruce site show that the public exposure is less than 3 µSv per year to a person living at the fenceline. Waste handling and storage at the WWMF contribute a fraction of this dose. Emplacing the waste in the DGR will further reduce the exposure.

THE SAFETY CASE FOR THE DGR

Building the Safety Case: Natural Barriers to Protect the Public

The DGR will safely isolate the public from the nuclear waste. Public doses are estimated to be very small, less than current doses from the WWMF.

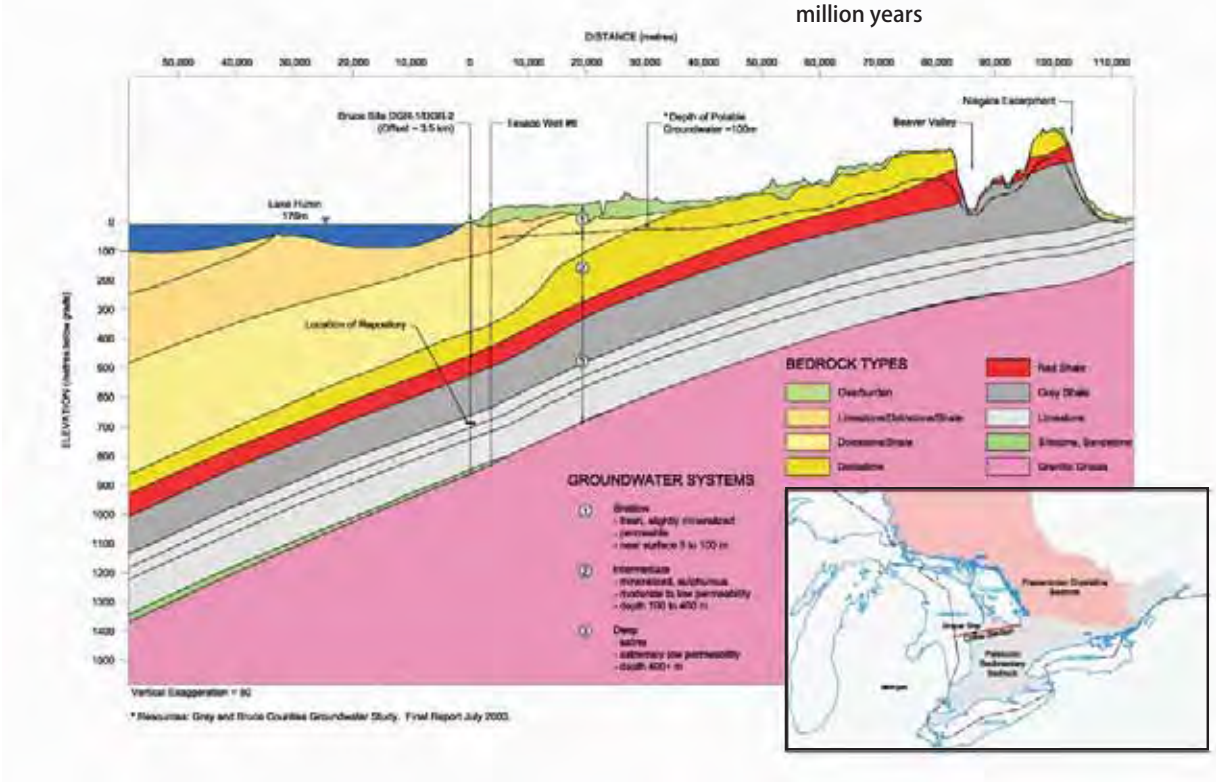
This estimate is based on the site's geologic setting:

- The repository will be located at a depth of about 660 metres (2150 feet) in low permeability limestone beneath a protective cap of 200 metres (650 feet) of low permeability shale rock
- Radionuclides from the waste would move through the limestone and the overlying shale layer at extremely low rates – less than 1mm per year
- The local rock formations are 450 million years old and have remained stable through major climate change, including many ice ages
- Almost all of the radioactivity would decay within or near the repository
- In the unlikely event of a significant earthquake, it would have little to no impact on the DGR; earthquakes do the most damage to structures located at the surface

Protecting Groundwater

The natural properties of the sedimentary bedrock formations beneath the Bruce site will isolate the L&ILW from ground and surface water resources.

- Regional groundwater resources are drawn from permeable bedrock aquifers within 100m of ground surface
- At greater depths (400+m) the horizontally layered and thick bedrock formations, which extend beneath Lake Huron, have created a stagnant, sluggish groundwater domain characterized by extremely low bedrock permeabilities and saline waters (6 times seawater)
- At the proposed DGR horizon, the groundwater domain appears stable and unaffected by near surface or glacial events (9) during the last million years



SAFETY SCENARIO REVIEW: MALFUNCTIONS AND ACCIDENTS

Safety Assessment

An important part of the DGR proposal is to complete a detailed estimate of the potential impacts.

A preliminary assessment was completed in 2003. The results predicted very little impact from the repository.

This assessment is presently being updated to take into account:

- Current forecast waste inventory, including Intermediate Level Wastes such as those presently being received at WWMF
- Geological data from the site characterization program
- Updated conceptual design information

The updated safety assessment will consider:

- Normal Operation and Accidents
- Pre-Closure and Post-Closure periods
- Potential effects on humans and on biota

The Pre-Closure assessment considers the safety of the repository during the operational and pre-closure periods. During these periods, the wastes are transferred underground and placed in the repository. The safety characteristics are basically those associated with normal handling and storage of low & intermediate level wastes, plus those associated with mining. The preliminary assessment will consider a wide variety of potential hazards, such as fires, and container breaches.

The Post-Closure assessment addresses the safety of the repository after the underground portion has been closed and sealed. It extends far into the future, and assumes that beyond a few hundred years the site reverts to a green-field use. The assessment will consider both the expected changes to the site and repository that will occur over time, as well as unlikely or "what if" scenarios such as future human intrusion.

The Deep Geologic Repository Project

ENVIRONMENTAL ASSESSMENT

ACTIVITIES

The Environmental Assessment, along with the GSCP and a Safety Assessment, will assist OPG in applying for a construction licence from the Canadian Nuclear Safety Commission (CNSC).

- In June 2007, the Minister of the Environment referred the DGR project to a review panel
- OPG has contracted an independent consultant to gather baseline environmental data and identify any potential effects on the environment
- During the course of this work, OPG will provide information to stakeholders and seek their input on the project

The Current Schedule Moving Forward

2007 - 2009	Ongoing Environmental Assessment and site characterization studies
2010	Environmental Assessment Review Panel appointed
2010	OPG Submits Environmental Impact Statement To Review Panel
2010 or 2011	Public Review of Environmental Impact Statement
2011	Public Hearing
2011 or 2012	Review Panel Issues Report to Minister
2012	Cabinet decides on Acceptability of Environmental Impact Statement
2012	CNSC Considers Construction Licence Application
2012 - 2017	Construction
2017	Seek operating licence from CNSC
2017/2018	DGR operation begins

STUDY AREAS

The Environmental Assessment Guidelines will require study areas that encompass the environment that might be affected by the Project, or which may be relevant to the assessment of cumulative effects. The study areas identified for the project include all relevant components of the environment including the people, land, water, air and other aspects of the natural environment.

Three generic study areas were selected: the Regional Study Area, the Local Study Area, and the Site Study Area. These may be refined to reflect the needs of specific studies.

The Regional Study Area includes areas within the municipal boundaries of Bruce County .

The Local Study Area includes areas within the municipal boundaries of the Municipality of Kincardine. This area represents the host community for the WWMF.

The Site Study Area includes the Bruce Nuclear site, particularly the OPG-retained lands where the DGR project will be located (The Project Area).

BASELINE ENVIRONMENTAL STUDIES

Baseline environmental activities are underway.

They include the following:

- LIDAR (high density topographic) survey
- Noise level assessment
- On-site surface water quality assessment
- Terrestrial habitat assessment
- Archaeological survey
- Wild turkey and breeding bird surveys
- Amphibian surveys
- Muskrat surveys

Future studies will include traffic counts, economic and social environment studies.

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CHOOSING THE VALUED ECOSYSTEM COMPONENTS

What is a VEC?

- Valued Ecosystem Components, or VECs, are features of the environment selected to be a focus of an Environmental Assessment because of their ecological, social and economic value, and their potential vulnerability to effects of the Project
- VECs can be individual species or important groups of species within food webs. They can also be resources or features valued for their uniqueness or importance in maintaining the economic base, social structure and/or community stability
- The VECs are the assessment endpoints; they must represent meaningful measures of the environmental effects that may be caused by the Project





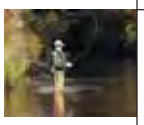


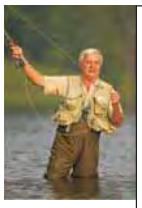







PROPOSED VALUED ECOSYSTEM COMPONENTS

	Grouping	VEC	Rationale
	Features of the Physical Environment	Air Quality Noise Levels Surface Water Quality Surface Water Quantity and Flow Soil Quality Groundwater Quality Groundwater Flow	• Key elements of the physical environment that may be affected by project activities. • They are important as both assessment end points and as pathways to other VECs.
	Plants	Eastern White Cedar Heal-all Common Cattail Variable Leaf Pondweed	• Land-based and aquatic plants are important elements of the environment, providing shelter and support to other species. • Plants may also be used for their food or medicinal values. • The proposed plant VECs were selected to represent the aquatic, emergent and land-based species present in the project area.
	Mammals	Muskrat White-tailed Deer Meadow Vole	• The mammals proposed as VECs were chosen for their presence in the project area, to represent different habitats on site, as well as their respective positions on the food chain.
	Amphibians and Reptiles	Midland Painted Turtle Northern Leopard Frog	• The proposed reptile and amphibian VECs were selected based on their presence in the project area, and potential to be affected by activities associated with the DGR project.
	Birds	Mallard Red-eyed Vireo Wild Turkey Yellow Warbler Bald Eagle	• The proposed bird VECs were selected based on their presence in the Site, Local or Regional Study Areas. • Species were selected to represent the range of habitats present in the project area, or respective positions on the food chain.
	Benthic Fish	Redbelly Dace Creek Chub Lake Whitefish	• Benthic fish are those that live in or near the bottom of the water column, referred to as the “benthic zone”. • The species proposed as VECs were chosen to represent those present in the Railway Ditch, Stream C and Lake Huron. • Benthic fish are a valuable food resource for other organisms and an important component of commercial fishing in the region.

	Grouping	VEC	Rationale
	Pelagic Fish	Spottail Shiner Smallmouth Bass Brook Trout	• Pelagic fish are free swimming fish that live in open water. • The species proposed as VECs were chosen to represent those present in the Railway Ditch, Stream C and Lake Huron. • Pelagic fish are a valuable food resource as well as an important sport fish in the region.
	Invertebrates (e.g., water-born insects)	Benthic Invertebrates Burrowing Crayfish	• The proposed invertebrate VECs were selected based on their presence in the project area, and potential to be affected by activities associated with the DGR project. • Invertebrates represent an important source near the base of the food chain.
	Ecological Features	Lake Huron Stream C Railway Ditch Wetland	• Ecological features represent features or elements of the natural environment, considered to be culturally or scientifically important. Such features are comprised of several ecological aspects and affected by a range of pathways. • The proposed VECs represent important habitat for wildlife or fish, or have local and international importance.
	Human and Social Issues	Human Health Population Employment Business Activity Tourism Inverhuron Park Housing and Property Values Municipal Finance, Infrastructure, Services and Facility/Resources	• The proposed VECs represent features of the socio-economic environment that human's value and may be affected by the Project.
	Aboriginal Issues	First Nation Communities Aboriginal Heritage and Cultural Resources Traditional Use of Lands and Resources	• Aboriginal communities have distinct and identifiable issues • The proposed VECs represent interests of the Aboriginal communities that may be affected by the project.

Have your say

On the board are the proposed Valued Ecosystem Components (VEC). Place a pin in each VEC that is important to you. If there is a possible VEC you don't see represented, please add it to the board.

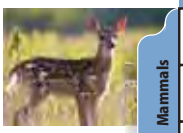
PLACE PIN IN OVAL TO IDENTIFY YOUR SELECTION

Features of the Physical Environment

- Air Quality
- Noise Levels
- Surface Water Quality
- Surface Water Quantity and Flow
- Soil Quality
- Groundwater Quality
- Groundwater Flow

Plants

- Eastern White Cedar
- Heal-all
- Common Cattail
- Variable Leaf Pondweed



Mammals

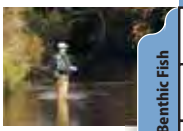
- Muskrat
- White-tailed Deer
- Meadow Vole

Amphibians & Reptiles

- Midland Painted Turtle
- Northern Leopard Frog

Birds

- Mallard
- Red-eyed Vireo
- Wild Turkey
- Yellow Warbler
- Bald Eagle



Benthic Fish

- Redbelly Dace
- Creek Chub
- Lake Whitefish

Pelagic Fish

- Spottail Shiner
- Smallmouth Bass
- Brook Trout

Invertebrates

- Benthic Invertebrates (eg. waterborne insects)
- Burrowing Crayfish

Ecological Features

- Lake Huron
- Stream C
- Railway Ditch
- Wetland

Human and Social Issues

- Human Health
- Population
- Employment
- Business Activity
- Tourism
- Inverhuron Park
- Housing and Property Values
- Municipal Finance, Infrastructure, Services and Facility/Resources

Aboriginal Issues

- First Nation Communities
- Aboriginal Heritage & Cultural Resources
- Traditional Use of Lands and Resources

The Deep Geologic Repository Project

AN INTERNATIONAL PERSPECTIVE

Around the world, research on the long-term management of nuclear waste has engaged thousands of scientists and involved billions of dollars in research. OPG collaborates with several international organizations concerned with nuclear waste management and has cooperative agreements with many countries that are in the forefront of nuclear waste management research and development. These links facilitate the exchange of technical information, joint research and development activities, and in some instances the exchange of technical staff. The DGR is no exception.

The Geoscience Review Group (GRG)

The Geoscience Review Group (GRG) includes representation from France, Switzerland, United States and Canada. The members have, between them, nearly one hundred years of experience and have worked on nuclear waste programs in Japan, Hungary, Switzerland, Sweden, Finland, Korea, United States and the United Kingdom.

For the DGR, the GRG will provide guidance and expertise related to:

- Implementation of field laboratory measurement techniques and methods
- Interpretation and synthesis of field and laboratory data
- International practice for geoscientific investigations in sedimentary sequences for radioactive waste management purposes
- Review and direction of strategies for geosynthesis development

The GRG will independently assess the adequacy of all aspects of this phase of the site investigation.

OPG's Geoscience Review Group (L to R) Dr. Joe Pearson, USA - Dr. Derek Martin, Canada - Jacques Delay, France and Dr. Andreas Gautschi, Switzerland examine drill core samples taken from the DGR site.

Examples of Other Facilities Around the World for Low and Intermediate Level Waste

The DGR would employ technology similar to that used at sites in United States, Sweden, and Finland. Each of these international sites has unique differences in site characteristics.

Waste Isolation Pilot Plant (WIPP)
New Mexico, U.S.

- Located in the desert
- The underground repository was excavated in 250 million year-old bedded salt approximately 660m below surface
- Maximum capacity of 174,000 m^3
- Status: Began disposal operations in 1999

Forsmark Facility
Sweden

- Located at the Forsmark nuclear power station site
- The underground repository was excavated to a depth of 60 metres in crystalline rock below the Baltic Sea
- Status: Opened 1988

Olkiluoto (VLJ) Facility
Finland

- Located near the Olkiluoto nuclear power station
- The underground repository was excavated to a depth of 70 to 100 metres underground in crystalline rock
- Status: Began operation in 1992

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THE WESTERN WASTE MANAGEMENT FACILITY (WWMF)

THE SITE FOR THE DGR

Intermediate level waste storage.

- The WWMF, located at the Bruce site, began operations in 1976
- It is located on 19 hectares about one and a half kilometers from Lake Huron, just northwest of Tiverton, Ontario
- Prior to opening the WWMF, OPG stored low and intermediate level waste at the Radioactive Waste Operating Site #1, also on the Bruce site
- Safe, interim storage facilities are currently processing and storing waste at this site in various buildings and in-ground engineered structures such as concrete trenches and in-ground storage containers
- There are also facilities for storing refurbishment waste, such as steam generator
- Additional processing, maintenance and storage facilities are periodically constructed to meet waste management needs
- The proposed DGR will be situated beneath this OPG owned property

Have your say

On the board are the proposed Valued Ecosystem Components (VEC). Place a pin in each VEC that is important to you. If there is a possible VEC you don't see represented, please add it to the board.

PLACE PIN IN OVAL TO IDENTIFY YOUR SELECTION

CHESLEY

Features of the Physical Environment

Air Quality	3
Noise Levels	2
Surface Water Quality	3
Surface Water Quantity and Flow	4
Soil Quality	3
Groundwater Quality	3
Groundwater Flow	4

Plants

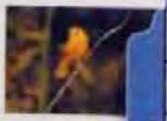
Eastern White Cedar	3
Wild Oat	2
Common Carrot	2
Variable Leaf Pondweed	2

Mammals

Muskrat	2
White-tailed Deer	3
Meadow Vole	2

Amphibians & Reptiles

Midland Painted Turtle	3
Northern Leopard Frog	3



Birds

Mallard	2
Red-eyed Vireo	2
Wild Turkey	2
Yellow Warbler	2
Bald Eagle	2

Benthic Fish

Creek Chub	3
Lake Whitefish	3

Primary Fish

Spottail Shiner	2
Smallmouth Bass	2
Brook Trout	2

Benthic Invertebrates

Benthic Invertebrates (eg. waterborne insects)	2
Burrowing Crayfish	2

Ecological Features

Lake Huron	3
Stream C	2
Railway Ditch	2
Wetland	3

Human and Social Issues

Human Health	3
Population	3
Employment	3
Business Activity	3
Tourism	3
Inverhuron Park	3
Housing and Property Values	2
Municipal Finance, Infrastructure, Services and Facility Resources	3

Aboriginal Interest

First Nation Communities	3
Aboriginal Heritage & Cultural Resources	2
Traditional Use of Lands and Resources	2

Have your say

On the board are the proposed Valued Ecosystem Components (VEC). Place a pin in each VEC that is important to you. If there is a possible VEC you don't see represented, please add it to the board.

PLACE PIN IN OVAL TO IDENTIFY YOUR SELECTION

Kincardine - Oct 15

Features of the Physical Environment

- Air Quality — 6
- Noise Levels — 2
- Surface Water Quality — 6
- Surface Water Quantity and Flow — 6
- Soil Quality — 4
- Groundwater Quality — 5
- Groundwater Flow — 4

Plants

- Eastern White Cedar — 3
- Heal-all — 2
- Common Cattail — 2
- Variable Leaf Pondweed — 2

Mammals

- Muskrat — 2
- White-tailed Deer — 3
- Meadow Vole — 2

Amphibians & Reptiles

- Midland Painted Turtle — 2
- Northern Leopard Frog — 3

Birds

- Mallard — 2
- Red-eyed Vireo — 2
- Wild Turkey — 2
- Yellow Warbler — 2
- Bald Eagle — 4

Fish

- Redbelly Dace — 2
- Creek Chub — 2
- Lake Whitefish — 2

Pelagic Fish

- Spottail Shiner — 2
- Smallmouth Bass — 3
- Brook Trout — 4

Invertebrates

- Benthic Invertebrates (eg. waterborne insects) — 2
- Burrowing Crayfish — 2

Ecological Features

- Lake Huron — 5
- Stream C — 2
- Railway Ditch — 2
- Wetland — 2

Human and Social Issues

- Human Health — 4
- Population — 2
- Employment — 2
- Business Activity — 2
- Tourism — 2
- Inverhuron Park — 3
- Housing and Property Values — 4
- Municipal Finance, Infrastructure, Services and Facility/Resources — 3

Aboriginal Issues

- First Nation Communities — 2
- Aboriginal Heritage & Cultural Resources — 2
- Traditional Use of Lands and Resources — 2

Have your say

On the board are the proposed Valued Ecosystem Components (VEC). Place a pin in each VEC that is important to you. If there is a possible VEC you don't see represented, please add it to the board.

PLACE PIN IN OVAL TO IDENTIFY YOUR SELECTION

Features of the Physical Environment
- Air Quality ✓✓
- Noise Levels ✓✓
- Surface Water Quality ✓✓✓
- Surface Water Quantity and Flow ✓✓
- Soil Quality ✓✓
- Groundwater Quality ✓✓✓
- Groundwater Flow ✓

Plants
- Eastern White Cedar ✓✓
- Heat-all ✓
- Common Cattail ✓
- Variable Leaf Pondweed ✓

Mammals
- Muskrat ✓
- White-tailed Deer ✓
- Meadow Vole

Amphibians & Reptiles
- Midland Painted Turtle ✓✓
- Northern Leopard Frog ✓

Spotted Turtle ✓

Birds
- Mallard ✓
- Red-eyed Vireo ✓
- Wild Turkey ✓
- Yellow Warbler ✓
- Bald Eagle ✓

Hooded Merganser recorded ✓

Fish
- Redbelly Dace ✓
- Creek Chub ✓
- Lake Whitefish ✓

Pelagic Fish
- Spottail Shiner
- Smallmouth Bass
- Brook Trout

Invertebrates
- Benthic Invertebrates (eg. waterborne insects)
- Burrowing Crayfish

Ecological Functions
- Lake Huron ✓✓✓
- Stream C ✓
- Railway Ditch
- Wetland ✓

Human and Social Uses
- Human Health ✓✓
- Population ✓
- Employment
- Business Activity
- Tourism ✓
- Inverhuron Park ✓✓
- Housing and Property Values ✓
- Municipal Finance, Infrastructure, Services and Facility Resources ✓

Aboriginal Values
- First Nations Consultation ✓
- Aboriginal Heritage & Cultural Resources
- Traditional Use of Lands and Resources

Metis Nation of Ontario

Have your say

On the board are the proposed Valued Ecosystem Components (VEC). Place a pin in each VEC that is important to you. If there is a possible VEC you don't see represented, please add it to the board.

PLACE PIN IN OVAL TO IDENTIFY YOUR SELECTION

Owen Sound
Oct. 23

Air Quality 8
Noise Levels 7
Surface Water Quality 9
Surface Water Quantity and Flow 9
Soil Quality 8
Groundwater Quality 12
[illegible] 12

Eastern White Cedar 5
Heal-all 5
Common Cattail 7
Variable Leaf Pondweed 7

Muskrat 7
White-tailed Deer 5
Meadow Vole 7

Midland Painted Turtle 8
Northern Leopard Frog 7

Mallard 6
Red-eyed Vireo 6
Wild Turkey 7
Yellow Warbler 7
Bald Eagle 7

Redbelly Dace 6
Creek Chub 7
Lake Whitefish 8

Spottail Shiner 7
Smallmouth Bass 7
Brook Trout 7

Benthic Invertebrates (eg. waterborne insects) 7
Burrowing Crayfish 8

Lake Huron 10
Stream C 7
Railway Ditch 7
Wetland 10

Human Health 14
Population 4
Employment 4
Business Activity 3
Tourism 4
Inverhuron Park 4
Housing and Property Values 5
Municipal Finance, Infrastructure, Services and Facility/Resources

First Nation Communities 9
Aboriginal Heritage & Cultural Resources 7
Traditional Use of Lands and Resources 6

WALKERTON OCT . 7

Have your say

On the board are the proposed Valued Ecosystem Components (VEC). Place a pin in each VEC that is important to you. If there is a possible VEC you don't see represented, please add it to the board.

PLACE PIN IN OVAL TO IDENTIFY YOUR SELECTION

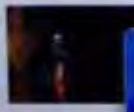
Features of the Physical Environment
- Air Quality
- Noise Levels
- Surface Water Quality
- Surface Water Quantity and Flow
- Soil Quality
- Groundwater Quality
- Groundwater Flow

Plants
- Eastern White Cedar
- Heal-all
- Common Cattail
- Variable Leaf Pondweed

Mammals
- Muskrat
- White-tailed Deer
- Meadow Vole

Amphibians & Reptiles
- Midland Painted Turtle
- Northern Leopard Frog

Birds
- Mallard
- Red-eyed Vireo
- Wild Turkey
- Yellow Warbler
- Bald Eagle



Birds
- Redhelly Dove
- Hawk Owls
- Lake Whitefish

Pelagic Fish
- Spottail Shiner
- Smallmouth Bass
- Brook Trout

Invertebrates
- Benthic Invertebrates (eg. waterborne insects)
- Burrowing Crayfish

Ecological Features
- Lake Huron
- Stream C
- Railway Ditch
- Wetland

Human and Social Values
- Human Health
- Population
- Employment
- Business Activity
- Tourism
- Downtown Park
- Housing and Property Values
- Municipal Finance, Infrastructure, Services and Facility Resources

Cultural
- First Nations Communities
- Aboriginal Heritage & Cultural Resources
- Traditional Use of Lands and Resources

Have your say

On the board are the proposed Valued Ecosystem Components (VEC). Place a pin in each VEC that is important to you. If there is a possible VEC you don't see represented, please add it to the board.

PLACE PIN IN OVAL TO IDENTIFY YOUR SELECTION

Wiarton

- Air Quality — 4
- Noise Levels — 4
- Surface Water Quality — 4
- Surface Water Quantity and Flow — 5
- Soil Quality — 5
- [illegible] — 5
- Groundwater Flow — 4

- Eastern White Cedar — 1
- Heal-all
- Common Cattail — 1
- Variable Leaf Pondweed

- Muskrat
- White-tailed Deer — 3
- Meadow Vole

- Midland Painted Turtle — 1
- Northern Leopard Frog — 1

- Mallard — 1
- Red-eyed Vireo — 2
- Wild Turkey — 2
- Yellow Warbler — 2
- Bald Eagle — 2

- [illegible]
- [illegible]
- [illegible] — 2

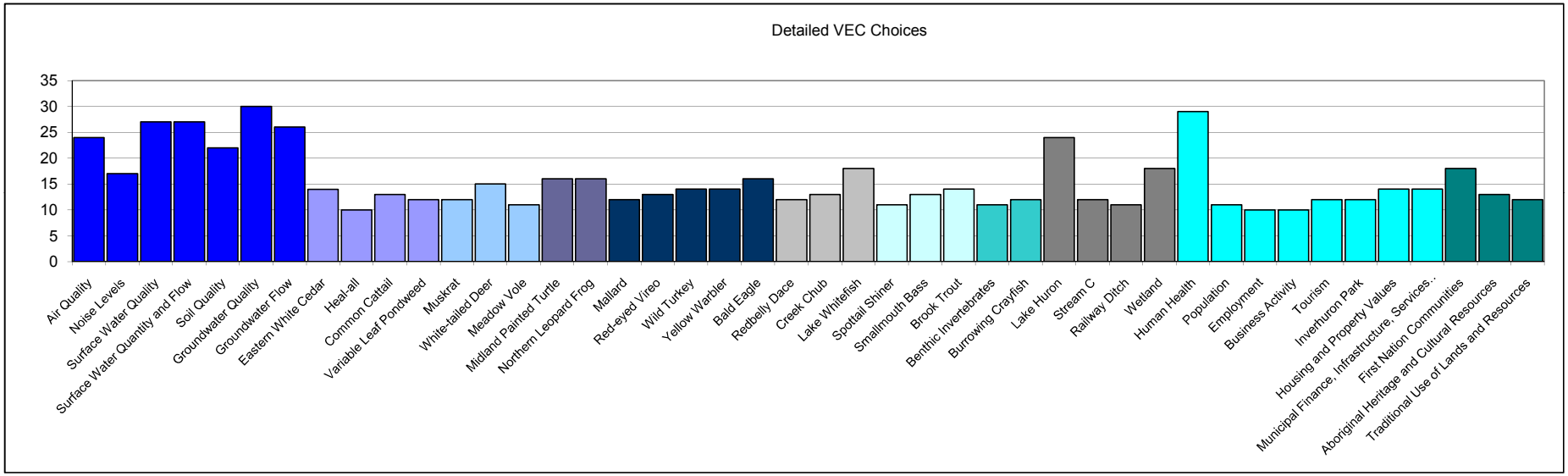
- Spottail Shiner
- Smallmouth Bass — 1
- Brook Trout — 1

- [illegible]
- Burrowing Crayfish

- Lake Huron — 3
- Stream C
- Railway Ditch
- Wetland — 1

- Human Health — 4
- Population — 1
- Employment — 1
- Business Activity — 2
- Tourism — 1
- Downtown Park
- Housing and Property Values — 2
- Municipal Property, Infrastructure, Services and Facility Resources — 3

- First Nations Communities — 2
- Aboriginal Heritage & Cultural Resources — 1
- Traditional Use of Lands and Resources — 1


Detailed VEC Choices
35
30
25
20
15
10
5
0
Air Quality
Noise Levels
Surface Water Quality
Surface Water Quantity and Flow
Soil Quality
Groundwater Quality
Groundwater Flow
Eastern White Cedar
Heal-all
Common Cattail
Variable Leaf Pondweed
Muskrat
White-tailed Deer
Meadow Vole
Midland Painted Turtle
Northern Leopard Frog
Mallard
Red-eyed Vireo
Wild Turkey
Yellow Warbler
Bald Eagle
Redbelly Dace
Creek Chub
Lake Whitefish
Spottail Shiner
Smallmouth Bass
Brook Trout
Benthic Invertebrates
Burrowing Crayfish
Lake Huron
Stream C
Railway Ditch
Wetland
Human Health
Population
Employment
Business Activity
Tourism
Inverhuron Park
Housing and Property Values
Municipal Finance, Infrastructure, Services...
First Nation Communities
Aboriginal Heritage and Cultural Resources
Traditional Use of Lands and Resources

Appendix E

Sign-in Sheets and Comment Cards Received

(sign-in sheets not provided)

Owen Sound

PLACE STAMP HERE

Comments/Questions?
Let us know.

The presentors are very friendly and very knowledgeable about the Deep Geological Repository.

Thank you kindly you have given me a bit family piece of mind.

Name: Fely Alan & Alexandra Clarke

Address:

Phon

Email:

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

www.opg.com/dgr email: nwmd@opg.com Phone: 519-361-6414 ext. 4065

Please leave this card with our open house staff, or mail it back to us at your convenience. You can also email us with your comments at nwmd@opg.com or visit our website for more information at www.opg.com/dgr

Open House Evaluation

Please rank the following statements on a scale of 1 to 5 where "1" is "strongly disagree","3" is neutral or "no opinion" and "5" is "strongly agree".

a. The open house panels helped me to understand the deep geological repository (DGR) proposal.

1 2 3 4 5

b. The open house location and hours were convenient for me.

1 2 3 4 5

c. The open house staff were helpful.

1 2 3 4 5

d. Overall, the open house helped me to satisfy the information needs I had.

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1 2 3 4 5

ONTARIO POWER GENERATION

Comments/Questions?
Let us know.

PLACE
STAMP
HERE

Have these information
sessions at all
the highschools in
area -
They are the
Name: recipients of
Address: these projects.
Phone: S. Moulder
Email:

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

www.opg.com/dgr email: nwmd@opg.com Phone: 519-361-6414 ext. 4065

Please leave this card with our open house staff, or mail it back to us at your convenience. You can also email us with your comments at nwmd@opg.com or visit our website for more information at www.opg.com/dgr

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ONTARIO POWER GENERATION

OWOS Sounds

Comments/Questions?
Let us know.

STAFF WERE VERY HELPFUL

Name: PAUL GRIFFIN

Address:

Phone:

Email:

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P.O. Box 7000
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ONTARIO POWER GENERATION

OWEN SOUND

Comments/Questions?
Let us know.

PLACE
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Name: JAN GRIFFIN

Address:

Phone:

Email:

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P.O. Box 7000
Tiverton, Ontario
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ONTARIO POWER GENERATION

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Let us know.

I am concerned about disposal right on the shore of Lake Huron - likely OK for the low level waste, but why not put the intermediate level waste DGR say in un-populated northern Ontario and away from any major water body?

True, you have determined the stability & impermiability of the Bruce site bedrock but who can predict about future geologic upheaval.

Why not do what's easy and locate the DGR away from people and away from the great lakes, which would spread radiation everywhere if there were a leak.

Name: Grant Anderson

Address: [illegible] Sound [illegible]

[illegible]

Phone: [illegible]

Email: _____

OWEN SOUND

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Comments/Questions?
Let us know.

Wonderful idea - not burying it deep enough - about 20 miles deep would be appropriate - mining is not always safe - I suppose this will be seismically qualified, just like Pickering, - quakes occur - Your $1,000,000 CEO could go down to check it out.

Name:

Address:

Phone:

Email:

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Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

F. Butler
[redacted]

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PLACE
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Name: KEN YATES

Address: [redacted]

Phone:

Email:

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PLACE
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Name: N. YATES

Address: [redacted]

Phone: [redacted]

Email:

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ONTARIO POWER GENERATION

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Let us know.

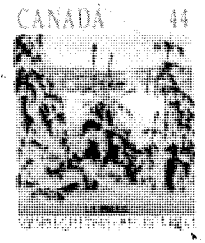
GOOD PRESENTATION

Name: BILL HARDIE

Address: [redacted]

Phone: [redacted]

Email: [redacted]



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ONTARIO POWER GENERATION

CHESLEY

PLACE STAMP HERE

Comments/Questions?
Let us know.

We would like more information about the safety of the waste over time!

Name: Lloyd Pepper

Address: [redacted]

Phone: [redacted]

Email:

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Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

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1 2 3 4 (5)

ONTARIO POWER GENERATION

CAUSEY

Comments/Questions?
Let us know.

PLACE
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Name: Russ Symons

Address: [redacted]

Phone: [redacted]

Email: [redacted]

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ONTARIO POWER GENERATION

CHESLEY

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Comments/Questions?
Let us know.

The Neighbours publication must reflect all views of OPG neighbours, not a singular view which puts a consistently positive spin on DGR. Propaganda presents a singular message!

Name: L. Taylor

Address: [redacted]

Phone:

Email:

A publication with less bias is preferable.

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CHESLEY

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Comments/Questions?
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Name: Larry Demitruk

Address: [redacted]

Phone:

Email:

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ONTARIO POWER GENERATION

WIARTON

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ONTARIO POWER GENERATION

WIARTON

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Comments/Questions?
Let us know.

please add me
to your mailing
list for the
Newsletter
"Neighbours"
Thankyou

Name: Rebecca Woolvett

Address: [redacted]

Phone: [redacted]

Email:

Ontario Power Generation
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Tiverton, Ontario
N0G 2T0

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ONTARIO POWER GENERATION

WIARTON

Comments/Questions?
Let us know.

PLACE
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THANKS FR COMING
TO WIARTON, GLAD
THOUGH WE ARE OUTSIDE
THE HOST AREA.

Name: Ed Woodcott

Address: [redacted]

Phone: [redacted]

Email: [redacted]

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ONTARIO POWER GENERATION

WIARTON

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Comments/Questions?
Let us know.

THANKS - GOOD FOR THE COMMUNITY TO HAVE THE OPPORTUNITY TO LEARN.

Name: GWEN GILBERT

Address: [redacted]

Phone: [redacted]

Email: [redacted]

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ONTARIO POWER GENERATION

Comments/Questions?
Let us know.

VERY INTERESTING-

Name: ERNIE FARROW

Address: [redacted]

Phone: [redacted]

Email:

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ONTARIO POWER GENERATION

4 of 5

NWMD001

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Comments/Questions?
Let us know.

All questions answered - very informative.
Good display.

Name: Werner Nitsch

Address: [redacted]

Phone: [redacted]

Email: [redacted]

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ONTARIO POWER GENERATION

WIARTON

Comments/Questions?
Let us know.

Staff were well informed + handled all questions well. Spoke with Diane who had excellent explanations for all.

Name: Ann Kennedy

Address: [redacted]

Phone: [redacted]

Email:

PLACE STAMP HERE

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1 2 3 4 5

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1 2 3 4 5

ONTARIO POWER GENERATION

WIARTON

PLACE
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Comments/Questions?
Let us know.

Name:

Address:

Phone:

Email:

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

www.opg.com/dgr email: nwmd@opg.com Phone: 519-361-6414 ext. 4065

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1 2 (3) 4 5

ONTARIO POWER GENERATION

Comments/Questions? x)
Let us know.

PLACE STAMP HERE

THE WHOLE CONCEPT OF THIS PROJECT IS FLAWED.
EVEN VERY LOW PERMEABLE LIMESTONE WOULD NOT
SECURELY CONTAIN HAZARDOUS WASTE OVER THE
CENTURIES THEY ARE RADIOACTIVE AND DEADLY.
WE NEED TO PROTECT FUTURE GENERATIONS
KEEP ALL WASTE FROM REACTOR OPERATIONS
ABOVE GROUND. PHASE OUT NUCLEAR, DON'T REFURBISH!!

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

Name: [redacted]
Address: [redacted]
Phone: [redacted]
Email:

x) THESE COMMENTS ARE MADE ON BEHALF OF THE OVER 1,000 MEMBER OF CITIZENS FOR RENEWABLE ENERGY (CFR

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1 2 3 (4) 5

ONTARIO POWER GENERATION

Comments/Questions?
Let us know.

Well organized.
Friendly & helpful staff.

Name: P. TUCKER

Address: [redacted]

Phone:

Email: [redacted]

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

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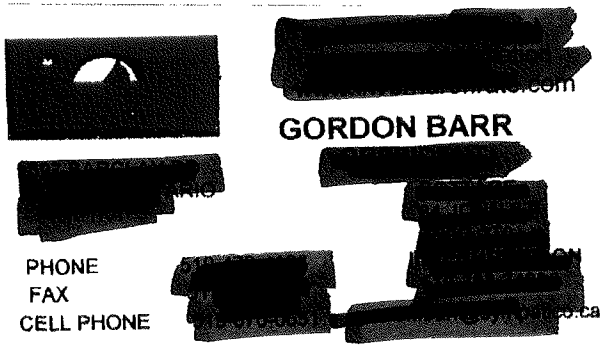
1 2 3 4 (5)

ONTARIO POWER GENERATION

Comments/Questions?
Let us know.

AS PRESIDENT OF THE ENGLEHURT AND DISTRICT RATEPAYERS ASSOCIATION. THIS OPEN HOUSE WAS HELPFUL.



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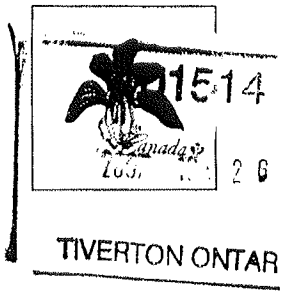

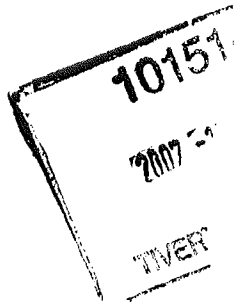

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1 2 3 4 (5)

ONTARIO POWER GENERATION

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Comments/Questions?
Let us know.

1/ I AM VERY SUPPORTIVE OF THIS PROJECT.

2, THE MAJOR KEY TO SUCCESS WILL BE YOUR ONGOING PUBLIC OUTREACH ACTIVITIES

3, GOOD LUCK WITH THE ENV. ASSESSMENT PROCESS.

Name: Glenn R. Smith

Address: [redacted]

Phone: [redacted]

Email: [redacted]

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

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1 2 3 4 (5)

ONTARIO POWER GENERATION

KINCARDINE

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Comments/Questions?
Let us know.

- I believe the site for the new proposal is bar to large of mine waste in one spot
- Should be drilled to Granitic gneiss

Name: Erik Panthel

Address: [redacted]

Phone: [redacted]

Email:

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

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1 2 3 4 5

ONTARIO POWER GENERATION

KINCARDINE

OCT 15

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Comments/Questions?
Let us know.

I am interested in a tour and a more detailed & continuing report on this project. Please keep us informed regularly as you discover new information.

Name: Nellie Pantel

Address: [redacted]

Phone: [redacted]

Email: _____

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

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1 2 3 4 5

ONTARIO POWER GENERATION

KINCARDINE

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Comments/Questions?
Let us know.

I feel that this project makes sense for this area and would be supportive of it going ahead, with all the safeguards, studies and precautions which are in place, or proposed.

Name: J. Clements

Address: [redacted]

Phone: [redacted]

Email:

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

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ONTARIO POWER GENERATION

Comments/Questions?
Let us know.

1) Why not make the storage site large enough to allow for expansion of nuclear in accordance to the IPSP of the OPA

2) Don't close access shafts until many years down the road when operating experience of facility is available

Name: PHILIPP ANDRES

Address: [redacted]

Phone: [redacted]

Email: [redacted]

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1 2 3 (4) 5 | more required prior to construction

e. I will recommend to my friends and family members that they should come to a future DGR open house.

1 2 3 (4) 5

ONTARIO POWER GENERATION

Comments/Questions?
Let us know.

I AGREE WE NEED
A RESPOSITORY

Name: C. GAMEIRO

Address: [redacted]

Phone: [redacted]

Email:

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ONTARIO POWER GENERATION

Comments/Questions?
Let us know.

Why can't low level be cost effectively placed in a structure, if not the Goderich Salt Mine, then similar design instead of so much excessive cost to basically bury low-risk garbage. This looks excessive even for a "spent fuel repository until that fuel can be reburned in a future fitted Reactor design

Name: Lynn Courtney

Address: [redacted]

Phone: [redacted]

Email: [redacted]

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000,
Tiverton, Ontario
N0G 2T0

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1 2 3 4 5

ONTARIO POWER GENERATION

WALLENSTEIN

07-17

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Comments/Questions?
Let us know.

Name: Jenni-Lynn Schiestel

Address: [redacted]

Phone: [redacted]

Email:

Ontario Power Generation
Public Affairs Officer
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ONTARIO POWER GENERATION

WALKERTON

OCT 17

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Comments/Questions?
Let us know.

Speaker for nxt years meeting

Name: FEDERATION of

Address: [redacted]

Phone:

Email: [redacted]

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N0G 2T0

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ONTARIO POWER GENERATION

WALKERTON

OG17

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Comments/Questions?
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Address: _____

_____

Phone: _____

Email: _____

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1 2 3 4 5

need to make them open

ONTARIO POWER GENERATION

WALKERTON

OCT 17

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ONTARIO POWER GENERATION

WALKERTON

OCT 17

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Comments/Questions?
Let us know.

Name: J. Harvey Weingarten

Address: [redacted]

Phone: [redacted]

Email:

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

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OCT 17

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Address: _____

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Phone: _____

Email: _____

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ONTARIO POWER GENERATION

WALKERTON

0217

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Comments/Questions?
Let us know.

Thanks for a very informative session!

Name: TONY ZETTEL

Address: [redacted]

Phone: [redacted]

Email:

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

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1 2 3 4 (5)

ONTARIO POWER GENERATION

PORT ELGIN

OCT 18

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Comments/Questions?
Let us know.

Thanks-
Good presentation + explanation.
Wish we were progressing as well on Long term fuel storage - It could benefit from the level of study here.

Name: William Palmer

Address: [redacted]

Phone:

Email:

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

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ONTARIO POWER GENERATION

PORT ELGIN

OCT 18

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Comments/Questions?
Let us know.

Personally would have liked a Presentation with Q + A.
More frequent interaction with General Public (cost?)

Name: EAMONN MURPHY

Address: [redacted]

Phone: [redacted]

Email: [redacted]

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

Please leave this card with our open house staff, or mail it back to us at your convenience. You can also email us with your comments at nwmd@opg.com or visit our website for more information at www.opg.com/dgr

Open House Evaluation

Please rank the following statements on a scale of 1 to 5 where "1" is "strongly disagree","3" is neutral or "no opinion" and "5" is "strongly agree".

a. The open house panels helped me to understand the deep geological repository (DGR) proposal.

1 2 3 4 5

b. The open house location and hours were convenient for me.

1 2 3 4 5

c. The open house staff were helpful.

1 2 3 4 5

d. Overall, the open house helped me to satisfy the information needs I had.

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e. I will recommend to my friends and family members that they should come to a future DGR open house.

1 2 3 4 5

ONTARIO POWER GENERATION

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Comments/Questions?
Let us know.

I fully support the project & am pleased the results of your study. Good luck

Name: Howard Kuhn

Address: [redacted]

Phone: [redacted]

Email:

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

www.opg.com/dgr email: nwmd@opg.com Phone: 519-361-6414 ext. 4065

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Comments/Questions?
Let us know.

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Name: ______________________________

Address: ______________________________

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Phone: ______________________________

Email: ______________________________

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ONTARIO POWER GENERATION

PORT ELGIN

OCT 18

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Comments/Questions?
Let us know.

Name: JOHN STEVENS

Address: [redacted]

Phone: [redacted]

Email: [redacted]

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

www.opg.com/dgr email: nwmd@opg.com Phone: 519-361-6414 ext. 4065

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(1) 2 3 4 5

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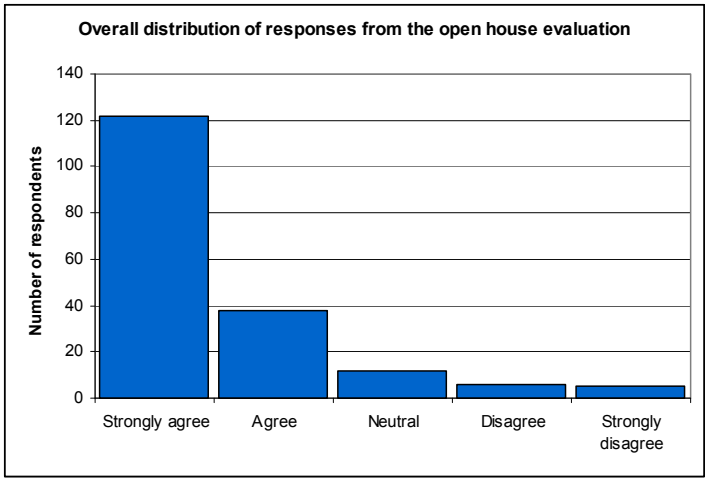
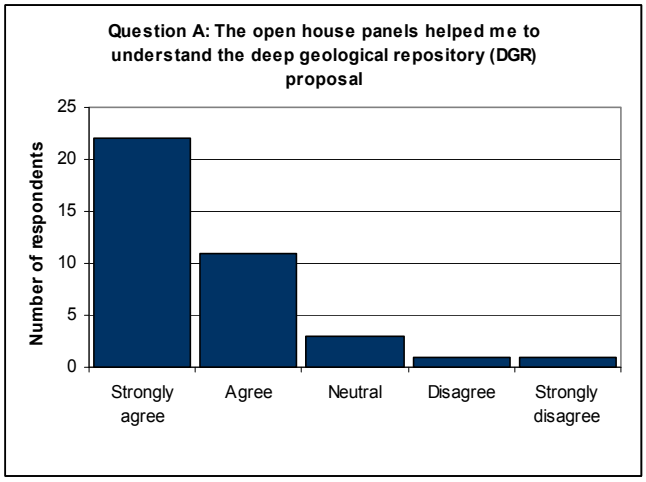
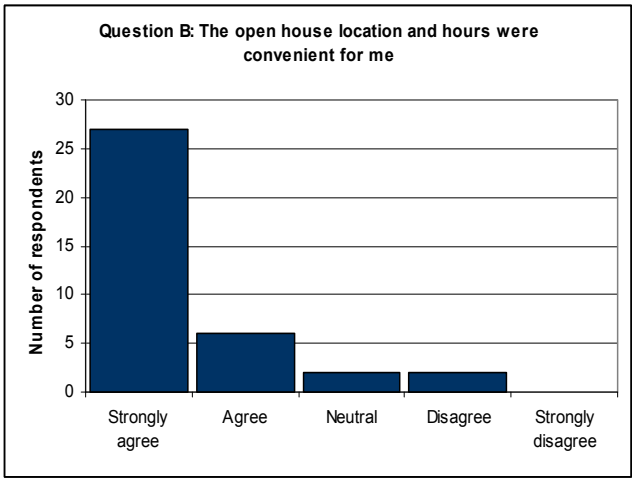
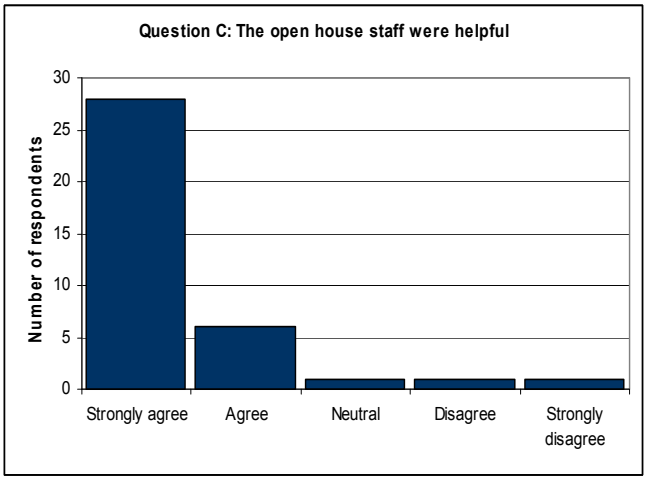
Cumulative Responses to Comment Card Questions
DGR Open Houses, October 2007

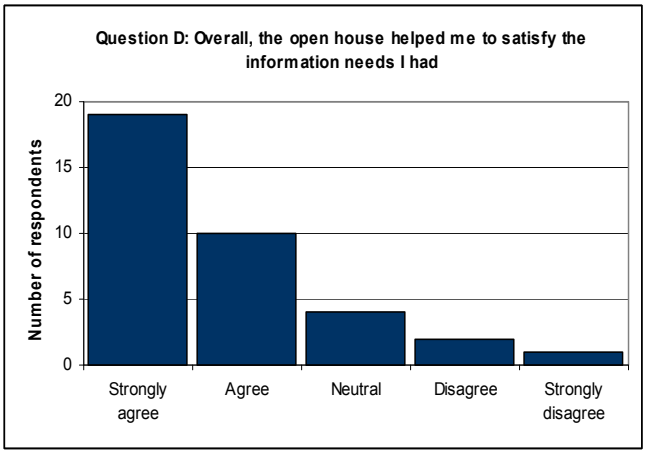
- **Total number of cards returned: 45**
- **38 respondents answered questions evaluating open houses**
- **29 respondents wrote comments**

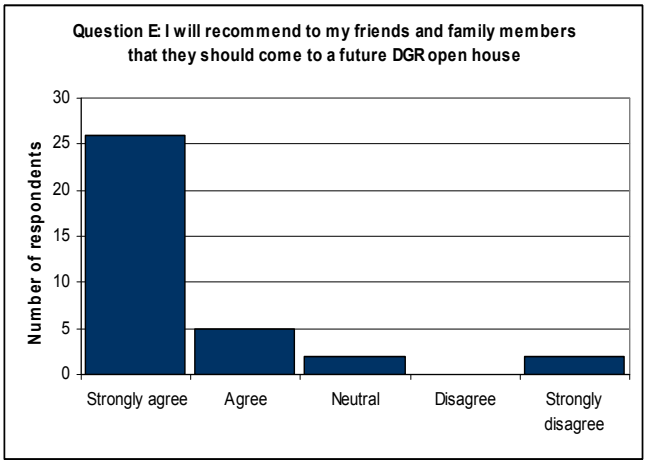












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OPG's Deep Geologic Repository Project Communications and Consultation Report: Community Open Houses

December 2008

Prepared by:
AECOM Canada Ltd.

Date: December 2008

OPG's Deep Geologic Repository Project

Communications & Consultation Report:

Community Open Houses November 2008

Prepared for

Ontario Power Generation (OPG)

December 2008

Reference: **60743**

Distribution:

- **Ontario Power Generation**
- **AECOM Canada Ltd.**

Table of Contents

Appendices

1. Introduction

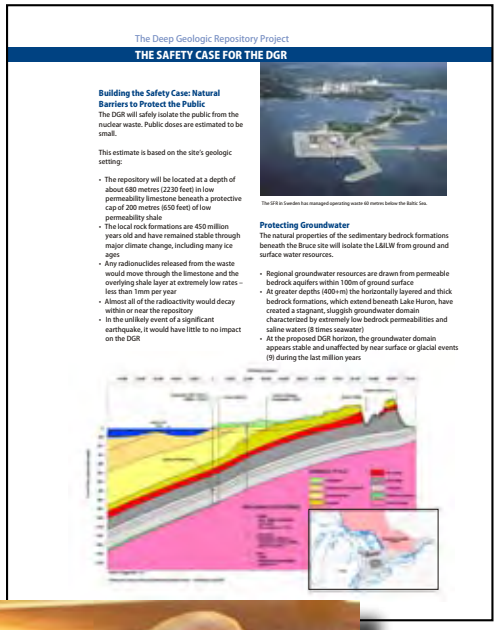
This report documents a series of seven Community Open Houses hosted by Ontario Power Generation (OPG) in November 2008. The report was prepared by Gartner Lee Limited operating as AECOM and contains materials prepared by OPG and AECOM, and local newspaper reports.

2. Community Open House Topics

This second round of community open houses was held to provide interested community members with an opportunity to learn about and provide input on the following topics:

- the proposed OPG Deep Geologic Repository (DGR) project, and changes and updates since previous Open Houses;
- the Environmental Assessment undertaken as an integral part of the planning and approval process;
- the results of geoscientific characterization work done in 2007, and the drilling of boreholes in 2008;
- the updated conceptual design of the DGR;
- the science and technology behind safe storage of low and intermediate waste; and
- the change in the depth of the DGR.

The open houses also offered a venue for community members to provide comments on the open house format and the proposed project.


The Deep Geologic Repository Project

THE SAFETY CASE FOR THE DGR

Building the Safety Case: Natural Barriers to Protect the Public

The DGR will safely isolate the public from the nuclear waste. Public doses are estimated to be small.

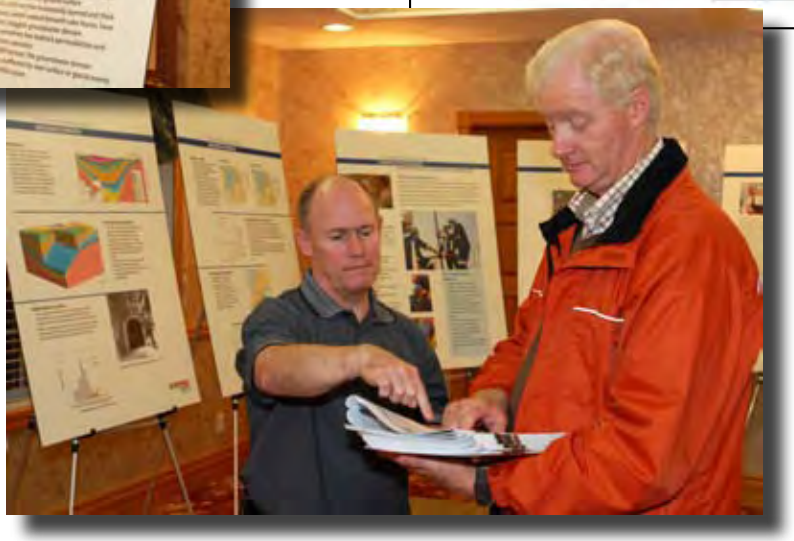
This estimate is based on the site's geologic setting:

- The repository will be located at a depth of about 680 metres (2230 feet) in low permeability limestone beneath a protective cap of 200 metres (650 feet) of low permeability shale
- The local rock formations are 450 million years old and have remained stable through major climate change, including many ice ages
- Any radionuclides released from the waste would move through the limestone and the overlying shale layer at extremely low rates – less than 1mm per year
- Almost all of the radioactivity would decay within or near the repository
- In the unlikely event of a significant earthquake, it would have little to no impact on the DGR

Protecting Groundwater

The natural properties of the sedimentary bedrock formations beneath the Bruce site will isolate the L&ILW from ground and surface water resources.

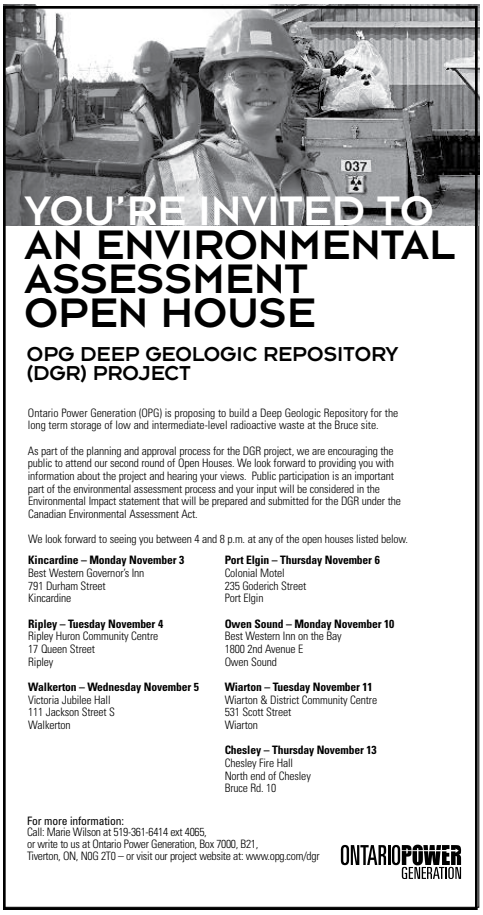
- Regional groundwater resources are drawn from permeable bedrock aquifers within 100m of ground surface
- At greater depths (400+m) the horizontally layered and thick bedrock formations, which extend beneath Lake Huron, have created a stagnant, sluggish groundwater domain characterized by extremely low bedrock permeabilities and saline waters (8 times seawater)
- At the proposed DGR horizon, the groundwater domain appears stable and unaffected by near surface or glacial events (9) during the last million years



3. Notification

Notification to community members was provided by the following:

- A postcard format letter of invitation delivered by Canada Post's Unaddressed Admail to nearly 50,000 households in surrounding communities, including Kincardine, Ripley, Walkerton, Port Elgin, Owen Sound, Chesley and Wiarton where the open houses were held (see Appendix A for a list of community distribution).
- A newspaper announcement published as an insert in the Kincardine News, Kincardine Independent, Lucknow Sentinel, Walkerton Herald Times, Owen Sound Sun Times, Port Elgin Shoreline Beacon, and the Wiarton Echo, prior to the open houses (Appendix A).
- Letters sent to local elected officials, City and County municipal staff leaders (including police, fire and emergency services), local and regional non-governmental organizations with a potential interest, and local and regional media outlets. Invitations were sent to a number of organizations in the United States as well (see Appendix A for the mailing list).
- Radio spots were purchased for six local radio stations that serve the open house communities. Seven different announcements, specific to each open house, were prepared (Appendix A).
- An advertisement was placed in the October 2008 edition of Marketplace, a local advertising publication (Appendix A).
- The dates, times and locations of the Open Houses were posted on the DGR page of the OPG website (www.opg.com/dgr) prior to the Open Houses.



4. Dates and Venues

The community open houses were held at the following locations:

Kincardine – Monday November 3
Best Western Governor's Inn
791 Durham Street
Kincardine, ON

Ripley – Tuesday November 4
Ripley Huron Community Centre
17 Queen Street
Ripley, ON

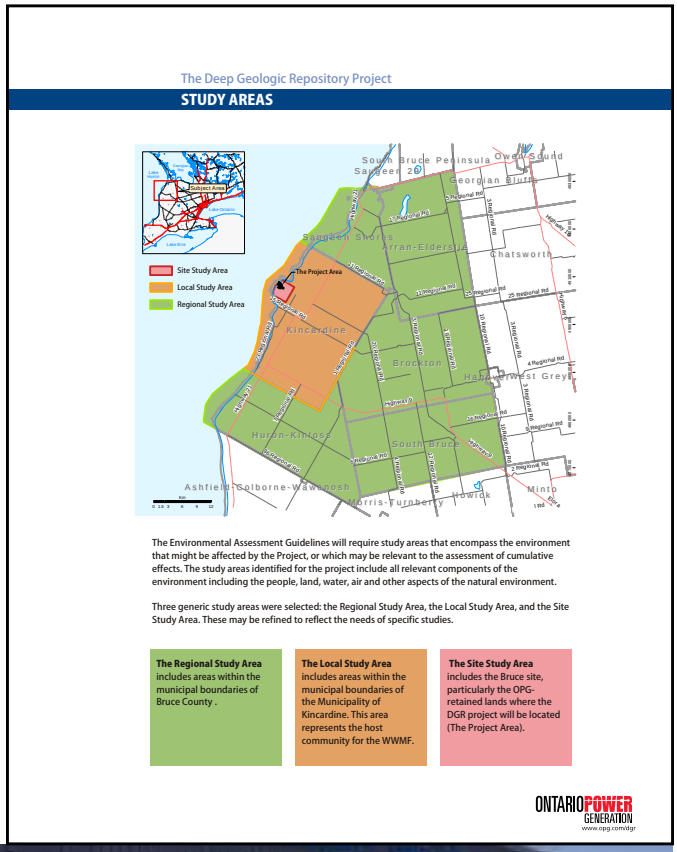
Walkerton – Wednesday November 5
Victoria Jubilee Hall
111 Jackson Street South
Walkerton, ON

Port Elgin – Thursday November 6
Colonial Motel
235 Goderich Street
Port Elgin, ON

Owen Sound – Monday November 10
Best Western Inn on the Bay
1800 2nd Avenue East
Owen Sound, ON

Wiarton – Tuesday November 11
Wiarton & District Community Centre
Wiarton, ON

Chesley – Thursday November 13
Chesley Fire Hall
Bruce Road 10
Chesley, ON



5. Number of Participants

A total of 149 persons registered their names as attendees of the community open houses:

Kincardine - 28
Ripley - 13
Walkerton - 12
Port Elgin - 17
Owen Sound - 31
Chesley - 13
Wiarton - 35

It is estimated that more than 90% of attendees signed in.
Sign-in lists are provided in Appendix E.

6. Community Open House Format

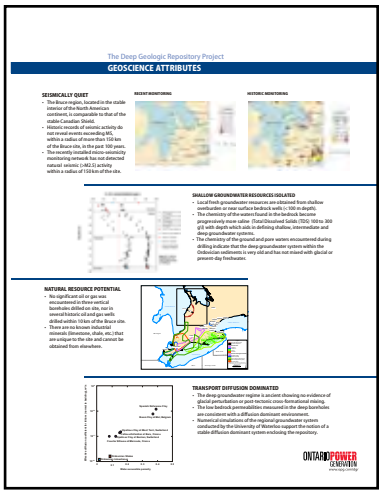
The community open houses provided an informal opportunity for community members to learn about the proposed project and to have their questions answered. Participants viewed display materials, had discussions with OPG representatives and enjoyed light refreshments.

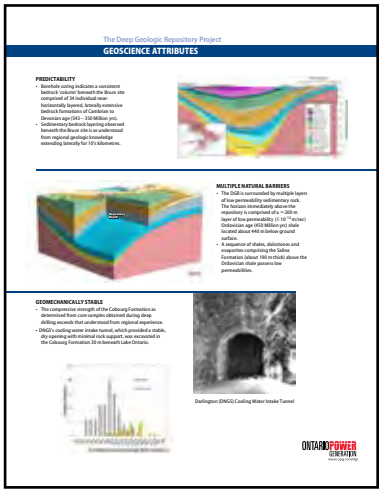
The open houses ran from 4 pm to 8 pm. Take-home copies of recent OPG newsletters, copies of the 2007 DGR Annual Report, brochures describing the DGR project as well as copies of the open house display panels were available (Appendix C).

Participants were encouraged to fill out comment cards and to provide input on Valued Ecosystem Components (VECs) that were important to them.

Display Panels

Twenty-one 3'x5' display panels provided the following information:

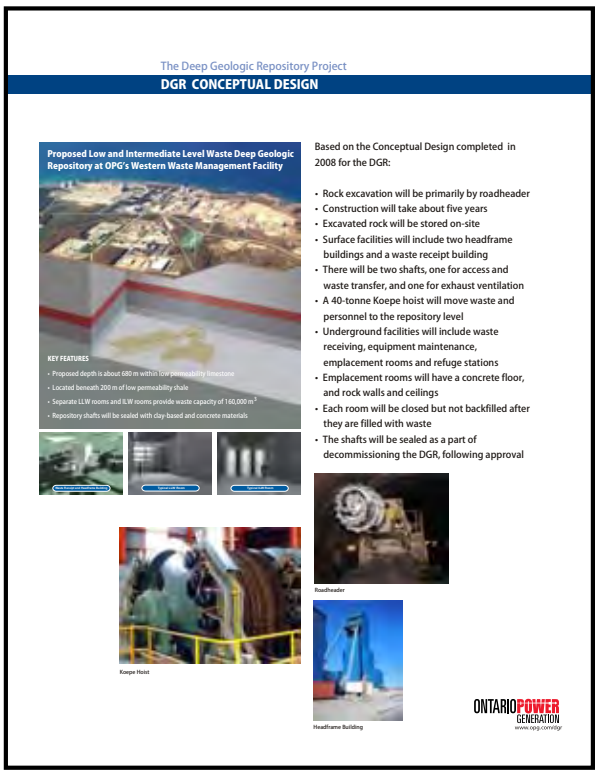


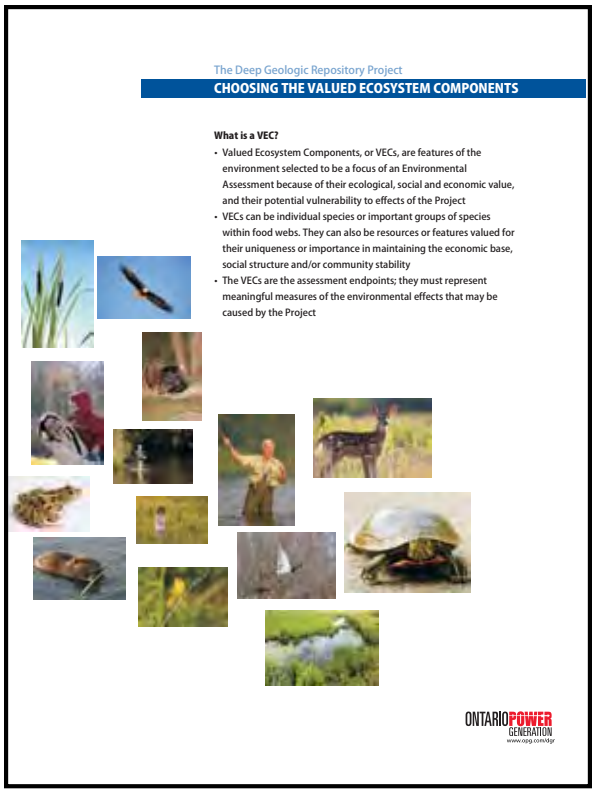


1. "Welcome" – illustrating OPG employees expressing a welcoming smile, and technical photos and illustrations
2. "The Western Waste Management Facility (WWMF)" – an aerial photo mapping the current OPG Bruce site
3. "The Facts About Nuclear Waste" – illustrating and explaining low level and intermediate level nuclear waste
4. "What is Radiation?" – a description of sources of radiation in the environment, and radiation exposure regulations
5. "Waste Inventory" - a breakdown of the different waste materials to be emplaced in the DGR
6. "An Overview of the Proposed Deep Geological Repository" – illustrating key features of the proposed construction and operation of the DGR
7. "DGR Conceptual Design" - illustration of the 2008 design
8. "Scientific Investigations" – explaining the Geoscientific Site Characterization Program
9. "Geoscience Attributes" - presenting the predictability of bedrock, the multiple natural barriers and the geomechanical stability of the rock
10. "Geoscience Attributes II" - presenting the seismically quiet nature of the region, the isolation of shallow groundwater resources, the lack of natural resource potential and the diffusion dominated transport of deep groundwater
11. "Borehole Locations" - indicating the location and stratigraphy of boreholes
12. "An International Perspective" – an overview of international experiences in the long-term management of nuclear waste
13. "The Safety Case for the DGR" – a description of natural barriers to protect the public, and groundwater
14. "Safety Assessment"– provides an outline of the safety assessments for normal operation and accidents, as well as the potential effects on humans and biota during Pre-Closure and Post-Closure.

15. “The Steps to Move Forward” – describing and illustrating the decision and approval process
16. “Environmental Assessment Activities” – an outline of the current schedule moving forward
17. “Study Area” – a map delineating the Regional Study Area, the Local Study Area, and the Site Study Area
18. “Baseline Environment” – a list and illustrations of the environmental studies conducted in 2007 and 2008
19. “Choosing the Valued Ecosystem Components (VECs)” – an explanation of the term VEC, and how these environmental features are selected and evaluated during an environmental assessment
20. “Valued Ecosystem Components” – listing proposed specific environmental features
21. “Your Questions about the DGR Project and Our Responses” – a panel listing public comments and OPG responses

See Appendix D for images of each of the display panels.



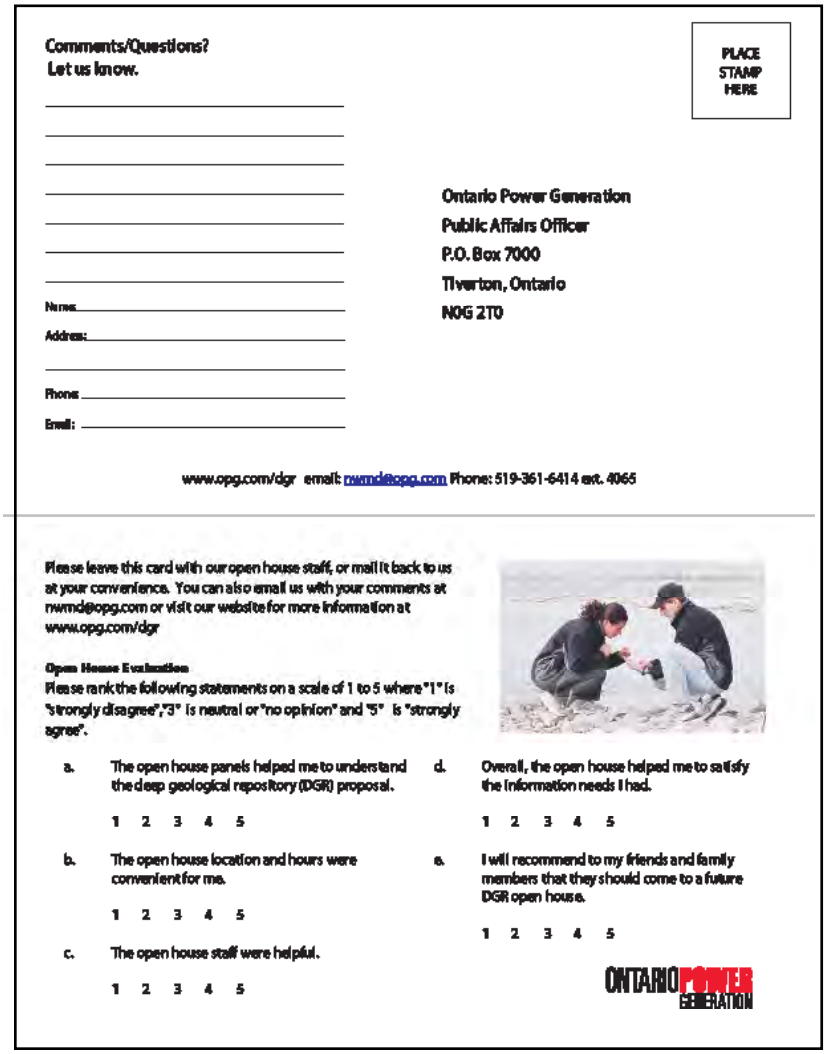


7. Opportunities for Input

Comment Cards

Comment cards in the style of large sized postcards provided the opportunity for participants to rate their experience at the open house, and to write comments. Cards could be filled out at the open house, or mailed in afterwards.

In total, 12 comment cards were returned. Of those, 8 included written comments, and all responded to the questions evaluating the open house. All comment card feedback, as well as graphs showing the cumulative question responses, are provided in Appendix E.



Comments/Questions?
Let us know.

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Name:
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1 2 3 4 5

e. I will recommend to my friends and family members that they should come to a future DGR open house.
1 2 3 4 5

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8. Key Areas of Discussion

Many Open House attendees were already familiar with the proposed DGR project, having participated in other stakeholder communications events. The majority of those who attended the Open Houses supported the project. One of the primary reasons for attending the Open Houses was to obtain an update on the progress of the project and the studies associated with it. Visitors tended to stay for about an hour. Comments received from prior Open Houses were also presented on a display panel with OPG responses (presented in Appendix D).

The discussions at the 2008 Open Houses tended to revolve around a number of key issues:

- **Proximity of the proposed DGR to Lake Huron**
  - » ***OPG response:*** *The proposed DGR is about 1.5 kilometres from the lake and more than 500 m below the depth of the lowest point of Lake Huron. The DGR project will provide long term storage underground at 680 m for waste currently managed safely at surface. The low permeability of the host rock for the DGR will isolate and contain the waste from surface water resources.*
- **Transportation of waste**
  - » ***OPG response:*** *OPG has been safely transporting waste from Darlington and Pickering for more than 35 years. Low and intermediate level nuclear waste will continue to be transported to the WWMF even if the DGR project does not proceed.*
- **Understanding the difference between levels of waste**
  - » ***OPG response:*** *Low level waste has low levels of radioactivity and includes protective clothing, floor sweepings, mops, rags, etc. It can be handled without special radiation protection. Intermediate level waste includes used reactor core components, and resins and filters. It cannot be handled without radiation protection.*
- **Suspicion that "the door is open" for high level waste disposal, or that waste will be imported from other nuclear companies in Canada or other countries**
  - » ***OPG response:*** *The Hosting Agreement with the Municipality of Kincardine stipulates the facility will manage only waste from OPG-owned reactors. OPG's Environmental Impact Statement and application for licence are for low and intermediate level waste only from OPG-owned reactors.*
- **Effects on wildlife, including effects on hunting in the area**
  - » ***OPG response:*** *The environmental impact statement, which will be the subject of a hearing before a review panel, will assess potential effects on the natural environment, including wildlife.*
- **Effects of earthquakes on the proposed DGR**
  - » ***OPG response:*** *The proposed site for the DGR, in Bruce County,*

is in one of the lowest seismic zones in Canada. Additional monitoring of low level seismic activity is in progress and will continue for three years.

- **Whether there are similar sites elsewhere**
  - » ***OPG response:*** *An underground repository in New Mexico, the Waste Isolation Pilot Plant has operated since 1999. Forsmark in Sweden began operation in 1988 and Olkiluoto, in Finland began operating in 1992. These facilities all handle low and intermediate level waste.*
- **Potential health risks associated with nuclear sites in general, including possible links to increased levels of leukemia**
  - » ***OPG response:*** *OPG is not aware of any increased incidence of cancers in the proximity of the site. Durham Region, in Radiation and Health in Durham Region 2007, assessed possible health effects from the Pickering and Darlington NGSs. It concludes that disease rates in Ajax-Pickering and Clarington did not indicate a pattern to suggest that the Pickering NGSs and Darlington NGS were causing health effects in the population.*
- **Need to assure that employment opportunities associated with the project are available to local residents**
  - » ***OPG response:*** *OPG supports offering employment to local residents who have the necessary qualifications.*
- **Construction techniques for the shaft, particularly the suitability of the roadheader for construction of the first shaft**
  - » ***OPG response:*** *OPG appreciates the input on construction techniques. These techniques will be further assessed in the next phase of the engineering studies.*
- **Security of the site against terrorist activity**
  - » ***OPG response:*** *The Bruce site has controlled access and has a very well trained security team on site. The waste is currently at surface. The DGR will move it to below ground where it is less accessible.*
- **Cost of the project**
  - » ***OPG response:*** *The cost of the DGR is currently estimated to be about $1 billion. This includes $600 million for construction and $400 million for operation. A more detailed cost estimate is not yet available.*
- **Would the DGR withstand being hit by a meteor?**
  - » ***OPG response:*** *The DGR is 680 m below ground surface. As a part of the safety assessment, a number of malfunctions and accidents were evaluated for frequency and effect. The feasibility of the DGR being impacted by a meteor was assessed as negligible.*

9. Media Coverage of the Open Houses

Journalists interviewed OPG representatives and guests during the open houses.

Following the community open houses, the following articles, editorials and letters-to-the-editor appeared in local newspapers and radio stations (see Appendix B):

- Bayshore Broadcasting Centre (Owen Sound) - Monday, November 3, 2008: “Nuke Waste Open Houses in Region,” by reporter John Divinski
- http://coastnews.blogspot.com/ - Monday, November 3, 2008: “OPG Meetings,” by Lynda Cooper, News Director and morning show co-host at Coast Fm
- Radio CKNX AM (Wingham) – Tuesday, November 4, 2008: “OPG Nuclear Waste Plan in Bruce County Domain Again”
- Bayshore Broadcasting Centre (Owen Sound) – Thursday, November 6, 2008: “OPG Holds Another Open House,” by reporter Shannon Snoes
- Bayshore Broadcasting Centre (Owen Sound) – Thursday, November 13, 2008 “Final OPG Open House in Chesley,” by reporter Shannon Snoes
- Radio CKNX AM (Walkerton) – Friday, November 14 2008: “OPG Storage Open Houses Wrap UP”
- Bayshore Broadcasting Centre (Owen Sound) – Monday, November 17, 2008 “OPG Pleased with Open Houses,” by reporter John Divinski

10. Appendices

Appendix A: Notification Materials

- Letter of Invitation (addressed mail)
- Mailing List for Invitation Letters
- Postcard Invitation (unaddressed admail)
- Distribution Breakdown for postcard Invitation
- Newspaper announcement
- Placement of newspaper announcements
- Distribution of Radio Scripts
- Radio Scripts
- Marketplace announcement

Appendix B: Newspaper Coverage

- Bayshore Broadcasting Centre (Owen Sound) - Monday, November 3, 2008: "Nuke Waste Open Houses in Region," by reporter John Divinski
- http://coastnews.blogspot.com/ - Monday, November 3, 2008: "OPG Meetings," by Lynda Cooper, News Director and morning show co-host at Coast Fm
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Appendix C: Open House Handouts

- DGR 2007 Annual Report
- "Neighbours: News from OPG's Western Waste Management Facility," May 2008
- "Neighbours: News from OPG's Western Waste Management Facility," September 2008

Appendix D: Open House Display Panels

Appendix E: Open House Sign-in Sheets and Comment Cards

Appendix A

Notification Materials

(list of recipients removed)

ONTARIO POWER GENERATION

700 University Avenue Toronto, Ontario M5G 1X6

W-00216-07722.05-T12

October 17, 2008

Dear

Subject: Community Consultation for OPG's Deep Geologic Repository

Consistent with the requirements of the Canadian Environmental Assessment Act, OPG is pursuing completion and acceptance of an environmental impact statement for the proposed Deep Geologic Repository (DGR) for Low and Intermediate Level Radioactive Waste at the Bruce site.

As a part of that environmental assessment process, OPG is seeking opportunities to continue its communications with interested stakeholders on the proposed DGR project. To further our communications efforts, Open Houses have been scheduled in communities in the vicinity of the Bruce site during the early part of November, 2008. At these Open Houses we look forward to providing additional information, answering your questions, and hearing your views, on the proposed project. Your views will be considered in the environmental impact statement submitted to the Review Panel.

Open Houses are being held at the locations listed below and will be open between the hours of 4 p.m. and 8 p.m. each evening.

Kincardine
Monday November 3
Best Western Governor's Inn
791 Durham Street

Ripley
Tuesday November 4
Ripley Huron Community Centre
17 Queen Street

Walkerton
Wednesday November 5
Victoria Jubilee Hall
111 Jackson Street S

Port Colonial Motel
Thursday November 6
235 Goderich Street

Elgin

Owen Sound
Monday November 10
Best Western Inn on the Bay
1800 2nd Ave E

Chesley
Thursday November 13
Chesley Fire Hall
North end of Chesley, Bruce Rd. 10

Wiarton
Tuesday November 11
Wiarton & District Community Centre
531 Scott Street

We look forward to seeing you at one or more of the Open Houses. If you would like further information on the proposed DGR project please refer to our web site at: www.opg.com/dgr or call Marie Wilson at 519-361-6414, ext. 4065.

Sincerely

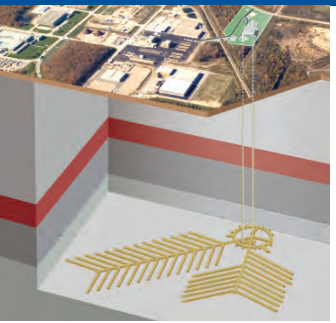
Terry Squire
Director, Public Affairs
Nuclear Waste Management Division

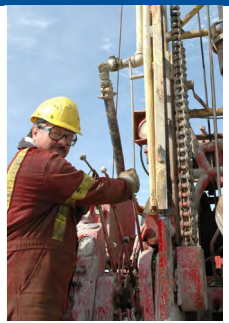
YOU ARE INVITED

to participate in our Open Houses on the Deep Geologic Repository (DGR) Project. Ontario Power Generation (OPG) is proposing to build a Deep Geologic Repository for the long term storage of low and intermediate level radioactive waste at the Bruce site.

At this second round of Open Houses we look forward to providing you with updated information on the DGR Project, to answering your questions, and hearing your views. Your comments will be considered in the environmental impact statement submitted under the Canadian Environmental Assessment Act for the DGR project.

KEEPING YOU INFORMED ABOUT THE DEEP GEOLOGIC REPOSITORY PROJECT





ONTARIO POWER GENERATION

Open Houses will be held at the locations listed below. Open House hours of operation are 4:00 p.m. to 8:00 p.m. We look forward to seeing you there.

DATES AND LOCATIONS

Kincardine
Monday November 3
Best Western Governor's Inn
791 Durham Street

Ripley
Tuesday November 4
Ripley Huron Community Centre
17 Queen Street

Walkerton
Wednesday November 5
Victoria Jubilee Hall
111 Jackson Street S

Port Elgin
Thursday November 6
Colonial Motel
235 Goderich Street

Owen Sound
Monday November 10
Best Western Inn on the Bay
1800 2nd Avenue E

Wiarton
Tuesday November 11
Wiarton & District Community Centre
531 Scott Street

Chesley
Thursday November 13
Chesley Fire Hall
North end of Chesley, Bruce Rd. 10

FOR MORE INFORMATION

- Please call Marie Wilson at 519-361-6414 extension 4065
- Write to us at OPG, Box 7000, B21, Tiverton, ON, N0G 2T0
- Visit our project website at: **www.opg.com/dgr**

ONTARIO POWER GENERATION

Post Card Mailing for October 2008 Open Houses		
Kincardine P.O.	All Postal Codes	4000
Owen Sound P.O.	All Postal Codes	13901
Chepstow P.O.	N0G 1L0	1400
Clifford P.O.	N0G 1M0	842
Elmwood P.O.	N0G 1S0	702
Formosa P.O.	N0G 1W0	258
Holyrood P.O.	N0G 2B0	192
Mildmay P.O.	N0G 2J0	992
Chesley P.O.	N0G 1L0	1467
Neustadt P.O.	N0G 2M0	434
Paisley P.O.	N0G 2N0	933
Ripley P.O.	N0G 2R0	726
Teeswater P.O.	N0G 2S0	747
Tiverton P.O.	N0G 2T0	1315
Walkerton P.O.	N0G 2V0	3343
Wingham P.O.	N0G 2W0 R.R. #1 Lucknow, R.R. #2 Lucknow, R.R. #3 Lucknow, R.R. #5 Lucknow, R.R. #7 Lucknow, LB0001 Lucknow	1357
Allenford P.O.	N0H 1A0	480
Annan P.O.	N0H 1B0	449
Bognor P.O.	N0H 1E0	202
Kemble P.O.	N0H 1S0	446
Leith P.O.	N0H 1V0	100
Lions Head P.O.	N0H 1W0	1023
Mar P.O.	N0H 1X0	458
Miller Lake P.O.	N0H 1Z0	256
Port Elgin P.O.	N0H 2C0	3974
Shallow Lake P.O.	N0H 2K0	625
Southampton P.O.	N0H 2L0	2127
Stokes Bay P.O.	N0H 2M0	90
Tara P.O.	N0H 2N0	1329
Tobermory P.O.	N0H 2R0	735
Wiarton P.O.	N0H 2T0	4742
TOTAL		49645

MEDIA PURCHASE AUTHORIZATION
OPG 2008 - "DGR Open Houses" - REV1

Gaggi Fax: 416-482-9672

Signatures here acknowledge the release of funds for the following purchase as authorized by Ontario Power Generation and partners&edell. This booking will be made through Gaggi Media Communications, but will be billed directly to Ontario Power Generation c/o partners&edell. This holds Ontario Power Generation and partners&edell fully responsible for the payment of all invoices. These invoices will be sent first to Gaggi Media Communications for authorization and verification and then sent to partners&edell for final payment.

Release the following funds:

Medium	Dates	Ad Size	Type	Total Ads	Material Due
Kincardine News	Oct. 22, 29	4x136	B/W	2	
Kincardine Independant	Oct. 22, 29	3x136	B/W	2	
Lucknow Sentinel	Oct. 22, 29	4x136	B/W	2	
Walkerton Herald Times	Oct. 29, Nov. 5	5x136	B/W	2	**ASAP**
Port Elgin Shoreline Beacon	Oct. 29, Nov. 5	4x136	B/W	2	
Wiarton Echo	Oct. 29, Nov. 5	4x136	B/W	2	
Owen Sound Sun Times	Nov. 6, 7, 8	5x136	B/W	3	

TOTAL OPG COST (net media + fees): $5,927

Bill McKinlay
Ontario Power Generation

Date

Meagan Crichton
Partners & Edell

Date

YOU'RE INVITED TO AN ENVIRONMENTAL ASSESSMENT OPEN HOUSE

OPG DEEP GEOLOGIC REPOSITORY (DGR) PROJECT

Ontario Power Generation (OPG) is proposing to build a Deep Geologic Repository for the long term storage of low and intermediate-level radioactive waste at the Bruce site.

As part of the planning and approval process for the DGR project, we are encouraging the public to attend our second round of Open Houses. We look forward to providing you with information about the project and hearing your views. Public participation is an important part of the environmental assessment process and your input will be considered in the Environmental Impact statement that will be prepared and submitted for the DGR under the Canadian Environmental Assessment Act.

We look forward to seeing you between 4 and 8 p.m. at any of the open houses listed below.

Kincardine – Monday November 3
Best Western Governor's Inn
791 Durham Street
Kincardine

Ripley – Tuesday November 4
Ripley Huron Community Centre
17 Queen Street
Ripley

Walkerton – Wednesday November 5
Victoria Jubilee Hall
111 Jackson Street S
Walkerton

Port Elgin – Thursday November 6
Colonial Motel
235 Goderich Street
Port Elgin

Owen Sound – Monday November 10
Best Western Inn on the Bay
1800 2nd Avenue E
Owen Sound

Wiarton – Tuesday November 11
Wiarton & District Community Centre
531 Scott Street
Wiarton

Chesley – Thursday November 13
Chesley Fire Hall
North end of Chesley
Bruce Rd. 10

For more information:
Call: Marie Wilson at 519-361-6414 ext 4065,
or write to us at Ontario Power Generation, Box 7000, B21,
Tiverton, ON, N0G 2T0 – or visit our project website at: www.opg.com/dgr

ONTARIO POWER GENERATION

MEDIA PURCHASE AUTHORIZATION
OPG 2008 - "DGR Open Houses" RADIO

Gaggi Fax: 416-482-9672

Signatures here acknowledge the release of funds for the following purchase as authorized by Ontario Power Generation and partners&edell. This booking will be made through Gaggi Media Communications, but will be billed directly to Ontario Power Generation c/o partners&edell. This holds Ontario Power Generation and partners&edell fully responsible for the payment of all invoices. These invoices will be sent first to Gaggi Media Communications for authorization and verification and then sent to partners&edell for final payment.

Release the following funds:

Station	Dates	Spot Length	Total Spots	Material Due
CIYN FM "The Coast"	Nov. 1-11, 13	:30 seconds Annoncer-Read	24	ASAP
CKYC FM "Country 93"	Nov. 1-11, 13	:30 seconds Annoncer-Read	24	ASAP
CHGB FM "The Beach"	Nov. 1-11, 13	:30 seconds Annoncer-Read	48	ASAP
CFOS AM "560 CFOS"	Nov. 1-11, 13	:30 seconds Annoncer-Read	24	ASAP

TOTAL OPG COST (net media + fees): $4,665

Bill McKinlay
Ontario Power Generation

Date

Meagan Crichton
Partners & Edell

Date

MEDIA PURCHASE AUTHORIZATION
OPG 2008 - "DGR Open Houses" CKNX FM/AM

Gaggi Fax: 416-482-9672

Signatures here acknowledge the release of funds for the following purchase as authorized by Ontario Power Generation and partners&edell. This booking will be made through Gaggi Media Communications, but will be billed directly to Ontario Power Generation c/o partners&edell. This holds Ontario Power Generation and partners&edell fully responsible for the payment of all invoices. These invoices will be sent first to Gaggi Media Communications for authorization and verification and then sent to partners&edell for final payment.

Release the following funds:

Station	Dates	Spot Length	Total Spots	Material Due
CKNX FM "The One"	Nov. 1-11, 13	:30 seconds Annoncer-Read	36	ASAP
CKNX AM "Country 920'	Nov. 1-11, 13	:30 seconds Annoncer-Read	36	ASAP

TOTAL OPG COST (net media + fees): $3,604

Bill McKinlay / Cindy Kaye
Ontario Power Generation

Date

Meagan Crichton
Partners & Edell

Date

Connecting with OPG

Marie Wilson

Is there anything more aromatic or tantalizing than the pungent smell of garlic bread? Fresh Italian or Sourdough bread soaked with butter and garlic oil only if you please (no pulp) when toasted, creates intoxicating wafts that assault the olfactory system and torment one's appetite. And what a perfect accompaniment for the soups, stews, curries, casseroles and comfort food dishes that seem to come with the approach of winter and our genuine desire to cocoon within the warmth of our own four walls. But what does garlic or garlic bread have to do with OPG - an Ontario - based company whose principal business is the generation and sale of electricity in Ontario? Locally we operate the Western Waste Management Facility (WWMF) at the Bruce site. And did I happen to mention that we have a track record in the safe and responsible management of nuclear waste that spans over a 40-year period? Anyway, back to the connection with garlic because we are Connecting with OPG.

One of the neat things about our Deep Geologic Repository (DGR) travelling mobile is the fact that when we take our road show out to various public events, we quite often get volunteer support from staff members who, as stewards of the waste, enjoy the opportunity to meet the public and chat about the nuclear waste management business.

Alan Cowan, a used fuel mechanic in our used fuel dry storage facility, volunteered with us at the recent International Plowing Match held in Teeswater and in his own words, "I really enjoyed the opportunity to meet people and talk about the business."

Okay, but you still want to know about the garlic connection?

In addition to wearing his OPG hat at the IPM, Alan was also wearing his garlic farmer hat (there you go) and as one thing connects with another, Alan and wife Wendy manned a garlic exhibit set up in the Bruce County tent. They were part of a team of exhibitors with the Grey Bruce Agriculture & Culinary Association (ACA). The not-for profit group, formed in 2007, is dedicated to promoting the linking of Grey Bruce farmers, processors and restaurants to deliver an authentic culinary experience, while also reducing the environmental footprint by reducing the need to transport goods. Alan notes that the association publishes and distributes about 50,000 maps which list over 100 food businesses in the counties. The businesses' hours of operation and contact information are listed on the back. The ACA also operates a website, which lists over 300 local food businesses at food@brucecounty.on.ca

Alan and Wendy Cowan promote their home-grown garlic through the Grey Bruce Agriculture & Culinary Association which was featured in the Bruce County tent at the IPM.

Although he is quick to point out that his position at the WWMF, where he has worked since 1982, always comes first Alan said he really enjoys his 100-acre Arranhill Garlic Farm located near Allenford. He grows 8,000 lbs of garlic annually, and about 60 per cent of his product has a ready market as seed while the remainder is sold locally.

"My background is farming.....I just love the land," he said.

"In the springtime when everything is new and fresh, garlic is the first product to peek through the earth."

Alan also notes that garlic contains a powerful substance called Allicin with anti-bacterial properties that has been utilized throughout the ages for medicinal purposes.

"The Egyptians fed garlic to their slaves when they were building the Pyramids in order to keep them healthy and fit for work," he said.

In order for garlic to be effective it is most powerful when eaten raw, which creates its own symptoms that could be described as less than aromatic and tantalizing. Thankfully, Alan wasn't demonstrating the medicinal properties of his product when he was working the DGR exhibit or we might have received fewer visitors- just kidding Alan! As it was, we talked to hundreds of people about our project and our operations at the WWMF. Talk about being connected!

In addition to all of the folks we talked to at the IPM and Pumpkinfest and... we are also hosting another round of open houses in seven communities to give people yet another medium for discussing the DGR. Open houses will be held from 4 p.m. - 8 p.m. at th following locations on the following days: Nov. 3 - Kincardine, Best Western Governor's Inn, Nov. 4 - Ripley, Ripley Huron Community Centre, Nov. 5 - Walkerton - Victoria Jubilee Hall, Nov. 6 - Saugeen Shores, Colonial Motel, Nov. 10 - Owen Sound, Best Western Inn on the Bay, Nov. 11 - Wiarton, Wiarton Arena, Nov. 13 - Chesley, Chesley Fire Hall.

And talking about cooler temperatures, cocooning, staying indoors and all that good stuff, the Kincardine Christmas Tour of Homes is going to be held on Nov. 8 from 6 p.m. to 9 p.m. and Nov. 9 from 12:30 p.m. to 4:30 p.m. All proceeds will be used for the purchase of medical equipment for the Kincardine Hospital For more information, please call Sylvia at 519-396-3888 or Donna at 519-396-7181 and watch for posters in the windows of downtown merchants. Cheers!*

ONTARIO POWER GENERATION

Appendix B

Newspaper Coverage

Nuke waste open houses in region
<http://www.radioowensound.com/news.php?id=15820>
Bayshore Broadcasting News Centre - Owen Sound,Ontario,Canada Ontario Power Generation (OPG) is ready to begin its second round of open houses to give you an opportunity to discuss the proposed Deep Geologic Repository ...

News for Monday, November 3rd, 2008

Nuke waste open houses in region , Bayshore Broadcasting Centre Written by John Divinski

Ontario Power Generation (OPG) is ready to begin its second round of open houses to give you an opportunity to discuss the proposed Deep Geologic Repository project in Bruce County.

Media Relations Manager for OPG's Western Waste Management Facility in Bruce County says they're proposing to take all of the low and intermediate level waste which comes from all the reactors at Bruce, Darlington and Pickering nuclear stations and bury it underground.

Wilson says the waste will be buried about 680 meters underground where they will manage it permanently.

Wilson points out the material will be in a chamber underground that is further down than Toronto's CN Tower is up.

She says there are not proposing, nor will they be equipped to take high level waste which is known as used or spent fuel.

Wilson says as part of their continuing environmental assessment procedures into the project, they are holding another series of open house to discuss one-on-one with anyone who has any questions or concerns about the plan.

The open houses begin tonight in Kincardine at the Governor's Inn.

Other meetings will be held in Ripley at the Ripley Huron Community Centre on Tuesday, Nov. 4th; Walkerton's Victoria Jubilee Hall on Wednesday, Nov. 5th; Colonial Motel in Port Elgin on Thursday, Nov. 6th; Best Western Inn on the Bay in Owen Sound on Monday, Nov. 10th; Wiarton and District Community Centre on Tuesday Nov. 11th; and at the Chesley Fire Hall in Chesley on Thursday, Nov. 13th.

All open houses run from 4pm to 8pm

Google Blogs Alert for: "ontario power generation"

November 3 News Stories
<http://coastnews.blogspot.com/2008/11/november-3-news-stories.html>
By Lynda Cooper(Lynda Cooper)
The second round of open houses hosted by Ontario Power Generation, gets underway in Kincardine today. OPG's media relations manager, Marie Wilson says this is the chance for anyone who has a concern about the proposed Deep Geologic ...
Coast News - http://coastnews.blogspot.com/
<http://coastnews.blogspot.com/>

OPG Meetings
The second round of open houses hosted by Ontario Power Generation, gets underway in Kincardine today. OPG's media relations manager, Marie Wilson says this is the chance for anyone who has a concern about the proposed Deep Geologic Repository Project, to speak one to one with OPG about it. The plan calls for underground storage of low and intermediate level waste, from all reactors at the Bruce site, Darlington and Pickering. All meetings are scheduled from 4pm till 8pm. Today's takes place at the Best Western, Governor's inn, tomorrow at the Ripley Huron Community Centre, Wednesday, Walkerton's Jubilee Hall, and the Colonial Motel in Port Elgin on Thursday.

OPG Nuclear Waste Plan in Bruce County Domain Again
<http://www.am920.ca/news.php?artID=27765>
CKNX Radio - Wingham,Ontario,Canada
Ontario Power Generation is taking its plan to bury radioactive waste in Bruce County to the public. A series of environmental assessment open houses kicked ...

OPG Nuclear Waste Plan in Bruce County Domain Again

CKNX Radio, Wingham
Ontario Power Generation is taking its plan to bury radioactive waste in Bruce County to the public.
A series of environmental assessment open houses kicked off last night in Kincardine.
These are the second round of open houses to keep the public informed and give them a chance to comment on the plans.
The plan, called the Deep Geologic Repository Project, involved burying low and medium level radioactive waste 2 230 feet below the surface in a series of rooms.
The company says the bedrock formations will contain the wastes for thousands of years.
The timetable for the project is lengthy -- operation is not expected to begin until 2017.
The open house moves to Ripley tonight, Walkerton tomorrow, Port Elgin on Thursday and Owen Sound, Wiarton and Chesley next week.

News for Thursday, November 6th, 2008
Bayshore Broadcasting Centre
OPG holds another open house
Written by Shannon Snoes

You can learn more about Ontario Power Generation's plans to construct a Deep Geologic Repository at the Bruce Site.

There is an open house in Port Elgin tonight at the Colonial Motel on Goderich Street.

OPG is proposing to take all low and intermediate level waste from the province's reactors, and bury it underground, about 680 metres.

These information sessions are part of OPG's continuing environmental assessment procedure into the project.

The next open house is Monday, November 10th at the Best Western Inn on the Bay in Owen Sound.

Next week, one will be held in Wiarton at the community centre on Tuesday, then at the the fire hall in Chesley on Thursday.

All open houses run from 4 PM to 8 PM.

****

News for Thursday, November 6th, 2008
CKNX Radio AM920
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Written by Shannon Snoes

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All open houses run from 4 PM to 8 PM.

Maggie Van den Enden
Editorial Assistant
Public Affairs
Ontario Power Generation
¿ media@opg.com

OPG Storage Open Houses Wrap Up
<http://www.am920.ca/news.php?artID=27928>
CKNX Radio - Wingham,Ontario,Canada
Spokesperson Marie Wilson says the public wants to know if the Deep Geologic Repository will harm drinking water and Lake Huron and whether the facility ...

Local
<http://www.am920.ca/graphics/spot.gif>

OPG Storage Open Houses Wrap Up

Two questions dominated a series of open houses Ontario Power Generation held for the proposed low and intermediate level nuclear waste storage under the Bruce site.
Spokesperson Marie Wilson says the public wants to know if the Deep Geologic Repository will harm drinking water and Lake Huron and whether the facility will store used fuel.
Wilson says high level waste won't be allowed on the site, while deep rock and multiple barriers will protect the water.
Wilson says OPG wants to give the public every opportunity to learn about the nuclear waste storage proposal as it moves through two more years of environmental assessment and goes to a public hearing expected in 2012.

OPG pleased with Open Houses
<http://www.radioowensound.com/news.php?id=16234>
Bayshore Broadcasting News Centre - Owen Sound,Ontario,Canada OPG is proposing to take all of the low and intermediate level waste which comes from all the reactors at Bruce, Darlington and Pickering nuclear stations ...

News for Monday, November 17th, 2008
Bayshore Broadcasting Centre
OPG pleased with Open Houses
Written by John Divinski

Seven open houses and 150 discussions.

Ontario Power Generation has completed its latest round of open houses on its proposed Deep Geologic Respository project at the Bruce site.

Spokesperson Marie Wilson says they conducted open house information sessions in seven different communities since November 3rd and they talked to 150 people.

Wilson says the biggest issue was people wanted assurances that the project would contain only low and intermediate level nuclear waste which was the company's plan from the beginning.

Another issue that surfaced was protection of the water tables in the area.

Wilson says OPG chose the Bruce site area for the repository because of the make-up of the rock underground which will keep the buried waste from leeching into any water supplies or Lake Huron.

Wilson says the company will continue to talk to anyone who wants to listen about their project.

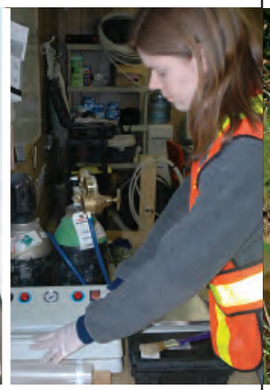
OPG is proposing to take all of the low and intermediate level waste which comes from all the reactors at Bruce, Darlington and Pickering nuclear stations and bury it 680 meters underground.

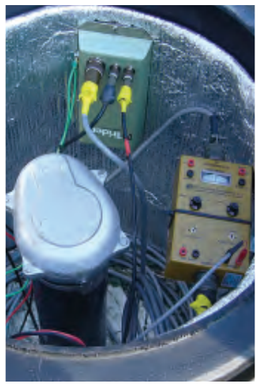
Appendix C

Open House Hand-Outs







DEEP GEOLOGIC REPOSITORY PROJECT

ANNUAL REPORT

2007

Materials used in this report are enviromentally friendly. Cover and text stocks are recycled and recyclable, with a minimum of 10% post-consumer waste. Vegetable based inks have been used throughout.

Design, Print, Distribution: OPG Office Services

ONTARIO POWER GENERATION
www.opg.com/dgr

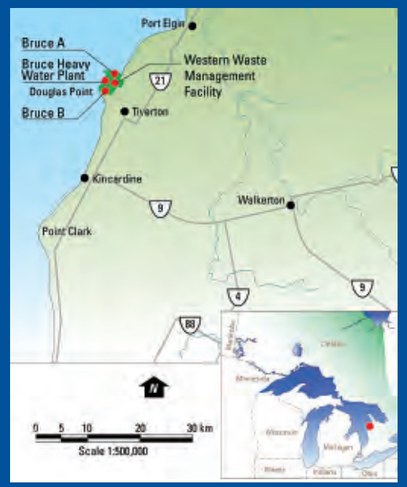
ONTARIO POWER GENERATION

TABLE OF CONTENTS

ARROW indicates proposed location of the DGR at the Bruce site in the Municipality of Kincardine

KEY FEATURES

- Proposed depth about 680 metres (2230 feet)
- Located in geologically stable, low permeability limestone
- Located beneath protective cap of 200 metres of low permeability shale
- Capacity of about 160,000 cubic metres of L&ILW
- Located adjacent to OPG's existing Western Waste Management Facility on the Bruce site



THE DGR PROJECT

Ontario Power Generation (OPG), with the support of the local municipalities, is seeking regulatory approval for the construction of a Deep Geologic Repository (DGR) for the long-term management of low and intermediate level radioactive waste (L&ILW) on lands adjacent to the Western Waste Management Facility on the Bruce site in the Municipality of Kincardine. The facility would manage about 160,000 cubic metres of L&ILW from OPG-owned nuclear generating stations in Ontario.

The DGR is currently in the regulatory approvals phase which is expected to last about five years. This process includes geoscientific site investigations, environmental baseline monitoring, safety assessment analyses, conceptual and preliminary engineering design, completion of an Environmental Assessment, and application for Site Preperation and Construction Licences.

The DGR would be located about 680 m (2230 feet) below ground surface in low permeability limestone, beneath a 200 m (660 feet) thick layer of low permeability shale. These sedimentary bedrock formations, that provide natural barriers, will safely isolate the radioactive waste for many thousands of years and beyond. This rock has remained stable for more than 450 million years in spite of geologic upheavals, major climate change and glacial cycles.

The proposed DGR would be composed of a series of emplacement rooms excavated in the rock. Conventional mining methods would be used to construct the repository over a period of about five years. Access to the DGR and the emplacement rooms would be by vertical shaft. Once the DGR ceases to receive waste and following a period of monitoring, OPG expects to seek approval to close the facility. This would entail sealing the repository access shafts with clay-based and concrete materials.

REGULATORY PROCESS

In June 2007, the federal Environment Minister announced that the DGR project had been referred to a review panel for assessment under the Canadian Environmental Assessment Act. This announcement confirmed the recommendation made by the Canadian Nuclear Safety Commission (CNSC) in December 2006.

In August 2007, consistent with the Minister's announcement, OPG submitted to the CNSC its application for a Site Preparation and Construction Licence. The next step in the regulatory review process is the finalization of the Panel Agreement, which will outline the regulatory review process, and the guidelines (scope) for the environmental assessment.

Although the scope and process have not been finalized, OPG has been progressing with studies to verify the site-specific geologic information, which to date have indicated favourable conditions for the DGR, as well as environmental baseline studies, safety studies, and conceptual engineering work.

Information on baseline environment is collected in support of the environmental assessment.

GEOSCIENTIFIC SITE CHARACTERIZATION STUDIES

Geoscientific investigations to assess and confirm the suitability of the Bruce site to safely host the DGR were initiated in 2006. These investigations are part of a stepwise multi-year program scheduled for completion in 2010. A key goal of these investigations is to verify preliminary geoscientific assessments, initiated as early as 2002, that provided independent and peer reviewed evidence of favourable conditions for implementation of the DGR concept.

In 2007 Site Characterization studies focused on the completion of Phase 1 Bruce site field investigations and the development of a Geosynthesis report. The site-specific field investigations were focused on the drilling, testing, and instrumentation of two deep boreholes.

The Geoscience Review Group at work

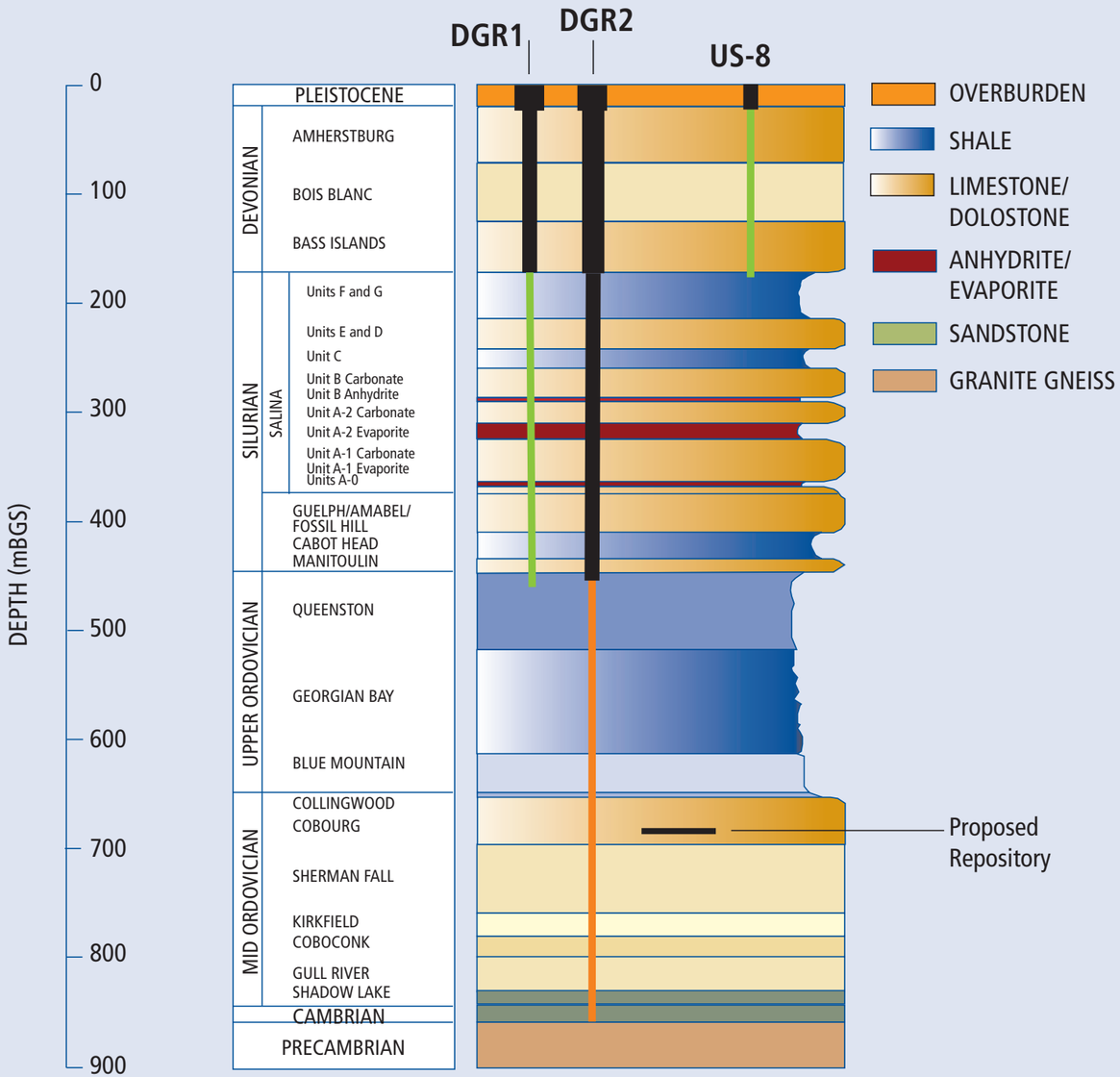
The Geosynthesis work program examined issues at a regional scale to establish a geoscientific basis for understanding site characteristics that contribute to predictions of long-term DGR performance and safety. This work program has involved the coordinated effort of universities (6) in Canada and abroad, along with 30 other geoscientist professionals. In addition, an independent Geoscience Review Group, which draws on experience from the French and Swiss Radioactive Waste Management programs in similar geologic settings, has provided technical oversight and advice throughout 2007.

BOREHOLES

The two deep boreholes, DGR1 and DGR2, provided the first opportunity to explore the Paleozoic age sedimentary bedrock formations directly beneath the Bruce site. The 160 mm diameter boreholes were drilled from a single site of depths to 463m and 863m below ground surface (mBGS). The boreholes were cored such that a continuous record of the Devonian to Cambrian age sedimentary rock layers occurring beneath the site was brought to surface for inspection, sampling and storage at an 0n-site Core Storage Facility. More than 850 m of rock core was retrieved in 2007, from which over 200 samples were collected and preserved for laboratory mineralogical, petrophysical, geomechanical and pore fluid analysis.

The bedrock stratigraphy at DGR1 and DGR2 was consistent with earlier conceptual models of the site and is comprised of 33 horizontally layered carbonate, shale, evaporite and sandstone bedrock formations that vary in thickness from approximately 2 to 99 m. The limestone of the Cobourg Formation proposed to host the DGR is first intersected at approximately 660 mBGS and has a thickness of 27m. The Cobourg is overlain by more than 200 m of shale comprising the Queenston, Georgian Bay and Blue Mountain bedrock formations. Preliminary results indicate water held within the rock core pore space below a depth of approximately 180 m possess Total Dissolved Solid concentrations in excess of 200 gm /L (i.e. 6 times more saline than seawater). This supports an earlier contention that the water has been isolated in the rock for a very long time.

Drill crew displays a 10-foot long section of rock core from DGR2.



BEDROCK FORMATIONS AND STRATIGRAPHY BENEATH THE BRUCE SITE BASED ON RESULTS OF PHASE 1 DEEP BOREHOLE DRILLING.

A borehole testing program immediately followed the completion of drilling. This program included geophysical logging in which instruments are lowered into the open boreholes to measure bedrock properties necessary to select bedrock formation boundaries, and to reveal information on bedrock fracturing, strength and stress conditions, and mineralogy. These tests were followed by down-hole hydraulic straddle packer tests to estimate rock permeabilities that, for the rock enclosing the repository, were at or less than 10^{-11} m/sec. Upon completion of the borehole testing, casing systems that allow long-term monitoring of groundwater conditions at 48 isolated intervals within the two boreholes were installed. These deep casing systems, in addition to three other shallow casing systems installed in the upper 100-180 m of the bedrock surface at different site locations, are part of a growing monitoring well network that will be used to establish baseline conditions at the site.

GEOSYNTHESIS

The Geosynthesis activities complement the site-specific investigation by examining issues surrounding the origin and evolution of sedimentary bedrock formations that are to enclose and isolate the proposed DGR. These activities have focused on compiling existing scientific data at a regional scale to examine issues of bedrock formation stratigraphic predictability, groundwater migration, bedrock fracturing, natural resources and seismicity. Numerical modelling of the regional scale groundwater system has also been undertaken to explore the role of bedrock formation layering and permeabilities, depth dependent variably saline ground and pore waters, and glacial events on groundwater movement and stability at time frames relevant to repository safety. These studies will be documented in supporting technical reports contributing to a Phase I Geosynthesis being prepared.

Representatives of the Geological Survey of Canada, Ontario Geological Survey and Ministry of Natural Resources examined the core from DGR2 during a September 2007 Workshop at the on-site Core Storage Facility.

SEISMOLOGY

A network of three borehole seismometers was installed by the University of Western Ontario in the summer of 2007 to monitor low-level seismic activity within an approximate 50 km radius of the DGR site. Annual reports of seismic activity from this network, prepared by the Geological Survey of Canada, will improve the understanding of low-level seismic activity in the region.

One of three low-level seismometers installed as part of the DGR geoscience program.

The Geoscience Review Group examines core from DGR1

GEOSCIENCE REVIEW GROUP

The Geoscience Review Group (GRG) is a peer review group comprised of internationally renowned scientists and engineers who ensure that information and lessons learned in similar international work programs are reflected in OPG's work. The GRG reviewed test plans, and visited the Bruce site to observe the drilling of DGR2 and the hydraulic testing of DGR1 and core recovered from DGR1. They also participated in reviewing Geosynthesis work. Based on its 2007 work the GRG reported that the Phase 1 site program has been well designed, is being carried out according to well-documented test plans, and is producing results that will be used to further assess the suitability of the Bruce site.

SAFETY ASSESSMENT

The primary purpose of the DGR is to contain and isolate the wastes. Based on our current understanding, the following safety principles are expected to apply:

- *There are no significant adverse near-term environmental or socioeconomic effects*
- *The site geological features and conditions provide several lines of evidence supporting long-term safety*
- *The facility design can be built and operated using proven technologies and in a safe manner*
- *Considering the facility design, waste inventory and site geological features, the postclosure impacts will be very small*

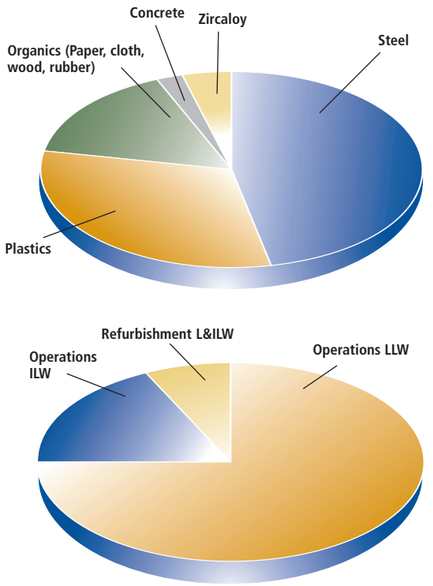
The potential impacts of the facility are addressed through safety assessment. The pre-closure assessment considers the safety of the repository during the operational period. The post-closure assessment addresses the safety of the repository after the underground portion has been closed and sealed, and extends far into the future.

The safety assessment is following Canadian and international guidelines, which encourage a well-structured, transparent and traceable approach. The assessment will consider both a normal evolution scenario and disruptive scenarios. The latter include a variety of potential hazards and "what if" scenarios, such as future human intrusion, in order to test and illustrate the safety of the repository. The results from the safety assessment in turn provide feedback to the site characterization and facility design work.

The safety assessment is conducted in stages, with interaction with the site characterization, waste inventory and facility design work programs.

A preliminary assessment, completed in 2003, is presently being updated to take into account:

- *Current forecast waste inventory, including intermediate level wastes such as those presently received at the WWMF*
- *Geological data from the Site Characterization Program, including results from the first two deep boreholes at the site*
- *Current facility design*



Waste composition: by weight and material (top), and by volume and source (bottom).

Head Frame Building at the Nickel Rim Mine in Sudbury

FACILITY ENGINEERING

The conceptual design for the DGR that was developed in 2004 has been updated and further optimized through more detailed analyses of key elements of the design. In addition, OPG has benchmarked the DGR design against designs of other similar existing and proposed facilities located in Europe and the United States and this has led to improvements in the DGR design.

The DGR concept is comprised of horizontally-excavated emplacement rooms arranged in two panels with access provided via two vertical concrete-lined shafts. The emplacement rooms would be constructed at a depth of about 680 m within a stable limestone formation. In this concept, waste packages are lowered by shaft hoist to the repository horizon and then transferred by forklift to emplacement rooms. Waste packages are stacked within emplacement rooms by forklift and, when full, the rooms are isolated by closure walls. When filled with waste and after receipt of all necessary regulatory approvals, the repository would be sealed by placing low permeability clay based materials and concrete plugs in each shaft.

In 2007, OPG's engineering consultant assessed alternative arrangements for various aspects of the 2004 DGR design concept, recommended a preferred arrangement for each, and then updated the conceptual design. In particular the consultant assessed and optimized the design for the following key aspects of the DGR facility design:

- *Configuration of selected repository waste packages*
- *Repository access-ways (i.e., shaft versus ramp access)*
- *Main shaft hoisting system*
- *Shaft design and sealing*
- *Underground waste package handling system*
- *Emplacement room and tunnel configurations*
- *Repository development (i.e., timing of emplacement room construction)*
- *Waste rock management*
- *Facility location and layout*

During visits to L&ILW repositories at Olkiluoto in Finland, Konrad in Germany, and WIPP in the United States, OPG and its engineering consultant toured the repositories and met with operators to gather design information that would be relevant to the DGR design. The major observations and findings are related to type of repository access, hoisting equipment, ventilation design and controls, layout of emplacement rooms, underground mobile equipment and materials handling.

Accessway at the Olkiluoto repository in Finland. The repository was commissioned in 1992 and manages low and intermediate level waste.

An emplacement room at the Waste Isolation Pilot Plant in New Mexico, United States, a facility which was constructed at about the same depth as OPG's DGR is planned.

Kincardine resident discusses the DGR Project at an Open House.

COMMUNITY ENGAGEMENT

OPG's strategy for engaging stakeholders in discussion on the DGR project is to go to events where the public would already be gathering. Events that DGR staff participated in, along with the DGR trailer, included the Owen Sound, Port Elgin and Kincardine Home Shows, Tiverton Energy Expo, Kincardine Scottish Games, Saugeen PowWow, Port Elgin Pumpkinfest, Clarington Family Safety Day and summer markets in Kincardine and the surrounding area.

OPG staff made presentations on the DGR project to a number of local business groups, service clubs and associations, and agricultural, angling and hunting, and retiree associations. Presentations were also made to groups in other nuclear host communities including the Durham Nuclear Health Committee and the Pickering Community Advisory Council.

Attendees complete comment cards after having visited the DGR Open House in Owen Sound.

Open Houses for the DGR project were held in October in the communities of Kincardine, Port Elgin, Owen Sound, Walkerton, Wiarton, Chesley, and Ripley. More than 200 people attended the seven open houses to obtain an update on the status of the DGR project and to provide their feedback on the proposed DGR to OPG. The public has expressed their appreciation for the opportunity to obtain regular updates on the status of the DGR project.

OPG met several times through the year with representatives of the Saugeen Ojibway Nations to provide updates on the proposed DGR and to discuss with them their views on how they wish to be involved in the environmental assessment process.

Three DGR Project-specific newsletters were published and distributed to more than 25,000 local residences.

DGR Exhibit at Kincardine Scottish Festival.

Environmental baseline studies include an assessment of terrestrial habitat.

ENVIRONMENTAL ASSESSMENT

A series of field studies were undertaken at the Bruce site to establish baseline environmental data to better assess the potential effects of the proposed DGR. Completed work to date includes studies of noise level, on-site surface water quality, wild turkey, breeding birds, amphibians and muskrat surveys, as well as archaeological and terrestrial habitat assessments.

This information will augment data which is already available as a result of ongoing monitoring programs and recent environmental assessments

Another key component of the environmental assessment which began in 2007 was the development of the preliminary list of Valued Ecosystem Components (VECs). The VECs are features of the environment selected to be a focus of the environmental assessment because of their ecological, social, or economic value and their potential vulnerability to the effects of the DGR project. OPG sought comments from the public on the preliminary list of VECs at its Open Houses in the fall of 2007 and will continue to consult on them until the EA guidelines are finalized.

OPG is awaiting the final guidelines for the environmental assessment, expected from the regulatory agencies in 2008, as a basis for advancing the environmental assessment process.

Baseline environment studies assessed the habitat for various species including wild turkey in winter and in summer.

Scientists conduct baseline fish monitoring studies in a stream near the proposed DGR site.

PROJECT SCHEDULE
L & ILW DEEP GEOLOGIC REPOSITORY

The current schedule for the regulatory review phase of the DGR project is based on a number of planning assumptions. The schedule will be revised as further information is available.

Girls and geology ROCK!

Heather Conway, Julia Conway (daughter) and Olivia Conway (niece) participated in the 'Geology Rocks' workshop. Hannah Bos (above right, in purple) is ready to head out to the field with this prospector's pick.

Fiona Robertson takes a closer look at a sample of Basalt Rock. during the hands-on portion of the work-shop.

It looks like these girls are definitely alert and interested as they examine core samples from site characterization work for the DGR.

Eighteen young girls discovered firsthand that geology really does rock after attending a workshop hosted by Ontario Power Generation (OPG) at its core storage facility located at the Western Waste Management Facility (WWMF) on March 12.

The Grade 5-7 girls are members of the Girls in Real Life Science (GIRLS) Club, an initiative designed to expose girls to the the "real life" applications of science and technology that was developed and launched by the Bruce chapter of Women in Nuclear (WiN) in 2007.

Monique Hobbs, a senior geologist and senior scientist with OPG, and Jim McLay, an OPG geophysicst, were on hand to provide their expertise for "The Geology Rocks" session, which included a discussion of careers in geology, key points about the DGR, an examination of fossils and real hands on experience where the girls were given a collection of rocks, which they had to try to classify based on various rock property clues.

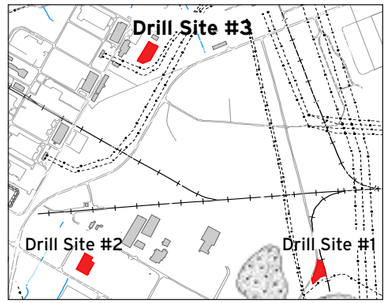
Heather Conway, an employee at the WWMF, took her daughter Julia and niece Olivia to the workshop and also helped out as a parent volunteer. "It's just such a great learning opportunity for girls in a rural area like this," she said of the girls science club.

"It was awesome," Olivia said when asked about the geology workshop. Cousin Julia was also enthusiastic. "I liked looking at the real fossils, but it was really neat to be able to touch the different rocks. We couldn't touch the fossils," she said.

Hannah Bos, another participant in the program was also enthusiastic about what she experienced. "I thought a rock was just a rock, but now I know there are all kinds of rocks and I know how to tell the differences between some," she said. OPG was thrilled to provide the girls with an opportunity to learn more about geology and perhaps, we will one day see some of them working on projects such as the DGR.

Continued from page one

of the horizontally-layered limestone and shale rock formations beneath the Bruce site that enclose and overlie the repository horizon, as well as assurance that they are without major fractures, faults or deformities. This information will contribute to the growing knowledge of the site that will serve as a basis to establish baseline background conditions and contribute to an understanding of its suitability for implementation of the Deep Geologic Repository concept. The geoscientific site characterization program is a multi-phase stepwise program which builds on the success of work done in previous stages. Although OPG geologist Mark Jensen notes it too early in the program to make any definitive statements about Phase One site characterization activities, early indications are that initial expectations that the Bruce site offers natural geologic barriers to isolate and contain the low and intermediate level radioactive waste for extremely long time periods is more than reasonable.



Six boreholes, two at each site, will be drilled as part of the scientific investigations at the Bruce site.

Neighbours

Neighbours is printed on 100% recycled stock

WWMF is published for the neighbours of Ontario Power Generation's Western Waste Management Facility.

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ONTARIO POWER GENERATION

News from OPG's Western Waste Management Facility

SPECIAL EDITION: Keeping you informed about the Deep Geologic Repository

Neighbours

A part of the community for more than 40 years • MAY 2008

OPG MOVES FORWARD WITH NEXT PHASE TO VERIFY DGR SITE

Driller Paul Marier is hard at work at the Bruce site where Phase Two of the geoscientific site characterization plan for OPG's proposed DGR, which includes the drilling of two vertical boreholes at two separate drill sites, began at the end of March.

Phase two of geoscientific site characterization activities, to verify the Bruce site as a location for Ontario Power Generation's (OPG) proposed Deep Geologic Repository (DGR) for the long-term management of low and intermediate level radioactive waste, is underway. The second phase began in March 2008 and is expected to last for two years.

The drilling, coring, testing and instrumentation of four more deep boreholes – two vertical and two inclined – will be the mainstay of the second stage of scientific investigations. Data gained from these boreholes, which will be drilled to depths of 860 metres, will add to the previous work completed with boreholes DGR 1 and DGR 2 in 2007.

The six boreholes are deliberately positioned in a triangle formation outside of the DGR footprint to maintain the integrity of the proposed repository site. Triangulation of the boreholes will provide evidence as to the nature and predictability of the stratigraphic, geochemical and hydrogeologic properties of

Continued on page four

CNSC invites comments on DGR guidelines, panel agreement

The Canadian Nuclear Safety Commission (CNSC) and the Canadian Environmental Assessment Agency (CEAA) issued the draft guidelines for the Deep Geological Repository (DGR) environmental assessment and the draft Panel Agreement on April 4, 2008.

The DGR project was referred to a Review Panel by the Environment Minister in June 2007 after a public hearing convened by the CNSC in the Municipality of Kincardine in October 2006.

The draft guidelines outline the scope of the environmental assessment that OPG is required to conduct for the proposed DGR project. The Review Panel Agreement outlines the process by which the Review Panel will conduct the public review and public hearing of the Environmental Impact Statement for the project.

OPG is pleased that these documents are out for public comment and review until June 18, 2008. The public review period provides an opportunity for anyone who is interested in the project, whether they are in support of the project or opposed to it, to provide input which will assist the regulator in scoping the assessment of the proposed project. OPG will be reviewing its study programs relative to the guidelines to identify any additional work required.

A public information session will be held in the area near the project by the Agency and CNSC in order to give the public the opportunity to learn more about the draft EIS guidelines and draft Review Panel Agreement for this project. Watch local media as well as the following websites: www.nuclearsafety.gc.ca or www.ceaa-acee.gc.ca.

ONTARIO POWER GENERATION

Keeping you informed about the DGR

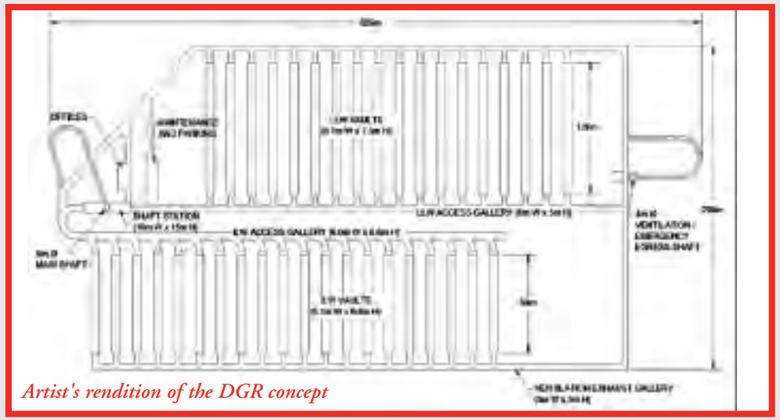
International expertise and experience influences EVOLUTION OF DESIGN

Designing a DGR

As Ontario Power Generation (OPG) moves forward with its Deep Geologic Repository (DGR) proposal, progress is being made on several fronts that will eventually meld together as part of the Environmental Impact Statement. Although it's expected the regulatory phase of the project will take about five years with a decision on the construction licence expected around 2012, there is still a lot of work to be done. Phase Two deep borehole drilling is beginning (see story in this newsletter), work continues on the safety assessment analysis, environmental baseline monitoring and the environmental assessment. And a key milestone of 2008 will be the finalization of the DGR conceptual engineering design as it moves towards the final stages.

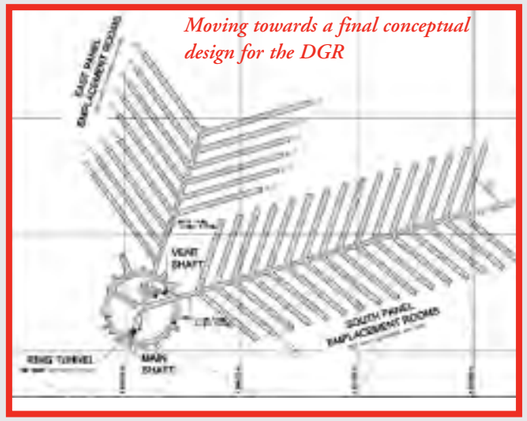
Now many of you will have seen the artist's rendition of the proposed DGR, which has been front and centre for the last several years. You've seen it in the mail in brochures and Neighbours newsletters, in newspaper ads, on the side of our travelling DGR mobile exhibit and on posters at our open houses. It's become our signature image, which depicts the repository deep beneath a cut-away aerial view of the Bruce site with its emplacement rooms laid out along two main access tunnels with shafts, distanced from each other at either end, leading up 660 metres to the surface.

Many of the design aspects of the original artist's concept were preliminary and expected to change with subsequent research, and after several years of work, the design has changed with a final conceptual design expected in May. Just as international collaboration and international peer review with our Geoscience Review Group (GRG) has proven to be extremely beneficial to the scientific investigations, which began at the Bruce site in fall 2006 and are continuing, international collaboration has also played a significant role in the design for the DGR. Changes have been incorporated into the final conceptual design that were based on research done in Finland, Germany, and the United States – countries that have geologic repositories for low and intermediate level nuclear waste. Although the final conceptual design isn't expected to be finalized until May, it is well on its way.



Artist's rendition of the DGR concept

Ring tunnel and islanded shafts key elements of new conceptual design.



Moving towards a final conceptual design for the DGR

Moving forward with a footprint for OPG's Deep Geologic Repository

The evolution of the design concept for Ontario Power Generation's Deep Geologic Repository (DGR) encompasses several changes to major keys areas: shaft locations and underground layout, main hoisting system, underground waste handling equipment, ventilation system, underground construction, waste rock management and shaft sealing system. The mainstay of this article will deal with the areas for shaft access, shaft locations and the underground layout.

The repository layout as shown in the artist's rendition has substantially changed from horizontally excavated emplacement rooms along two main access tunnels to a pair of what look like chevrons or fern leaves radiating out to the south and east from a central ring tunnel. The original design had the main shaft and ventilation shaft located at opposite ends of the repository, but the design has changed to accommodate two islanded shafts inside a ring tunnel within close proximity of each other. Preliminary discussions about repository access included the possibility of a ramp. Subsequent research favours shaft access. Martyn Dawborn, a Hatch Associate and Project Manager for DGR Engineering, noted that factors such as the ground conditions, grouting, transportation of waste packages and the final sealing of the repository are all better served by a shaft system.

The islanded shafts are centralized around the underground infrastructure, contained within a ring tunnel, which embodies all of the amenities and services required for the repository such as sanitary facilities, communications and instrumentation room, lunch room office area, electrical sub station, geo lab, storage etc. This arrangement allows for the underground infrastructure to be kept in close proximity to the shaft areas, while keeping the emplacement rooms away from the normally occupied and high activity areas. The compact shaft arrangement underground also makes for a more efficient surface layout where the shafts are within close proximity to the WWMF, which currently manages, on an interim basis, all of the low and intermediate nuclear waste from not only the Bruce reactors, but Darlington and Pickering.

Emplacement rooms are positioned in two panels (East and South) that are accessed by tunnels that radiate out from the ring tunnel. The South Panel will contain the majority of low level waste (LLW) packages while the East Panel is designed to contain the intermediate level waste (ILW) and large, heavy, irregularly shaped LLW packages such as heat exchangers and steam generators. All of the emplacement rooms are dead-ended in that there is only one way in and out of them from the main access tunnels.

Capacity with the new design concept allows for the management of about 200,000 m^3 of LLW and ILW compared to a previous volume of 106,000 m^3 of waste. There is also less excavation per cubic metre of waste with this new conceptual design. All of the emplacement rooms would be constructed in a sequential fashion before any emplace-ment operations commence as opposed to campaigns for the sake of efficiency.

Safety is an integral part of design

When it came to providing a conceptual design for Ontario Power Generation's (OPG) proposed DGR, Martyn Dawborn, who has worked on many projects in the mining and metallurgical sectors, said the amount of work required on safety was rigorous and beyond, and then beyond again, the norm of what might be expected with the majority of projects in non-nuclear industries.

Martyn Dawborn

And as an Associate and Project Manger for Hatch – a project management company that currently has more than 60 offices globally and $50 billion worth of projects under management worldwide – Martyn knows how important safety is with any project. In a company profile, it's noted that Hatch provides "excellent safety performance that protects the health and safety of our employees, clients, visitors and contractors while delivering quality design, project and construction management services. However, the attention and detail to safety that Martyn encountered with the DGR truly stands out as memorable in a long line of work.

"The amount of work required in the area of safety for the design is greater than the effort one might normally expect." he said.

With extensive experience in the mining industry, Martyn notes that safety is a systemic part of the mining industry, but another key driver is schedule. With a mine, the sooner you can get it constructed and operating, the sooner you can begin to get a return on all that investment capital. Such of course isn't the case with the DGR, which isn't a revenue-producing mine or facility.

"It's more about providing a safe design for the DGR that has been optimized for cost. We have to keep in mind that safety is absolutely paramount, and we must be able to demonstrate to the public at large that the DGR will be able to safely isolate low and intermediate nuclear waste for thousands of years and beyond," he said.

Kurt Strobele, Chairman & CEO of Hatch, is excited to be involved with a project, which will allow his company to bridge the gap between research, technology and project implementation with an innovative approach – an area that Hatch is noted for.

"The DGR represents a new development opportunity for us where we can cross-pollinate our skills and experience from various disciplines in applications for this project," he said.

Kurt also noted that Hatch is a company that prides itself on sustainability and environmental stewardship so being involved in a project for the nuclear industry such as the DGR, fits that bill.


Kurt Strobele

CONNECTIONS OF A DGR KIND

Tiverton Energy Solutions Expo *– Dropping Science Rappers left, Rob Macleod, Ryan Berry and Lenny MacLeod took time out from singing songs about how cool science is to discover just how cool the DGR is.*

Kincardine Home & Garden Show *– Doug and Cathy Mallory of Kincardine have their questions answered by OPG's Manager of Repository Engineering Richard Heystee.*

Chesley Agri Fair *– OPG's Lynda Cain gets up close and personal with Sparky the Fire Dog who resides at the Chesley Fire Department.*

Chesley Agri Fair *– Left, Grey County Warden Kevin Eccles, Mayor of Arran-Elderslie Ron Oswald and Bruce County Warden Milt McIver chat with OPG's Director of Public Affairs Terry Squire.*

Kincardine Scottish Festival *– Kincardine News editor Troy Patterson checks out the hands-on activities at the mobile exhibit while covering the heavy events, sponsored by OPG.*

Chesley Agrifair *– Steven Elder creates his own energy with one of OPG's popular red balls.*

We're coming to a town near you

There have been numerous DGR mobile exhibit sitings over the spring and summer, which is indeed a good thing. Ontario Power Generation (OPG) wants to ensure that members of the public have lots of information about the proposed Deep Geologic Repository (DGR) project for the long-term management of low and intermediate nuclear waste at the Bruce site. So saying, the exhibit has a tour schedule that has included: Chesley Kinsmen Mid-Western Agrifair, Saugeen Home and Recreation Show in Walkerton, Kincardine Home and Garden Show, Wiarton Home Show, Tiverton Energy Solutions Expo, Kincardine Scottish Festival, Kincardine Market in the Park, Port Elgin Flea Market, Keady Market, Walkerton Farmer's Market and Sauble Christian Fellowship Church Garage Sale.

Late summer and fall events include the Chippewas of Nawash Traditional Pow-Wow, Pumpkinfest, International Plowing Match, Clarington Family Safety Day and a number of open house venues for the DGR which will be held in Kincardine, Walkerton, Saugeen Shores, Ripley, Chesley, Wiarton and Owen Sound.

For more info visit opg.com/dgr

Neighbours

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WWMF is published for the neighbours of Ontario Power Generation's Western Waste Management Facility.

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ONTARIO POWER GENERATION

News from OPG's Western Waste Management Facility

SPECIAL EDITION: Keeping you informed about the Deep Geologic Repository

Neighbours

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Knowledge from different disciplines offers consistency to overall geologic model for DGR

Geoscientists and technical experts working co-operatively on OPG's DGR met in June at a workshop held at Gartner Lee Limited in Markham to discuss their Phase One reports for the Geosynthesis. Members of OPG's Geoscience Review Group (GRG) were there to provide a review of the findings in the research reports. Left, Dr. Sean Frape – University of Waterloo, Mark Jensen – OPG Manager of Geoscience, Ken Raven – Principal Intera Engineering, Dr. Derek Martin – GRG member, Rob Frizzell – Gartner Lee Limited, Dr. Joe Pearson – GRG member, Dr. Dougal McCreath – Laurentian University, Dr. Monique Hobbs – OPG Senior Scientist, Dr. Jon Sykes – University of Waterloo, Bob Leech – Gartner Lee Limited and Tom Lam – OPG Senior Technical Specialist. Dr. Andreas Gautschi and Jacques Delay, the two other members of the GRG, were unable to attend the workshop.

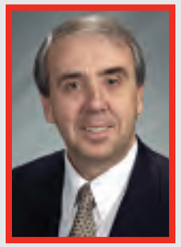
OPG's seismograph network registers low level activity

OPG's seismograph network, which was installed in August of last year to measure low level seismic activity within a 150 km radius of the Bruce site, registered events at or about 11 p.m. on July 31 – the night many Kincardine residents heard two big bangs. OPG's Manager of Geoscience Mark Jensen, based on communication with the Geologic Survey of Canada, said that OPG's network (part of the site characterization activities for the DGR) registered a seismic event at about 23:01, with a magnitude of 1.4. "It was a confirmed mining blast from the Goderich mine, and it definitely wasn't an earthquake," Jensen said. "A second event occurring at about 23:10 was comprised of two distinct shocks about 20 seconds apart. These shocks, which were likely what was heard, were related to a distubrance in the atmosphere, not ground motion." Jensen noted that seismic activity with a magnitude of 1.4 wouldn't be felt or heard. "The network was designed and installed to pick up extremely low level seismic activity that could not previously be detected," he said. OPG's network routinely picks up low level seismic activity from the operation of quarries in Owen Sound, Collingwood and the salt mine at Goderich. OPG's seismographs are located at Ashfield, Meryville Lake near Southampton and Walkerton in shallow boreholes.

ONTARIO POWER GENERATION

Keeping you informed about the DGR

Phase One work provides confidence in proposed location for DGR



DGR benefits from international expertise

Derek Martin

Dr. Derek Martin, a professor in geotechnical engineering at the University of Alberta, knows a fair bit about the long-term management of nuclear waste.

Martin is a member of Ontario Power Generation's (OPG) Geoscience Review Group (GRG) that is offering peer review for the geoscientific site characterization of OPG's proposed Deep Geologic Repository (DGR) for the long-term management of low and intermediate nuclear waste at the Bruce site. He comes to the table with a cornucopia of invaluable knowledge gained from years of study, research and practical field experience in a variety of industries including nuclear waste management, oil and gas, mining and underground construction.

"At the end of the day, every country must live with the geologic mediums that they are given, and the challenges imposed by this is what makes the work stimulating," he said. "Each rock type has its own challenges and engineered solutions."

Martin said the differences in the various rock types found internationally encourages the countries involved in site characterization work to share the results of their investigations.

"Canada, with OPG's DGR project, is making significant contributions to our understanding of tight shales and limestone rock formations."

Martin is joined on the GRG by Dr. Joe Pearson, a hydrogeochemist from North Carolina, Jacques Delay from ANDRA – France's National Agency for Radioactive Waste Management and Dr. Andreas Gautschi from NAGRA – Switzerland's National Co-operative for the Disposal of Radioactive Waste.

Scientific work at site supports regional geologic footprint

Dr. Martin is encouraged – "strongly encouraged" by the results to date of the multi-phased, multi-step, geoscientific site characterization of OPG's proposed DGR.

Based on existing, regional, geological information, there are expectations that the clay-rich, limestone sedimentary rock formations for the proposed site at 680 metres are: stable, predictable, spread out laterally over long distances, and exhibit extremely low permabilities to provide multiple natural barriers in which to isolate the waste.

"The work done with the first two boreholes (DGR 1 and DGR 2) in Phase One supports the regional information for the project's geologic model," Martin said.

In terms of the site's ability to isolate the waste from Lake Huron and the area's drinking water and ground water systems, Martin said, "There is no evidence to support the presence of permeable zones in the tight, rock formations that would allow for the rapid movement of fluids.

"We are looking at rock formations so tight that we are pushing the limits of our investigation technology in order to measure the permeability. In fact, what we are learning in terms of how to deal with these extremely tight formations – how to characterize them – is of huge significance to the industry."

As Martin explains, the hydraulic conductivity of the pore water found at 680 metres means any movement of water will take place very slowly to the extent of about one millimetre a year, which is about one million times slower than the movement of water that flows in the upper 100 metres.

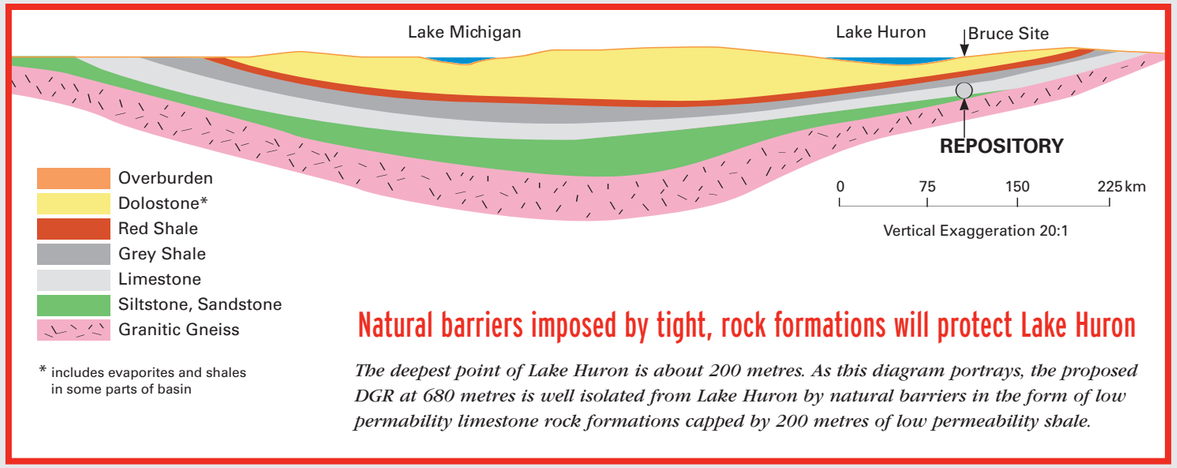
When asked about the position of the repository, which is about one km inland from Lake Huron, and whether that poses a threat to the integrity of the lake, Martin said that Canada isn't the first country to position a repository within the vicinity of a large body of water.

"Both Sweden and Finland have experience with repositories quite close to the water," he said, noting the Swedish SFR waste facility, which has been in operation since 1988, is located about 60 metres beneath the Baltic Sea underneath 55 metres of fractured crystalline rock and about five metres of low permeability soil near the Forsmark Nuclear Power Plant.

"It stands to reason that if they can operate their facility safely (since 1988) then how many more orders of magnitude safer are we when you compare 680 metres to 60 metres and the fact that our facility will be located in clay-rich, limestone sedimentary rock beneath a 200-metre cap of low permeability shale."

Emphasizing the fact that the geology offers multiple natural barriers between the lake and the drinking and ground water systems, Martin added that international experience provides evidence and confidence that the low permability rock will adequately contain the waste. Although there are still four more boreholes to be drilled, cored, probed and equipped with multi-level ground water monitoring equipment, Martin said the program is already harvesting the "kind of results that were expected" and further investigations are expected to build and provide greater confidence on what has already been done.

Phase Two investigations began at the Bruce site in April 2008 with the coring of DGR 3 at a separate site as part of the plan to position the boreholes in a triangular arrangement. This will allow for an understanding of the three-dimensional nature of the subsurface. The geophysical logging of DGR 3, where various probes are inserted inside the borehole to test for properties such as clay content and borehole diameter, is complete. Hydraulic testing in DGR 3 is currently underway. DGR 4 is currently being drilled and cored, at a separate site, and as of press time progress had been made to 200 metres. The drilling of DGR 4 will continue to 860 metres. All work on DGR 3 and DGR 4 is expected to be completed by December. Two inclined boreholes will be drilled in 2009.



Natural barriers imposed by tight, rock formations will protect Lake Huron

The deepest point of Lake Huron is about 200 metres. As this diagram portrays, the proposed DGR at 680 metres is well isolated from Lake Huron by natural barriers in the form of low permability limestone rock formations capped by 200 metres of low permeability shale.

Dr. Derek Martin (right) shares a moment with Dr. Dougal McCreath during a geosynthesis workshop held in Markham to discuss various streams of data from Phase One research. No one piece of data will determine the ultimate safety case for the DGR. Instead, it will be multiple lines of data and multiple lines of reasoning that will provide confidence in the location of the site for the construction of a long-term management facility for low and intermediate level nuclear waste.

Multiple lines of reasoning will build confidence in DGR safety case

When it comes to verifying the rock formations which will host the DGR, Dr. Martin emphasizes that no single piece of data stands alone by itself, but multiple sets of data from all of the investigative programs will provide consistency that speaks to the pedigree of the host rock.

"For instance, during Phase One we established numerous data sets from two boreholes, which were drilled to different depths of 463 metres and 863 metres," he said. "They provided us with information, which reflects existing regional information which was the initial basis for our geologic model. As we go forward in Phase Two with the drilling of four more boreholes, we can expect the data from those to reflect what was done in DGR 1 & DGR 2. If there are no differences, then it provides us with great confidence as we go forward with more testing, providing even more confidence in our geologic model."

Martin also noted that it's important that the data from the different boreholes tell the same story.

"For example, the results of the geochemical analysis and the hydrogeologic testing must be compatible," he said. "They are very different data sets, but the results of one must be consistent with the story being told by the other."

When asked at what point one can be sure that they have produced enough data to provide conclusive evidence as to the nature of the geologic footprint, Martin said it depends on the geology of the rock.

"The simpler the geology, the fewer the number of boreholes," he said, adding that the clay-rich limestone, sedimentary rock formations found at the Bruce site are relatively simple.

"How many boreholes very much depends on the consistency in the results as well as any issues that are identified during the repository design and safety assessment because the main purpose of the investigations is to provide information for those two elements," he said."When those two aspects are satisfied, the surface investigations will be complete."

In addition to the data from the six deep boreholes currently planned, the results of other investigative work such as the 2D seismic survey and seismicity studies are expected to provide even more consistency and additional multiple lines of reasoning for the DGR.

Appendix D

Open House Display Materials

NATURAL BARRIERS TO PROVIDE LONG TERM MANAGEMENT TO SAFELY ISOLATE LOW & INTERMEDIATE LEVEL WASTE

WELCOME

KEEPING YOU **INFORMED** ABOUT THE **DEEP GEOLOGIC REPOSITORY PROJECT**

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THE WESTERN WASTE MANAGEMENT FACILITY (WWMF)

THE SITE FOR THE DGR

Intermediate level waste storage.

- The WWMF, located at the Bruce site, began operations in 1976
- It is located on 19 hectares about one and a half kilometres from Lake Huron, just northwest of Tiverton, Ontario
- Prior to opening the WWMF, OPG stored low and intermediate level waste at the Radioactive Waste Operating Site #1, also on the Bruce site
- Currently waste is processed and stored in safe, interim storage facilities at this site in various buildings and in-ground engineered structures such as concrete trenches and in-ground storage containers
- There are also facilities for storing refurbishment waste, such as steam generators
- Additional processing, maintenance and storage facilities are periodically constructed to meet waste management needs
- The proposed DGR will be situated beneath OPG owned property

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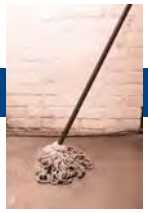
THE FACTS ABOUT NUCLEAR WASTE



What is Low Level Waste?

Low level waste (LLW) consists of minimally radioactive materials that have become contaminated during routine clean-up and maintenance at nuclear generating stations.

Low level waste:

- Includes mop heads, cloths, paper towels, temporary floor coverings, floor sweepings, protective clothing and hardware items such as tools
- Consists of paper, plastics, metal, rubber, cotton and other miscellaneous materials
- Can be safely handled using normal industrial practices and equipment without any special radiation protection
- Makes up about 95 percent of the total non-fuel waste volume received at OPG's Western Waste Management Facility

About 3000 cubic metres of low level waste is stored annually. The majority of low level waste volume is incinerated or compacted for volume reduction before it is placed in concrete warehouse-like buildings for interim management.

Low level waste can be safely handled using normal industrial practices.

What is Used Fuel?

- Consists of used fuel reactor bundles
- OPG is not seeking approval to store used fuel in the DGR
- The Host Agreement with Kincardine and certain design elements of the DGR preclude used fuel from the repository

Intermediate Level Waste Storage

What is Intermediate Level Waste?

Intermediate level waste (ILW) consists primarily of used reactor core components, and resins and filters used to keep reactor water systems clean, and reactor retube parts such as pressure tubes.

Intermediate level waste:

- Requires shielding to protect workers during handling
- Is not processed for volume reduction
- Makes up approximately five per cent of all non-fuel waste received at the Western Waste Management Facility – approximately 200 cubic metres each year
- Is stored mainly in steel lined concrete containers set into the ground

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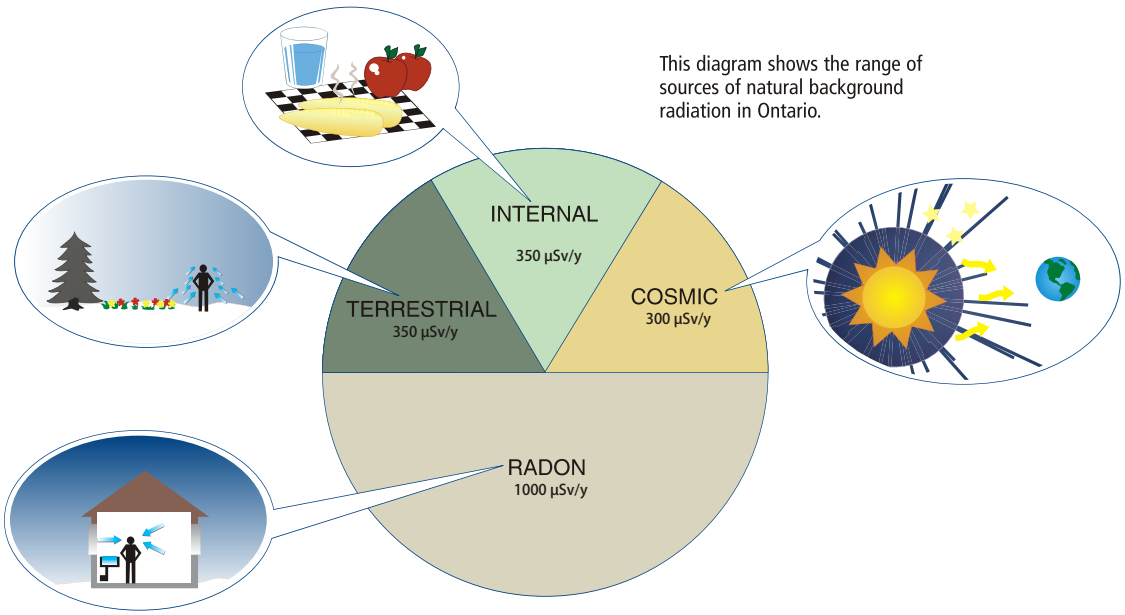
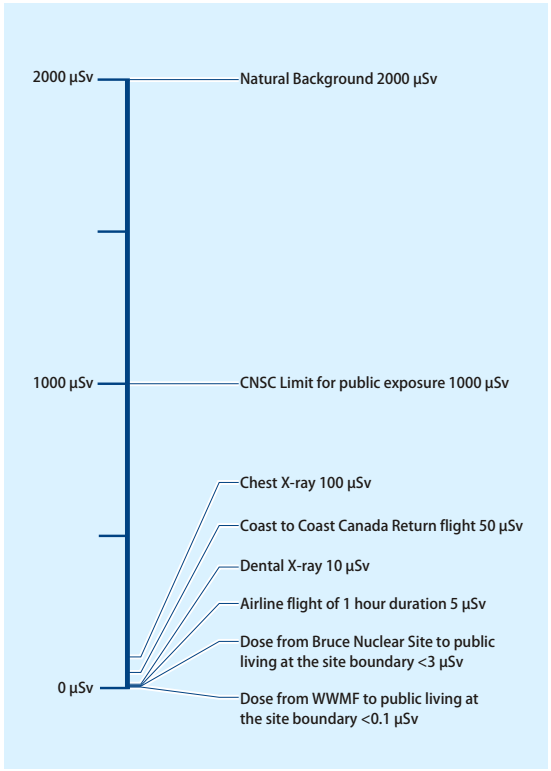
WHAT IS RADIATION?



This diagram shows the range of sources of natural background radiation in Ontario.



Sources of Radiation in Our Environment

People are exposed to radiation from a number of natural sources such as the bedrock, and also from human activities such as medical examinations, smoke detectors and power generation.

Radiation dose is measured in Sieverts, and the dose of radiation received by people is often expressed in millionths of a Sievert, or microSievert (µSv). The amount of radiation that the average person in Canada is exposed to, from all natural sources, is about 2,000 µSv per year. A chest x-ray gives you about 100 µSv, a dental x-ray set about 10 µSv.

Radiation Exposure Regulations

The nuclear industry adheres to both national regulations and international recommendations. The limit for public radiation exposure from nuclear facilities is 1,000 µSv per year. For nuclear waste repositories, the International Commission on Radiological Protection recommends a dose constraint of 300 µSv per year after closure.

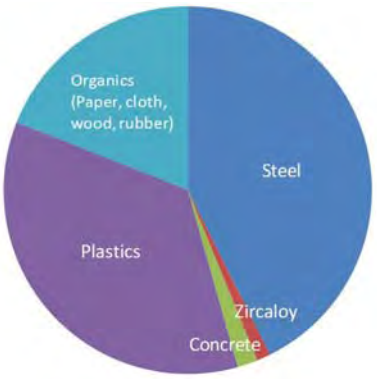
Results from careful monitoring of all nuclear activities at the Bruce site show that the public exposure is less than 3 µSv per year to a person living at the fenceline. Waste handling and storage at the WWMF contribute a fraction of this dose. Emplacing the waste in the DGR will also further reduce this dose after closure.

WASTE INVENTORY

The inventory of waste to be emplaced in the DGR is comprised of a variety of different materials and contains varying quantities of different radionuclides. Waste inventory consists of 75% low level, 11% intermediate level and 14% refurbishment waste.

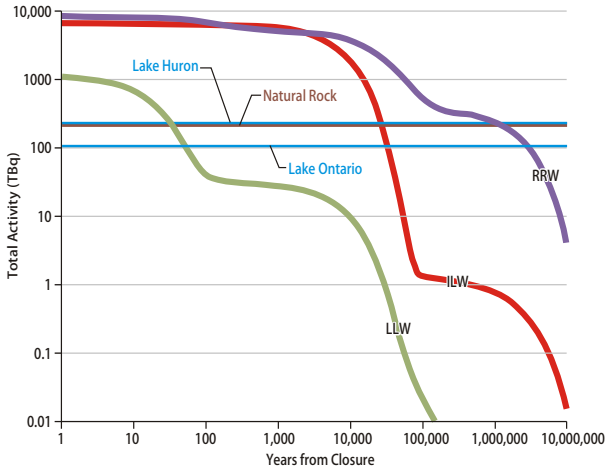
Initial amount and half life of radionuclides

Radionuclide	Amount (kg)	Half life (years)
Zr-93	2050	1,530,000
Nb-94	650	20,300
C-14	40	5,730
U-238	30	4,468,000,000
Ni-59	10	75,000
Cl-36	1	301,000
Se-79	0.07	295,000
I-129	0.025	15,700,000
H-3	0.0035	12
Pu-239	0.23	24,000
Pu-240	0.08	6,500
Pu-242	0.002	376,000

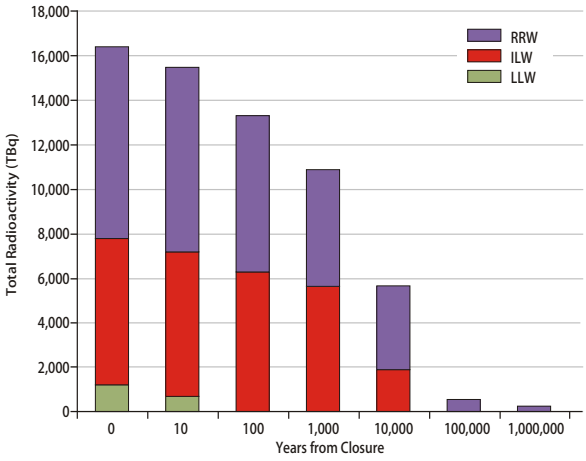


Proportional composition of waste in the DGR (by weight)

The radioactivity of the waste decays over time. Different radionuclides decay at different rates. These figures show composite decay rates of low (LLW), intermediate (ILW) and reactor refurbishment L and IL (RRW) wastes.



Repository waste activity as a function of time compared with natural radioactivity of Lakes Huron and Ontario and rock above repository.



Total activity of waste as a function of time.

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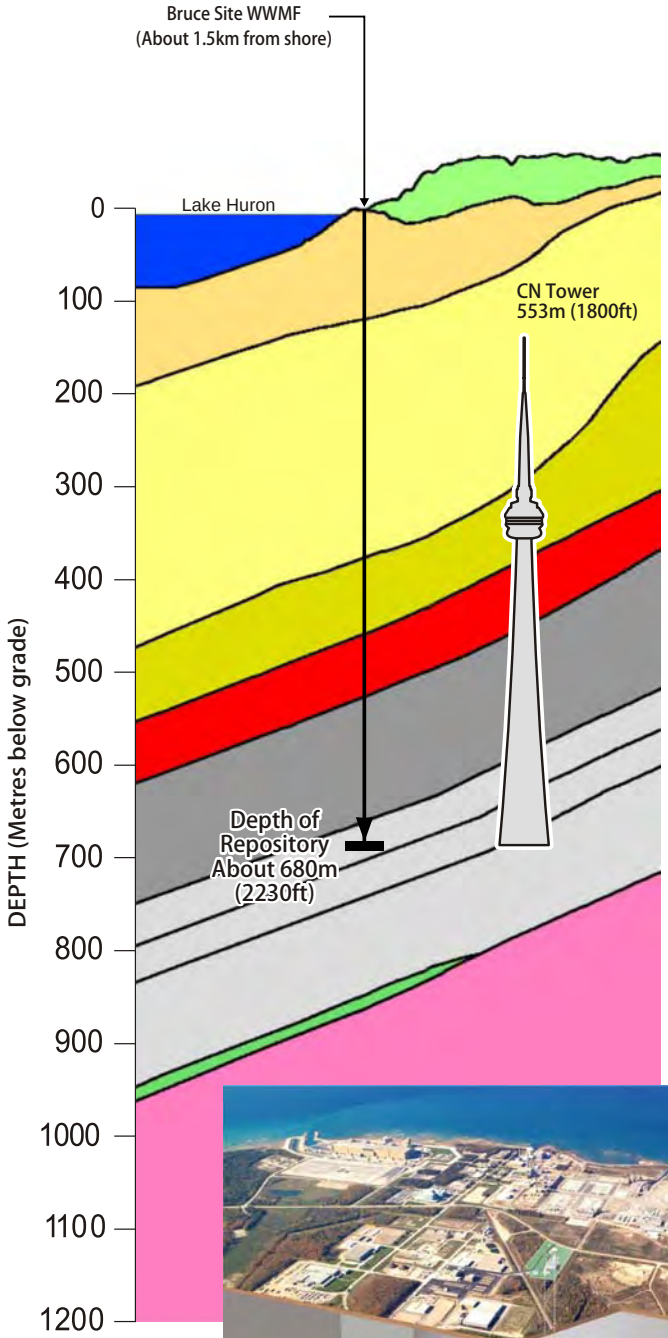
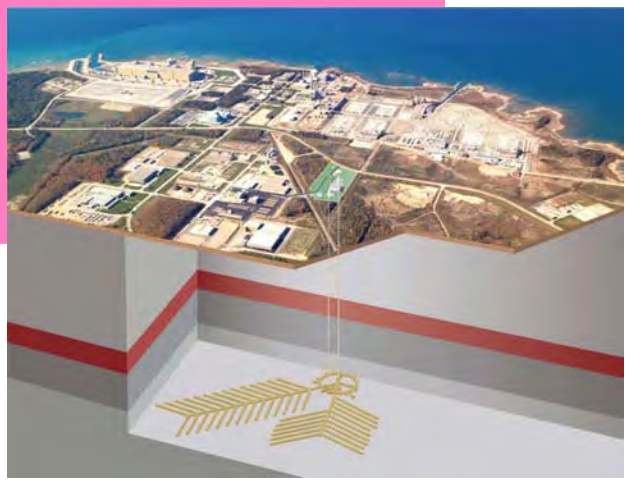
AN OVERVIEW OF THE PROPOSED DEEP GEOLOGIC REPOSITORY





OPG, with the support of the local community, has proposed the construction and operation of a Deep Geologic Repository (DGR) for the long-term management of low and intermediate level nuclear waste on lands adjacent to the Western Waste Management Facility in Kincardine, Ontario.

The DGR would be located about 680 metres or 2230 feet below ground surface in very low permeability limestone, beneath a very thick layer of low permeability shale, both more than 450 million years old. These sedimentary bedrock formations will safely isolate and contain nuclear waste for many thousands of years and beyond.

The proposed repository will be composed of a series of emplacement rooms. Conventional mining methods will be used to construct the repository. Access to the DGR and emplacement rooms will be by vertical shafts.

Key Features

- Proposed depth is about 680 metres (2230 feet) within low permeability limestone – deeper than the CN Tower is tall
- Capacity of 160,000 cubic metres of waste
- Located beneath a protective 200 metre (650 feet) cap of low permeability shale.
- Repository access shafts will be sealed with clay-based and concrete materials
- Located adjacent to OPG's existing Western Waste Management Facility on the Bruce site

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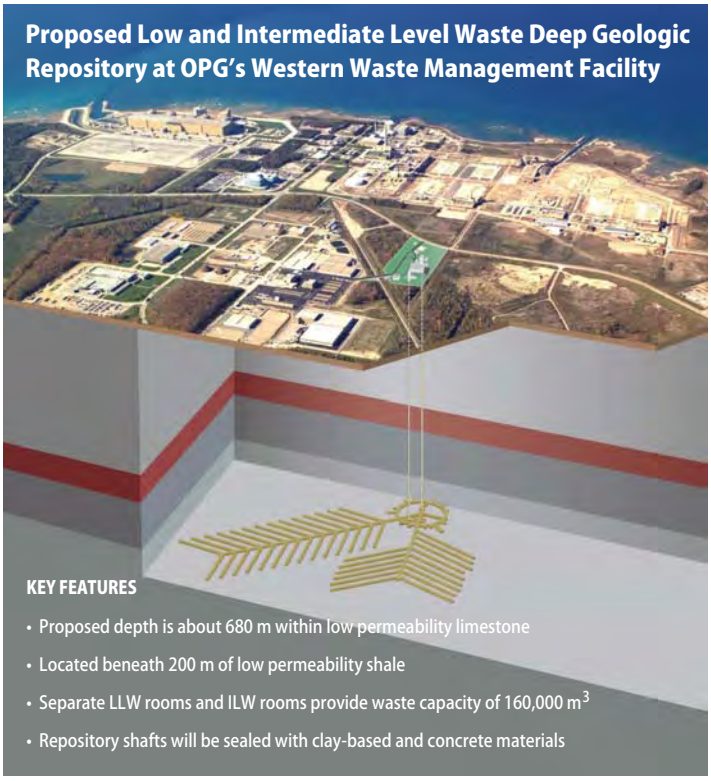
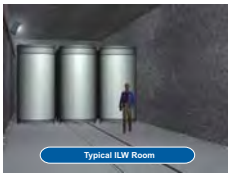
DGR CONCEPTUAL DESIGN





Based on the Conceptual Design completed in 2008 for the DGR:

- Rock excavation will be primarily by roadheader
- Construction will take about five years
- Excavated rock will be stored on-site
- Surface facilities will include two headframe buildings and a waste receipt building
- There will be two shafts, one for access and waste transfer, and one for exhaust ventilation
- A 40-tonne Koepe hoist will move waste and personnel to the repository level
- Underground facilities will include waste receiving, equipment maintenance, emplacement rooms and refuge stations
- Emplacement rooms will have a concrete floor, and rock walls and ceilings
- Each room will be closed but not backfilled after they are filled with waste
- The shafts will be sealed as a part of decommissioning the DGR, following approval

Roadheader

Koepe Hoist

Headframe Building

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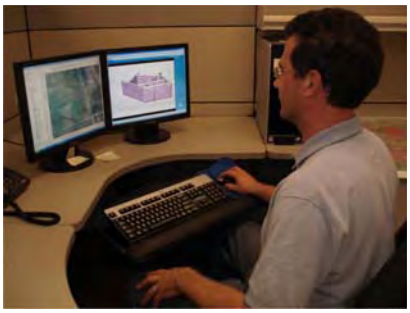
SCIENTIFIC INVESTIGATIONS

GEOSCIENTIFIC SITE CHARACTERIZATION PROGRAM



Gathering the Geological Evidence

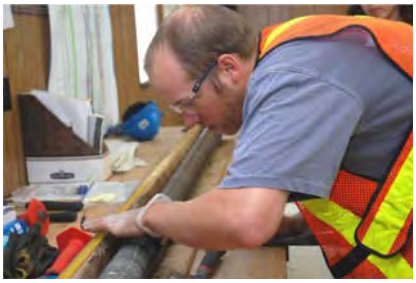
Background geoscientific studies and consultation with external scientists provided strong evidence that the Bruce site was well-suited to host the DGR. This included a Geotechnical Feasibility Study that considered the geologic, hydrogeologic, seismic and geomechanical characteristics of the bedrock formations beneath the site that, in part, was supported by information from decades of drilling for oil and gas in Southwestern Ontario.

Site-Specific Knowledge: The Geoscientific Site Characterization Program (GSCP)

To add to the body of information that already exists, additional scientific investigations are underway to confirm the suitability of the Bruce site for DGR implementation.

Various studies are being done to investigate a number of factors, including:

- The physical and chemical properties of the sedimentary bedrock formations occurring directly beneath the site
- The influence of seismic activity on repository safety
- The presence of viable oil and gas reserves
- The capacity of the rock formations to protect surface and groundwater resources



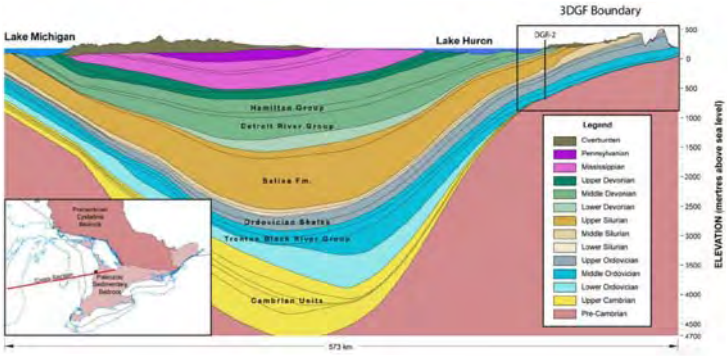
GSCP studies include the following:

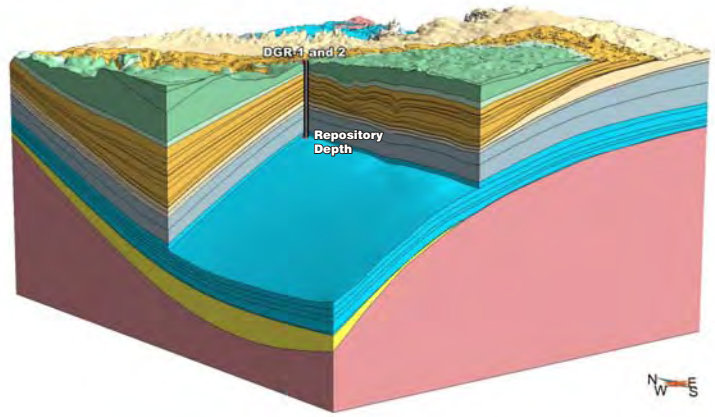
- Coring and testing of six deep boreholes to extract site-specific knowledge of the bedrock layers
- A 2D seismic reflection survey that will enable imaging of the horizontally layered sedimentary bedrock formations and their undisturbed lateral extent beneath the site
- Installation and monitoring of a new borehole seismograph network to allow an improved regional understanding of low-level seismic activity
- Installation of a network of shallow bedrock groundwater monitoring wells

GEOSCIENCE ATTRIBUTES

PREDICTABILITY

- Borehole coring indicates a consistent bedrock 'column' beneath the Bruce site comprised of 34 individual near-horizontally layered, laterally extensive bedrock formations of Cambrian to Devonian age (543 – 350 Million yrs).
- Sedimentary bedrock layering observed beneath the Bruce site is as understood from regional geologic knowledge extending laterally for 10's kilometres.



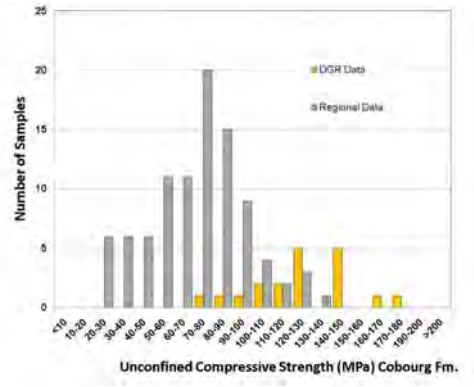


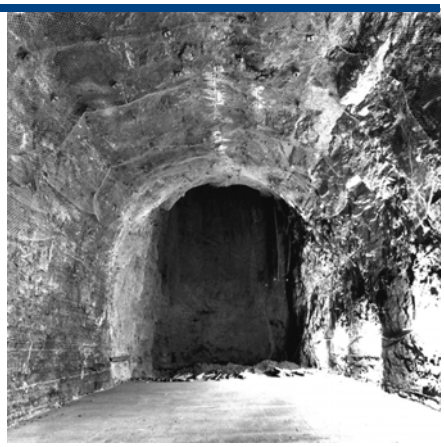
MULTIPLE NATURAL BARRIERS

- The DGR is surrounded by multiple layers of low permeability sedimentary rock. The horizon immediately above the repository is comprised of a ≈200 m layer of low permeability ($\leq 10^{-12}$ m/sec) Ordovician age (450 Million yrs) shale located about 440 m below ground surface.
- A sequence of shales, dolostones and evaporites comprising the Salina Formation (about 190 m thick) above the Ordovician shale possess low permeabilities.

GEOMECHANICALLY STABLE

- The compressive strength of the Cobourg Formation as determined from core samples obtained during deep drilling exceeds that understood from regional experience.
- DNGS's cooling water intake tunnel, which provided a stable, dry opening with minimal rock support, was excavated in the Cobourg Formation 30 m beneath Lake Ontario.





Darlington (DNGS) Cooling Water Intake Tunnel

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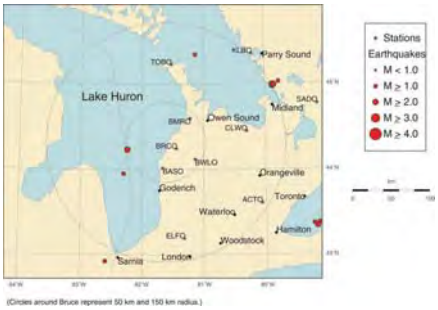
GEOSCIENCE ATTRIBUTES

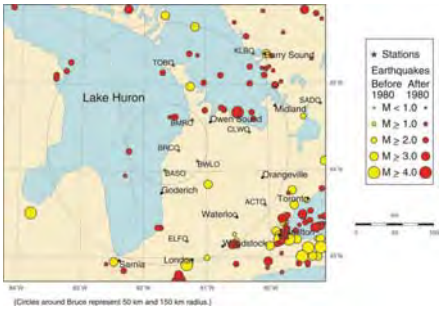
SEISMICALLY QUIET

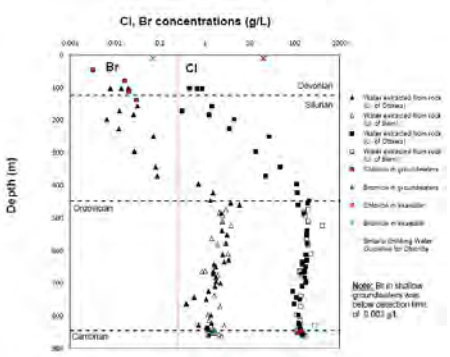
- The Bruce region, located in the stable interior of the North American continent, is comparable to that of the stable Canadian Shield.
- Historic records of seismic activity do not reveal events exceeding M5, within a radius of more than 150 km of the Bruce site, in the past 100 years.
- The recently installed micro-seismicity monitoring network has not detected natural seismic (>M2.5) activity within a radius of 150 km of the site.

RECENT MONITORING



HISTORIC MONITORING



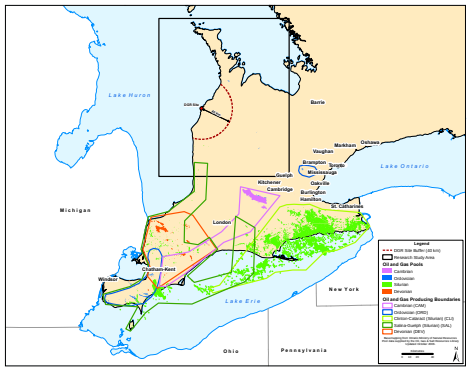


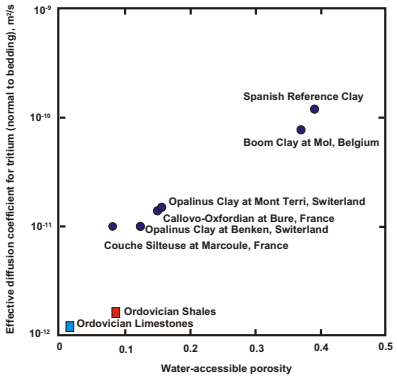
SHALLOW GROUNDWATER RESOURCES ISOLATED

- Local fresh groundwater resources are obtained from shallow overburden or near surface bedrock wells (<100 m depth).
- The chemistry of the waters found in the bedrock become progressively more saline (Total Dissolved Solids (TDS) 100 to 300 g\l) with depth which aids in defining shallow, intermediate and deep groundwater systems.
- The chemistry of the ground and pore waters encountered during drilling indicate that the deep groundwater system within the Ordovician sediments is very old and has not mixed with glacial or present-day freshwater.

NATURAL RESOURCE POTENTIAL

- No significant oil or gas was encountered in three vertical boreholes drilled on site, nor in several historic oil and gas wells drilled within 10 km of the Bruce site.
- There are no known industrial minerals (limestone, shale, etc.) that are unique to the site and cannot be obtained from elsewhere.





TRANSPORT DIFFUSION DOMINATED

- The deep groundwater regime is ancient showing no evidence of glacial perturbation or post-tectonic cross-formational mixing.
- The low bedrock permeabilities measured in the deep boreholes are consistent with a diffusion dominant environment.
- Numerical simulations of the regional groundwater system conducted by the University of Waterloo support the notion of a stable diffusion dominant system enclosing the repository.

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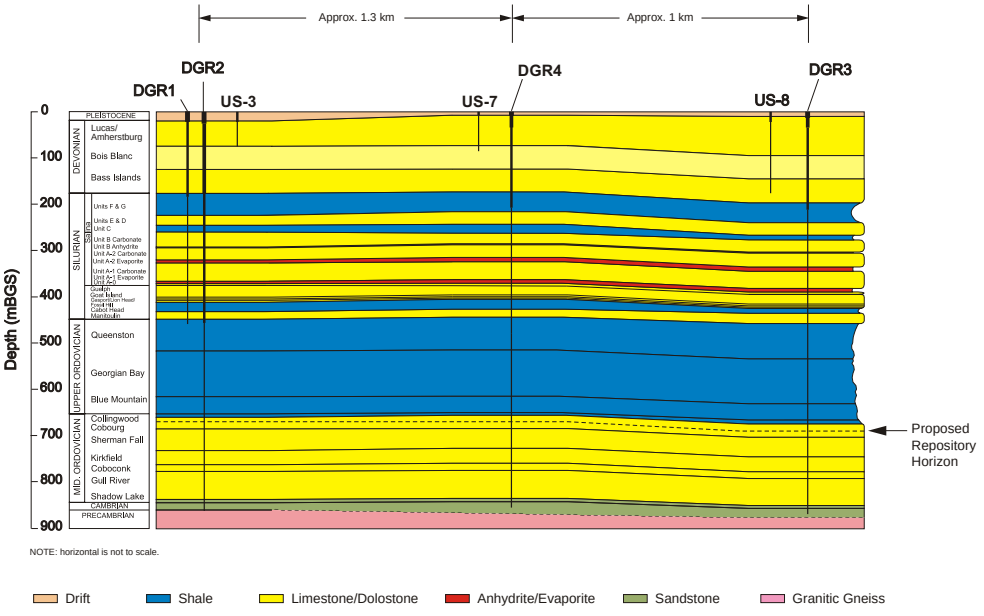
BOREHOLE LOCATIONS

Borehole Locations

Borehole Stratigraphy



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AN INTERNATIONAL PERSPECTIVE

Around the world, research on the long-term management of nuclear waste has engaged thousands of scientists and involved billions of dollars in research. OPG collaborates with several international organizations concerned with nuclear waste management and has cooperative agreements with many countries that are in the forefront of nuclear waste management research and development. These links facilitate the exchange of technical information, joint research and development activities, and in some instances the exchange of technical staff. The DGR is no exception.

The Geoscience Review Group (GRG)

The Geoscience Review Group (GRG) includes representation from France, Switzerland, United States and Canada. The members have, between them, nearly one hundred years of experience and have worked on nuclear waste programs in Japan, Hungary, Switzerland, Sweden, Finland, Korea, United States and the United Kingdom.

For the DGR, the GRG provides guidance and expertise related to:

- Implementation of field laboratory measurement techniques and methods
- Interpretation and synthesis of field and laboratory data
- International practice for geoscientific investigations in sedimentary sequences for radioactive waste management purposes
- Review and direction of strategies for Geosynthesis development

The GRG will independently assess the adequacy of all aspects of the site investigations.

OPG's Geoscience Review Group (L to R) Dr. Joe Pearson, USA - Dr. Derek Martin, Canada - Jacques Delay, France and Dr. Andreas Gautschi, Switzerland examine drill core samples taken from the DGR site.

Examples of Other Facilities Around the World for Low and Intermediate Level Waste

The DGR would employ technology similar to that used at sites in United States, Sweden, and Finland. Each of these international sites has unique differences in site characteristics.

Waste Isolation Pilot Plant (WIPP)
New Mexico, U.S.

- Located in the desert
- The underground repository was excavated in 250 million year-old bedded salt approximately 660m below surface
- Status: Began disposal operations in 1999

Forsmark Facility
Sweden

- Located at the Forsmark nuclear power station site
- The underground repository is in crystalline rock about 60m below the Baltic Sea
- Status: Began operation in 1988

Forsmark.

Olkiluoto (VLJ) Facility
Finland

- Located near the Olkiluoto nuclear power station
- The underground repository was excavated to a depth of 70 to 100 metres in crystalline rock
- Status: Began operation in 1992

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THE SAFETY CASE FOR THE DGR

Building the Safety Case: Natural Barriers to Protect the Public

The DGR will safely isolate the public from the nuclear waste. Public doses are estimated to be small.

This estimate is based on the site's geologic setting:

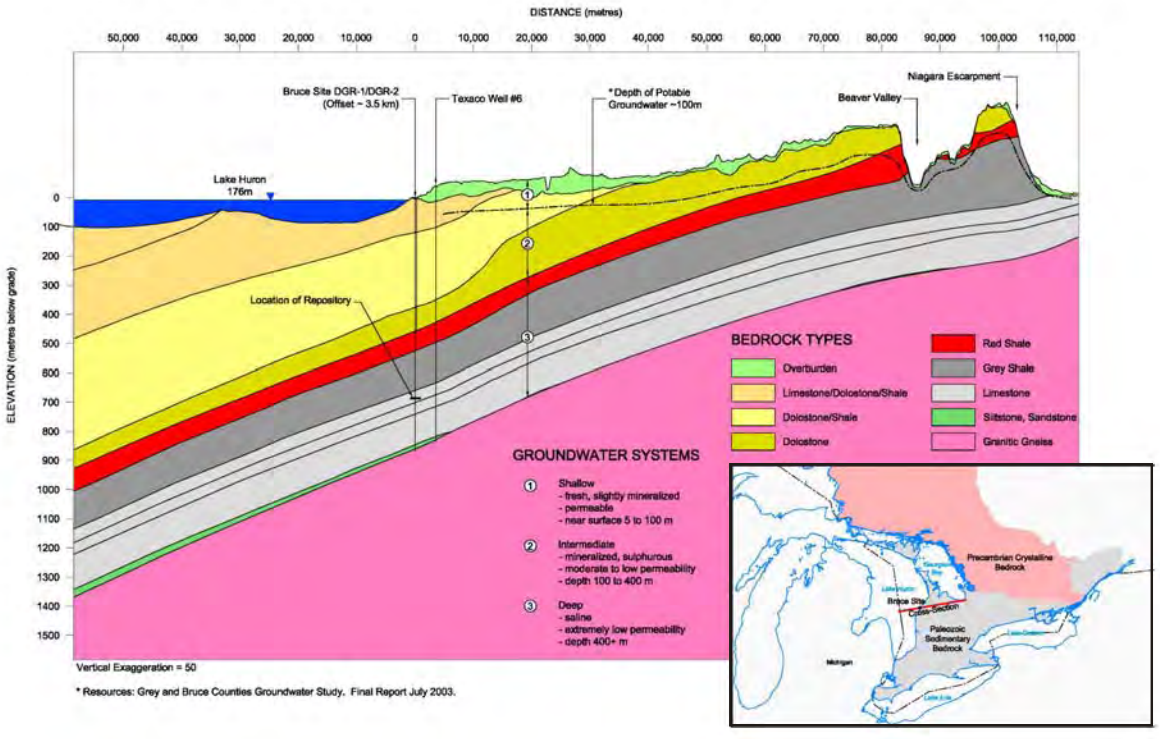
- The repository will be located at a depth of about 680 metres (2230 feet) in low permeability limestone beneath a protective cap of 200 metres (650 feet) of low permeability shale
- The local rock formations are 450 million years old and have remained stable through major climate change, including many ice ages
- Any radionuclides released from the waste would move through the limestone and the overlying shale layer at extremely low rates – less than 1mm per year
- Almost all of the radioactivity would decay within or near the repository
- In the unlikely event of a significant earthquake, it would have little to no impact on the DGR

The SFR in Sweden has managed operating waste 60 metres below the Baltic Sea.

Protecting Groundwater

The natural properties of the sedimentary bedrock formations beneath the Bruce site will isolate the L&ILW from ground and surface water resources.

- Regional groundwater resources are drawn from permeable bedrock aquifers within 100m of ground surface
- At greater depths (400+m) the horizontally layered and thick bedrock formations, which extend beneath Lake Huron, have created a stagnant, sluggish groundwater domain characterized by extremely low bedrock permeabilities and saline waters (8 times seawater)
- At the proposed DGR horizon, the groundwater domain appears stable and unaffected by near surface or glacial events (9) during the last million years



SAFETY ASSESSMENT

Safety Assessment

An important part of the DGR proposal is to assess the potential impacts.

Preliminary safety assessments were completed in 2003 and 2007. The results predicted very little impact from the repository.

Key observations from preliminary results:

- The host rock is effective in retarding radionuclide movement
- The sealed shaft is important to consider as a potential pathway
- The repository will take a very long time to resaturate
- Gas generation from decomposing waste, and C-14 in this gas, are important to consider

These assessments are presently being updated to take into account:

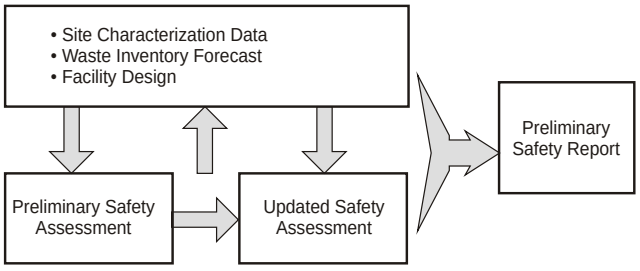
- Current forecast waste inventory, including Intermediate Level Wastes such as those presently being received at WWMF
- Geological data from the site characterization program
- Updated conceptual design information

The updated safety assessment will consider:

- Normal operation and accidents
- Pre-closure and Post-closure periods
- Potential effects on humans and on biota

The Pre-closure assessment considers the safety of the repository during the operational and pre-closure periods. During these periods, the wastes are transferred underground and placed in the repository. The safety characteristics are basically those associated with normal handling and storage of low & intermediate level wastes, plus those associated with mining. The preliminary assessment will consider a wide variety of potential hazards, such as fires, and container breaches.

The Post-closure assessment addresses the safety of the repository after the underground portion has been closed and sealed. It extends far into the future, and assumes that beyond a few hundred years the site reverts to a green-field use. The assessment will consider both the expected changes to the site and repository that will occur over time, as well as unlikely or "what if" scenarios such as future human intrusion.



The Deep Geologic Repository Project

THE STEPS TO MOVE FORWARD

DECISION AND APPROVAL PROCESS

Keeping You Informed

At OPG, we understand the importance of working together with Ontario communities to help assure Ontario's energy future. We realize that transparency, dialogue, and easy access to information are vital to the success of the DGR project.

To provide you with more information and to obtain your feedback on the proposal, OPG will continue to provide opportunities for you to meet with us at trade shows, open houses, community events and through community speaking engagements.

Please visit our web site at www.opg.com/dgr, call OPG at 519 361-6414 ext. 4065, or email us at **marie.wilson@opg.com** for information on upcoming events or to provide comments.

- Formal environmental assessment and licensing processes for the DGR project began in 2005 and are expected to take six to eight years to complete
- Throughout the process, there will be many opportunities for people to express their views on the DGR proposal
- A stepwise four-year Geoscientific Site Characterization Program (GSCP) began in 2006 to confirm the suitability of the Bruce site to host the DGR
- The GSCP, along with an Environmental Assessment and a Safety Assessment, will support OPG's application for site preparation/construction licence from the Canadian Nuclear Safety Commission (CNSC)

Complete Regulatory Compliance

As one of the most closely regulated industries in Canada, OPG complies with and will continue to adhere to the very stringent requirements of the CNSC and other agencies that oversee our activities – Natural Resources Canada, Transport Canada, the Canadian Environmental Assessment Agency, the Provincial Ministry of the Environment, etc.

ENVIRONMENTAL ASSESSMENT

ACTIVITIES

The Environmental Assessment, along with the GSCP and a Safety Assessment, will support OPG's application for site preparation/construction licence from the Canadian Nuclear Safety Commission (CNSC).

- In April 2008, the Minister of the Environment issued draft guidelines for the DGR Environmental Impact Statement and a draft Joint Panel Agreement for public review
- OPG's independent consultant gathered baseline data
- During the course of this work, OPG continues to provide information to stakeholders and seek their input on the project

The Current Schedule Moving Forward

2007 - 2009	Ongoing Environmental Assessment and site characterization studies
2011	Environmental Assessment Review Panel appointed
2011	OPG Submits Environmental Impact Statement To Review Panel
2011	Public Review of Environmental Impact Statement
2012	Public Hearing
2012	Review Panel Issues Report to Minister
2012	Cabinet decides on Acceptability of Environmental Impact Statement
2012	CNSC Considers Construction Licence Application
2012 - 2017	Construction, subject to licensing
2017	Seek operating licence from CNSC
2017/2018	DGR operation begins, subject to licensing

The Deep Geologic Repository Project

STUDY AREAS

The Environmental Assessment Guidelines will require study areas that encompass the environment that might be affected by the Project, or which may be relevant to the assessment of cumulative effects. The study areas identified for the project include all relevant components of the environment including the people, land, water, air and other aspects of the natural environment.

Three generic study areas were selected: the Regional Study Area, the Local Study Area, and the Site Study Area. These may be refined to reflect the needs of specific studies.

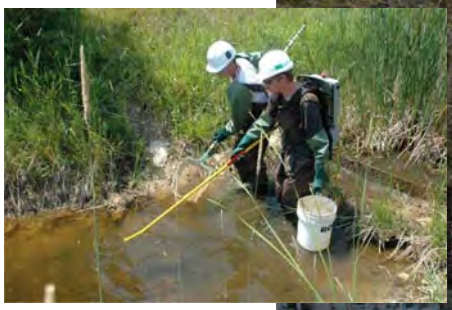
The Regional Study Area includes areas within the municipal boundaries of Bruce County .

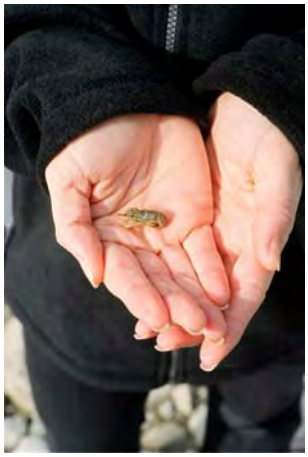
The Local Study Area includes areas within the municipal boundaries of the Municipality of Kincardine. This area represents the host community for the WWMF.

The Site Study Area includes the Bruce site, particularly the OPG-retained lands where the DGR project will be located (The Project Area).

The Deep Geologic Repository Project

BASELINE ENVIRONMENT





Baseline environmental studies were undertaken in 2007 and 2008. The results indicate that the Bruce site is home to:

- A population of wild turkeys
- 37 breeding birds, representing 21 species, in the project area
- Several varieties of frogs and turtles
- Chimneys of burrowing crayfish
- White-tailed deer
- Many other flora and fauna

For the OPG retained lands in the project area, not including the space under industrial use, just over 20 ha (43%) are occupied by cultural plant community types and just under 28 ha (57%) support naturally-occurring plant community types. Approximately 24 ha (84%) of the naturally-occurring vegetation is forest, reflecting the prevalence of forest and the characteristic vegetation of the Great Lakes-St. Lawrence Forest Region.

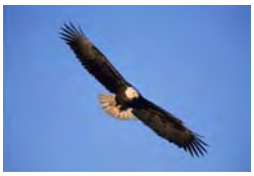
Two archaeological sites are recorded in the Ontario Ministry of Culture's Ontario Archaeological Sites Database within the Bruce site boundary. Both sites are along the Nipissing Great Lakes strandline-sand dune complex. No evidence of habitation or burial site activity was encountered in the DGR site study area.

Further studies may be required to address any gaps in information.

CHOOSING THE VALUED ECOSYSTEM COMPONENTS

What is a VEC?

- Valued Ecosystem Components, or VECs, are features of the environment selected to be a focus of an Environmental Assessment because of their ecological, social and economic value, and their potential vulnerability to effects of the Project
- VECs can be individual species or important groups of species within food webs. They can also be resources or features valued for their uniqueness or importance in maintaining the economic base, social structure and/or community stability
- The VECs are the assessment endpoints; they must represent meaningful measures of the environmental effects that may be caused by the Project











The Deep Geologic Repository Project

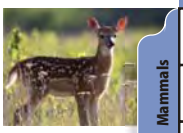
VALUED ECOSYSTEM COMPONENTS

On the board are the proposed Valued Ecosystem Components (VEC).

You provided comment at the last Open House and are invited to comment again.

Features of the Physical Environment
- Air Quality
- Noise Levels
- Surface Water Quality
- Surface Water Quantity/Flow
- Soil Quality
- Groundwater Quality
- Groundwater Flow

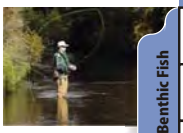
Plants
- Eastern White Cedar
- Heal-all
- Common Cattail
- Variable Leaf Pondweed



Mammals
- Muskrat
- White-tailed Deer
- Meadow Vole

Amphibians & Reptiles
- Midland Painted Turtle
- Northern Leopard Frog

Birds
- Mallard
- Red-eyed Vireo
- Wild Turkey
- Yellow Warbler
- Bald Eagle



Benthic Fish
- Redbelly Dace
- Creek Chub
- Lake Whitefish

Pelagic Fish
- Spottail Shiner
- Smallmouth Bass
- Brook Trout

Invertebrates
- Benthic Invertebrates (eg. waterborne insects)
- Burrowing Crayfish

Ecological Features
- Lake Huron
- Stream C
- Railway Ditch
- Wetland

Human and Social Issues
- Human Health
- Population
- Employment
- Business Activity
- Tourism
- Inverhuron Park
- Housing and Property Values
- Municipal Finance, Infrastructure, Services and Facility/Resources

Aboriginal Issues
- First Nation Communities
- Aboriginal Heritage & Cultural Resources
- Traditional Use of Lands and Resources

YOUR QUESTIONS ABOUT THE DGR PROJECT *AND* OUR RESPONSES

Public Comment/ Feedback	OPG Response
Drinking water quality needs to be assured.	The DGR is located at a depth of 680 m below ground surface. Drinking water wells are typically no deeper than 100 m. There are several hundred metres of low permeability rock between the water in the upper aquifer and the DGR. These layers will assure that any radioactivity released to the subsurface would have a negligible effect on groundwater resources many thousands of years in the future.
Why is the DGR located near the shore of Lake Huron?	The DGR is located about 1.5 km from the shore and more than 500 m below the depth of the lowest point of the lake. The DGR project moves waste currently stored at surface at the Western Waste Management Facility to 680m below ground. The low permeability of the rock in which the DGR is located will passively assure a negligible effect on surface water resources.
Will the drinking water of millions of residents in the Great Lakes Basin be contaminated?	The characteristics of the rock in which the DGR will be located will isolate the waste from the Great Lakes. The dose is predicted to be negligible initially and will continue to decay over time. Also for comparison, even if the entire waste volume were to be dissolved into Lake Huron, the corresponding drinking water dose would be a factor of 100 below the regulatory criteria initially, and decreasing with time.
Will used nuclear fuel be stored in the DGR?	The Hosting Agreement between OPG and the Municipality of Kincardine states that used nuclear fuel will not be stored in the DGR. OPG is seeking regulatory approval only to manage Low and Intermediate Level waste in the DGR. The DGR conceptual design could not accommodate used fuel dry storage containers.
Will waste from other producers be stored in the DGR?	The Agreement between OPG and the Municipality of Kincardine includes only waste from OPG owned nuclear generating stations. OPG is seeking approval only for waste from OPG-owned nuclear generating stations.
How much will the DGR cost and who pays for it?	The lifetime cost of the DGR is approximately $1 Billion. This includes $600 million for construction and $400 million for operation. The funds to pay for the DGR have been collected as part of the cost of electricity over the years and are already held in a segregated fund for this purpose.
Has construction of the DGR begun?	OPG is still proceeding with the regulatory review process for the DGR. Currently site investigations are underway and the data collected will be used to develop a preliminary safety report, a preliminary engineering design, and an environmental impact statement, which will be submitted to the review panel in 2011. Construction can only begin once a site preparation/construction licence has been received.

Appendix E

Sign-in Sheets and Comment Cards Received

(sign-in sheets not provided)

DGR Open House Comment Card Feedback
November 2008

	The open house panels helped me understand the DGR proposal	The open house location and hours were convenient	The open house staff were helpful	The Open House helped me satisfy the information needs I had	I will recommend to others that they should attend a future DGR Open House	Comments
Liz Durnin	5	5	5	5	5	
Liz Dadson	5	5	5	5	5	
Peter Tucker	5	5	5	5	5	Well researched & well presented
John Ryan	5	5	5	4	5	Nice show, thank you
Jackie Clements	4	4	5	4	5	Support the project & hope it comes to fruition
D. Duimering	4	3	4	3	4	Would like to see a detailed breakdown of economic impact including costs by category
Jim Tripp	5	5	5	5	5	Thank you for the open house and the carry away information
S. Brown	5	5	5	5	5	
J. Steward	4	4	4	4	4	We are not geologic experts; what you have put forward seems to make sense. We're sure an ecological group would point things out to us so I'm not sure. We haven't

	The open house panels helped me understand the DGR proposal	The open house location and hours were convenient	The open house staff were helpful	The Open House helped me satisfy the information needs I had	I will recommend to others that they should attend a future DGR Open House	Comments
						heard all sides.
Alan & Fely Clarke	4	4	4	4	4	We just hope that when the time comes you'll give employment opportunities to the people of Grey-Bruce, Thanks
Robert Reid	5	5	5	5	5	I would appreciate receiving a copy of the material presented at the open house.
Total Score	51	50	52	49	52	
Average Score	4.6	4.5	4.7	4.5	4.7	

Comments/Questions?
Let us know.

I would appreciate receiving a copy of the material presented at the open house.
Thank you

Name: Robert Reid
Address: [redacted]
Phone: [redacted]
Email:

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Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

www.opg.com/dgr email: marie.wilson@opg.com Phone: 519-361-6414 ext. 4065

Please leave this card with our open house staff, or mail it back to us at your convenience. You can also email us with your comments at nwmd@opg.com or visit our website for more information at www.opg.com/dgr

Open House Evaluation

Please rank the following statements on a scale of 1 to 5 where "1" is "strongly disagree","3" is neutral or "no opinion" and "5" is "strongly agree".

a. The open house panels helped me to understand the deep geological repository (DGR) proposal.

1 2 3 4 (5)

b. The open house location and hours were convenient for me.

1 2 3 4 (5)

c. The open house staff were helpful.

1 2 3 4 (5)

d. Overall, the open house helped me to satisfy the information needs I had.

1 2 3 4 (5)

e. I will recommend to my friends and family members that they should come to a future DGR open house.

1 2 3 4 (5)

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ONTARIO POWER GENERATION

Comments/Questions?
Let us know.

We just hope that when times come that you'll give the employment opportunities to the people of Grey-Bruce

Thanks

Name: Alan & Fely Clarke

Address: [redacted]

Phone: [redacted]

Email: _____

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Comments/Questions?
Let us know.

WE ARE NOT GEOLIGAL EXPERTS. WHAT YOU HAVE PUT FORWARD SEEMS TO MAKE SENSE. WE'RE SURE AN ECOLOGICAL GROUP WOULD POINT THINGS OUT TO US. SO, I'm NOT SURE - WE HAVEN'T HEARD ANY SIDES.

Name: J. STEWART

Address: [redacted]

Phone: [redacted]

Email:

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Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
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ONTARIO POWER GENERATION

Comments/Questions?
Let us know.

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Name: L Brown

Address: [redacted]

Phone: [redacted]

Email: n/a

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1 2 3 4 5

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ONTARIO POWER GENERATION

KINCARDINE

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Comments/Questions?
Let us know.

THANK YOU FOR
YOUR OPEN HOUSE
AND THE INFORMATION
I WAS ABLE TO
CARRY AWAY

Name: JIM TRIPP

Address: [redacted]

Phone: [redacted]

Email: [redacted]

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1 2 3 4 (5)

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ONTARIO POWER GENERATION

KINCARDINE

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Comments/Questions?
Let us know.

I would like to see a detailed breakdown of the economic impact. including a breakdown of the costs by category, i.e. excavation, shaft, cavities construction, hardware, etc.

Name: D. Duimering

Address: [redacted]

Phone: [redacted]

Email: [redacted]

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1 2 (3) 4 5

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ONTARIO POWER GENERATION

KINCARDINE

PLACE STAMP HERE

Comments/Questions?
Let us know.

I am supportive of this proposed project, and hope it does come to fruition.

Name: Jackie Clements

Address: [redacted]

Phone:

Email:

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Tiverton, Ontario
N0G 2T0

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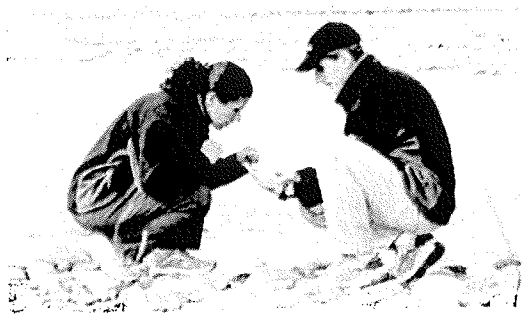

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ONTARIO POWER GENERATION

KINCARDINE

PLACE
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Comments/Questions?
Let us know.

Nice Show THANK you
For PUTTING IT ON

Name: John Ryan
Address: [redacted]
Phone: [redacted]
Email: [redacted]

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

www.opg.com/dgr email: marie.wilson@opg.com Phone: 519-361-6414 ext. 4065

Please leave this card with our open house staff, or mail it back to us at your convenience. You can also email us with your comments at nwmd@opg.com or visit our website for more information at www.opg.com/dgr

Open House Evaluation

Please rank the following statements on a scale of 1 to 5 where "1" is "strongly disagree","3" is neutral or "no opinion" and "5" is "strongly agree".

a. The open house panels helped me to understand the deep geological repository (DGR) proposal.

1 2 3 4 (5)

b. The open house location and hours were convenient for me.

1 2 3 4 (5)

c. The open house staff were helpful.

1 2 3 4 (5)

d. Overall, the open house helped me to satisfy the information needs I had.

1 2 3 (4) 5

e. I will recommend to my friends and family members that they should come to a future DGR open house.

1 2 3 4 (5)

www.opg.com/dgr email: marie.wilson@opg.com Phone: 519-361-6414 ext. 4065

ONTARIO POWER GENERATION

KINCARDINE

PLACE
STAMP
HERE

Comments/Questions?
Let us know.

Well Researched & very well presented.

Thanks.

Name: PETER TUCKER

Address: [redacted]

Phone: [redacted]

Email: [redacted]

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

www.opg.com/dgr email: marie.wilson@opg.com Phone: 519-361-6414 ext. 4065

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ONTARIO POWER GENERATION

KINCARDINE

PLACE
STAMP
HERE

Comments/Questions?
Let us know.

Name: LIZ AASON

Address: [redacted]

Phone:

Email:

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

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www.opg.com/dgr email: marie.wilson@opg.com Phone: 519-361-6414 ext. 4065

ONTARIO POWER GENERATION

RIPLEY

PLACE
STAMP
HERE

Comments/Questions?
Let us know.

Name: Liz Durnin

Address: [redacted]

Phone: [redacted]

Email:

Ontario Power Generation
Public Affairs Officer
P.O. Box 7000
Tiverton, Ontario
N0G 2T0

www.opg.com/dgr email: marie.wilson@opg.com Phone: 519-361-6414 ext. 4065

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ONTARIO POWER GENERATION

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www.opg.com/dgr email: marie.wilson@opg.com Phone: 519-361-6414 ext. 4065

ONTARIO POWER GENERATION

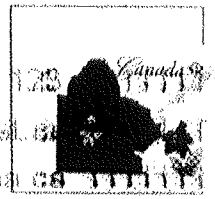
Comments/Questions?
Let us know.

Name: M HARRISON

Address: [redacted]

Phone:

Email:



Ontario Power Generation
Public Affairs Officer
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Tiverton, Ontario
N0G 2T0

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DEEP GEOLOGIC
REPOSITORY
FOR OPG's LOW & INTERMEDIATE LEVEL WASTE

OPG's Deep Geologic Repository Project Communications and Consultation Report: Community Open Houses November 2009

December 2009

Prepared by:
AECOM

NWMO DGR REP-07723-0001

AECOM

Note:
The Nuclear Waste Management Organization (NWMO) is managing the development of a Deep Geologic Repository for low and intermediate level radioactive waste, at the Bruce nuclear site, on behalf of Ontario Power Generation (OPG).

Nuclear Waste Management Organization
22 St. Clair Avenue East, Toronto, Ontario M4T 2S3 Canada
Toll Free: 1.866.249.6966
www.nwmo.ca

DEEP GEOLOGIC
REPOSITORY
FOR OPG's LOW & INTERMEDIATE LEVEL WASTE

OPG's Deep Geologic Repository Project Communications and Consultation Report: Community Open Houses November 2009

December 2009

Prepared by:
AECOM

Recommended by: _____

D. Barker Date
Environment al Assessment Manager
NWMO

Accepted by: _____

A. Castellan Date
Vice President, Environmental Assessment &Corporate Support
NWMO

DOCUMENT HISTORY

Title:	OPG's Deep Geologic Repository Project Communications and Consultation Report: Community Open Houses November 2009		
Report Number:	NWMO DGR-REP-07723-00001		
Revision:	0	**Date: March 17, 2010**	December 2009
Notes:	Initial Release		
Prepared by:	L. Taylor Consultation and Communications Specialist		
Reviewed by:	Don Richardson Senior Consultant, Consultation and Communications		
Approved by:	Don Richardson 		

Table of Contents

Appendices

1. Introduction

This report documents a series of seven Community Open Houses hosted by the Nuclear Waste Management Organization (NWMO) on behalf of **Ontario Power Generation (OPG)** in November 2009. The report was prepared by AECOM and contains materials prepared by NWMO and AECOM, and local newspaper reports.


OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

WELCOME

KEEPING YOU INFORMED

WHY WE ARE HERE:

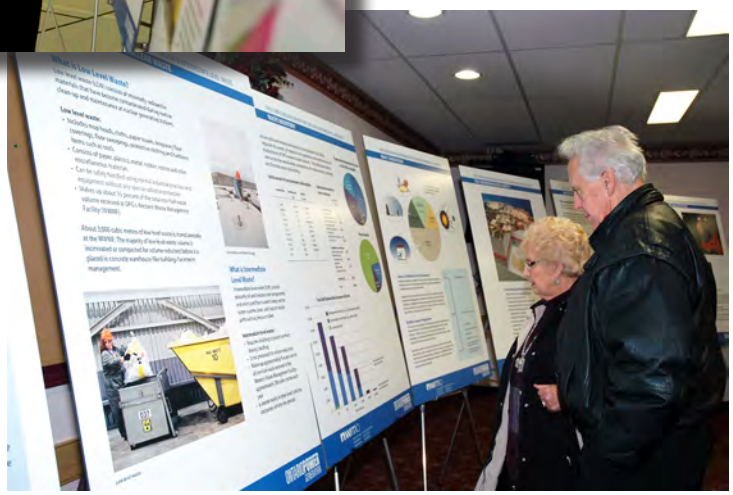
- Share information about Ontario Power Generation's proposed Deep Geologic Repository Project
- Provide an update on the status of work in support of the regulatory approvals process
- Answer your questions and obtain your feedback

WHO WE ARE:

- Ontario Power Generation (OPG) operates the Western Waste Management Facility and is the owner, licensee, and operator of the DGR
- The Nuclear Waste Management Organization (NWMO) has been contracted by OPG to seek regulatory approval for the DGR

nwmo

ONTARIO POWER GENERATION

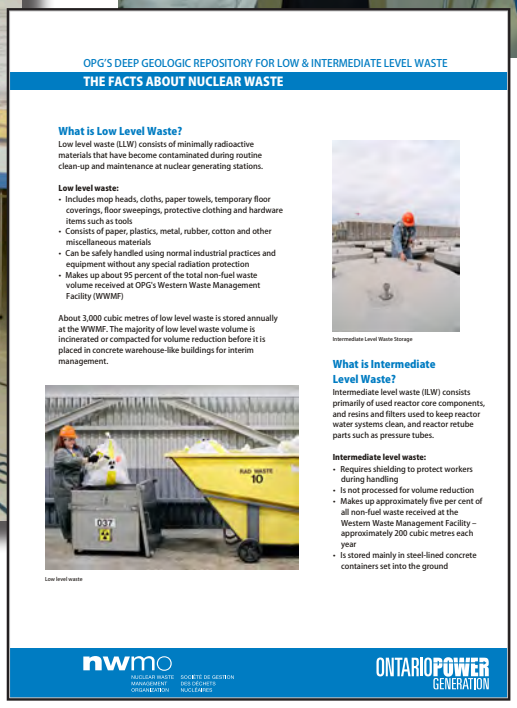


2. Community Open House Topics

This is the third round of Community Open Houses held to provide interested community members with an opportunity to learn about and provide input on the following topics:

- the proposed OPG Deep Geologic Repository (DGR) Project for Low and Intermediate Level Waste, and changes and updates since previous Open Houses;
- the Environmental Assessment undertaken as an integral part of the planning and approval process;
- the results of geoscientific characterization work done to date;
- the results of the safety assessment work done to date;
- the updated conceptual design of the DGR; and
- the science and technology behind safe storage of low and intermediate waste.

The Open Houses also offered a venue for community members to provide comments on the open house format and the proposed project.



OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

THE FACTS ABOUT NUCLEAR WASTE

What is Low Level Waste?

Low level waste (LLW) consists of minimally radioactive materials that have become contaminated during routine clean-up and maintenance at nuclear generating stations.

Low level waste:

- Includes mop heads, cloths, paper towels, temporary floor coverings, floor sweepings, protective clothing and hardware items such as tools
- Consists of paper, plastics, metal, rubber, cotton and other miscellaneous materials
- Can be safely handled using normal industrial practices and equipment without any special radiation protection
- Makes up about 95 percent of the total non-fuel waste volume received at OPG's Western Waste Management Facility (WWMF)

About 3,000 cubic metres of low level waste is stored annually at the WWMF. The majority of low level waste volume is incinerated or compacted for volume reduction before it is placed in concrete warehouse-like buildings for interim management.

Low level waste

Intermediate Level Waste Storage

What is Intermediate Level Waste?

Intermediate level waste (ILW) consists primarily of used reactor core components, and resins and filters used to keep reactor water systems clean, and reactor retube parts such as pressure tubes.

Intermediate level waste:

- Requires shielding to protect workers during handling
- Is not processed for volume reduction
- Makes up approximately five per cent of all non-fuel waste received at the Western Waste Management Facility – approximately 200 cubic metres each year
- Is stored mainly in steel-lined concrete containers set into the ground

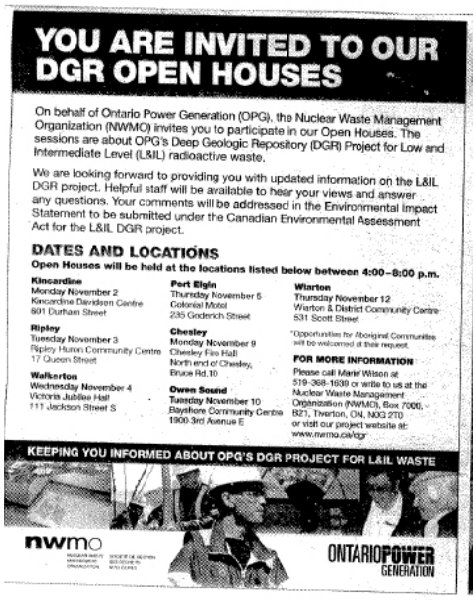
nwmo NUCLEAR WASTE MANAGEMENT ORGANIZATION / SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

ONTARIO POWER GENERATION

3. Notification

Notification to community members was provided by the following:

- A postcard format letter of invitation was delivered by Canada Post's Unaddressed Admail to more than 50,000 households in the communities where the Open Houses were held, in Kincardine, Ripley, Walkerton, Port Elgin, Owen Sound, Chesley and Wiarton, and in the surrounding communities (see Appendix A for a list of community distribution).
- A newspaper announcement was published as an advertisement in the Kincardine News, Kincardine Independent, Lucknow Sentinel, Walkerton Herald Times, Owen Sound Sun Times, Port Elgin Shoreline Beacon, and the Wiarton Echo, prior to the open houses (Appendix A).
- Letters were sent to those on the Stakeholder list, including local elected officials, City and County municipal staff leaders (including police, fire and emergency services), local and regional non-governmental organizations with a potential interest, and local and regional media outlets. Invitations were sent to a number of organizations in the United States as well (see Appendix A for the mailing list).
- Radio spots were purchased for six local radio stations that serve the open house communities. Seven different announcements, specific to each open house, were prepared and aired prior to and on the day of each Open House (Appendix A).
- An advertisement was placed in the October 2008 edition of Marketplace, a local advertising publication (Appendix A).
- The dates, times and locations of the Open Houses were posted on the DGR page of the NWMO website (www.nwmo.ca/dgr) prior to and during the Open Houses.
- The October 2009 DGR Newsletter, was distributed by Canada Post drop to nearly 25,000 included the dates, times and locations of the Open Houses.



4. Dates and Venues

The Community Open Houses were held at the following locations:

Kincardine – Monday November 2
Davidson Centre
601 Durham Street
Kincardine, ON

Ripley – Tuesday November 3
Ripley Huron Community Centre
17 Queen Street
Ripley, ON

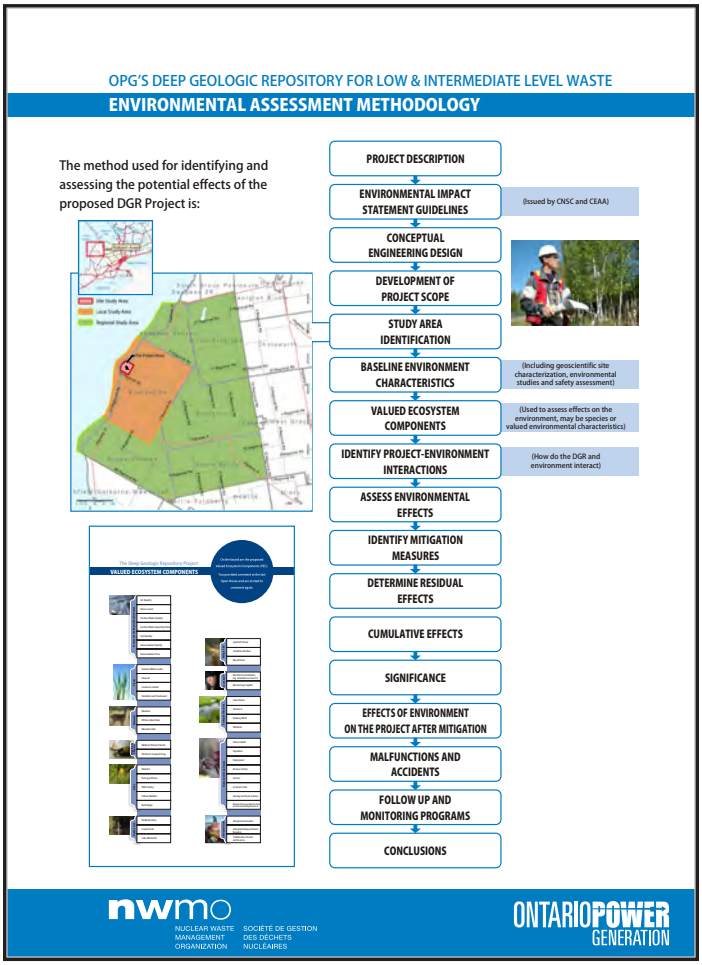
Walkerton – Wednesday November 4
Victoria Jubilee Hall
111 Jackson Street South
Walkerton, ON

Port Elgin – Thursday November 5
Colonial Motel
235 Goderich Street
Port Elgin, ON

Chesley – Monday November 9
Chesley Fire Hall
Bruce Road 10
Chesley, ON

Owen Sound – Tuesday November 10
Bayshore Community Centre
190 3rd Avenue East
Owen Sound, ON

Wiarton – Thursday November 12
Wiarton & District Community Centre
Wiarton, ON



5. Number of Participants

A total of 89 persons registered their names as attendees of the Community Open Houses:

Kincardine - 18
Ripley - 5
Walkerton - 10
Port Elgin - 18
Owen Sound - 22
Chesley - 5
Wiarton - 11

It is estimated that more than 90% of attendees signed in. Sign-in lists are provided in Appendix E.

6. Community Open House Format

The Community Open Houses provided an informal opportunity for community members to learn about the proposed project, to have their questions answered and to provide feedback on the project. Participants viewed display materials, had discussions with NWMO and OPG representatives and enjoyed light refreshments.

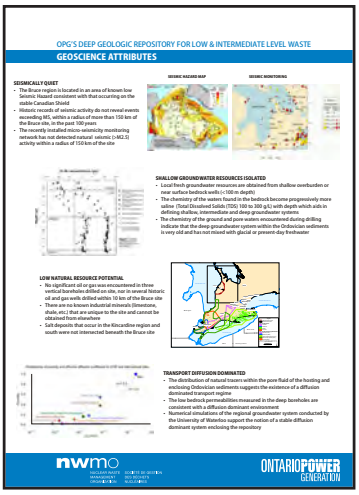
Each Open House ran from 4 pm to 8 pm. Copies of recent NWMO project newsletters, copies of the 2008 DGR Annual Report, brochures describing the DGR Project for Low and Intermediate Level Waste as well as copies of the Open House display panels were available for participants to take away (Appendix C).

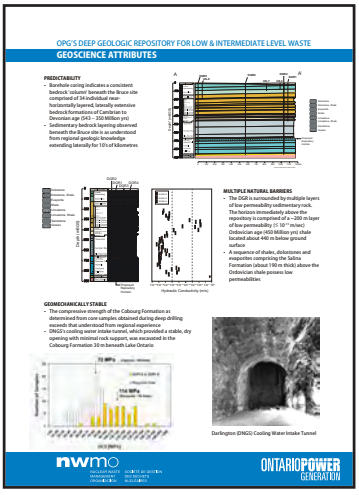
Participants were encouraged to fill out comment cards.

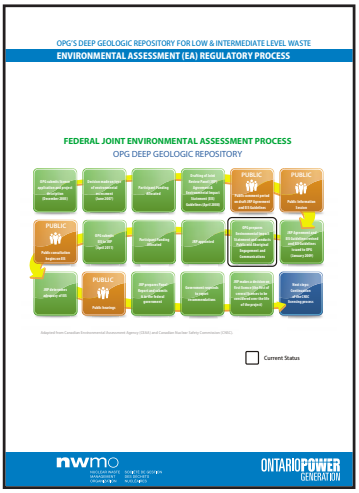
Display Panels

Twenty-one 30” x 40” display panels provided the following information:

1. “Welcome” – showing employees at work on the project
2. “The Facts About Nuclear Waste” – illustrating and explaining low level and intermediate level nuclear waste
3. “What is Radiation?” – a description of sources of radiation in the environment, and radiation exposure regulations
4. “Waste Inventory” - a breakdown of the different waste materials to be emplaced in the DGR
5. “An Overview of the Proposed Deep Geologic Repository” – illustrating key features of the proposed construction and operation of the DGR
6. “DGR Engineering Design Concept” - illustration of the 2009 design
7. “Geoscientific Investigation at the Bruce Site” – photo collage illustrating aspects of the Geoscientific Site Characterization Program
8. “Geoscience Attributes” - presenting the predictability of bedrock, the multiple natural barriers and the geomechanical stability of the rock
9. “Geoscience Attributes II” - presenting the seismically quiet nature of the region, the isolation of shallow groundwater resources, the lack of natural resource potential and the diffusion dominated transport of deep groundwater
10. “Borehole Locations” - indicating the location and stratigraphy of boreholes
11. “An International Perspective” – an overview of international experiences in the long-term management of nuclear waste
12. “The Safety Case for the DGR” – a description of natural barriers to protect the public, and groundwater
13. “The Role of Safety Assessment”– provides an outline of the role safety assessments and explains the iterative process involved.

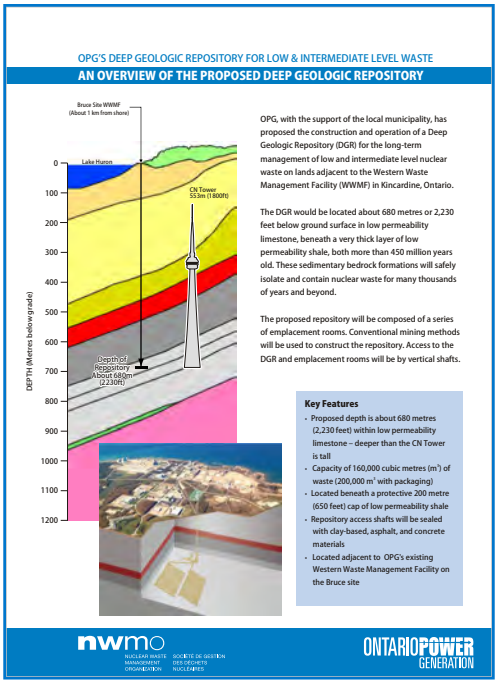


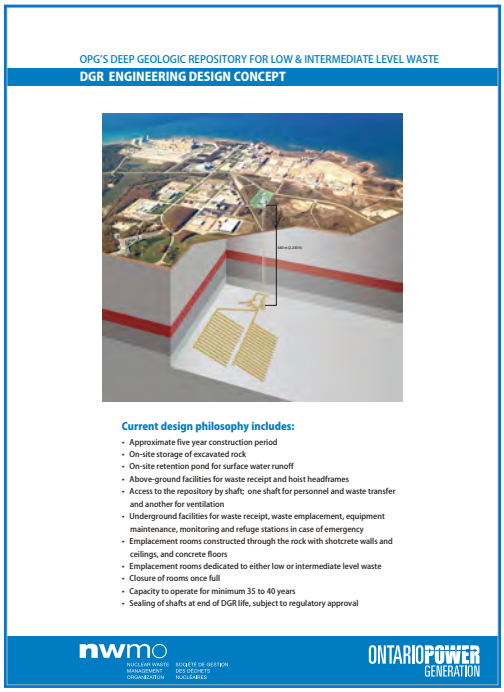




14. “Operational (Preclosure) Safety Assessment”– provides an outline of the role safety assessments for normal operation and accidents, as well as the potential effects on humans and biota during PreClosure.
15. “Long-Term (Postclosure) Safety Assessment - Approach” – outlines the method used and scenarios assessed the interim safety assessment
16. “Long-Term (Postclosure) Safety Assessment - Results” – presents the interim safety assessment conclusions
17. “Environmental Assessment Regulatory Process” – describing and illustrating the decision and approval process
18. “Environmental Assessment Methodology” – flowchart outlining the components of the EA investigations
19. “Our Answers to Some of Your Previous Questions” – a panel listing public comments and OPG responses
20. “Major Project Works and Activities” – explains the site preparation and construction phases
21. “Major Project Works and Activities” – explains the operations phase

See Appendix D for images of each of the display panels.





7. Opportunities for Input

Comment Cards

Comment cards in the style of large sized postcards provided the opportunity for participants to rate their experience at the Open House, and to write comments. Cards could be filled out at the Open House, or mailed in afterwards.

In total, 24 comment cards were returned. Of those, seven included written comments, and all responded to the questions evaluating the Open House. All comment card feedback is provided in Appendix E.

Comments/Questions?
Let us know.

PLACE STAMP HERE

Nuclear Waste Management Organization
Media Relations Manager
P.O. Box 7000, B21
Tiverton, Ontario
N0G 2T0

Name:
Address:
Phone:
Email:

email: dgrinfo@nwmo.ca mwilson@nwmo.ca Phone: 519-368-1639

Please leave this card with our open house staff, or mail it back to us at your convenience. You can also email us with your comments at dgrinfo@nwmo.ca or visit our website for more information at www.opg.com/dgr.

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email: dgrinfo@nwmo.ca mwilson@nwmo.ca
Phone: 519-368-1639

nwmo NUCLEAR WASTE MANAGEMENT ORGANIZATION SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

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8. Key Areas of Discussion

Many Open House attendees were already familiar with the proposed DGR Project, having participated in other stakeholder communications events. The majority of those who attended the Open Houses expressed support for the project. One of the primary reasons for attending the Open Houses was to obtain an update on the progress of the project and the studies associated with it. Visitors tended to stay for between 20 and 60 minutes on average. Comments received from prior Open Houses were also presented on a display panel with NWMO/OPG responses (presented in Appendix D).

The discussions at the 2009 Open Houses covered a broad range of subjects. The questions most frequently asked included the following key issues:

How can it be assured that no contaminants will escape to surface waters?

NWMO/OPG response: The proposed DGR is about 1 km from the lake and more than 400 m below the depth of the lowest point of Lake Huron near the site. The DGR Project will store waste currently managed safely at surface underground at a depth of 680 m . The DGR is proposed in a layer of very low permeability limestone and is overlain by a 200 m thick layer of low permeability shale which isolates the repository from surface water resources.

What is the difference between the different types of radioactive waste?

NWMO/OPG response: Low level waste has low levels of radioactivity and includes protective clothing, floor sweepings, mops, rags, etc. It can be handled without special radiation protection. Intermediate level waste includes used reactor core components, and resins and filters. It cannot be handled without radiation protection.

What assurance is there that "the door isn't open" for high level waste disposal, or that waste will not be imported from other nuclear companies in Canada or other countries?

NWMO/OPG response: The Hosting Agreement between the Municipality of Kincardine and OPG is for the management of waste from OPG-owned reactors. OPG's Environmental Impact Statement and application for licence are for low and intermediate level waste only from OPG-owned reactors.

Can the waste be recycled/reused?

NWMO/OPG response: Although there have been recent statements in the media about waste recycling opportunities for nuclear waste, the majority of the low and intermediate level waste proposed to be placed in the DGR has no further value.

How will the doses underground compare with those at the surface?

NWMO/OPG response: The doses to workers underground from low level waste will be comparable to those currently experienced in the above-ground storage buildings. Similarly, doses to workers handling the intermediate level waste will be about the same as to those handling the waste above ground. OPG will have monitoring programs in place to assure that workers are not exposed to unacceptable doses.

How many generations of nuclear waste will the DGR accept?

NWMO/OPG response: The DGR has been sized to accept all the L&ILW from Pickering, Darlington and the Bruce generating stations for their lifetimes, and allows for each generating station to be refurbished once.

Are there potential health risks associated with nuclear sites in general, including possible links to increased levels of leukemia?

NWMO/OPG response: OPG is not aware of any increased incidence of cancers in the proximity of the site. Durham Region, in Radiation and Health in Durham Region 2007, assessed possible health effects from the Pickering and Darlington NGSs. It concludes that disease rates in Ajax-Pickering and Clarington did not indicate a pattern to suggest that the Pickering NGSs and Darlington NGS were causing health effects in the population.

When would the DGR be operating?

NWMO/OPG response: According to the current schedule, construction could start in 2012/2013 and the DGR could be operating in 2017/2018.

What passive controls would be in place to mark the location of the DGR for future generations?

NWMO/OPG response: At this time there are no specific plans. Control mechanisms aren't required for another 50-100 years. At that time, it's expected several countries will be in the same position, and it's anticipated a solution will be developed with international consensus.

What is the cost of the project and where will the money come from?

NWMO/OPG response: The cost of the DGR is currently estimated to be about $1 billion. This includes $600 million for construction and $400 million for operation. A more detailed cost estimate is not yet available. An existing segregated fund, which has been accumulating funds as part of electricity rates and is fully funded, will be used to pay the cost of the DGR Project.

What routes are used to transport the waste to the WWMF?

NWMO/OPG response: Paved provincial and municipal roads suitable for commercial vehicles carrying heavy loads are used to transport the waste unless emergent conditions dictate a need for change.

9. Media Coverage of the Open Houses

Journalists interviewed NWMO and OPG representatives and Open House attendees during the open houses.

Following the community open houses, the following articles, editorials and letters-to-the-editor appeared in local newspapers and radio stations (see Appendix B):

- Bayshore Broadcasting Centre (Owen Sound) - Monday, November 2, 2009: “New Open Houses for DGR,” by reporter James Morgan
- Bayshore Broadcasting Centre (Kincardine) - Tuesday, November 3, 2009: “Little interest in DGR meeting,” by reporter James Morgan
- Radio CKNX AM (Wingham) – Tuesday, November 3rd, 2009: “More Talk About Nuclear Waste Storage”
- Saugeen Times - Wednesday, November 4th, 2009: “New emplacement design unveiled at DGR open house,” by Liz Dadson
- Kincardine News - Tuesday, November 10th, 2009: “DGR project making headway,” by Elyse Dewar
- Walkerton Herald Times (Walkerton) – Wednesday, November 11, 2009: “Keeping the public informed,” photo by John McPhee
- Kincardine Independent - Wednesday, November 11th, 2009: “People knowledgeable about DGR, says official,” by Eric Howard

10. Appendices

Appendix A: Notification Materials

- Letter of Invitation (addressed mail)
- Mailing List for Invitation Letters
- Postcard Invitation (unaddressed admail)
- Distribution Breakdown for postcard Invitation
- Newspaper announcements
- Placement of newspaper announcements
- Distribution of Radio Scripts
- Radio Scripts
- Marketplace announcement

Appendix B: Newspaper Coverage

Appendix C: Open House Handouts

- DGR 2008 Annual Report
- Information booklet: Keeping You Informed
- DGR newsletter, October 2009
- Western Waste Management Facility booklet

Appendix D: Open House Display Panels

Appendix E: Open House Sign-in Sheets and Comment Cards

Appendix A

Notification Materials

(list of recipients removed)

Angelo Castellan
Vice President
Environmental Assessment &
Corporate Support
Tel 647.259.3018
Email acastellan@nwmo.ca

DGR-07723-T10

October 14, 2009

Mr. Brent Adlam
Centre of Applied Renewable Energy
P.O. Box 29
Brussels ON N0G 1H0

Dear Mr. Adlam:

Subject: Community Consultation for OPG's Low and Intermediate Level Radioactive Waste (L & ILW) Deep Geologic Repository Project

Consistent with the requirements of the Canadian Environmental Assessment Act, Ontario Power Generation (OPG) is pursuing completion and acceptance of an Environmental Impact Statement (EIS) for the proposed Deep Geologic Repository (DGR) Project for Low and Intermediate Level Radioactive Waste at the Bruce nuclear site. The Nuclear Waste Management Organization (NWMO) has been contracted by OPG to undertake the regulatory approvals process for the DGR.

As a part of that environmental assessment process, NWMO and OPG are seeking opportunities to communicate with interested stakeholders on the proposed DGR Project. To further these communication efforts, open houses have been scheduled in communities in the vicinity of the proposed project at the Bruce nuclear site during the early part of November 2009. At these open houses, we look forward to providing additional information about the DGR, responding to questions, and hearing the views of stakeholders on the proposed project. This feedback will be considered in the environmental impact statement submitted to the Joint Review Panel (that will preside over the hearings for the EIS and the site preparation/ construction licence application).

Open Houses are being held at the locations listed below and will be open between the hours of 4 p.m. and 8 p.m. each evening.

Kincardine	**Ripley**
Monday November 2	Tuesday November 3
Kincardine Davidson Centre	Ripley Huron Community Centre
601 Durham Street	17 Queen Street
Kincardine, ON	Ripley, ON

Walkerton

Wednesday November 4

Victoria Jubilee Hall

111 Jackson Street S

Walkerton, ON

Port Elgin

Thursday November 5

Colonial Motel

235 Goderich Street

Port Elgin, ON

Chesley

Monday November 9

Chesley Fire Hall

North end of Chesley, Bruce Rd. 10

Owen Sound

Tuesday November 10

Bayshore Community Centre

1900 3rd Avenue E

Owen Sound, ON

Wiarton

Thursday November 12

Wiarton & District Community Centre

Wiarton, ON

We look forward to seeing you at one or more of the Open Houses. If you would like further information on the proposed DGR Project please refer to our web site at: www.nwmo.ca/dgr or call Marie Wilson at 519-368-1639.

Sincerely,

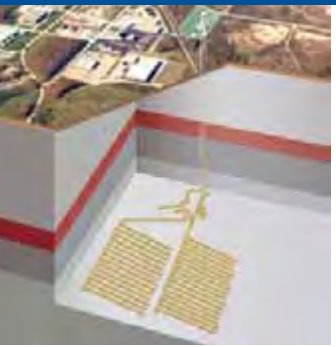
Angelo Castellan

YOU ARE INVITED TO OUR DGR OPEN HOUSES

On behalf of Ontario Power Generation (OPG), the Nuclear Waste Management Organization (NWMO) invites you to participate in our open houses. The sessions are about OPG's Deep Geologic Repository (DGR) Project for low and intermediate level (L&ILW) radioactive waste. OPG has contracted NWMO to undertake the regulatory approvals process for this project to be located at the Bruce site.

At this third round of Open Houses we look forward to providing you with updated information on the DGR Project, to answering your questions, and hearing your views. Your comments will be addressed in the environmental impact statement submitted under the Canadian Environmental Assessment Act for the DGR Project.

KEEPING YOU INFORMED ABOUT OPG'S DGR PROJECT FOR L&ILW WASTE



nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

ONTARIO POWER GENERATION

Open Houses will be held at the locations listed below. Open House hours of operation are 4:00 p.m. to 8:00 p.m. We look forward to seeing you there.

DATES AND LOCATIONS

Kincardine
Monday November 2
Kincardine Davidson Centre
601 Durham Street

Ripley
Tuesday November 3
Ripley Huron Community Centre
17 Queen Street

Walkerton
Wednesday November 4
Victoria Jubilee Hall
111 Jackson Street S

Port Elgin
Thursday November 5
Colonial Motel
235 Goderich Street

Chesley
Monday November 9
Chesley Fire Hall
North end of Chesley, Bruce Rd. 10

Owen Sound
Tuesday November 10
Bayshore Community Centre
1900 3rd Avenue E

Wiarton
Thursday November 12
Wiarton & District Community Centre
531 Scott Street

* Opportunities for engagement in Aboriginal communities will be welcomed at their request.

FOR MORE INFORMATION

Please call Marie Wilson at 519-368-1639 or write to us at the Nuclear Waste Management Organization (NWMO), Box 7000, B21, Tiverton, ON, N0G 2T0 or visit our project website at: www.nwmo.ca/dgr

nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

Printed on 100% recycled paper

ONTARIO POWER GENERATION

Post Card Mailing for November 2009 Open Houses		
Kincardine P.O.	All Postal Codes	5339
Owen Sound P.O.	All Postal Codes	14029
Chepstow P.O.	N0G 1L0	146
Clifford P.O.	N0G 1M0	941
Elmwood P.O.	N0G 1S0	720
Formosa P.O.	N0G 1W0	255
Holyrood P.O.	N0G 2B0	208
Mildmay P.O.	N0G 2J0	1007
Chesley P.O.	N0G 1L0	1429
Neustadt P.O.	N0G 2M0	403
Paisley P.O.	N0G 2N0	958
Ripley P.O.	N0G 2R0	791
Teeswater P.O.	N0G 2S0	1989
Tiverton P.O.	N0G 2T0	1325
Walkerton P.O.	N0G 2V0	3710
Allenford P.O.	N0H 1A0	499
Annan P.O.	N0H 1B0	393
Bognor P.O.	N0H 1E0	212
Kemble P.O.	N0H 1S0	426
Leith P.O.	N0H 1V0	100
Lions Head P.O.	N0H 1W0	1059
Mar P.O.	N0H 1X0	537
Miller Lake P.O.	N0H 1Z0	267
Port Elgin P.O.	N0H 2C0	4499
Shallow Lake P.O.	N0H 2K0	666
Southampton P.O.	N0H 2L0	2406
Stokes Bay P.O.	N0H 2M0	90
Tara P.O.	N0H 2N0	1427
Tobermory P.O.	N0H 2R0	712
Wiarton P.O.	N0H 2T0	4915
TOTAL		51,458

YOU ARE INVITED TO OUR DGR OPEN HOUSES

On behalf of Ontario Power Generation (OPG), the Nuclear Waste Management Organization (NWMO) invites you to participate in our Open Houses. The sessions are about OPG's Deep Geologic Repository (DGR) Project for Low and Intermediate Level (L&IL) radioactive waste.

We are looking forward to providing you with updated information on the L&IL DGR project. Helpful staff will be available to hear your views and answer any questions. Your comments will be addressed in the Environmental Impact Statement to be submitted under the Canadian Environmental Assessment Act for the L&IL DGR project.

DATES AND LOCATIONS

Open Houses will be held at the locations listed below between 4:00–8:00 p.m.

Kincardine
Monday November 2
Kincardine Davidson Centre
601 Durham Street

Ripley
Tuesday November 3
Ripley Huron Community Centre
17 Queen Street

Walkerton
Wednesday November 4
Victoria Jubilee Hall
111 Jackson Street S

Port Elgin
Thursday November 5
Colonial Motel
235 Goderich Street

Chesley
Monday November 9
Chesley Fire Hall
North end of Chesley,
Bruce Rd.10

Owen Sound
Tuesday November 10
Bayshore Community Centre
1900 3rd Avenue E

Wiarton
Thursday November 12
Wiarton & District Community Centre
531 Scott Street

*Opportunities for Aboriginal Communities will be welcomed at their request.

FOR MORE INFORMATION

Please call Marie Wilson at 519-368-1639 or write to us at the Nuclear Waste Management Organization (NWMO), Box 7000, B21, Tiverton, ON, N0G 2T0 or visit our project website at: www.nwmo.ca/dgr

KEEPING YOU INFORMED ABOUT OPG'S DGR PROJECT FOR L&IL WASTE

nwmo

ONTARIO POWER GENERATION

(continued)

Third round of open houses into Deep Geologic Repository project begin Monday

Science

To Comment on this article Click Here

On behalf of the Ontario Power Generation (OPG), the Nuclear Waste Management Organization (NWMO) is hosting a third round of open houses into the Deep Geologic Repository project for low-level and intermediate-level nuclear waste. The NWMO has been contracted to undertake the regulatory approvals process for this project to be located at the Bruce Nuclear site.

At these open houses, the public will be provided with updated information on the repository project; people can ask questions and make their views known.

The open houses run 4-8 p.m. The first one will be at the Davidson Centre in Kincardine, Monday, Nov. 2; followed by one at the Ripley-Huron Community Centre, Tuesday, Nov. 3; at Victoria Jubilee Hall in Walkerton, Wednesday, Nov. 4; the Colonial Motel in Port Elgin, Thursday, Nov. 5; the Chesley Fire Hall, Monday, Nov. 9; Bayshore Community Centre in Owen Sound, Tuesday, Nov. 10; and Wiarton and District Community Centre, Thursday, Nov. 12.

For more information, contact Marie Wilson at 519-368-1639, write the NWMO at Box 7000, B21, Tiverton, Ontario, N0G 2T0; or visit the project website at www.nwmo.ca/dgr.

Click Saugeen Times
Click Kincardine Times
Click CCNews

Friday, October 30, 2009

Print Schedule for 2009 Open House Advertising

PAPER	Contact	SPEC	SIZE	INSERTION DATES
Kincardine News	John Bauman 519-396-2963	B&W	4.9 x 6.2 inches	October 20
Kincardine Independent	Eric Howald 519-396-3111	B&W	5 x 7 ¾ inches	October 20
Lucknow Sentinel	John Bauman 519-396-2963	B&W	4.9 x 6.2 inches	November 3
Shoreline Beacon	John Bauman 519-396-2963	B&W	4.9 x 6.2 inches	November 3
Wiarton Echo	John Bauman 519-396-2963	B&W	4.9 x 6.2 inches	November 3, November 12
Walkerton Herald Times	April Wells 519-881-1600	B&W	5.1 x 6.2	October 28, November 4
Sun Times (Owen Sound)	Louise Kazariane 519-372-4344	B&W	5 11/16 x 6 ¾ inches	November 7, 9, 10

Copy:

Headline: **You are invited to our DGR open houses**

All of the ads will have the following copy above the photo collage:

The Nuclear Waste Management Organization (NWMO), on behalf of Ontario Power Generation (OPG), invites you to participate in our Open Houses on the proposed Low and Intermediate Level Waste Deep Geologic Repository project (L&IL DGR).

We are looking forward to providing you with updated information on the L&IL DGR project. Helpful staff will be available to hear your views and answer any questions. Your comments will be addressed in the Environmental Impact Statement to be submitted under the Canadian Environmental Assessment Act for the L&IL DGR project.

Photo collage – try to stick to the postcard as much as possible, but you may have to drop a photo to make it fit the ad size.

OPG's logo to be on the bottom right with NWMO on the bottom left as per the postcard

Open House Schedule: Print the schedule as per the postcard with the same time, dates and locations; however, as the open houses occur, some will fall off the schedule, necessitating a change in the copy – see below:

Kincardine News –Advertise all of the open houses in both ads – Oct. 20, Oct. 27

Kincardine Independent – Advertise all of the open houses in both ads – Oct. 20, Oct. 27

Luc know Sentinel – Advertise all of the open houses on October 27, Drop Kincardine in Nov. 3 edition

Shoreline Beacon – Advertise all of the open houses on October 27, Drop Kincardine in Nov. 3 edition

Wiarton Echo – Advertise all of the open houses in Nov. 3 ad except for Kincardine, the Nov. 12 ad will only advertise the Wiarton open house and the ad copy will have to change from **You are invited to our DGR open houses** to **You are invited to our DGR open house – the copy in the first paragraph will also change from open houses to open house**

Walkerton Herald Times – Advertise all of the open houses on Oct. 28 and drop both Kincardine and Ripley for the Nov. 4 edition

Sun Times – Advertise only the Chesley, Owen Sound and Wiarton open houses on November 7 & 9, and then drop Chesley so that the November 10 ad just advertises Owen Sound and Wiarton.

The Haliburton Broadcasting Group

50-2 Balls Drive, Bracebridge, ON P1L 1T1

Station: CIYN 95.5 FM

Account #: 67168 Contract #:

Account Name: Nuclear Waste Management Organization

Agency Name:

Address: Box 7000, B21

City: Tiverton PROVINCE: ON

Postal Code: N2Z 2T0

Contact Name: Marie Wilson

Phone#: 519-361-2673

Fax #:

Email Address: mwilson@nwmo.ca

Account Exec: Ryan Berry

Rep House:

COPY INFO:

OF CARTS

Product: Open Houses

Ad Name: OPG

Station Demo

Local

In house

Cart #'s 1675

New Account ☐ Revision ☐ Cancel ☐

Purchase Order #

Conflict Code: 5-15

BILLING INFORMATION:

*** Package Name: Fall 2009

	YES	NO
Make Good		
CO-OP		
CONTRA		

sut	start date	end date	len	flight	Daypart	Mon	Tues	Wed	Thur	Fri	Sat	Sun	Rate	#cms/wk	# wks	total cm	$ total
cm	Oct 31/09	Nov 1/09	30		6a-7p						6	6	$20.00	12	1	12	$240.00
cm	Nov 2/09	Nov 8/09	30		6a-7p	6	6	6	6	6	6	6	$20.00	42	1	42	$840.00
cm	Nov 9/09	Nov 9/09	30		6a-7p	6							$20.00	6	1	6	$120.00
													$0.00	0	0	0	$0.00
													$0.00	0	0	0	$0.00
													$0.00	0	0	0	$0.00
													$0.00	0	0	0	$0.00
													$0.00	0	0	0	$0.00
													$0.00	0	0	0	$0.00
													$0.00	0	0	0	$0.00
													$0.00	0	0	0	$0.00
													$0.00	0	0	0	$0.00

GRAND TOTAL OF CM'S: 60

Jan		July	
Feb		Aug	
Mar		Sept	
April		Oct	
May		Nov	
June		Dec	

Notes to Traffic:

Commercial will be written and produced in Kincardine Studio...

GROSS	$1,200.00
NET	$1,200.00
G.S.T.	$60.00
$TOTAL	$1,260.00

STO	

GST # 886541759

CONDITIONS: NET DUE PAYABLE 30 DAYS

CREDIT TERMS: OVERDUE ACCOUNTS ARE SUBJECT TO A SERVICE CHARGE OF 1.5% PER MONTH

Fourteen days written notice required for cancelation or revision of this contract. Advertisers terminating contract before expiry date or usage will be short rated to appropriate category when applicable or to be charged in its entirety.

All orders are net of agency commision unless otherwise stated.

This order is subject to compliance of all federal, provincial, municipal laws and regulations of the CRTC now in force or which may be enacted.

The Advertisers orders and covenants to pay for the schedule of broadcasts described above subject to the standard conditions listed above.

Advertiser: Nuclear Waste Management Organization

Date: Friday, October 09, 2009

Salesperson: Ryan Berry

Date: Friday, October 09, 2009

Approved By:

Entered By:

Radio Advertising for 2009 DGR open houses:

Radio script for the following dates to be broadcast by **The Coast**, **CKNX – FM 102, AM 920; CFOS – Country 93 and 97.7 The Beach**: Oct. 31, Nov. 1, 6, 7, 8,

You're invited. On behalf of Ontario Power Generation, the Nuclear Waste Management Organization is hosting Environmental Assessment Open Houses in seven Bruce communities to review plans for the safe, long-term management of low and intermediate-level nuclear waste in the proposed Deep Geologic Repository at the Bruce site. This is your opportunity to ask questions and get information. For details of where and when, look in your local newspaper or visit the DGR project website at www.nwmo.ca/dgr

November 2– The Coast; CKNX – FM 102, AM 920; CFOS – Country 93 and 97.7 The Beach

You're invited. On behalf of Ontario Power Generation, the Nuclear Waste Management Organization is hosting an Environmental Assessment Open House to review plans for the safe, long-term management of low and intermediate-level nuclear waste in the proposed Deep Geologic Repository at the Bruce site. This is your opportunity to ask questions and get information. Visit NWMO's open house **today in Kincardine at the Davidson Centre** from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

November 3 – The Coast; CKNX – FM 102, AM 920; CFOS – Country 93 and 97.7 The Beach

You're invited. On behalf of Ontario Power Generation, the Nuclear Waste Management Organization is hosting an Environmental Assessment Open House to review plans for the safe, long-term management of low and intermediate-level nuclear waste in the proposed Deep Geologic Repository at the Bruce site. This is your opportunity to ask questions and get information. Visit our open house **today in Ripley at the Ripley Huron Community Centre** from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

November 4- The Coast; CKNX – FM 102, AM 920; CFOS – Country 93 and 97.7 The Beach

You're invited. On behalf of Ontario Power Generation, the Nuclear Waste Management Organization is hosting an Environmental Assessment Open House to review plans for the safe, long-term management of low and intermediate-level nuclear waste in the proposed Deep Geologic Repository at the Bruce site. This is your opportunity to ask questions and get information. Visit our open house **today** in **Walkerton at Victoria Jubilee Hall** from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

November 5 – The Coast; CKNX – FM 102, AM 920; CFOS – Country 93 and 97.7 The Beach

You're invited. On behalf of Ontario Power Generation, the Nuclear Waste Management Organization is hosting an Environmental Assessment Open House to review plans for the safe, long-term management of low and intermediate-level nuclear waste in the proposed Deep Geologic Repository at the Bruce site. This is your opportunity to ask questions and get information. Visit our open house **today in Saugeen Shores at the Colonial Motel** from 4PM to 8PM. For more information, please visit nwmo.ca/dgr

November 9 - The Coast; CKNX – FM 102, AM 920; CFOS – Country 93 and 97.7 The Beach

You're invited. On behalf of Ontario Power Generation, the Nuclear Waste Management Organization is hosting an Environmental Assessment Open House to review plans for the safe, long-term management of low and intermediate-level nuclear waste in the proposed Deep Geologic Repository at the Bruce site. This is your opportunity to ask questions and get information. This is your opportunity to ask questions and get information. Visit our open house **today** in **Chesley at the Chesley Fire Hall** from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

November 10 –CKNX – FM 102, AM 920; CFOS – Country 93 and 97.7 The Beach

You're invited. On behalf of Ontario Power Generation, the Nuclear Waste Management Organization is hosting an Environmental Assessment Open House to review plans for the safe, long-term management of low and intermediate-level nuclear waste in the proposed Deep Geologic Repository at the Bruce site. This is your

opportunity to ask questions and get information. Visit our open house **today** in **Owen Sound at the Bayshore Community Centre** from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

November 12 –CKNX – FM 102, AM 920; CFOS – Country 93 and 97.7 The Beach

You're invited. On behalf of Ontario Power Generation, the Nuclear Waste Management Organization is hosting an Environmental Assessment Open House to review plans for the safe, long-term management of low and intermediate-level nuclear waste in the proposed Deep Geologic Repository at the Bruce site. This is your opportunity to ask questions and get information. Visit our open house **today** in **Wiarton at the Wiarton and District Community Centre** from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

Keeping you connected to the DGR

Marie Wilson

For the fourth year in a row, Ontario Power Generation (OPG) sponsored the Canadian Raptor Conservancy's Birds of Prey free-flying presentation at Pumpkinfest where birds such as the Golden Eagle, Red-Tailed Hawk and Peregrine Falcon performed three shows daily for the two-day event held on Oct. 3 and 4. In keeping with both tradition and the overall bird theme of the Pumpkinfest sponsorship, OPG provided shelter in their tent for interest groups that work with wildlife and habitats such as Friends of McGregor, Saugeen Conservation Authority and Marine Heritage. "OPG's Feathered Friends" definitely provided an informative, educational experience on several levels for the throngs of enthusiastic Pumpkinfest crowds who always attend this well known event, which was voted one of Ontario's top events, and winner of Festival and Events Ontario's Community Involvement Award.

Many of those who came to see OPG's Feathered Friends this year watched from beneath the cover of their umbrellas because of the aggressive rain which came in intervals; however, every cloud really does have a silver lining though, and most of those who came to watch the birds ended up in the OPG tent for some respite from the elements. So, although the attendance in the tent is always excellent, the inclement weather definitely caused a groundswell in the number of visitors going through to check out the wildlife displays as well as the Nuclear Waste Management Organization's (NWMO) exhibit on OPG's proposed low and intermediate level waste deep geologic repository (L&ILW DGR). And new to OPG's tent this year, was the addition of a new hands-on (literally) activity where participants were invited to make a bird feeder, again in keeping with the bird theme.

Most of you will be aware by now of the drama that unfolded at the big tent where a 1,678 - pound pumpkin tipped the scales to break the Canadian record by 141.5 lbs., and was just 11 pounds shy of the world record, but for those of us who were helping with the bird feeder line in the OPG tent, it felt like we were on the verge of setting our own record. About 504 participants - mostly wee ones - made their way through the line in front of the OPG display to: pick a cone (filled with lard), dip it in bird seed, wrap it in burlap and have it tied with a string long enough for hanging purposes to produce an epicurean feast fit for our avian feathered friends. As you might imagine, there was a lot of scooping of lard and tying of string by OPG and NWMO volunteers alike, who thoroughly enjoyed this interaction with the public – world record or not.

As a side note, it isn't by coincidence that OPG and NWMO employees were working side by side at Pumpkinfest. Given that NWMO is managing OPG's L&ILW DGR through the regulatory approvals process on OPG's behalf, there is a lot of interaction between employees from both companies. And just to be really clear, OPG is owner, future licensee and operator of the L&ILW DGR.

OPG volunteers from left, Lynda Cain, Dave Bell and Nancy Dillon prepare the "Make a Bird Feeder Station" in the OPG tent during Pumpkinfest.

And speaking of the L&ILW DGR, NWMO, on behalf of OPG, will be hosting a series of seven open houses at the beginning of November and you are invited to attend. Helpful staff will be available to hear your views, answer any questions and provide you with an update on the project. Open houses will be held from 4 – 8 p.m. at the following dates and locations: Kincardine - Kincardine Davidson Centre on Nov. 2, Ripley-Ripley Huron Community Centre on Nov. 3, Walkerton – Victoria Jubilee Hall on Nov. 4, Port Elgin – Colonial Motel on Nov.5, Chesley – Chesley Fire Hall on Nov. 9, Owen Sound – Bayshore Community Centre on Nov. 10, Wiarton – Wiarton & District Community Centre on Nov. 12. Hope to see you there and for more information give me a call at 519 368-1639 or visit our project website at: www.nwmo.ca/dgr. Opportunities for Aboriginal Communities will be welcomed at their request.

Before closing off, I want to mention that Bruce County Warden Bill Goetz was honoured at the annual Warden's Banquet on Oct. 24 at the Knight's of Columbus Hall between Mildmay and Walkerton. Known for his dry sense of humour, I'm sure Bill enjoyed the event where toasts, speeches and humour are never in short supply nor more appreciated. Congratulations to Warden Goetz!

Appendix B

Newspaper Coverage

bayshore broadcasting
NEWS CENTRE

New Open Houses for DGR

Monday, November 2, 2009 by James Morgan

You have the opportunity to find out the latest on plans for the Deep Geological Repository (DGR) at the Bruce nuclear site near Tiverton.

The planned facility will be 680 metres underground and will house low and intermediate level radioactive waste from nuclear reactor facilities across Ontario.

A series of open houses takes place over the next two weeks.

The first one is today from 4 PM to 8 PM in Kincardine at the Davidson Centre.

The next one is on Tuesday at the Ripley Huron Community Centre, others follow this week on Wednesday at Victoria Jubilee Hall in Walkerton, and Thursday at the Colonial Motel in Port Elgin.

The open houses continue on November 9th at the fire hall in Chesley, Tuesday November 10th at the Harry Lumley Bayshore Community Centre in Owen Sound, and the final one is on Thursday November 12th at the Wiarton and District Community Centre.

Nuclear Waste Management Organization Media Relations Manager Marie Wilson says they want to make sure they maintain community support for the project.

She says open houses allow them to gauge if opinion has changed, and new people always show up at open houses who haven't been at previous ones.

Wilson says low level radioactive waste includes items used for cleanup and maintenance in generating stations, and intermediate level items include things used to keep plant water systems clean.

She stresses that no "spent fuel" from reactors will be put in the DGR.

Wilson said once the Deep Geologic Repository is constructed, all of the waste currently stored above ground at the Bruce site's Western Waste Management Facility will be sent underground.

baysh re br adcasting
C O R P O R A T I O N

Tuesday, November 3, 2009

Little interest in DGR meeting

Kincardine
by **James Morgan**

The first in a series of open houses on the proposed Deep Geologic Repository (DGR) at the Bruce nuclear station near Tiverton is in the books.

Only 17 people attended the meeting last night at the Davidson Centre in Kincardine.

But Marie Wilson -- a spokesperson for Nuclear Waste Management Organization (NWMO) -- says that is typicel.

The DGR will be a 680 metre deep vault where low and intermediate level radioactive waste from Onterio's nuclear power plants will be stored underground.

No used fuel will be kept in the facility.

The Project Officer for the Canadian Nuclear Safety Commission was on hand.

Kay Klassen says a Joint Review Panel will make a decision on the Environmental Impact Statement for the development.

She says if the federal government accepts the report from that panel, then a decision will be made on whether or not to grant a licence for the facility.

Paul Gierszewski of the NWMO is involved with the safety analysis for the project.

He says they look at potential impacts on people, the environment, and after the facility is closed, and possible scenarios.

The analysis is done in order to show regulators what sort of safety measures will be taken.

Kincardine Councillor Gordon Campbell was at the open house.

Campbell says he personally doesn't have a problem with the DGR, but thinks the public needs to be kept informed about the planning process.

A decision on going ahead with the DGR is expected in two years.

Another DGR open house takes place today from 4 PM to 8 PM at the Huron Community Centre in Ripley

One is planned for Wednesday in Walkerton, and Thursday in Port Elgin.

The open houses continue next week on Monday in Chesley, Tuesday in Owen Sound, and Wiarton on Thursday.

More Talk About Nuclear Waste Storage

Tuesday, November 3, 2009 5:40 am

Another round of open houses for the Deep Geologic Repository Project.
That's the Ontario Power Generation's plan to dig down 2,230 feet one mile from Lake Huron near Bruce Power to store nuclear waste.
The Nuclear Waste Management Organization has been contracted by OPG to seek regulatory approval for the project.
OPG Public Affairs Manager Marie Wilson says everything to date shows the Bruce site is a good one for the project.

(Click arrow for audio or right click to download)

She adds used nuclear fuel will not be placed in the repository at the Bruce.

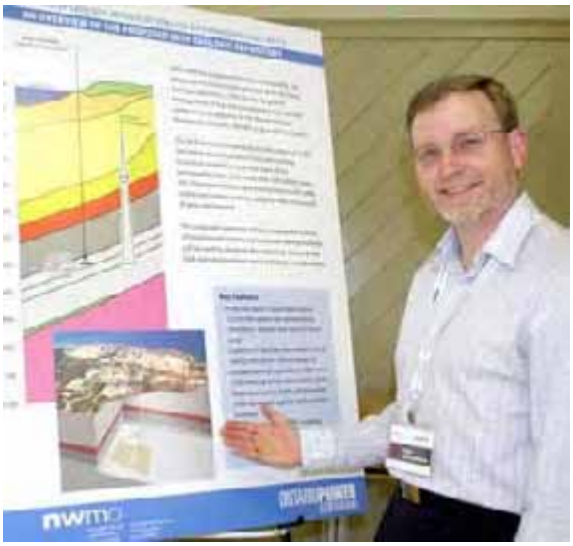
(continued)

New emplacement design unveiled at DGR open house

By Liz Dadson

Feature

To Comment on this article Click Here



Paul Gierszewski, director of repository safety, points to the new emplacement design in OPG's proposed DGR

Plans have changed for emplacement of the low-level and intermediate-level waste in Ontario Power Generation (OPG)'s proposed Deep Geologic Repository (DGR) at the Bruce Nuclear site in Kincardine.

Unveiled at an open house Monday night (Nov. 2) at the Davidson Centre in Kincardine, the layout of the emplacement rooms has changed to parallel panels in a rectangular shape, enhancing the stability of the rooms, says Marie Wilson, media relations manager for the Nuclear Waste Management Organization (NWMO) which is facilitating the regulatory and approvals process for this project.

Originally, the emplacement rooms were going to run in a diagonal pattern off a central location. "This is all part of the design process," says Wilson. "The new emplacement design is more efficient and effective."

As a handful of people stopped in at the open house, Wilson says the basic information about the DGR has not changed: the facility will hold 160,000 cubic metres of low-level and intermediate-level nuclear waste, 680 metres

Wilson says the four vertical boreholes have been drilled, allowing study of the rock at great depths. DGR-5, the first inclined borehole, has been completed and will help scientists discover if there are any fractures or faults in the rock that will house the DGR. The second inclined borehole (DGR 6), is expected to be finished early next year.

"We're now finalizing the engineering and design, working on the safety assessment, and completing some field work, such as the deer count," Wilson says.

This is the third round of open houses about the project, the last one was about a year ago, and another round will likely be held next year. Wilson says it's important to keep the public informed. "We have people coming in and asking questions," she says. "For some of them it's a new project. This is all in support of the Environmental Assessment process; we expect to be in public hearings by 2012."

Once the approvals process is completed, construction takes about five years. Wilson says, once approved, the DGR would be accepting low-level and intermediate-level waste by 2018.

An open house was also held in Ripley Tuesday night (Nov. 3), followed by open houses at Victoria Jubilee Hall in Walkerton on Wednesday (Nov. 4), and at the Colonial Motel in Port Elgin on Thursday (Nov. 5). Next week, open houses are scheduled at the Chesley Fire Hall on Monday, Nov. 9, the Bayshore Community Centre in Owen Sound on Tuesday, Nov. 10, and the Wiarton and District Community Centre on Thursday, Nov. 12. The events run 4-8 p.m.

(2,230 feet) below the surface.

Wednesday, November 04, 2009

DGR project making headway
Posted By ELYSE DEWAR, Kincardine News Staff
Kincardine News, page 33
November 10, 2009

Low to intermediate nuclear waste could be stored in Bruce County by 2017/18.

Last week, representatives from Ontario Power Generation (OPG) Deep Geologic Repository (DGR) project set up shop in local comments towns offering the public a chance to ask questions and become more informed on the DGR's progress.

On Tuesday, Nuclear Waste Management Organization (NWMO) staff managing the project were in Ripley with diagrams and displays to help citizens understand the project.

NWMO's Marie Wilson said the project is currently working on the environmental assessment (EA) process and a key part of that is providing the opportunity for public input and becoming informed on the project.

"We want to make sure people get the latest information we have and the DGR's process," said Wilson.

If NWMO obtains EA support, it can move forward with the DGR. In 2008, two deep bore test holes were drilled and three more were recently finished. They hope to have a sixth drilled by 2010.

Results from geoscience, engineering and design, safety assessment, environmental field work and communications will be reflected in the Environmental Impact Statement (EIS) which will be submitted to the Joint Review Panel (JRP), along with the Preliminary Safety Report.

Wilson said the public will then have a chance to review the EIS.

"There will be an opportunity for public comments and several public hearings in 2012," she said. "Some of those hearings will be in Kincardine."

By 2012, feedback from the public will be collected and the JRP will make a recommendation to the Minister of Environment on the suitability of the EIS.

Then, the minister will take it to the Cabinet for the final decision. EIS must be accepted before a site preparation/construction licence can be issued.

If approved, construction of the DGR could take up to five years.

"Then we can start putting low to intermediate waste down there," said Wilson.

Low level waste includes several items such as mop heads, cloths, paper towels, temporary floor coverings, protective clothing and hardware items. These, among many more, can be safely handled using normal industrial practices and equipment without any special radiation protection.

Low level waste makes up about 95 per cent of the total non-fuel waste volume received at OPG's Western Waste Management Facility (WWMF).

About 3,000 cubic metres of low level waste is stored annually at the WWMF. The majority of low level waste is incinerated or compacted for volume reduction before it's placed in concrete warehouse-like buildings for interim management.

Intermediate level waste consists primarily of used reactor core components, resins and filters used to keep reactor water systems clean and reactor retube parts such as pressure tubes.

This level of waste requires shielding to protect workers during handling and makes up about five per cent of all non-fuel waste received at the Western Waste Management Facility with about 200 cubic meters each year. It is stored in steel-lined concrete containers set into the ground.

The DGR is designed for the long-term management of low and intermediate nuclear waste on lands adjacent to WWMF in Kincardine.

The DGR would be located about 680 metres or 2,230 feet below ground surface in low permeability limestone, beneath a very thick layer of low permeability shale, both more than 450 million years old. To give an idea of how deep it will be, the CN Tower is 553 metres or 1,800 feet tall.

These sedimentary bedrock formations will safely isolate and contain nuclear waste for many thousands of years, Wilson said.

The repository will be composed of a series of emplacement rooms. Conventional mining methods will be used to construct the repository and access to the DGR and emplacement rooms will be the vertical shafts.

Bruce A restart a year behind schedule

by Kristen Shane

Bruce Power is set to restart Units 1 and 2 of the Bruce A nuclear generating station a year behind schedule and at a cost of about 24 per cent, or $650 million, more than it expected, company officials said last week.

When they were mapping out the project in the mid 2000s, they estimated it would cost $2.75 billion. They crossed that figure out last April and boosted it to $3.4 billion, as it still stands.

But at that time, CEO Duncan Hawthorne said he was still confident the project would be finished around the start of 2010, as the company had originally planned. Now, it expects to restart Unit 2 in mid 2011 and Unit 1 about four months later.

Bruce Power and one of its investors revealed the extent of the delay when they released their third-quarter earnings results last week, which covers a period from July to the end of September.

When the company cracked open Unit 2, the first to be refurbished, it was stumped to find red oxide dust that had to be inspected and cleaned. That caused some delay, said spokesperson Steve Cannon on Friday.

Bruce Power lost more time because it had to use newly invented processes and machinery to pull out parts of the old reactor.

"Work on Unit 1 is going a lot quicker because a lot of the tools and processes have been refined," said Cannon.

The project is about three-quarters finished and $3.1 billion has been spent. Company officials can breathe a sigh of relief now that most of the high-tech, high-risk activities are done and they can forge ahead on the rest, which includes more regular power plant construction activities such as electrical and valve work.

When the units are reconnected, they should be able to make a total of 1,500 megawatts of electricity, said Cannon.

In the mean time, most of Bruce Power's investors (one investor has opted out of funding the Bruce A restart) including the western Canadian energy company TransCanada Corp., are shouldering the cost overruns.

They are also taking a hit because Bruce Power produced less electricity in the summer's end. It sent 8.42 terawatt hours worth of electricity to the Ontario grid, down from 9.6 terawatt hours during the same period last year.

One terawatt hour is equal to one million megawatt hours. One megawatt hour is enough electricity to power 10,000 average light bulbs for an hour.

The production slump is partly because Bruce A Units 3 and 4 were shut down since early September for planned inspection and maintenance work. They were set to be brought back online "very soon" Cannon said Friday.

Also, Bruce B could have produced almost 11 per cent more electricity, but a provincial electricity supply regulator asked the company to shut units down temporarily at some points during summer because it didn't want to flood the provincial supply with more power than was needed.

The company's fourth quarter results should be available early next year.

People knowledgeable about DGR, says official

The low turnout at open houses in Kincardine and Ripley last week was a positive sign, says a Nuclear Waste Management Organization (NWMO) official.

Spokesperson Marie Wilson said Wednesday that 17 people turned out at the deep geological repository (DGR) open house in Kincardine Monday and five at the one in Ripley Tuesday.

The low turnout is a sign that most people are knowledgeable and comfortable with the project, said Wilson.

The open houses last week are part of the regulatory process. NWMO wants lots of venues for people to get information on the project, said Wilson.

Although turnout was low, officials had lots of interesting conversations, she said. Open houses allow people to get more detailed information.

NWMO is under contract with Ontario Power Generation (OPG) to manage the DGR project through the regulatory process. OPG will own and operate the DGR which will store low- and intermediate-level radioactive waste about 680 metres underground at the Western Waste Management Centre at Bruce Nuclear Power Development.

Paul Gierszewski, director of repository safety, explains a point to Bob Percival at the Nuclear Waste Management Organization's open house at the Davidson Centre on Monday evening of last week. (Eric Howald photo)

It is expected that a public hearing in 2012 will give OPG permission to proceed with the project. Once approval is given, construction would start and OPG would likely apply for an operating licence in 2017.

Paul Gierszewski, director of repository safety with NWMO, said at Monday's meeting that the test boreholes at the site have shown that the bedrock at the 680 foot level is much harder than expected. Building the repository will be like hard rock mining. The DGR will be far below the level of Lake Huron.

Once in operation, the DGR would operate for 35 to 40 years and have a workforce of 30.

By the time the project is finished, said Wilson, $1 billion will have been spent.

Health Unit says lessons learned from real-life test

BY PAT HALPIN
WDU Correspondent

Health authorities got a test of their pandemic plan thanks to the H1N1 outbreak.

The real life test was helpful, said Grey Bruce Medical Officer of Health Dr Hazel Lynn, but it also revealed glitches.

"This has been awesome practice. We're way, way better now having done some large clinics and realized the logistics of trying to get vaccine to outlying areas, so we're way better prepared now," Dr Lynn told Bruce County council last week.

Municipalities and health authorities have spent countless time and money on pandemic planning.

Still, health officials trying to follow a provincially set priority list were frustrated by slow release of the H1N1 vaccine and high demand even from low-risk groups.

At the same time mixed messages drove up demand for scarce supplies, while health unit staff struggled with practicalities of delivering vaccine and managing clinics.

"Part of the problem is we didn't have any tools until we got the vaccine. We needed it a month earlier if we were going to make a real difference here," Dr Lynn said.

"I'm really, really grateful this has not been a very virulent bug."

The peak of H1N1 cases in Grey and Bruce passed late last week, Dr Lynn told Bruce County councillors.

There will still be cases as the H1N1 outbreak winds down, but she said immunization could "blunt the impact" among susceptible people in the final days of the wave.

Enforcing the provincially- mandated priority list for flu shots has been a challenge, Dr Lynn admitted.

People with underlying health issues are at the top of the list, though fear and mixed messages have others anxious to join the line.

"We have complained a little to our Chief (Medical Officer) that don't tell everybody come get (a shot) if we don't have it. I don't have enough vaccine to do everybody, even if I would like to," she said.

Patients at risk can also get flu shots from their family doctor, Dr Lynn said.

Keeping the public informed

Don Jones and Diane Barker, right, of Nuclear Waste Management Ontario, discuss the proposed deep geologic repository project with Ruth Fischer, left, and Susan Rankin, at an Open House held at the Victoria Jubilee Hall last Wednesday night. The presentation updated residents on the progress of the Environmental Assessment, which is about two-thirds done, according to Kevin Orr of NWMO. A decision on the proposal to store low and intermediate level radioactive waste in a deep geologic repository at Ontario Power Generation is expected in 2012.

John McPhee photo

Appendix C

Open House Handouts

DGR
OPG's Deep Geologic Repository for Low & Intermediate Level Waste

Keeping You Informed About the Deep Geologic Repository October 2009

NWMO moves forward with OPG's DGR

Amphibians flourish in healthy habitats at Bruce nuclear site

It's about 9:30 p.m. on a balmy May evening at the Bruce nuclear site and Richard Baldwin, a biologist with Golder Associates, is getting ready to listen to what will be one of nature's natural symphonies in one of the many marsh habitats that dot the Bruce nuclear site.

The peeping begins, slowly at first, as the last remnants of the day's sun slips below the horizon, leaving darkness in place of the soft, purple hues that only moments ago gently brushed the water, the pine trees and the outcropping of rugged rocks. The stillness and solitude of the landscape, worthy of a Group of Seven painting, are broken by the shrill sounds of a Spring Peeper, and then another joins in, and yet another and another, and intermixed among the chorus of Spring Peepers, is the distinct baritone of a Grey Treefrog, who at this time of year, is expanding his lungs to the fullest to call a potential mate.

Rick listens carefully, clipboard in hand, translating the auditory range of frog sounds into meaningful data, which will help establish the baseline environmental conditions at the site for Ontario Power Generation's (OPG) proposed Deep Geologic

Biologist Rick Baldwin carefully listens as he conducts a frog count at the Bruce nuclear site in support of the EA process for OPG's DGR L&ILW.

(Continued on page 3)

NWMO moves forward with community initiatives

NWMO supports Chesley medical clinic

The Nuclear Waste Management Organization (NWMO) is managing the proposed Deep Geologic Repository for Low and Intermediate Level Waste project through the regulatory approvals process on behalf of Ontario Power Generation (OPG).

And as a new company to the area, NWMO is making a commitment to the development of the Bruce community through its DGR Community Partnership Program.

On the environmental front, NWMO continues to support local green initiatives such as the Green Cone Composting Program in the Town of South Bruce Peninsula. As it did in Brockton, NWMO is providing funding for promotional and educational materials about the program to ensure residents are aware that they can purchase green cones from the municipality at cost.

NWMO is pleased to provide financial support to the expansion of the Chesley Medial Clinic, which provides medical services to about 6,000 residents from the Municipalities of Arran-Elderslie and surrounding areas. It's hoped that a newly expanded and updated clinic – it will double in size going to 6200 sq. ft – will allow Arran-Elderslie to move forward with its desire to accommodate a Family Health Team of both doctors and a variety of health care professionals to administer to the health needs of its citizens, some of whom are orphan patients without current access to a doctor.

Saugeen Shores will soon be the site of a Regional Integrated Accessible Playground. This unique initiative will provide about 2500 children in Grey Bruce with access to a play area specifically designed to break down the barriers, which normally prevent children or parents with limitations from fully participating in most play spaces. Construction of this project, proudly supported by NWMO, is expected to begin in spring 2010.

For more information about the DGR Community Partnership Program, please contact Kevin Orr at 519-368-1644 or email korr@nwmo.ca.

NWMO is pleased to support the expansion of the Chesley Medical Clinic which is expected to help establish a Family Health Team for area residents. Fundraising committee members David Spencer and Clarke Birchard (respectively flank) Kevin Orr from NWMO at the cheque presentation.

OPG's DGR L&ILW hits the silver screen

The Nuclear Waste Management Organization (NWMO) joined hands with two community groups this past summer through the sponsorship of two outdoor viewings of family feature films at two separate events. A short video, which provides an overview of the proposed Deep Geologic Repository for Low and Intermediate Level Waste (DGR L&ILW) project, was also featured on the 25 ft. screen as a prelude to the showing of the films. It should be noted the NWMO is managing the DGR L&ILW, through the regulatory approvals process, on behalf of Ontario Power Generation (OPG).

NWMO sponsored the showing of *Kung Fu Panda* in Kincardine as part of their Canada Day festivities on July 2 and then on September 12, NWMO partnered with the Bruce County Museum and Cultural Centre to present *E.T. – the Extraterrestrial* on the giant outdoor stage. The museum, in conjunction with the Bruce County Astronomical Society, hosted a family astronomy event at the Outdoor Education Centre near Wiarton, so the space-related movie was in keeping with the overall space theme, and well received by the crowd.

Those in attendance thoroughly enjoyed the outdoor films, and NWMO will definitely be considering similar events at different venues as part of their planning for next year.

Bruce County museum and Cultural Centre volunteers James and Sandy Seaton learn more about OPG's DGR L&ILW from NWMO's Diane Barker before the outdoor showing of E.T. sponsored by NWMO.

NWMO moves forward with baseline field studies for OPG's DGR L&ILW

Left: Field biologist Tony Calverly conducts a breeding bird survey at the Bruce site in late May. A total of 60 species were identified during surveys conducted from May 29-31 and July 2-4. 40 of these were exhibiting breeding behaviour in appropriate habitats. No species at risk were identified during these surveys although two black-crowned night herons were observed flying over the site. These birds are listed as a vulnerable species in the province of Ontario by the Natural Heritage Information Centre.

Above: Susanne Carrelos, an environmental technician, conducts a round of water quality sampling from surface water at a number of locations at the Bruce site as part of the baseline field studies.

(Continued from page **1**)

Repository for Low and Intermediate Level Waste (DGR L&ILW).

The amphibian count is part of an extensive series of baseline field studies at the Bruce site, being conducted by Golder Associates, who is under contract to the Nuclear Waste Management Organization (NWMO). These studies, along with many others, are being done in support of a lengthy Environmental Assessment process for the DGR L&ILW and provide the basis for an examination of potential environmental effects. This information, along with results of public consultation, will be documented and submitted to the Joint Review Panel who will determine whether the project will ultimately move forward to construction.

"You need to establish a baseline set of data for the site environment so you have a starting point to gauge the potential effects of the project," Rick said. "If you start off with an abundant calling of frogs, and then it starts to decrease, you know something is wrong."

Rick notes that frogs or amphibians in general serve as environmental bellwethers for the degradation of their habitats.

"Amphibians breathe through their skins, which are very thin, so they are extremely sensitive to any changes in the environment, he said, adding that they will be the first to be affected by degradation such as toxins.

During his frog counts at the Bruce site, Rick has observed an abundance of calling at various levels over the roughly dozen designated spots he has studied. In terms of the protocol for counting frogs, it's determined by three levels. Level one is designated as an area where you can distinctly hear and discern the different species, while in level two, the callings are so numerous that the species start to overlap making it difficult to segregate the different sounds. In level three, there are so many callings that chaos rules and it's impossible to discern any of the species. The bottom line, Rick said, is that the Bruce site hosts at least a dozen healthy habitats where frogs (Spring Peepers, Grey Treefrogs, American Toads, and Green Frogs) flourish and make music.

Other baseline field studies being conducted as part of the investigations for the DGR L&ILW include: light assessment, water quality sampling, sediment sampling, stream geomorphic studies (physical features of earth's surface), stream aquatic habitat study, and surveys of Burrowing Crayfish, Vegetation, Basking Turtles, Breeding Birds, Meadow Voles and Deer population.

NWMO moves forward with Engineering/Design

OPG's DGR L&ILW has a new look

The design for Ontario Power Generation's (OPG) proposed Deep Geologic Repository for Low and Intermediate Level Waste (DGR L&ILW) facility has changed. The new underground layout is better suited for the expected deep rock conditions at the Bruce site.

The layout of the emplacement or waste storage rooms has changed to parallel panels of rooms in a rectangular shape. This room orientation will enhance the stability of the rooms.

The facility for low and intermediate level nuclear waste will be constructed at a depth of 680 metres in low permeability limestone bedrock overlain by a 200 metre thick cap of low permeability shale and it will accommodate about 160,000 cubic metres of low and intermediate level waste.

The change in lay-out is indicative of the progress that is being made in engineering/design, which along with the ongoing geoscience investigations, safety assessment, environmental field studies and community engagement work will support the environmental assessment process for OPG's DGR L&ILW.

Artist's rendition of OPG's Deep Geologic Repository for Low and Intermediate Level Waste

You are invited to an open house featuring OPG's DGR L&ILW

The Nuclear Waste Management Organization, on behalf of Ontario Power Generation (OPG), is hosting a series of seven open houses to review plans for the proposed Deep Geologic Repository for Low and Intermediate Level Waste (DGR L&ILW) project.

This third round of open houses, in three years, will focus on the Safety Assessment results to date. This discipline is examining both the radiological and conventional safety of the DGR L&ILW during its 40–50 year operating period, malfunctions and "what if accident scenarios" as well as how the facility will perform well into the future as it encounters phenomenon such as evolution and glaciations.

Updated information is also available from the geoscientific investigations and engineering and design.

As always, staff will be available to answer your questions, hear your views and provide any additional information that is required.

The open houses are being held as part of the environmental assessment, which encourages public participation in the process.

Open houses will be held from 4 p.m. to 8 p.m. at the following locations:

Kincardine	
November 2nd	Kincardine Davidson Centre
Ripley	
November 3rd	Ripley Huron Community Centre
Walkerton	
November 4th	Victoria Jubilee Hall
Saugeen Shores	
November 5th	Colonial Motel
Chesley	
November 9th	Chesley Fire Hall
Owen Sound	
November 10th	Bayshore Community Centre
Wiarton	
November 12th	Wiarton & District Community Centre

Opportunities for engagement in Aboriginal Communities will be welcomed at their request.

For more information, please contact Marie Wilson at 519-368-1639 or visit **www.nwmo.ca/dgr**.

nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

For more information on the DGR, please visit: **www.nwmo.ca/dgr**

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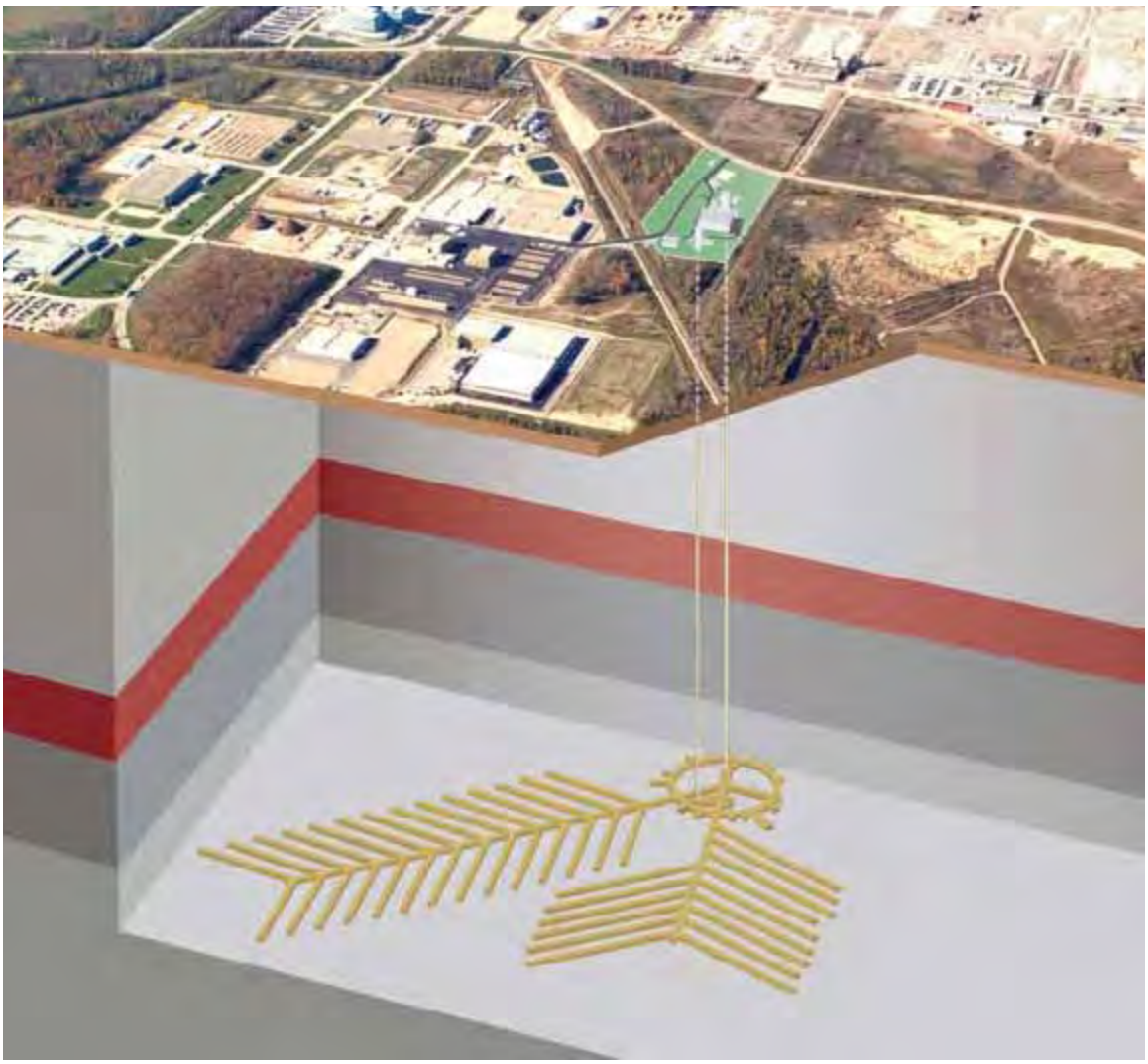
Printed on 100% recycled stock

DEEP GEOLOGIC

REPOSITORY

FOR OPG's LOW & INTERMEDIATE LEVEL WASTE



KEEPING YOU INFORMED

nwmo

NUCLEAR WASTE MANAGEMENT ORGANIZATION

SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

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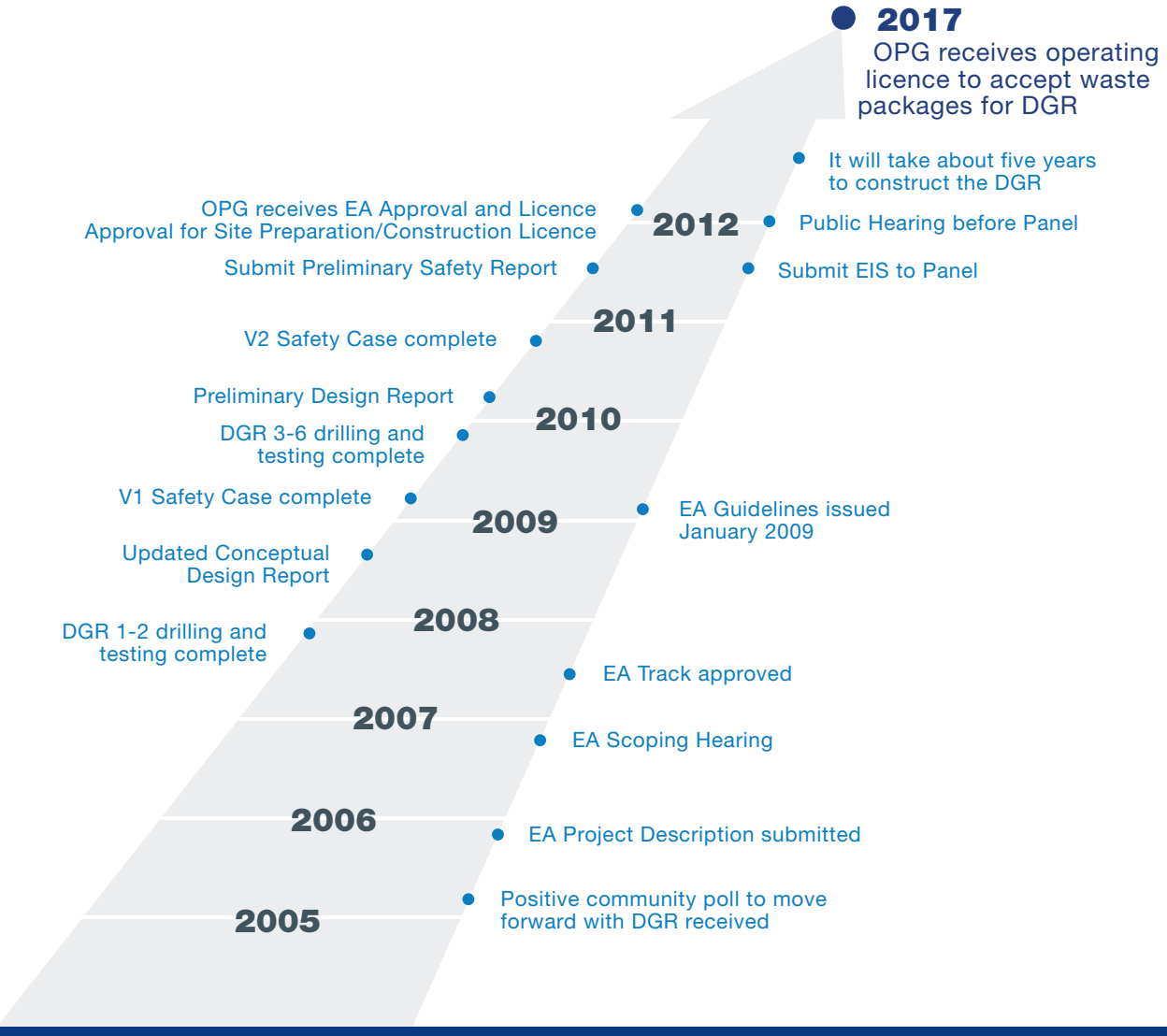
nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

Dear Stakeholder:

The Nuclear Waste Management Organization (NWMO) is pleased to provide you with this information on the proposed Deep Geologic Repository (DGR) project – a long-term management facility for low and intermediate level nuclear waste only. The NWMO is seeking regulatory and licensing approval for the project on behalf of Ontario Power Generation (OPG) who is the owner and licensee of the DGR. NWMO and OPG believe the DGR is a safe and environmentally responsible approach to managing the existing and future low and intermediate level nuclear waste from OPG's 20 reactors.

A formal environmental assessment and licensing process began for the DGR in 2005 and is expected to take six to eight years. A public hearing before a joint review panel will be held around 2012. Community consultation will provide many opportunities for members of the public to be informed and express their views on the proposal. This booklet is designed to provide you with an overview of the proposed DGR. For more information about the DGR, please visit **www.nwmo.ca/dgr**, call 519-368-1639 or email **mwilson@nwmo.ca**.

Project and Regulatory Process



For more information about the DGR regulatory process visit **www.nuclearsafety.gc.ca or www.ceaa-acee.gc.ca**

DGR Project Moving Through EA/Licencing Process

2005	Regulatory process to receive a licence to construct a DGR begins with the submission of the DGR Project Description to the Canadian Nuclear Safety Commission (CNSC) who must approve the licence
2007	DGR project was referred to a Joint Review Panel Environmental Assessment (EA) under the Canadian Environmental Assessment Act in June by the federal Environment Minister. The Joint Review Panel process allows a panel of three to consider both the Environmental Impact Statement (EIS) and the application for site preparation/construction licence
2008	Environment Minister and CNSC jointly issued draft guidelines for EIS and Joint Review Panel Agreement in April for public review. Participant funding awarded to six parties to assist with participation in public review
2009	Final guidelines were issued in January
2009+	Work continues to verify the Bruce site as a suitable location for the DGR and to analyze any potential effects on the environment from the DGR
2011	Results from geoscience, engineering and design, safety assessment, environmental field work and communications will be reflected in the EIS to be submitted to the Joint Review Panel along with the Preliminary Safety Report
	EIS will be available for public review
2012	A public hearing to hear feedback from individuals and groups will be held. The panel will make a recommendation to the Minister of Environment on the suitability of the EIS. The minister then takes it to Cabinet for the final decision. EIS must be accepted before a site preparation/construction licence can be issued

How will the project be funded?

- Construction and operation of the DGR is estimated at $1 billion with about $600 million of that slated for construction
- Under the Ontario Nuclear Funds Agreement, a segregated fund has been established for the long-term management of low and intermediate level nuclear waste from OPG reactors and the decommissioning of nuclear power plants. The DGR is already fully funded

Western Waste Management Facility (WWMF)

- OPG's WWMF, located in the Municipality of Kincardine, has safely managed low and intermediate level nuclear waste since 1974 and can continue in this role for many decades
- The WWMF manages all of the low and intermediate level nuclear waste from the Bruce, Pickering and Darlington generating stations. It also manages the low and intermediate level nuclear waste from the Douglas Point Generating Station, located at the Bruce site
- The WWMF manages high level nuclear waste from Bruce Power, while Darlington and Pickering have facilities for managing their own high level nuclear waste
- The DGR will provide safe long-term management for all of the low and intermediate level nuclear waste currently managed at the WWMF including waste from the future operation of OPG's existing reactors

Western Waste Management Facility

1: **10 Low Level Storage Buildings**
2: **Quadricells**
3: **Waste Volume Reduction Building**
4: **Transportation Package Maintenance Building**
5: **Used Fuel Dry Storage Facility**
6: **Refurbishment Waste Storage Buildings**
7: **In-Ground Storage Containers**
8: **Future Low Level Storage Buildings 11 & 12**

What is Low Level Nuclear Waste?

Low level waste is received at the WWMF

- Low level nuclear waste consists of common industrial items that have become contaminated with low levels of radioactivity during routine clean-up and maintenance at the nuclear generating stations
- It includes mops, rags, paper towels, temporary floor coverings, floor sweepings, protective clothing and hardware items such as tools
- It consists of paper, plastics, metal, rubber, cotton and other miscellaneous materials
- Low level nuclear waste can be safely handled using normal industrial practices and equipment without any special radiation protection

What is Intermediate Level Nuclear Waste?

Intermediate level nuclear waste is inserted into in-ground storage containers at the WWMF

- Intermediate level nuclear waste requires shielding to protect workers during handling
- Intermediate level nuclear waste typically includes ion exchange resins, filters and irradiated core components associated with refurbishment waste
- Approximately 290 m^3 of intermediate level nuclear waste is received each year at the WWMF
- Approximately five per cent of all waste (excluding used fuel) received at the WWMF is intermediate level nuclear waste

What is High Level Nuclear Waste?

Used fuel dry storage containers

- High level nuclear waste consists of fuel bundles that are used in the reactors to produce energy for electricity
- Fuel bundles spend a minimum of 10 years in large pool-like structures filled with water called fuel bays before they are placed in robust dry storage containers made of steel and concrete that provide shielding
- **Used Fuel will not be placed in the DGR.** It is stored on an interim basis at the site where it is generated
- The Nuclear Waste Management Organization has the responsibility for implementing Adaptive Phased Management – a long-term management plan that is intended to, with collaboration, continuous learning and adaptability, eventually lead to the construction of a geologic repository for all of Canada's used fuel

For more information about the NWMO and Adaptive Phased Management, please visit **www.nwmo.ca**

What is Refurbishment Nuclear Waste?

A steam generator is transported to the WWMF for interim management

- Refurbishment nuclear waste consists of low and intermediate nuclear waste generated from the refurbishment of reactors
- Intermediate refurbishment nuclear waste consists of irradiated core components such as pressure tubes, calandria tubes and end fittings that are safely managed in shielded containers inside a concrete refurbishment waste building
- Low level refurbishment nuclear waste consists of steam generators that are safely managed in a concrete refurbishment waste building

Transportation of Nuclear Waste

- Low and intermediate nuclear waste has been transported from the Pickering and Darlington generating stations to the WWMF for over 35 years
- Transportation of nuclear waste is regulated by the Canadian Nuclear Safety Commission (CNSC)
- No release of nuclear materials has ever occurred during transportation of the waste
- Training about the transportation of nuclear materials is provided to First Responders all along the transportation routes
- OPG has a Transport Canada emergency response plan in place with highly trained responders

A Community Partnership

In 2002, the Municipality of Kincardine and Ontario Power Generation signed a Memorandum of Understanding (MOU). The MOU set out terms to assess the feasibility of the long-term management of low and intermediate level nuclear waste at the Western Waste Management Facility located within the Bruce site.

- Under the MOU, Golder Associates conducted an Independent Assessment Study, which looked at the feasibility of various long-term management options for low and intermediate level nuclear waste at the Bruce site. It also included a preliminary safety assessment and took into account information from a study based on existing geological, groundwater and geotechnical information related to the Bruce site
- Three options were deemed to be technically feasible, safe and without significant social, economic or environmental impacts: enhanced storage and processing, above ground concrete vaults and deep geologic repository
- The Independent Assessment Study compared the options and included consultation with the local community and stakeholders
- In 2004, Council for the Municipality of Kincardine endorsed the DGR over all of the other options, by resolution, because of its greater safety margin
- In 2005, an independent polling of both permanent and seasonal residents was conducted in Kincardine which showed a majority of residents supported going forward with the DGR

Hosting Agreement

Key features:

- With the support of the community, OPG will obtain regulatory approvals to construct the Deep Geologic Repository for low and intermediate level nuclear waste

- Kincardine, Saugeen Shores, Huron-Kinloss, Arran-Elderslie and Brockton to receive $35 million (2004 dollars, inflation protected) paid over 30 years subject to achieving key milestones:
  > Environmental Assessment Guidelines
  > Environmental Assessment Approval
  > Construction Licence
  > Operating Licence

- The Municipalities will choose how to use the funds for the benefit of their communities

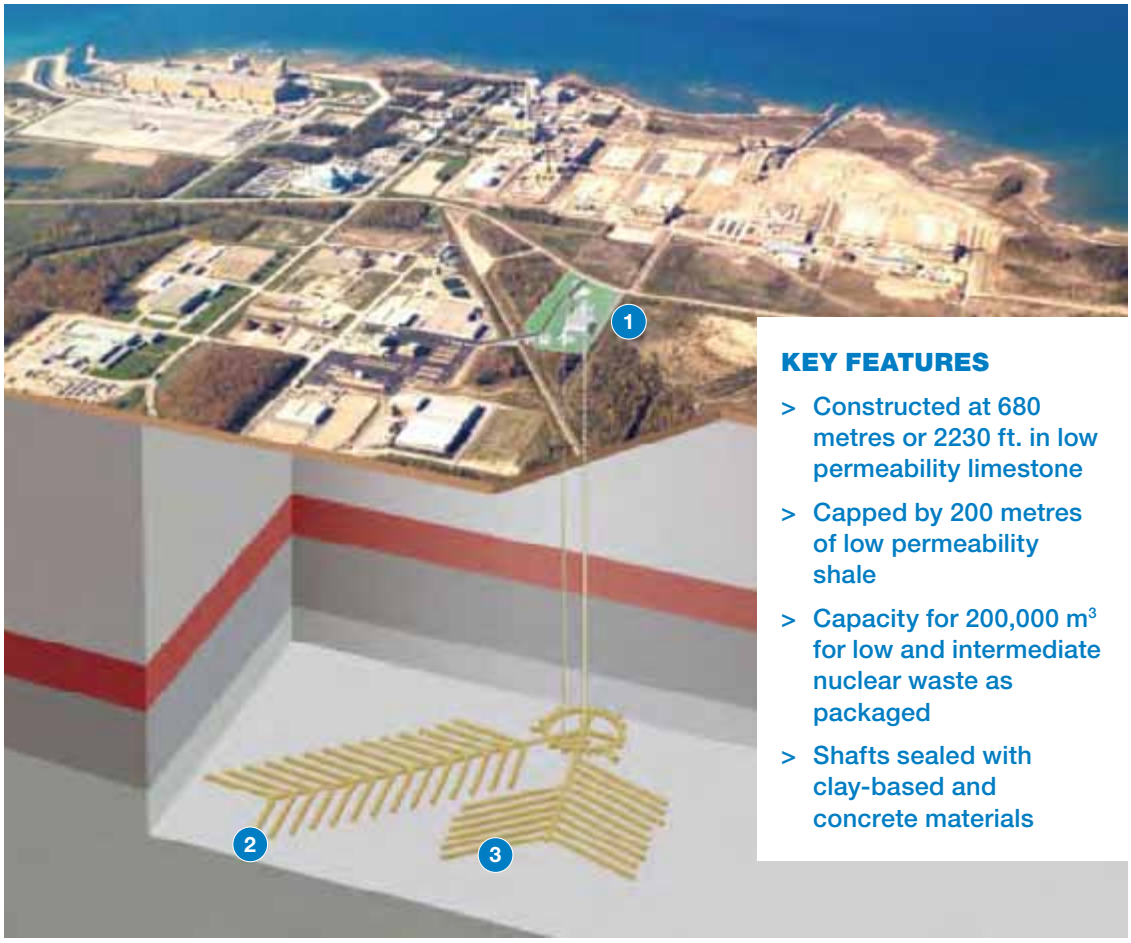
- Provision for 200,000 m^3, as packaged, of low and intermediate level nuclear waste produced until 2035 during reactor operations from OPG's 20 reactors, including refurbishment and decommissioning waste

- Provision to negotiate repository expansion for additional low and intermediate level nuclear waste for new build reactors in Ontario

- No used nuclear fuel will be placed in the Deep Geologic Repository

- Property Value Protection Plan

Proposed Deep Geologic Repository at OPG's WWMF



KEY FEATURES

- Constructed at 680 metres or 2230 ft. in low permeability limestone
- Capped by 200 metres of low permeability shale
- Capacity for 200,000 m^3 for low and intermediate nuclear waste as packaged
- Shafts sealed with clay-based and concrete materials

1: **DGR surface facilities**

2: **LLW emplacement room**

3: **Resin Liner Shields within ILW emplacement room**

DGR Conceptual Engineering Design

- Rock excavation will be primarily by roadheader
- The main shaft will provide personnel access and waste handling, and a second shaft will provide exhaust ventilation and an emergency escape route
- Excavated rock will be stored on-site
- Surface facilities will include a headframe building, and an adjoining building for waste package receipt and staging
- Construction will take about five years
- A 40-tonne hoist will move waste and personnel between the surface and repository levels
- Underground facilities, located in the ring tunnel, include waste receiving, a control room, equipment room, geoscience laboratory, refuge stations, cafeteria and showers
- Low and intermediate level nuclear waste will be managed in separate emplacement rooms. The rooms will be excavated in limestone and will have concrete floors
- Once filled, each room will be isolated by a wall, but not backfilled

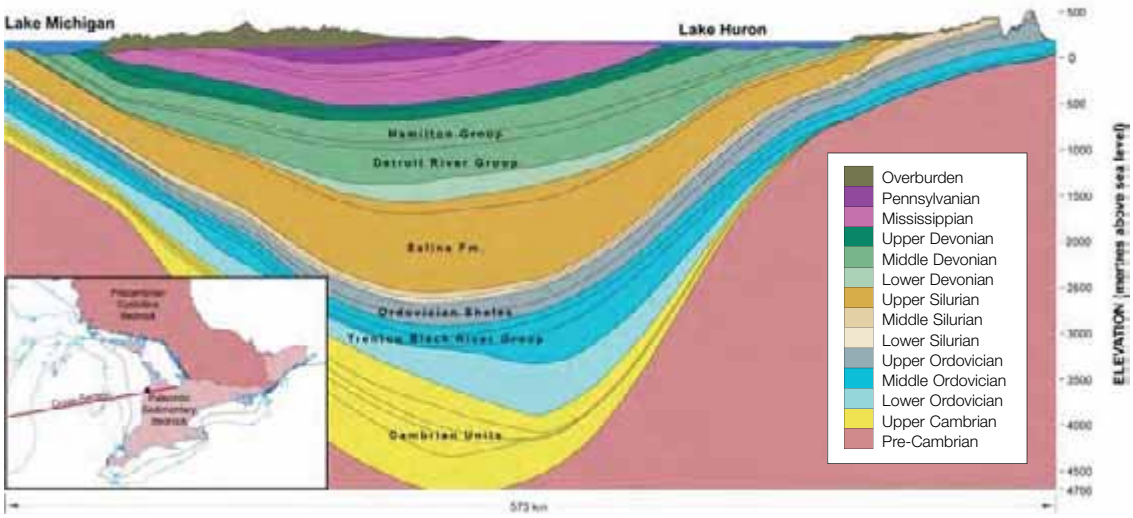
Roadheaders will be used to construct access tunnels and emplacement rooms

Geoscience Attributes

PREDICTABILITY

- Borehole coring indicates a consistent bedrock “column” beneath the Bruce site comprised of 34 horizontally-layered and laterally extensive bedrock formations of Cambrian to Devonian age (543–350 million years)

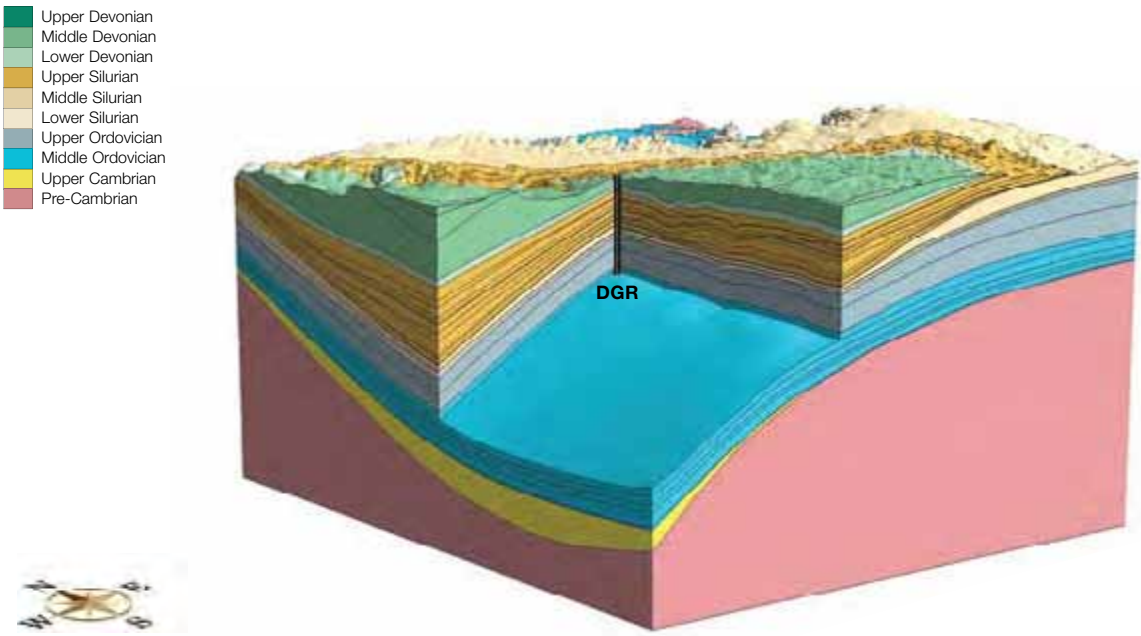
- Sedimentary bedrock layering, observed beneath the Bruce site, reflects the regional geologic knowledge that these layers extend laterally for great distances of up to hundreds of kilometres beyond the Bruce site



Geologic cross-section of Michigan Basin

MULTIPLE NATURAL BARRIERS

- The diagram below portrays the various geologic layers present at the Bruce site
- The DGR is surrounded by multiple layers of low permeability sedimentary rock. The horizon immediately above the repository is comprised of a 200-m layer of low permeability Ordovician age (450 Million years) shale located about 440 m below ground surface
- A sequence of shales, dolostones and evaporties, including the Silurian age (420 million years) Salina Formation (190 m thick) above the Ordovician shale, also possesses low permeabilties

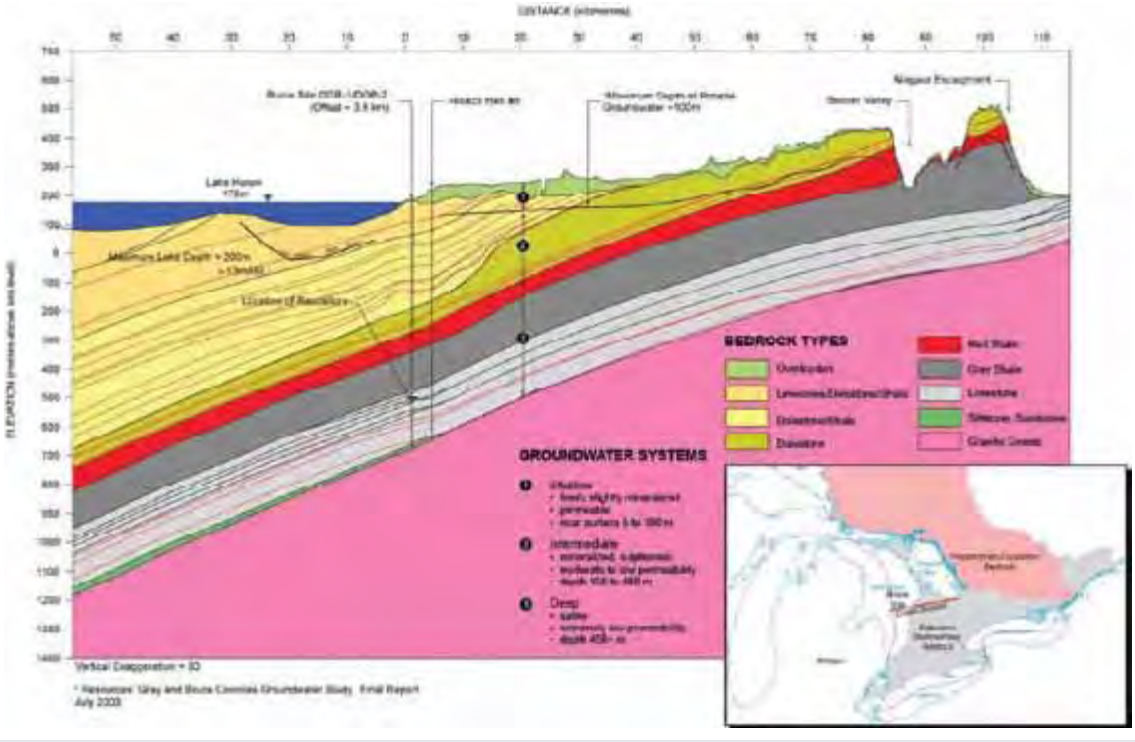


Regional study area 3-dimensional model of bedrock stratigraphy

Geoscience Attributes

NATURAL BARRIERS TO PROTECT GROUNDWATER AND SURFACE WATER

- Drinking water found in the upper 100 m is extremely well isolated from the DGR
- Water found at the repository depth has a salt content eight times that of seawater, an indication it has been trapped within the rock layers for millions of years, from the time when it was part of an ancient sea bed
- Pore water found at 680 m doesn't flow, but is sluggish and stagnant



DGR will protect Lake Huron

- The DGR will be located about one kilometre inland from Lake Huron
- The deepest point of Lake Huron at about 200 m (660 ft.) is well isolated from the DGR by over 400 m (1320 ft.) of rock layers

SEISMICALLY QUIET

Low level seismic monitor

- The Bruce region, located in the stable interior of the North American continent, is seismically comparable to the stable Canadian Shield. Historic records of seismic activity do not reveal events exceeding M5, within a radius of more than 150 km of the Bruce site, in the past 180 years

- A network of three low-level seismicity monitors was installed within a 50-km radius of the DGR site in 2007. Reports compiled by the Geological Survey of Canada from this network have not detected any seismic activity greater than M2.5 within a 150-km radius of the site. Seismic activity at a M2.5 level would not generally be felt by an individual at the surface. This network of seismic monitors will be utilized in the development of a detailed seismic model of the area

Geoscience Attributes

NATURAL RESOURCE POTENTIAL

- No significant oil or gas was encountered in three vertical boreholes drilled on site, nor in several historic oil and gas wells drilled within 10 km of the Bruce site. There are no known industrial minerals that are unique to the site and cannot be obtained from elsewhere

TRANSPORT DIFFUSION DOMINATED

- Low bedrock permeabilities measured in deep boreholes drilled at the Bruce site are consistent with an environment where the movement of radionuclides is only possible through diffusion

- Numerical simulations of the regional and site-scale groundwater systems conducted by the University of Waterloo support the assertion of a stable, diffusion dominant system enclosing the repository

GEOMECHANICALLY STABLE

- Core samples obtained during deep borehole drilling at the Bruce site exhibit compressive strength which exceeds original understanding based on existing regional, geologic information
- The DGR opening, constructed in the Cobourg Formation beneath the Bruce site, should be dry and stable
- The Darlington Nuclear Generating Station's cooling water intake/discharge tunnels, constructed in the Cobourg Formation 30 m beneath Lake Ontario, provide evidence that the formation can sustain a stable, dry opening with minimal rock support

Construction during Darlington cooling water intake tunnel

Geoscientific Site Characterization

PHASE ONE

A four-year, step-wise series of scientific investigations began in 2006 to verify the ability of the geology at the Bruce site to safely isolate and contain low and intermediate level nuclear waste. Phase One included the following test programs:

- 2D seismic reflection survey to image the sedimentary bedrock
- Three low-level seismographs installed at three locations within a 50-km radius of the Bruce site to monitor low level seismic activity
- Drilling and coring of vertical boreholes DGR 1 to 463 metres and DGR 2 to 863 metres to provide rock core samples for laboratory tests to measure physical and chemical rock properties
- Downhole geophysical logging of boreholes with various instruments to determine the different layers (formation contacts), rock density and porosity
- Hydraulic borehole testing to measure bedrock formation permeabilties
- Installation of Westbay multi-level groundwater monitoring equipment to allow long-term monitoring of deep groundwater conditions

PHASE TWO

- Phase Two of the Geoscientific Site Characterization began in April 2008 with the drilling, coring and instrumentation of two additional vertical boreholes at separate sites
- DGR 3 and DGR 4 were drilled to about 860 m in 2008
- Two additional steeply inclined boreholes will be drilled, cored and tested in 2009
- Triangulation of the boreholes provides evidence as to the nature and predictability of the stratigraphic, geochemical, and hydrogeologic properties of horizontally-layered limestone and shale rock formations

Deep Borehole Drilling Data Supports Historical Understanding of Site

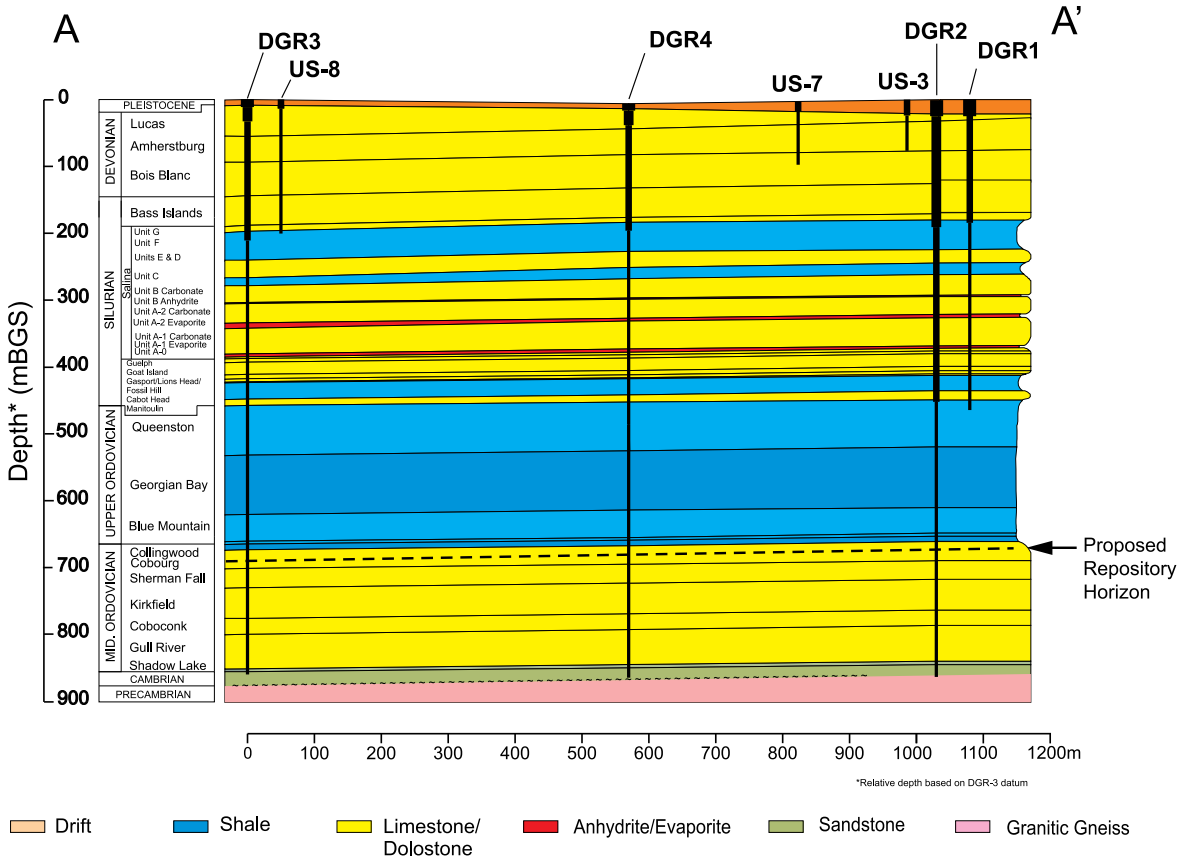
Six boreholes are positioned in a triangle formation outside of the DGR footprint to maintain the integrity of the proposed DGR site

Geoscientific investigations to date, in support of the existing regional and historical information about the site, have shown that the geology is:

> predictable
> geomechanically stable
> seismically quiet
> characterized by natural barriers which can isolate and contain the waste
> without natural resource potential

Further studies and research will add to the body of data already assembled.

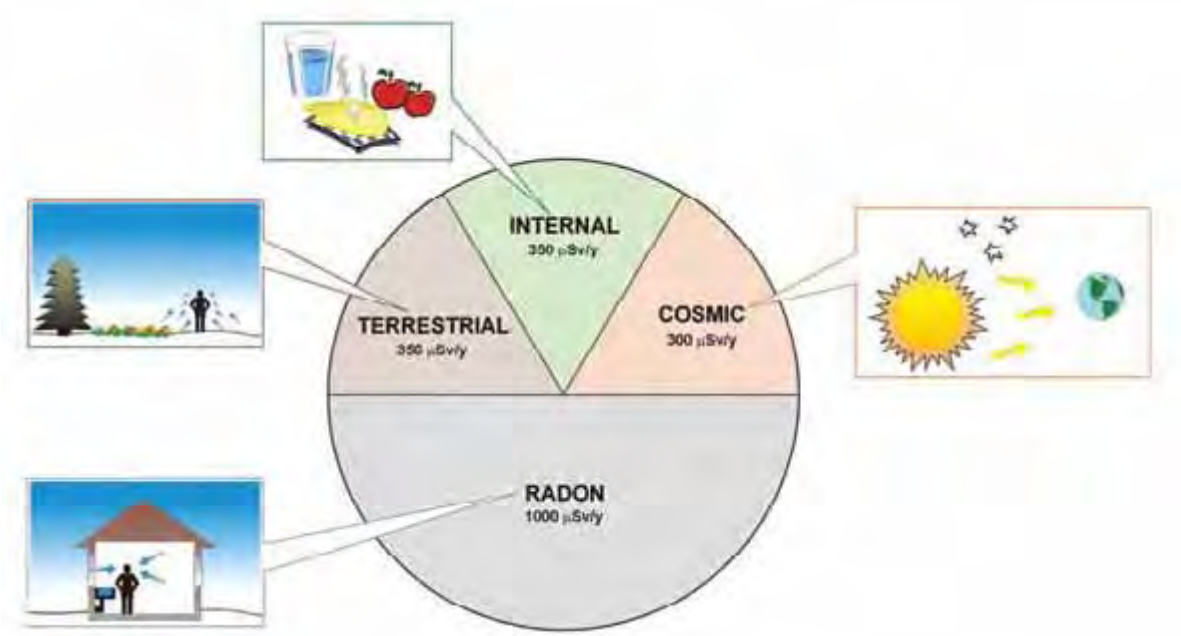
Borehole Stratigraphy Diagram



Geologic cross-section as shown on DGR Borehole Location Plan

Radiation Safety Background

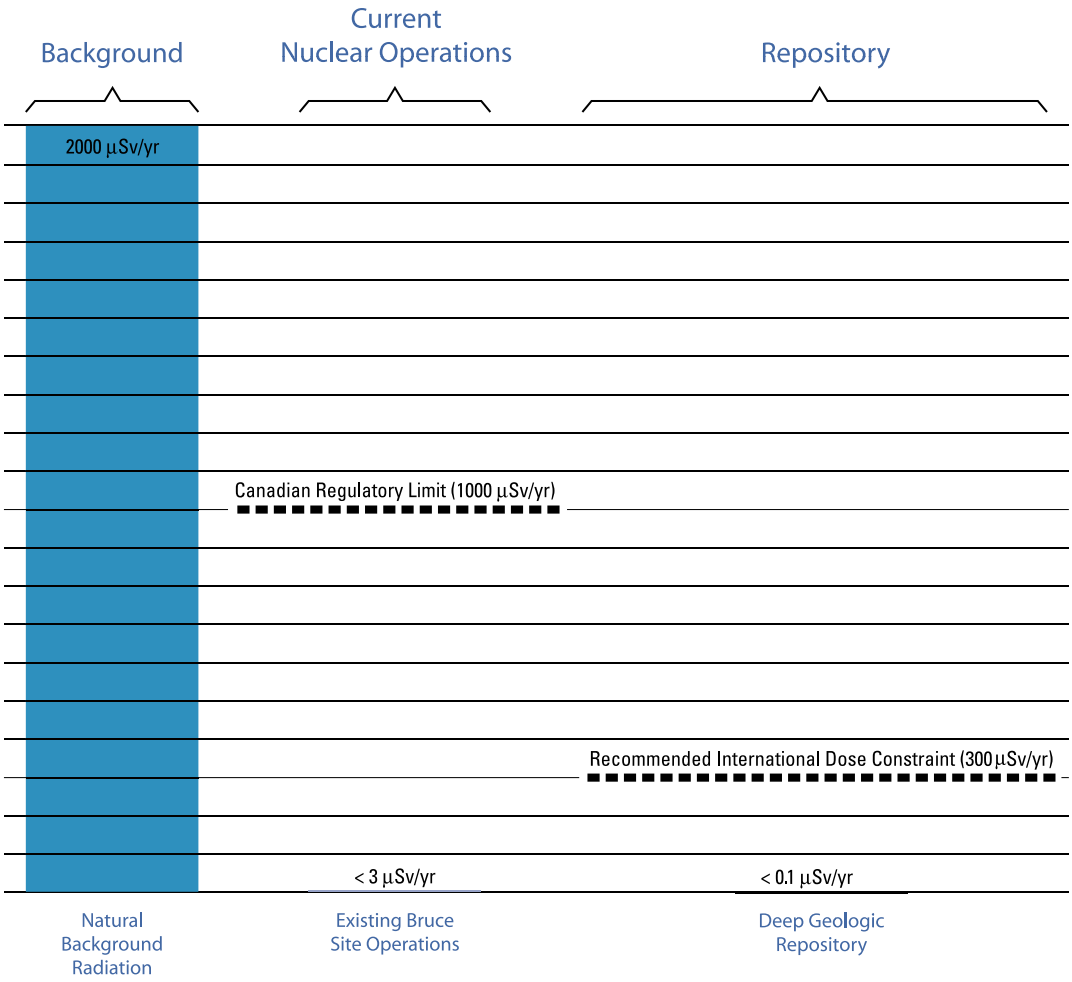
- Sievert is a unit of measure used to describe the effective dose of ionizing radiation received by people. Dose is often expressed in millionths of a Sievert, or microSievert (μSv)
- Natural background radiation averages about 2,000 μSv per year. This represents the amount of radiation dose that the average person in Canada receives each year from all natural sources
- The radiation received from a chest x-ray is 60 μSv
- Dose rate to the public, living at the site boundary, from the Bruce site activities is less than 3 μSv per year. Dose rate to the public, living at the site boundary, from the WWMF is less than 0.1 μSv per year



This diagram shows the range of sources of natural background radiation in Ontario. People are exposed to radiation from a number of natural sources such as the sun and the bedrock, and human activities such as medical examinations and power generation.

Preliminary Safety Assessment

- The safety assessment of the DGR is being completed by a team led by Quintessa Limited, a consulting firm based in the United Kingdom, which specializes in safety assessment of waste management facilities
- This chart shows the dose rate estimates for the Deep Geologic Repository. Maximum estimated doses to humans are well below the international standards and natural background levels
- A detailed safety assessment is well underway, using the latest scientific information from the Bruce site and design information



Safety Assessment

- Safety assessments assess the potential impacts of the DGR both during the operational as well as the period after the underground portion is closed, far into the future

- Observations from preliminary results from 2003 and 2007 indicate:
  - > Host rock is effective in retarding radionuclide movement
  - > The majority of radioactivity will decay in and around the repository
  - > Radionuclides will diffuse through the rock layers at extremely slow rates (less than one metre per 1000 years)
  - > Estimated dose to the public after 100,000 years is less than 0.1 µSv per year, well below the recommended international dose constraint

- Updated safety assessments will consider:
  - > Normal operation and accidents
  - > Pre-closure and post-closure periods
  - > Potential effects on humans and biota

International Experience with Repositories

A proven history with low and intermediate level waste

- The DGR has benefited from first-hand visits to long-term management facilities in Sweden, Finland and the United States. Information learned about surface facilities, repository access, hoisting, lay-out and material handling is being utilized in the design of the DGR. Such international collaboration is extremely beneficial in terms of experience, the exchange and analysis of reports and visits with key personnel

- The Forsmark facility in Sweden opened in 1988 and is located at the Forsmark nuclear power station site

- The Olkiluoto (VLJ) facility in Finland began operation in 1992 and was excavated to a depth of 70 to 100 m underground in crystalline rock. It is located near the Olkiluoto nuclear power station

- The Waste Isolation Pilot Plant (WIPP) located in New Mexico, United States is excavated to a depth of 600 m in a bedded salt formation and has been operating safely since 1999

Left: **Sweden's Forsmark Repository** Right: **Waste Isolation Pilot Plant in New Mexico**

Independent Review and Oversight

- A Geoscience Review Group (GRG) was established in 2005
- GRG members have, between them, over 100 years of work experience in international nuclear waste programs in Japan, Hungary, Switzerland, Sweden, Finland, Korea, USA and UK
- By providing peer review and oversight, the GRG ensures the DGR project will benefit from international experience in all aspects of the geoscientific site characterization

Geoscience Review Group: **Dr. Joe Pearson (USA), Dr. Derek Martin (Canada), Jacque Delay (France) and Dr. Andreas Gautschi (Switzerland) examine core samples taken from beneath the Bruce site**

Keeping You Informed

- Consultation with the public will continue throughout the six to eight year regulatory process at an intense level through newsletters and publications, open houses, website, speaking engagements, attendance at public events with mobile exhibit, briefings with key stakeholders including municipal, provincial and federal politicians, and media

Consultation with Aboriginal Peoples

- A Protocol agreement, signed by Saugeen Ojibway Nations (SON), OPG, and NWMO, provides a framework for SON's participation in the regulatory approval process and for the DGR project

- Discussions with the Historic Saugeen Métis and the Métis Nation of Ontario about the proposed DGR project have been initiated to facilitate their participation in the regulatory approval process

For more information please visit **www.nwmo.ca/dgr**

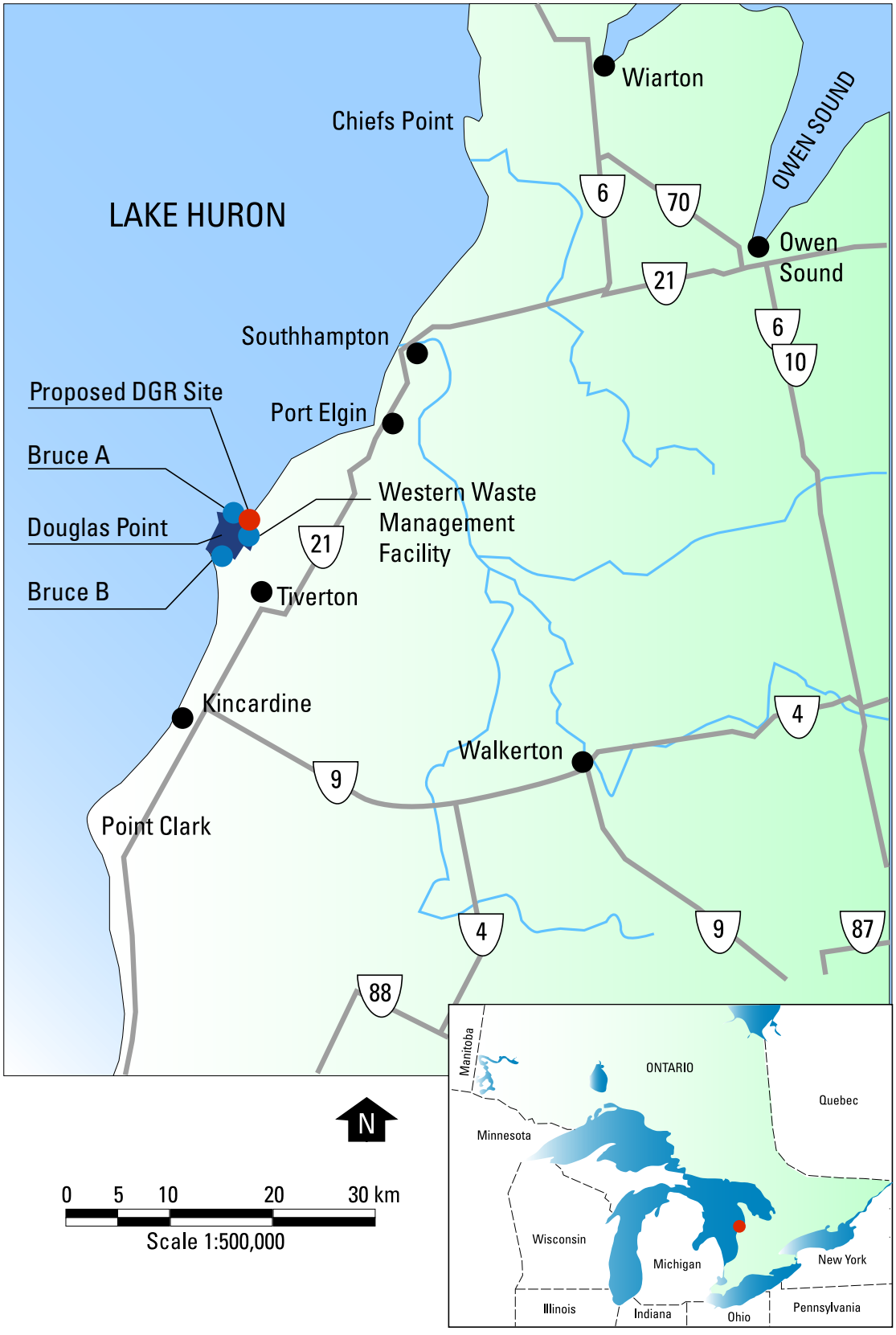
DEEP GEOLOGIC

REPOSITORY

FOR OPG's LOW & INTERMEDIATE LEVEL WASTE

ANNUAL REPORT
2008

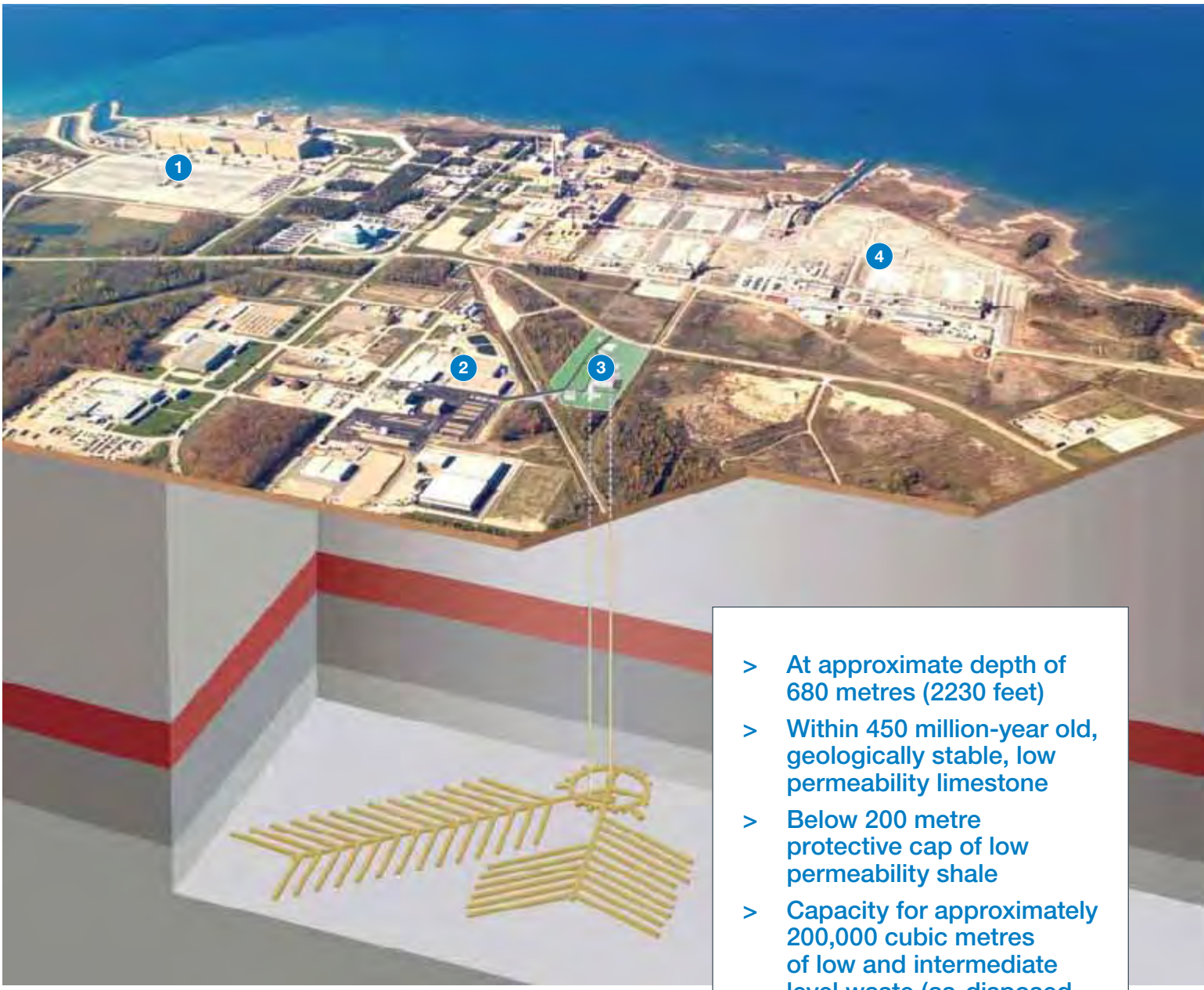
nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES



The Deep Geologic Repository is proposed adjacent to the Western Waste Management Facility in the Municipality of Kincardine

Contents

Key Features



1: **Bruce B Generating Station**
2: **Western Waste Management Facility**
3: **DGR Project Site**
4: **Heavy Water Plant Lands**

- At approximate depth of 680 metres (2230 feet)
- Within 450 million-year old, geologically stable, low permeability limestone
- Below 200 metre protective cap of low permeability shale
- Capacity for approximately 200,000 cubic metres of low and intermediate level waste (as-disposed volume equivalent to 160,000 cubic metres as stored at WWMF)

The DGR Project

Following completion of an Independent Assessment Study undertaken jointly by OPG and the Municipality of Kincardine in 2004, a Host Community Agreement was negotiated. A telephone poll conducted within the Muncipality of Kincardine by an independent company indicated community support. Ontario Power Generation (OPG) initiated the regulatory approvals process for the proposed Deep Geologic Repository (DGR) in 2005. The project has received the support of all municipal councils in Bruce County.

In 2008, project activities related to geoscientific characterisation, repository safety analyses, environmental assessment and conceptual facility engineering design continued. These activities are being conducted in support of the regulatory approvals process, through which OPG expects to receive a site preparation and construction licence in 2012. The Project, if approved, will provide long-term management of approximately 200,000 m^3 (as-disposed volume) of low and intermediate level radioactive waste (L&ILW).

The waste, which is produced as a result of the past and ongoing operation of OPG-owned nuclear generating stations at Pickering, Darlington and Bruce, will be emplaced in rooms about 680 m (2230 feet) underground in very low permeability Ordovician age limestone that is overlain by thick and very low permeability shale. This rock has remained stable for more than 450 million years through geologic upheavals, major climate change and glacial cycles. It will provide assurance for the safe containment and isolation of the waste many thousands of years into the future.

The DGR will be comprised of surface facilities to receive the waste and to support the underground facilities which include two shafts, and underground tunnels, emplacement rooms and maintenance areas excavated in the rock. The waste will be taken underground by hoist via a vertical shaft and placed in a series of emplacement rooms.

The DGR will be located adjacent to the Western Waste Management Facility (WWMF) at the Bruce site, near Tiverton, Ontario in the Municipality of Kincardine. Much of the waste to be placed in the DGR is already located at the WWMF.

Based on the current proposed schedule, construction of the DGR will commence in 2013 subject to receiving a construction licence, an operating licence will be sought in 2017, and waste will be placed in the DGR commencing around 2017. Emplacement activities would continue for a period of approximately 40 years. Once the DGR ceases to receive waste, and after a period of environmental monitoring, regulatory approval would be sought to decommission the facility. On receiving a decommissioning licence, the DGR would be closed by sealing the vertical repository access shafts with engineered seals comprised of clay-based, asphaltic and concrete materials.

Borehole hydraulic testing trailer

Transition of the DGR Project to the NWMO

Effective January 1, 2009, OPG contracted with the Nuclear Waste Management Organization (NWMO) to undertake a number of activities on its behalf to develop the DGR. As part of the arrangement, OPG staff that had been working on the DGR project became NWMO employees.

The NWMO is a not-for-profit company established under the Nuclear Fuel Waste Act by OPG, Hydro Québec and New Brunswick Power, the nuclear power utilities in Canada, to implement a long-term solution for Canada's used nuclear fuel.

The NWMO's implementation of Adaptive Phased Management (APM) plan for the safe management of Canada's used nuclear fuel is a separate project from OPG's proposed Deep Geologic Repository (DGR) and will remain so. Combining the expertise of key staff allows them to benefit from mutual experiences and lessons learned in the application of technology for deep geologic repositories, community consultation, and the collaboration with international partners. The DGR project will benefit from skills, knowledge and relationships developed in the APM program.

OPG continues to be the sole owner of the DGR and the DGR will only accommodate OPG's low and intermediate level waste as described in the current Host Community Agreement. The NWMO will be the Project Manager for the DGR project overseeing licensing and development activities. The DGR Project will proceed as planned, while honouring all commitments in the hosting agreement with the Municipality of Kincardine.

Regulatory Approval Process

The regulatory approval process that was initiated in December 2005, continues to progress toward a site preparation and construction licence. The DGR project was referred to a review panel under the Canadian Environmental Assessment Act, in June 2007. Subsequently, in April 2008 the Canadian Nuclear Safety Commission (CNSC) and the federal Environment Minister, jointly issued draft guidelines for the Environmental Impact Statement (EIS) and the Joint Review Panel Agreement for a public review period.

After completing the public review process, which included providing participant funding to six environmental groups to assist them in participating in the process, the CNSC and Canadian Environmental Assessment Agency issued the final guidelines for the EIS and the Joint Review Panel Agreement on January 26, 2009. The next steps in the approvals process include site specific studies to verify the suitability of the Bruce site for implementation of the DGR concept and analysis of the potential effects of the project on the environment. Upon completion of the field studies and analysis of the results, the various studies will be documented in the EIS. The EIS, along with the Preliminary Safety Report, will be submitted to the Joint Review Panel in 2011. The Panel will issue the documentation for a public review period, and will also conduct its own review. The public review period will be followed by a public hearing where stakeholders will have the opportunity to present their feedback on the DGR project.

After the hearing the Panel makes a recommendation to the Minister of the Environment who takes it to Cabinet for the final decision. The EIS must be accepted before a site preparation/construction licence can be issued.

Geoscientific Site Characterisation Program

Geoscientific site characterisation activities continued in 2008 as part of a multi-phase 4-year program initiated in 2006. The geoscience work program is divided into two key areas; site-specific characterisation studies that involve, among others, a multi-disciplinary deep drilling program at the Bruce site; and a Geosynthesis program that combined with information from the site-specific studies describes the geoscientific basis for understanding the past, present and future geologic evolution of the site as it influences DGR safety.

Geoscience Activities

During 2008, key progress involved the completion of two deep vertical boreholes, DGR-3 and DGR-4, which were drilled, cored and tested through the sedimentary sequence underlying the Bruce site to depths of 860 m below ground surface. The addition of these two boreholes in combination with information from two others completed in 2007 has generated a 3-dimensional understanding of the geologic conditions and properties for the bedrock formations hosting and enclosing the DGR. The results of the current site investigations were, in part, included in the Phase I Geosynthesis and six accompanying Supporting Technical Reports, which were issued in late 2008. These peer-reviewed reports, listed below, provide a description and synthesis of regional geologic, hydrogeologic, hydrogeochemical and geomechanical information that will aid development of the DGR Safety Case.

- Phase 1 Geosynthesis
- Phase 1 Long Term Climate Study
- Phase 1 Long Term Cavern Stability
- Phase 1 Regional Geology, Southern Ontario
- Phase 1 Regional Geomechanics, Southern Ontario
- Phase 1 Regional Hydrogeochemistry, Southern Ontario
- Phase 1 Hydrogeology Modelling

These reports are available on the OPG web site at: **www.nwmo.ca/dgr**.

Geoscientific investigations of the Bruce site are scheduled for completion in spring 2010. Upon completion, the program will have benefitted from the completion of 6 deep boreholes, including, two inclined deep boreholes, DGR-5 and DGR-6, planned for 2009. These two boreholes will be drilled on an incline of about 65° to purposefully attempt to intersect sub-vertical bedrock structure of potential interest to the DGR Safety Case. A final geosynthesis document describing the site characteristics based on both regional and site-specific studies as relevant to DGR safety is scheduled for completion in the fall of 2010.

Top: **Rock core retrieved from DGR-3**

Bottom: **Workover rig hydraulic testing at DGR-4**

Top: **Geologists show keen Interest in the core from DGR-3 and DGR-4**

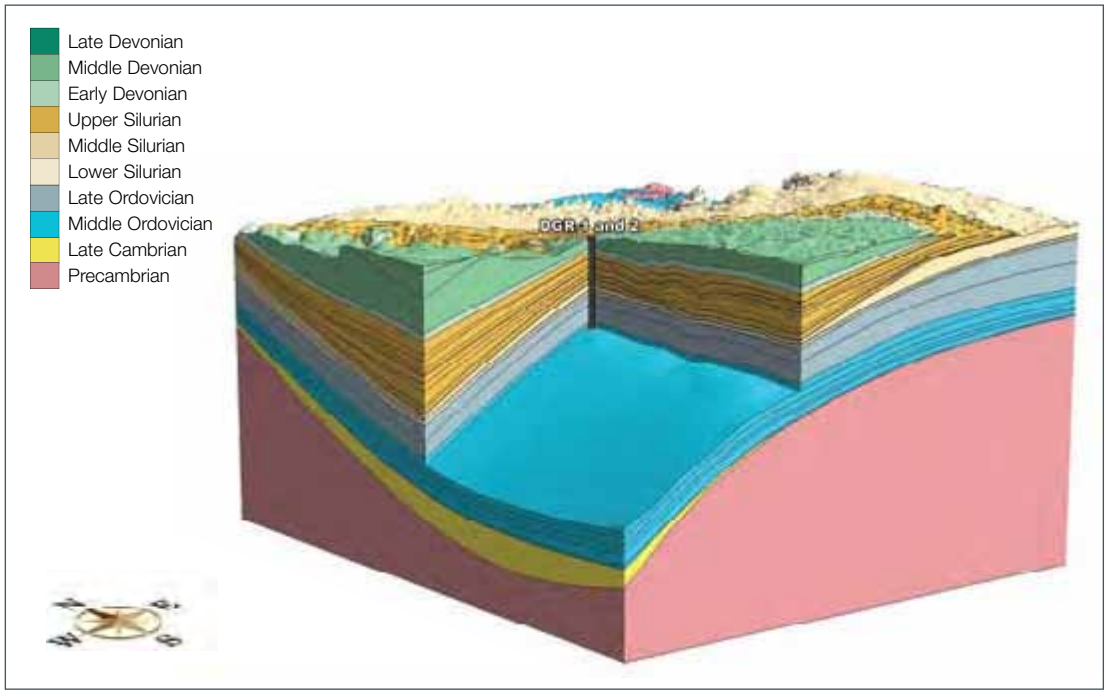
Bottom: **Technical experts gather for a DGR Geosynthesis Workshop**

An Evolving Understanding: Interim Results

The Geoscientific investigations conducted to date at Bruce site are providing useful insight as to the ability of the geologic layers hosting and enclosing the proposed DGR to safely contain and isolate the L&ILW. Specific attributes of the Bruce site that contribute to this understanding are described below.

PREDICTABILITY

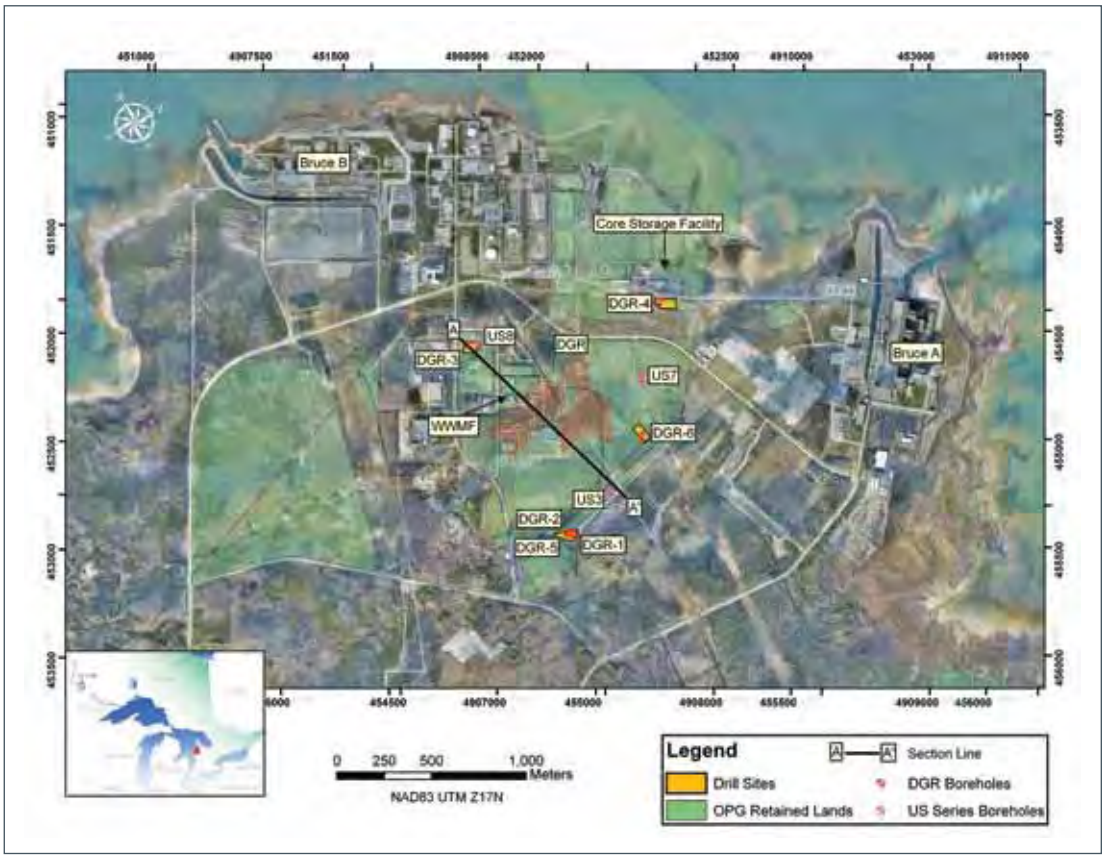
Regionally, the sedimentary bedrock stratigraphy was re-constructed using over 300 historical oil and gas well records within a 35,000 km^2 area surrounding the Bruce site. This stratigraphic model defines a near horizontally-layered, relatively undeformed and laterally extensive sedimentary sequence extending beneath Lake Huron that is comprised of carbonates, shales, evaporites and sandstones with predictable 'layer cake' geometry. Consistent with this understanding, the deep borehole program has confirmed that the sedimentary sequence beneath the Bruce site is comprised of 34 bedrock formations with a combined thickness of about 840 m. Individual formation contact elevations and thicknesses, particularly at the proposed repository horizon, have been found predictable to within metres. The repository, situated in the argillaceous limestone Cobourg Formation, is confirmed to be overlain by 200 m of shale.



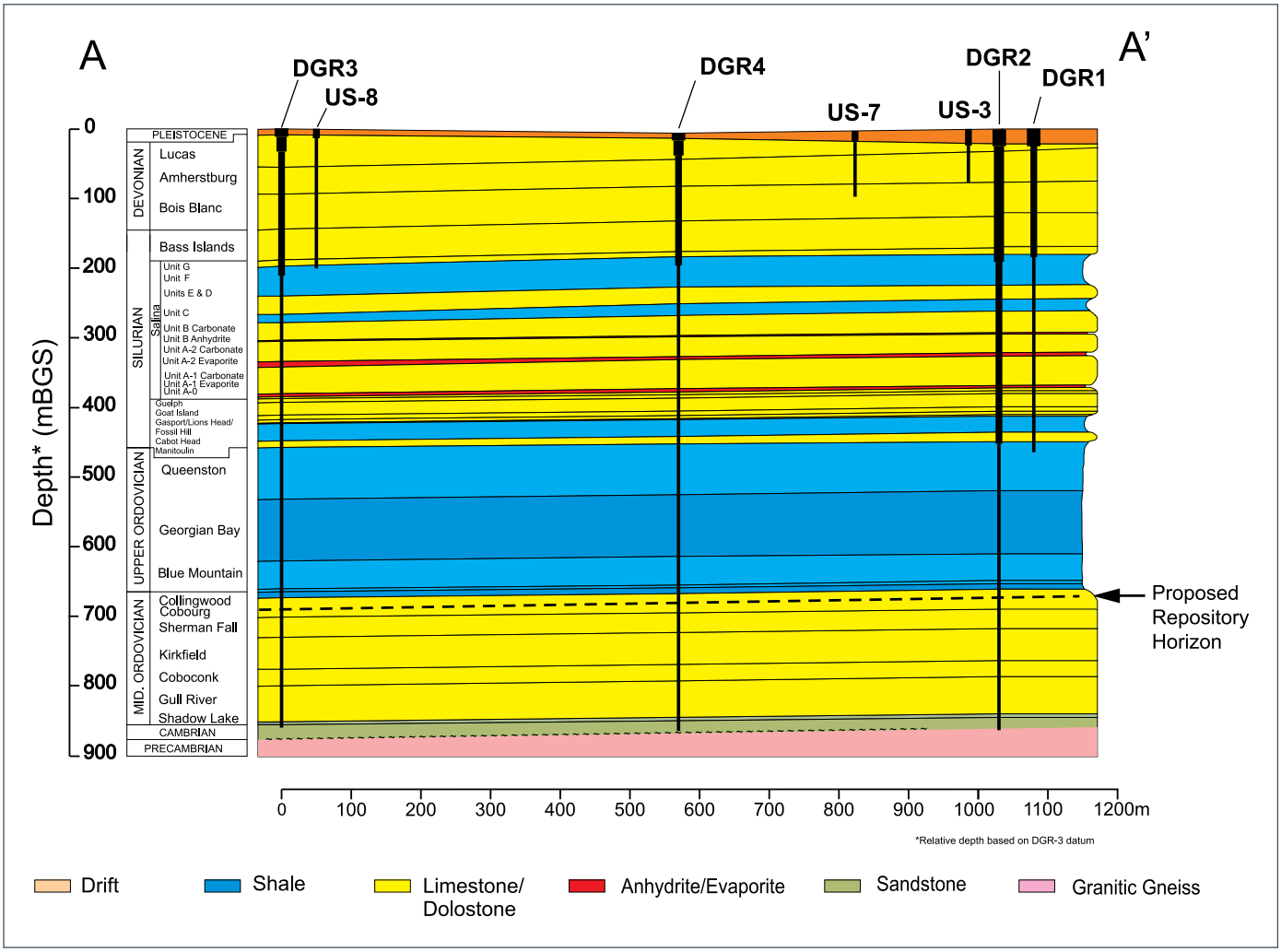
Michigan Basin – stratigraphic layering of rock

MULTIPLE NATURAL BARRIERS

The results of deep borehole testing confirm that the DGR repository horizon is under- and overlain by multiple layers of low permeability (≤10^{-12} to 10^{-14} m/sec) sedimentary bedrock. The repository is situated in a deep saline groundwater domain enclosed by Ordovician (490–443 million years) age rock formations. The overlying layers consist of three low permeability and laterally continuous shale formations (thickness 200 m). The underlying layers are limestone (thickness 150 m). A sequence of moderate to low permeability, Silurian (443–417 million years) age shales, dolostones, and evaporites (thickness 190 m) lie above these Ordovician formations within an intermediate groundwater domain. The borehole testing results are consistent with long-term borehole hydraulic monitoring data that reveal vertical groundwater pressure distributions within the sedimentary sequence. The presence of this pressure distribution can only exist with extremely low formation scale permeabilities and the absence of permeable vertical pathways.



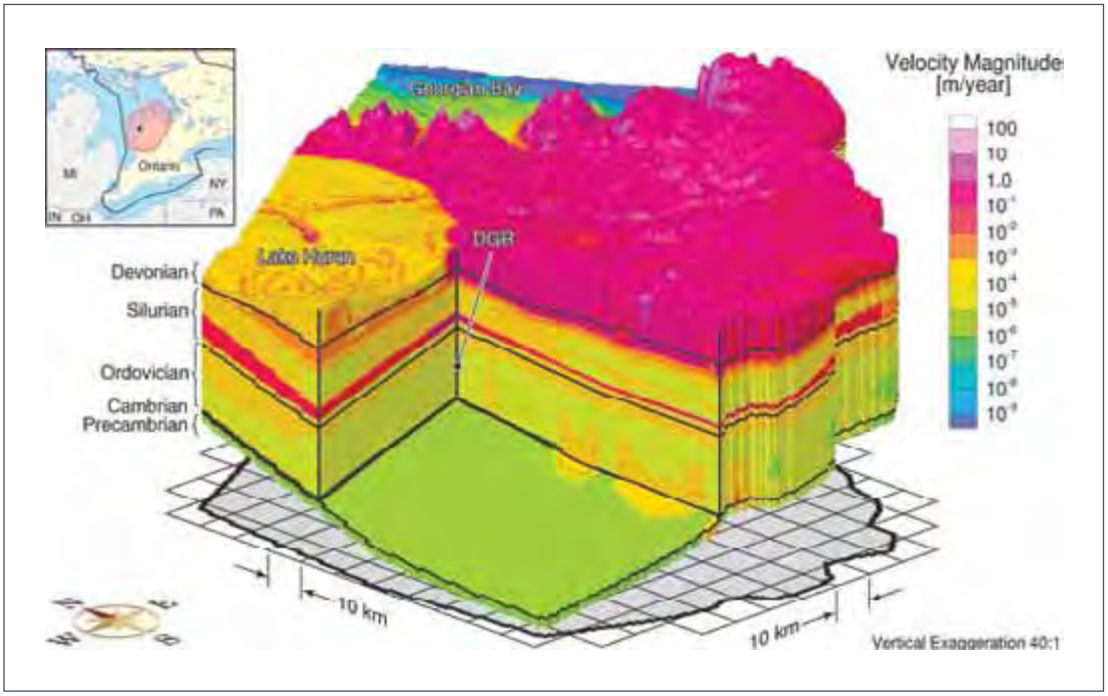
2009 Bruce Site Borehole Locations



Geologic cross-section as shown on DGR Borehole Location Plan

CONTAMINANT TRANSPORT DIFFUSION DOMINANT

The deep groundwater regime surrounding the DGR is ancient and is one in which contaminant transfer is diffusion dominated. Field and laboratory data gathered during deep borehole hydrogeologic and hydrogeochemical testing confirms this. The evidence includes the horizontally stratified, laterally continuous, low permeability sedimentary formations beneath the Bruce site and the occurrence of extremely saline (Total Dissolved Solids ≥ 250 gm/L) and chemically distinct bedrock formation groundwater and pore fluid compositions. These characteristics are all indicative of emplacement in the geologic past. This information contributes to the completion of numerical simulations of the regional and Bruce site groundwater movement. These simulations, which consider uncertainties related to past, present and future evolution of the groundwater system, consistently predict a stable diffusion dominant system enclosing the repository. It is estimated that solutes at the repository horizon would take more than 8 million years to discharge.

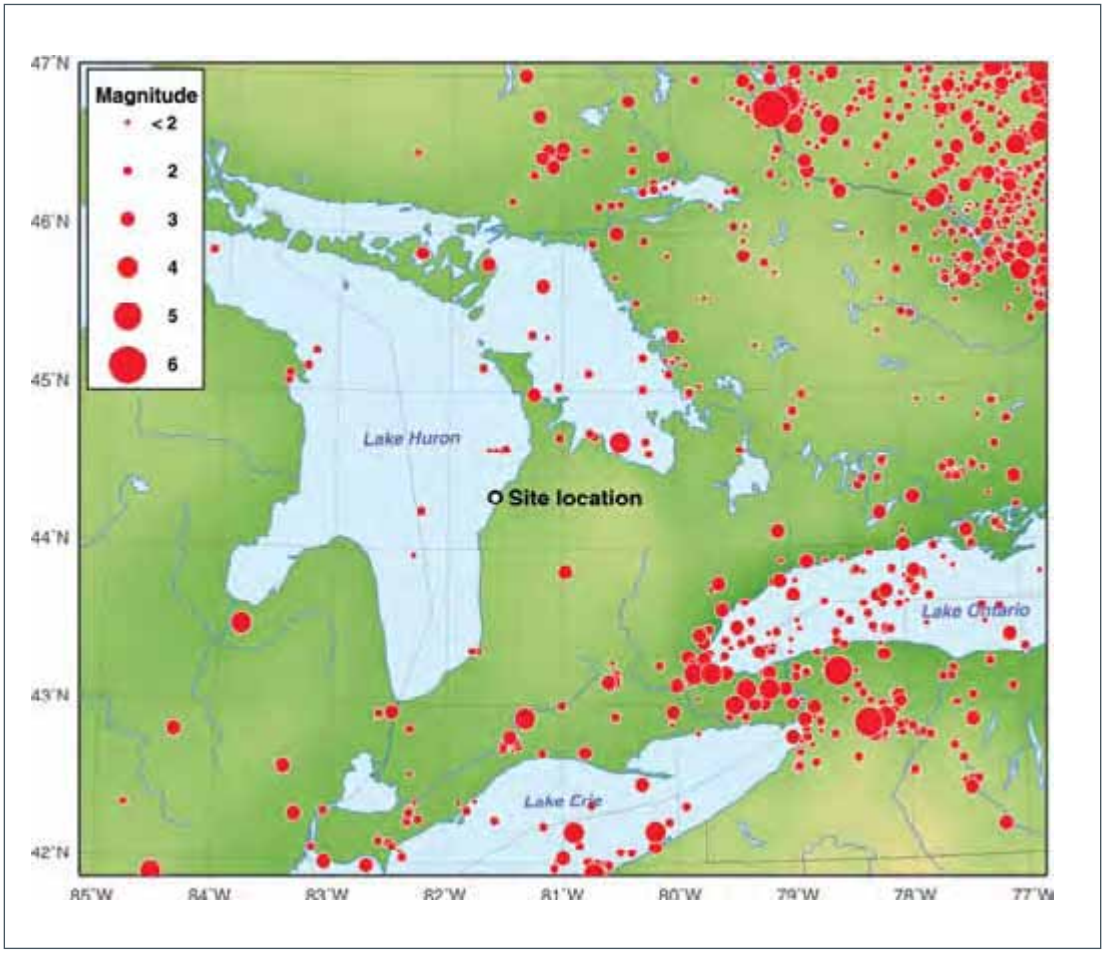


Modelling results – groundwater flow velocities
Phase 1 regional hydrogeology

SEISMICALLY QUIET SITE

The Bruce site is located within the tectonically stable interior of the North American continent, and is comparable in terms of stability to the Canadian Shield. Historic seismicity records indicate that there has not been a seismic event near Bruce site exceeding Magnitude 5 in over 180 years of observation.

A micro-seismicity borehole monitoring network was installed in the summer of 2007 to allow improved monitoring of micro-seismicity within a 50 km radius of the Bruce site. Monitoring of the new network is undertaken by the Geologic Survey of Canada's Canadian Hazard Information Service. Monitoring to date has not detected natural seismic activity greater than Magnitude 2.5 within a 150 km radius of the site. Seismic events below Magnitude 2.5 would not normally be felt at surface.



Seismic activity (start of historic records – 2007)

GEOMECHANICALLY STABLE HOST ROCK

The repository opening should be dry and stable. This assertion is supported by evidence gathered through review of underground construction experience within the Cobourg Formation, coupled with results from borehole permeability testing, geomechanical core testing, and numerical simulations of operational and long-term repository opening stability. A practical example of an underground opening in the Cobourg Formation includes the Darlington Nuclear Generating Station cooling water intake tunnel, which provided a stable, dry opening with little rock support only 30 m beneath Lake Ontario.

Darlington cooling water intake tunnel

NATURAL RESOURCE POTENTIAL IS LOW

The results of petroleum well drilling, and the coring and testing of the deep boreholes on Bruce site, coupled with knowledge of the geologic setting, strongly suggest that viable commercial oil and gas reserves do not exist within 40 km of the Bruce site. Commercially viable base metal deposits have not been identified in the study area.

GRG examines rock core

Geoscience Review Group

The mandate of the Geoscience Review Group (GRG), who provided guidance and oversight of the first phase of the geoscientific studies, was renewed for the second phase of the Geoscientific Site Characterisation Program. The GRG comprises internationally renowned scientists and engineers whose role on the DGR project is to ensure that information and lessons learned from their experience in similar international programs are reflected in the DGR project.

During 2008, the GRG attended workshops at which the results of the Bruce site and regionally based geosynthesis work programs were presented, and provided input and comment. The GRG also worked with the geosynthesis team to reconcile comments on the Phase 1 Geosynthesis report, issued in 2008.

Safety Assessment

The safety of the DGR during the operational phase and over the long-term, after operations have ceased and the facility has been decommissioned, are being studied. These technical studies of the operational and long-term safety of the proposed DGR will contribute to the environmental impact statement and the submissions supporting the site preparation/construction licence application. Canadian and international guidelines are being followed in the safety assessments.

Preclosure Safety

The preclosure safety assessment covers the period from the start of operations to the closure of the facility. Activities are currently focused on identifying the potential radiological impact of the DGR on workers and members of the public and developing an estimate of the radiological emissions for use in assessing possible impacts. Work is also being done to identify accidents, which could occur as a result of DGR operational failures or external hazards. The potential consequences of these accident scenarios are also assessed.

Based on experience from the WWMF operations, small amounts of tritium and C-14 are expected to be released from the DGR under normal operating conditions, dropping to zero as the DGR is closed. The potential sources of air emissions are the waste receipt building and the repository ventilation shaft. The potential sources of water emissions are the waste receipt building and the sump water pumped out of the repository.

The potential doses due to these small releases are estimated to be similar to the low doses presently observed for the WWMF, where many of the wastes are currently located. These results suggest that there are no concerns with respect to exposure to members of the public during normal operations of the DGR.

Accident scenarios were postulated for the DGR facilities, both above and below ground. These accidents were screened for likelihood and worst-case scenarios were identified for analysis. The accidents considered included breach of waste package and fire. The preliminary analysis suggests that radioactivity released from above or below ground accidents will not harm members of the public.

Future work will continue interacting with the engineering team to refine the design, and to improve the assumptions used in the safety analysis.

Postclosure Safety

The postclosure safety assessment period will start when the facility is closed and sealed, and continues to the time when the maximum dose impact is predicted to occur. The purpose of the safety assessment is to quantitatively assess the postclosure radiological and non-radiological safety of the proposed DGR. In the assessment, uncertainty in the future evolution of the site is addressed by analyzing a range of future scenarios.

Ensuring the safety assessment incorporates information from the conceptual design report

Scenarios being considered for the future evolution of the DGR system include the Normal Evolution Scenario, which describes the expected long-term evolution of the repository and site following closure, and four disruptive scenarios, which consider events with low probability that could disrupt the repository system. These include, for example, future human intrusion into the repository, as well as the effects of a very large earthquake.

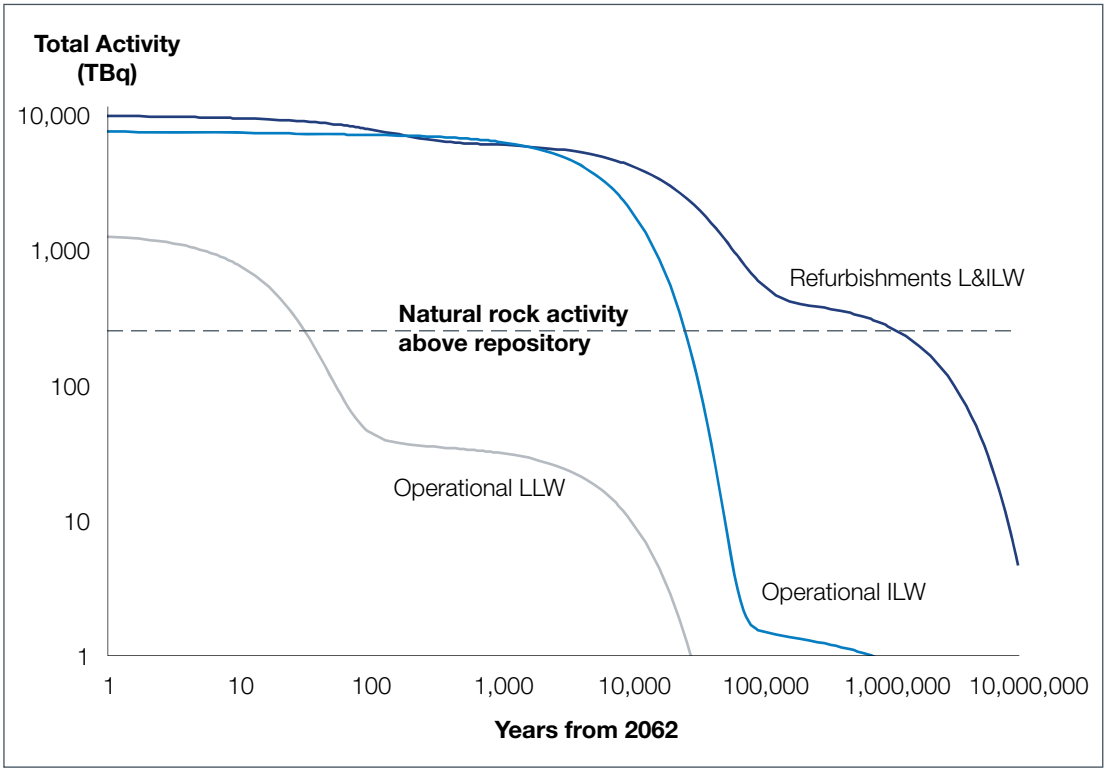
The current results of this work predict that there would be very little impact from the repository. Observations which contribute to this prediction include that the host rock is very effective in retarding movement of radionuclides, and the repository will take a very long time to resaturate. Other key observations which will be considered further in ongoing work include the importance of the sealed shaft as a potential pathway for radionuclides, and the importance of C-14 containing carbon dioxide and methane gas generated from decomposing organic and plastic waste.

Waste Inventory

The understanding of the waste inventory is based on more than 25 years of historical data. The radionuclide content has been measured and estimated using a variety of standard methods. The total estimated activity for disposal in the repository is approximately 980 PBq (9.8×10^{17} Bq) at 2017, the earliest possible start of operation. At the earliest assumed closure time (about 2062), the total activity is about 17 PBq (1.7×10^{16} Bq) (taking into account new waste being emplaced as well as decay of already stored wastes).

The total radioactivity will decrease with time due to radioactive decay. The following figure illustrates the radioactivity within the three major classes of waste – operational low-level waste (e.g. cleaning materials, mops), operational intermediate-level waste (e.g. water cleaning resins), and refurbishment waste (e.g. steam generators, pressure tubes). Initially, key radionuclides are tritium and C-14. At long times, the residual radioactivity is primarily due to Zr-93. For comparison, the low natural radioactivity of the host rock over the repository is also shown in the figure.

In 2008 additional work was undertaken to improve our knowledge of waste in areas of most importance to the safety case. This work included sampling of specific wastes currently stored at the WWMF. Results of this work will provide input to future safety assessment work.



Total radioactivity in the DGR as a function of time

Conceptual Design of the DGR

Conceptual layout of DGR surface facilities adjacent to WWMF

A conceptual design for the DGR was completed in 2008. This work updates and advances previous conceptual design work completed in 2004. The scope of work included all aspects of the DGR, including its construction, the receipt of waste from the WWMF and nuclear generating stations, and the emplacement of the waste in the DGR.

The surface features of the DGR include the main shaft, ventilation shaft and waste rock management area. The main shaft area will have a headframe equipped with a hoist to handle a 40-tonne payload, a waste package receiving building, and buildings housing equipment to heat and cool air to be delivered underground. The waste package receiving building and shaft office will be directly connected to the main shaft headframe building. In addition, a maintenance shop and storage area will be attached to the main shaft headframe building. The ventilation shaft area will include a headframe building with airlock, a hoist house, a waste rock bin, and an exhaust fan building.

A bridge will be constructed to provide the link between the existing WWMF and the DGR.

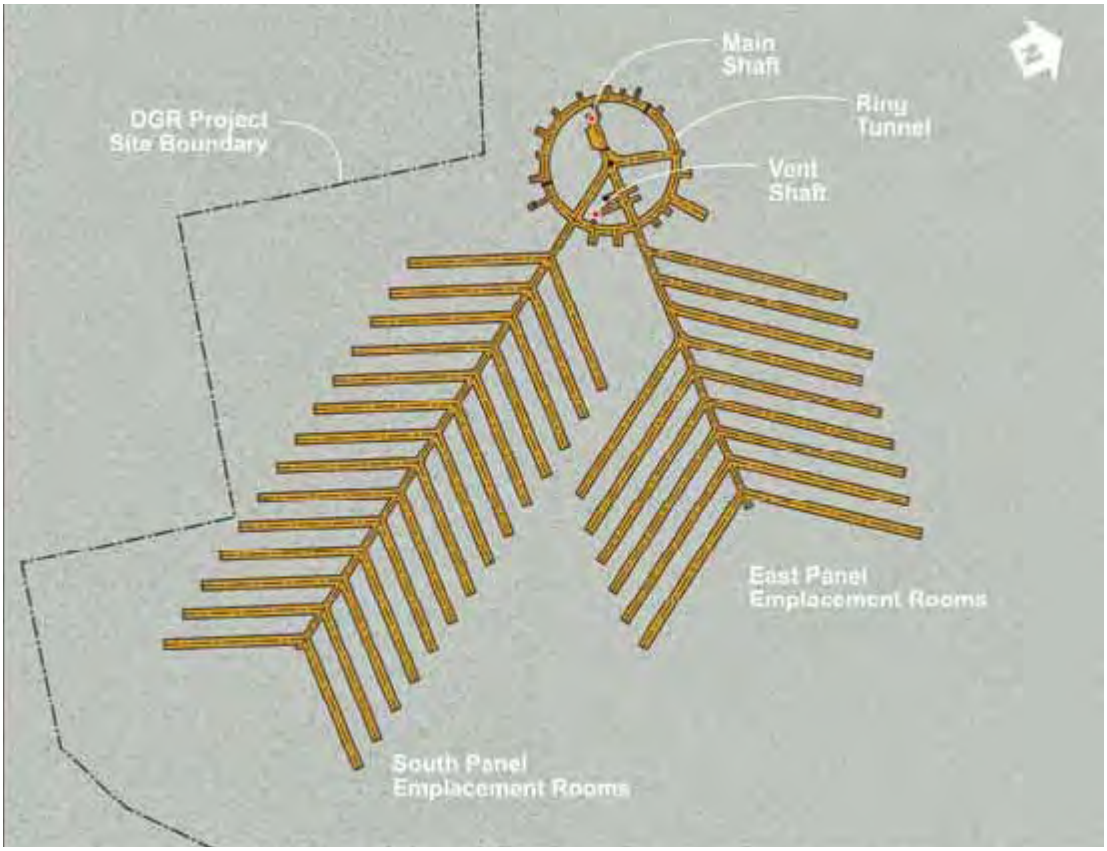
The reference capacity of the DGR is nominally 200,000 m^3 of “as-disposed” waste.

It is currently assumed that the DGR will be fully developed during initial construction.

The underground layout of the repository includes two vertical shafts located on a central ring tunnel. Two emplacement room access tunnels radiate out to the south and east, and smaller ancillary rooms will also be provided for administrative and maintenance activities off the central ring tunnel. This arrangement facilitates having all underground infrastructure near to the shafts, while keeping the emplacement rooms further from areas that are normally occupied or high activity areas.

Shafts will be excavated by traditional drill and blast methods in the harder dolostones, with vertical roadheaders currently being considered to excavate in the shales. A horizontal roadheader is the proposed excavation method for the access tunnels and emplacement rooms.

Storage for the waste rock volume, estimated to be about 700,000 m^3, will be at surface to the northeast of the two shafts.



Top: **Conceptual drawing of the surface facilities of the DGR**
Middle: **Conceptual drawing of a low level waste emplacement room in the DGR**
Bottom: **DGR underground layout**

Community Engagement

In 2008, OPG continued to take its consultation activities to locations and events where the public would already be gathering. The DGR exhibit trailer, in conjunction with staff, attended the Wiarton, Port Elgin, Walkerton and Kincardine Home Shows, the Kincardine Scottish Games, the Chippewas of Nawash PowWow, the International Plowing Match, the Port Elgin Pumpkinfest, Clarington Family Safety Day, and summer markets in Kincardine and the surrounding area.

Progress was made toward reaching agreement on a Protocol with the Saugeen Ojibway Nation (SON). In April, OPG and SON initialed a Protocol and agreed to work to finalize the schedules relating to implementing the agreement before signing the final Protocol. These discussions are expected to continue in 2009 and result in signing the Protocol. At meetings to discuss the Protocol, OPG also provided updates on the status of the DGR project.

Contact was made with two local Métis Community Councils, leading to meetings with the Saguingue Community Council and the Métis Nation of Ontario to provide an overview of the DGR project and to discuss how they would like to participate in the project. These discussions are expected to continue in 2009.

In March 2008, OPG took the opportunity to present a “Geology Rocks” workshop, based on the onsite drilling activities and the rock core, to members of the Girls in Real Life Science Club. The workshop provided a day-long discussion of careers in geology, key points about the DGR, an examination of fossils, and hands-on experience classifying rocks based on rock properties.

OPG and the DGR project also sponsored and participated in the International Plowing Match which was held in Teeswater, Ontario in September 2008. This event was attended by more than 97,000 people. Attendees were from Ontario and the world, including school children and the agricultural community, many of whom visited the exhibit to obtain information and provide feedback about nuclear waste management and the DGR project.

A series of Open Houses was held in the local communities of Kincardine, Ripley, Port Elgin, Walkerton, Wiarton, Owen Sound and Chesley during November. More than 150 people attended the Open Houses, most to receive updated information on the status of the DGR project but some to learn about the project for the first time, some to express their opposition to nuclear energy or the project, and some to discuss employment opportunities for local residents in association with the project.

Top: **A representative of the next generation attends a DGR open house**

Middle: **Girls in Real Life Science participate in the DGR Geology Rocks Workshop**

Bottom: **Fall Open House 2008**

Top: **OPG on behalf of the DGR Project sponsored and participated in the 2008 International Plowing Match**

Bottom: **OPG's DGR Exhibit participated in the Nawash PowWow**

Girls in Real Life Science participate in the DGR Geology Rocks Workshop

Throughout the year, project staff made more than 45 presentations on the DGR project to local community and service groups, and professional organizations. Many of these presentations provided updates on the DGR project to groups previously addressed, but OPG was also able to extend its network to service groups in Tobermory, Grand Bend, and to professional groups in London and Port Hope.

Three DGR Project newsletters were published and distributed by mail to nearly 25,000 local residences. The newsletters focused on the conceptual design of the DGR, the geologic model for the DGR, how the information gathered to date in the geoscientific site characterisation is contributing to the safety case, the Open Houses, and the second Rock Core Workshop.

The key comments received on the project continue to be associated with whether used nuclear fuel or waste from other producers will be stored in the DGR, the proximity of the DGR to Lake Huron and the Great Lakes, and the potential for contamination of drinking water. The community stakeholder events provided an opportunity for OPG to respond to the questions and comments that are provided.

Environmental Assessment Process

Scientists assess fish population

In January, 2009, following a public review and comment period in 2008, the Canadian Nuclear Safety Commission and the Canadian Environmental Assessment Agency released the final guidelines for the Environmental Impact Statement (EIS) for the DGR project and the Joint Review Panel (JRP) agreement. The EIS guidelines identify the information needed to examine the potential environmental effects of the proposed project as well as requirements for a licence to prepare a site and for construction. The JRP agreement deals with the establishment of an independent review panel including procedures for appointing the JRP members, the proposed terms of reference (i.e., responsibilities) for the panel and the process for conducting the reviews.

The compilation and documentation of baseline environmental data to support the EIS continued in 2008. These data provide the starting point from which the potential effects of the DGR project on the environment, including the physical, cultural, social, and economic components, will be assessed.

Left: **Wild turkeys populate the Bruce nuclear site**
Right: **Habitat assessment in winter conditions**

The information compiled to date indicates that:

- 21 species of birds were identified in the project area (lands proposed for the DGR project)
- two flocks of wild turkeys nest and live at the Bruce site
- Several varieties of frogs and turtles were sited in the local study area which includes the Bruce site and nearby surrounding lands
- there is evidence of chimney building crayfish in the project area
- white-tailed deer were sighted in the local study area.

Project Schedule

The DGR project continues to be on schedule with the geoscientific characterisation work expected to be completed in 2010. This information forms the basis for the safety assessment and the environmental impact statement, which will be submitted to the review panel early in 2011. The Panel hearing is expected to take place in 2012. If the review panel accepts the environmental impact statement, the site preparation/construction licence(s) could be issued in 2012.

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NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

www.nwmo.ca/dgr

Western Waste Management Facility

Our commitment to safe, responsible management

The electricity generated by nuclear power emits virtually no greenhouse-gas causing emissions. The by-product of electricity generated from nuclear power is nuclear waste, which is managed in a contained and controlled manner.

Every employee of OPG's Nuclear Waste Management Division recognizes and accepts the responsibility for the management of our waste in an environmentally, socially and financially-responsible manner. We are dedicated, uncompromising and absolute in our commitment to the safety of fellow employees, the public, the communities where we operate, and the environment.

Our commitment to safety and the environment

OPG has been safely storing nuclear waste from the Bruce, Pickering and Darlington generating stations for more than 40 years and we are proud of our operating record and the progress we have made towards long-term solutions for the future.

Western Waste Management Facility (WWMF) employees are well trained and regard safety for employees, the public and the environment as their top priority. They have accomplished significant milestones in these areas, such as achieving long-standing records of no "Lost Time Accidents" and excellent environmental performance. Safe work planning, safe work practices and attention to detail, along with a safety-conscious work attitude, has led to this excellent safety performance.

The WWMF has an Environmental Management System (EMS) that establishes strategies, objectives and targets for the facility to improve environmental performance. The EMS is based on the International ISO 14001 Standard, which provides a tool for ensuring and demonstrating a high standard of environmental responsibility. The WWMF was initially certified to the ISO environmental standard in 1999 and has successfully re-certified every year since.

- **OPG has been safely managing radioactive waste for more than 40 years**
- **The WWMF manages and provides interim storage of low and intermediate level waste from OPG's Pickering and Darlington nuclear stations and the Bruce Power stations**
- **The WWMF's Used Fuel Dry Storage Facility stores used fuel from the Bruce site only.**

Through employing highly qualified employees, careful planning, development of technology and equipment and the use of sound operating procedures, OPG has ensured that radioactive waste is managed safely and poses no significant risk to employees, the public or the environment.

ONTARIO POWER GENERATION

Regulatory authority

The nuclear industry is one of the most strictly regulated in Canada. The overall regulation of nuclear reactor operation and nuclear waste management in Canada is the responsibility of the Canadian Nuclear Safety Commission (CNSC). Every aspect of the management of low and intermediate level waste and used nuclear fuel is regulated by the CNSC.

What is nuclear waste?

During the operation of nuclear generating stations, waste is produced much like any other industry. Some of this waste becomes radioactive and must be handled using special procedures. OPG categorizes the radioactive waste into low, intermediate and used fuel.

Low level waste

Low level waste consists of minimally radioactive materials that have become contaminated during routine cleanup and maintenance such as mop heads, cloths, paper towels, floor sweepings and protective clothing. These items make up about 95 percent of the total non-fuel waste volume.

Low level waste at the WWMF is handled by trained personnel to process for volume reduction or to store as is.

Low level waste from the Bruce, Pickering and Darlington nuclear generating stations is received at the Waste Volume Reduction Building at the WWMF where it may be processed through either incineration or compaction to reduce its volume or to be stored as is. Following processing, the low level waste is placed into above-ground concrete warehouse-like structures called Low Level Storage Buildings. About 3000 m^3 of low level waste is stored annually (just over the volume of an Olympic swimming pool). Storage for refurbishment waste (fuel channel waste and steam generators) from the Bruce reactors is also provided at the WWMF. The WWMF has about 70,000 m^3 (25 Olympic swimming pools) of low level waste in storage as of 2009.

Intermediate level waste

Intermediate level waste consists primarily of used reactor core components and resins and filters used to keep reactor water systems clean. Intermediate level waste is more radioactive than low level waste and requires shielding to protect workers during handling.

Intermediate level waste, because of its radiological and physical properties, is not processed for volume reduction. It is stored mainly in steel lined concrete containers that have been set into the ground. About 290 m^3 of intermediate level waste is stored annually and in total about 9000 m^3 (three and a half Olympic swimming pools) is in storage as of 2009. Intermediate level waste makes up about five percent of the total volume of non-fuel waste produced from the nuclear generating stations.

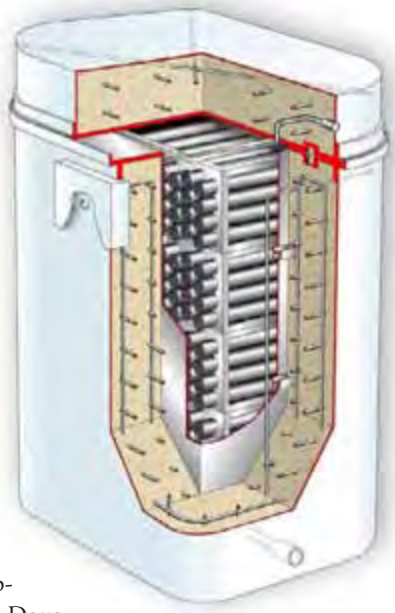
Low and intermediate level waste stored at the WWMF is continually monitored to ensure the integrity of the storage containers and can be retrieved at some future date for transfer to a long-term storage facility. The WWMF will continue to add storage structures as required (subject to applicable regulatory approvals). OPG is currently in the planning stages of a Deep Geologic Repository for the long-term storage of low and intermediate level waste at the Bruce site.

Ontario Power Generation employees carefully lower intermediate level waste into an in-ground storage container.

Used nuclear fuel

Used nuclear fuel, sometimes called high level waste because it is much more radioactive, is stored at the nuclear station site where it was generated. It is stored in the station's spent fuel bay, within the station, for at least 10 years. After that time it can be transferred to above-ground storage containers.

At the Western Waste Management Facility location, only used fuel from the Bruce Power stations is stored at the interim used fuel dry storage facility. The facility consists of a processing building and storage buildings. This facility went into operation in 2002 and is designed to provide storage space for about 2000 Dry Storage Containers (DSC). The overall Western Used Fuel Dry Storage Facility (WUFDSF) design includes four DSC storage buildings, each having the capacity to store about 500 containers. Two buildings have been commissioned (2002 & 2007) and construction of future storage buildings will be staged as additional space is required, with a new storage building built about every four to seven years.



Each dry storage container (DSC) is made of reinforced high-density concrete approximately 510 mm (20 inches) thick and is lined inside and outside with 12.7 mm (half inch) thick steel plate. This thickness of concrete provides an effective barrier against radiation.

Dry storage is a proven technology in use around the world. In Canada, dry storage is used by Hydro Quebec at Gentilly, New Brunswick Power at Point Lepreau and Atomic Energy of Canada at Chalk River and Douglas Point (located at the Bruce site). In addition to the facility at WWMF, OPG also operates dry storage facilities at the Pickering and Darlington nuclear sites.

Used nuclear fuel bundles are cooled in the station's spent fuel bay for a period of at least 10 years before being transferred.

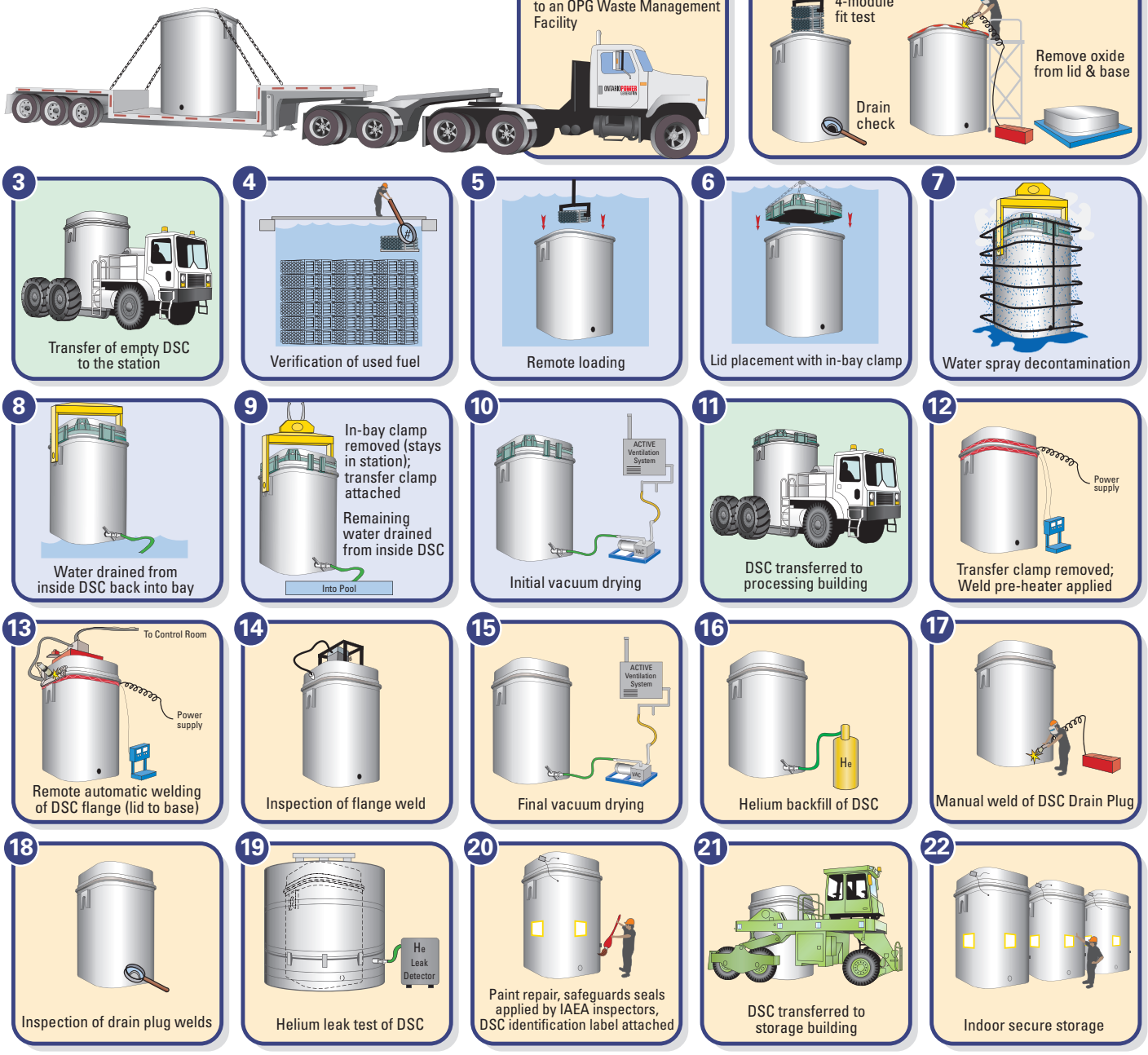
Dry storage process

The process of loading a dry storage container with used nuclear fuel begins first by submerging a 63-tonne container into one of Bruce Power's water-filled used fuel storage bays. Once in the storage bay, four modules each containing 96 used fuel bundles are loaded into the container under water. The used fuel bundles have been stored in the water-filled bay for at least 10 years, during which time they have cooled and become less radioactive.

The container, now holding 384 used fuel bundles, is removed from the bay and drained, decontaminated and vacuum dried. A transfer clamp secures the lid to the container which is moved to the dry storage facility with a large transport vehicle. Once received, the lid is welded to the container's base and the vent port is seal-welded. After the inside of the container has been vacuum dried, it is filled with helium gas. The remaining drain port is then seal-welded. The helium gas provides a means of leak detection for the sealed container and creates an inert atmosphere for the storage of used fuel. Before being placed into storage, the container undergoes rigorous testing to ensure that it is absolutely leak tight, and lastly, safeguard seals are applied by an inspector from the International Atomic Energy Agency (IAEA).

After weld-sealing, painting and installation of the International Atomic Energy Agency safeguard seals, the dry storage containers are placed in the storage building.

The used fuel dry storage process



Operations at the Waste Management Facility (WMF)

Operations at the Nuclear Generating Station (NGS) used fuel storage bay area

Transfer operations between NGS and WMF

Radioactive material transportation

A record of safety

OPG has an exceptional safety record in the transportation of radioactive materials by road. In almost 40 years, there has never been a release of radioactive materials during transportation. Our drivers are some of the best trained in their field. OPG ensures that they have high-level defensive driving training.

In a typical year OPG makes about 750 radioactive material shipments, covering about 500,000 kilometres. Shipments (roughly 23 percent) involve the transportation of low and intermediate level waste to the WWMF. A smaller number (roughly 13 percent) involve transporting tritiated heavy water from Bruce and Pickering to the Darlington Tritium Removal Facility for processing and remaining shipments involve the transportation of empty packages to and from different nuclear stations.

All of these shipments are logged into an OPG computerized database. This program logs information about the type of material being transported, point of origin, destination, etc.

Built for safety

Many different types of packaging are used to transport radioactive materials. All of the transport packages are built to requirements specified by the Canadian Nuclear Safety Commission. For example, the intermediate level waste transportation packages used for shipping spent resins and tritiated heavy water are built to Type B standards. According to federal regulations all Type B packages must be able to withstand a nine-metre drop onto an unyielding surface; a one-metre drop onto a steel pin; 30 minutes in an 800 degree celsius fire; and eight hours immersed in 15 metres of water. Only after field testing and/or computer analysis has demonstrated the packages can survive these tests will a licence to use the packaging be issued by the Canadian Nuclear Safety Commission.

OPG's radioactive material transportation program is further supported by:

- **Regular audits and safety assessments of transportation practices**
- **An ongoing training program**
- **Routine package inspection and maintenance, and**
- **A transportation emergency response plan that is audited both internally and externally by authorities like Transport Canada.**

Radioactive materials transportation is also regulated by Transport Canada's Transportation of Dangerous Goods Regulation. These regulations specify the documentation and administrative requirements in order to transport radioactive material on public roadways. The documentation must include specification of the contents on the shipping document, the labeling and placarding requirements, driver training requirements and an approved transportation emergency response plan.

Commitment to the future

OPG has an obligation to plan for the eventual decommissioning of our nuclear facilities including the Bruce Power leased reactors, and the long-term management of our nuclear wastes. OPG makes annual contributions to special funds dedicated solely for this purpose.

Our partnership with the Municipality of Kincardine to develop a Deep Geologic Repository for low and intermediate level waste on the Bruce site was endorsed by the community in 2005 and is now entering the rigorous environmental assessment stage, led by the Nuclear Waste Management Organization.

OPG has made a significant contribution to the Nuclear Waste Management Organization, which has recommended Adaptive Phased Management to the Federal government for the long-term management of used nuclear fuel in Canada, and endorsed in 2007.

Communicating our program

Although we are proud of our contributions to these initiatives, there is nothing we value more than our relationship with the people of Ontario. The safe storage of nuclear waste is done in a very transparent manner and OPG provides information in a variety of methods on nuclear waste management to the public.

For more information on our activities visit www.opg.com or call 519-361-6414 ext. 2764.

The deep geologic repository

for OPG's low and intermediate level waste

A long-term storage solution

Ontario Power Generation (OPG) has contracted the Nuclear Waste Management Organization (NWMO) to seek regulatory approval for construction of a proposed Deep Geologic Repository (DGR). This DGR, for the long-term management of low and intermediate level radioactive waste will be constructed on lands adjacent to OPG's Western Waste Management Facility (WWMF) on the Bruce nuclear site in the Municipality of Kincardine.

For over 40 years the WWMF has safely stored low and intermediate level waste from the Bruce, Pickering and Darlington nuclear sites on an interim basis. In 2002 the Municipality of Kincardine approached OPG to jointly review options for a long-term storage facility for low and intermediate level radioactive waste at the Bruce site.

An Independent Assessment Study identified three options deemed to be technically feasible and capable of safely storing the waste: the Deep Geologic Repository (DGR), Enhanced Processing, Treatment and Long-Term Storage and Covered Above-Ground Concrete Vault. In 2004 the Municipality of Kincardine by resolution endorsed moving forward with the DGR because of its higher safety margins.

The proposed DGR would manage about 160,000 cubic metres of low and intermediate level waste in underground emplacement rooms.

Only low and intermediate waste from OPG's Bruce, Pickering and Darlington generating stations will be accepted for storage in the DGR. Used fuel will not be stored in the DGR.

Committed to safety

The stability and predictability of the rock formations, along with their isolating capabilities, make an ideal setting where the waste can be safely stored while the radioactivity decays.

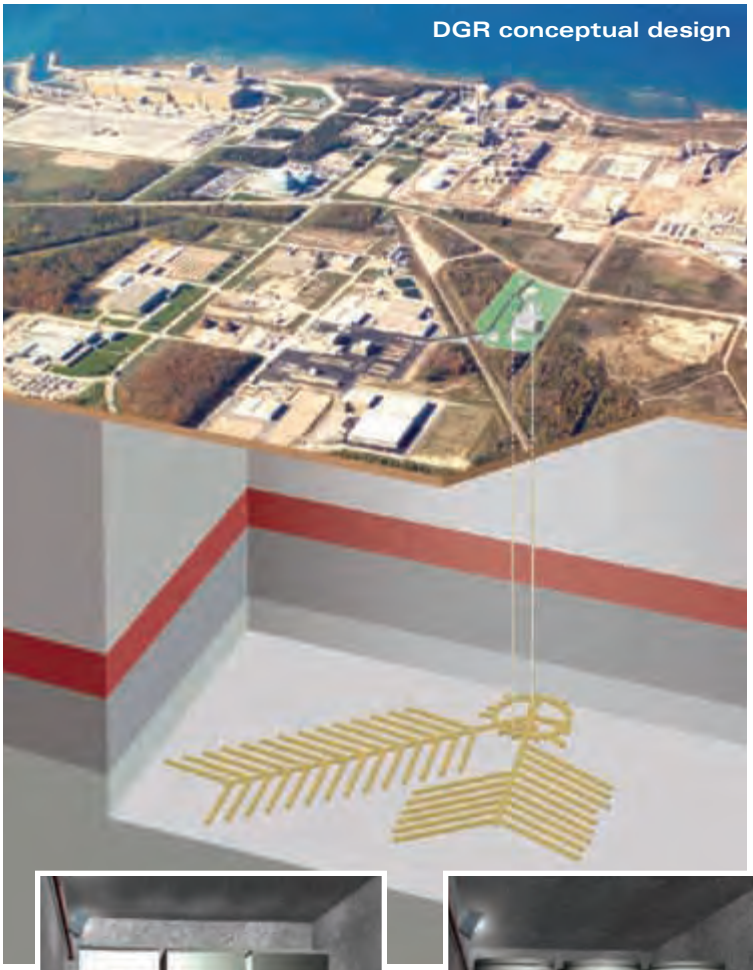
The proposed DGR location, 680 metres (2,230 feet) underneath the Bruce site, will be constructed in low permeability limestone capped by 200 metres of low permeability shale. These rock formations, thought to be in excess of 450 million years, have remained intact and without major faults or fractures through many geologic events.

In addition, the DGR is extremely isolated from all sources of groundwater, and the pore water at the level of the repository has a salt content more than eight times that of sea water indicating that it has been trapped at this level in excess of one million years. The salt content is also an indication that the pore water isn't mixing with the groundwater above.

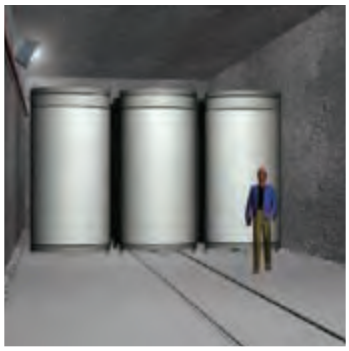
Verifying the site

A detailed four-year Geoscientific Site Characterization Program (GSCP) began in 2006 to verify the suitability of the DGR site. This scientific investigation, along with the information gained from environmental field studies, safety assessment and engineering/design, will assist in obtaining the necessary construction and operating licences from the Canadian Nuclear Safety Commission.

Formal environmental assessment and licensing processes began in 2005 and are expected to take six to eight years, with a public hearing to take place around 2012. Throughout this time period, there will be many opportunities for Kincardine and surrounding communities to learn more and to express their views on the proposed DGR.



Low level waste room



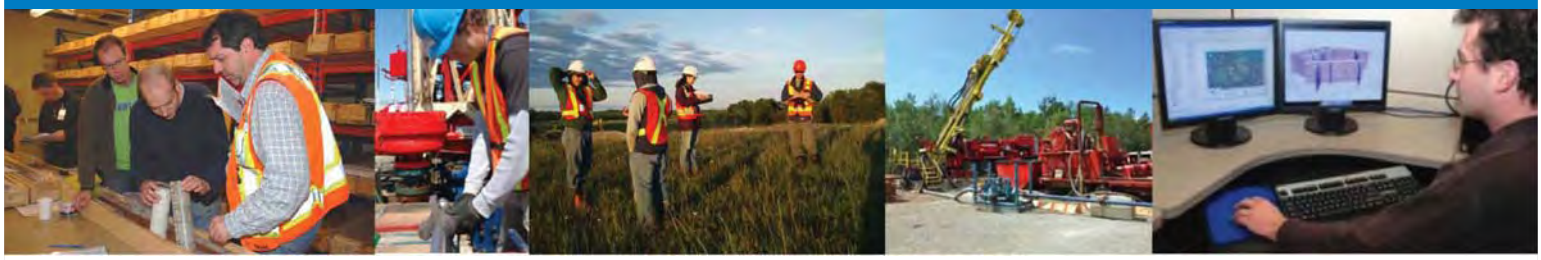
Intermediate level waste room

Recycled
Supporting responsible use of forest resources
www.fsc.org Cert no. SCS-COC-004789
© 1996 Forest Stewardship Council
Design, print, distribution: OPG Office Services

For more information please visit www.nwmo.ca/dgr or www.opg.com/dgr

Appendix D

Open House Display Panels



WELCOME

KEEPING YOU INFORMED

WHY WE ARE HERE:

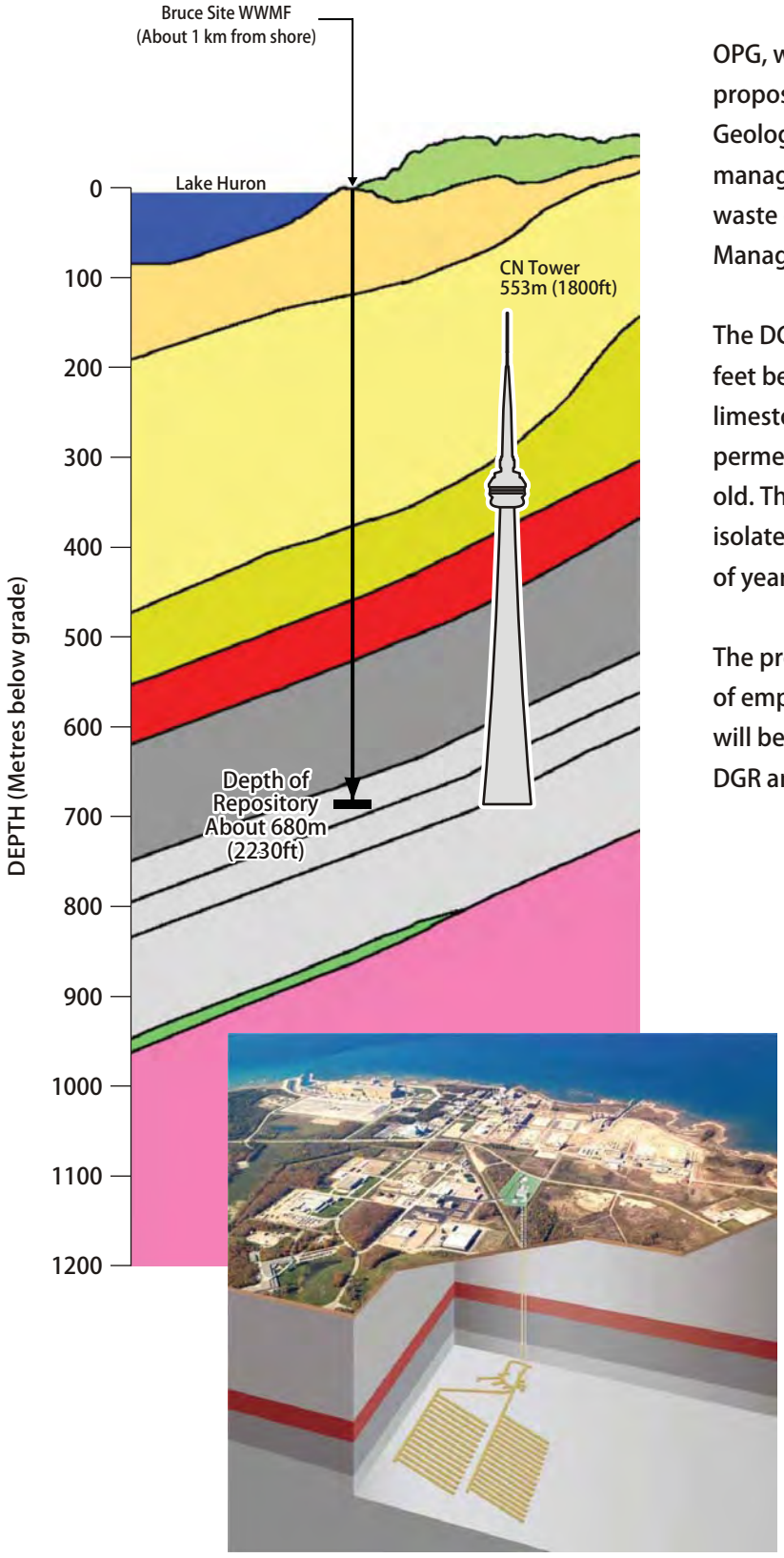
- Share information about Ontario Power Generation's proposed Deep Geologic Repository Project
- Provide an update on the status of work in support of the regulatory approvals process
- Answer your questions and obtain your feedback

WHO WE ARE:

- Ontario Power Generation (OPG) operates the Western Waste Management Facility and is the owner, licensee, and operator of the DGR
- The Nuclear Waste Management Organization (NWMO) has been contracted by OPG to seek regulatory approval for the DGR

OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

AN OVERVIEW OF THE PROPOSED DEEP GEOLOGIC REPOSITORY



OPG, with the support of the local municipality, has proposed the construction and operation of a Deep Geologic Repository (DGR) for the long-term management of low and intermediate level nuclear waste on lands adjacent to the Western Waste Management Facility (WWMF) in Kincardine, Ontario.

The DGR would be located about 680 metres or 2,230 feet below ground surface in low permeability limestone, beneath a very thick layer of low permeability shale, both more than 450 million years old. These sedimentary bedrock formations will safely isolate and contain nuclear waste for many thousands of years and beyond.

The proposed repository will be composed of a series of emplacement rooms. Conventional mining methods will be used to construct the repository. Access to the DGR and emplacement rooms will be by vertical shafts.

Key Features

- Proposed depth is about 680 metres (2,230 feet) within low permeability limestone – deeper than the CN Tower is tall
- Capacity of 160,000 cubic metres (m^3) of waste (200,000 m^3 with packaging)
- Located beneath a protective 200 metre (650 feet) cap of low permeability shale
- Repository access shafts will be sealed with clay-based, asphalt, and concrete materials
- Located adjacent to OPG's existing Western Waste Management Facility on the Bruce site

nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES
ONTARIO POWER GENERATION

OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

THE FACTS ABOUT NUCLEAR WASTE

What is Low Level Waste?

Low level waste (LLW) consists of minimally radioactive materials that have become contaminated during routine clean-up and maintenance at nuclear generating stations.

Low level waste:

- Includes mop heads, cloths, paper towels, temporary floor coverings, floor sweepings, protective clothing and hardware items such as tools
- Consists of paper, plastics, metal, rubber, cotton and other miscellaneous materials
- Can be safely handled using normal industrial practices and equipment without any special radiation protection
- Makes up about 95 percent of the total non-fuel waste volume received at OPG's Western Waste Management Facility (WWMF)

About 3,000 cubic metres of low level waste is stored annually at the WWMF. The majority of low level waste volume is incinerated or compacted for volume reduction before it is placed in concrete warehouse-like buildings for interim management.

Low level waste

Intermediate Level Waste Storage

What is Intermediate Level Waste?

Intermediate level waste (ILW) consists primarily of used reactor core components, and resins and filters used to keep reactor water systems clean, and reactor retube parts such as pressure tubes.

Intermediate level waste:

- Requires shielding to protect workers during handling
- Is not processed for volume reduction
- Makes up approximately five per cent of all non-fuel waste received at the Western Waste Management Facility – approximately 200 cubic metres each year
- Is stored mainly in steel-lined concrete containers set into the ground

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NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES
ONTARIO POWER GENERATION

WASTE INVENTORY

The low and intermediate level waste to be emplaced in the DGR is comprised of a variety of materials from operation and maintenance and refurbishment of OPG-owned nuclear stations. The information below summarizes the overall waste composition, the various waste containers, and the total waste radioactivity.

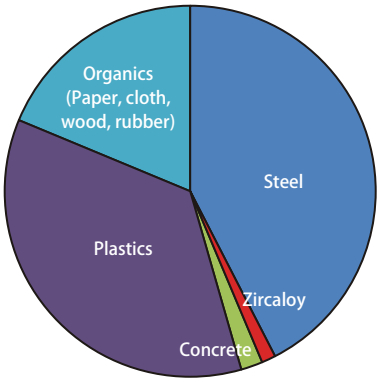
Initial amount of most abundant radionuclides

Radionuclide	Initial Amount (kg)	Halflife (years)
Zr-93	2000	1,530,000
Nb-94	600	20,300
C-14	40	5,730
U-238	30	4,468,000,000
Ni-59	10	75,000
Cl-36	1	301,000
Pu-239	0.2	24,000
Pu-240	0.08	6,500
Se-79	0.07	300,000
I-129	0.03	15,700,000
H-3	0.004	12

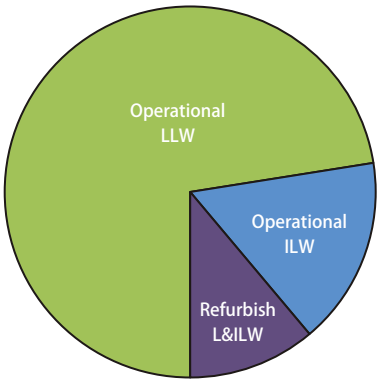
Approximate number of waste containers

	Number of Containers
Low-Level Wastes	
Incinerator ash	1,000
Compacted wastes	7,000
Non-processible wastes (used equipment)	27,000
Water cleanup IX resins and sludges	4,000
Steam generator segments	500
Sub-total LLW	39,000
Intermediate-Level Wastes	
Water cleanup IX resins	2,000
Water filters, core components, used equipment	8,000
Retube wastes (e.g. pressure tubes)	1,000
Sub-total ILW	**11,000**
Total	**50,000**

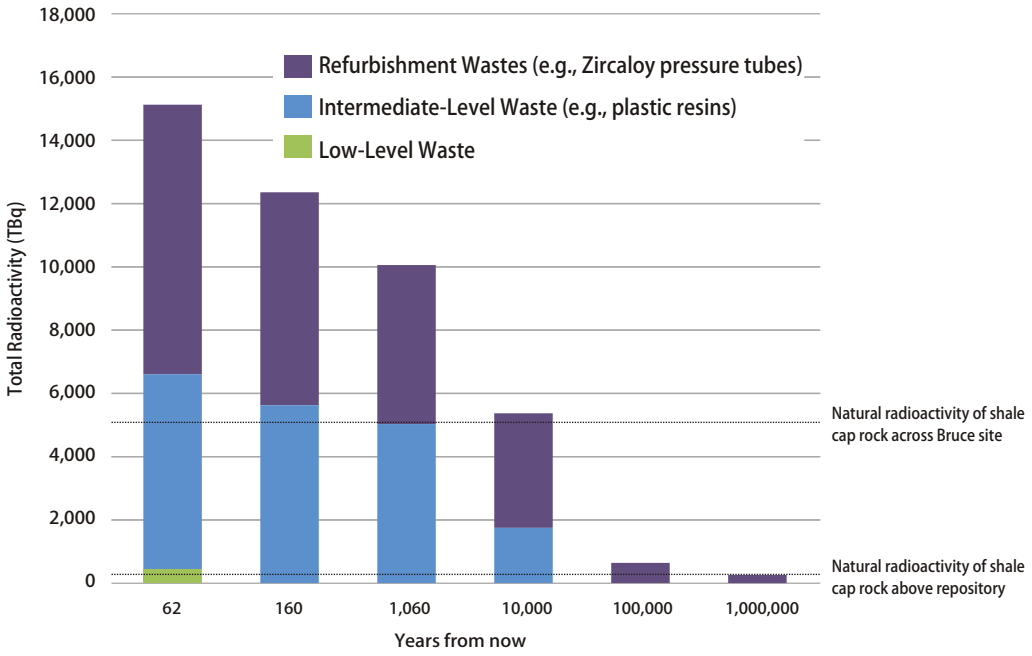
Proportional composition of waste in the DGR (by weight)



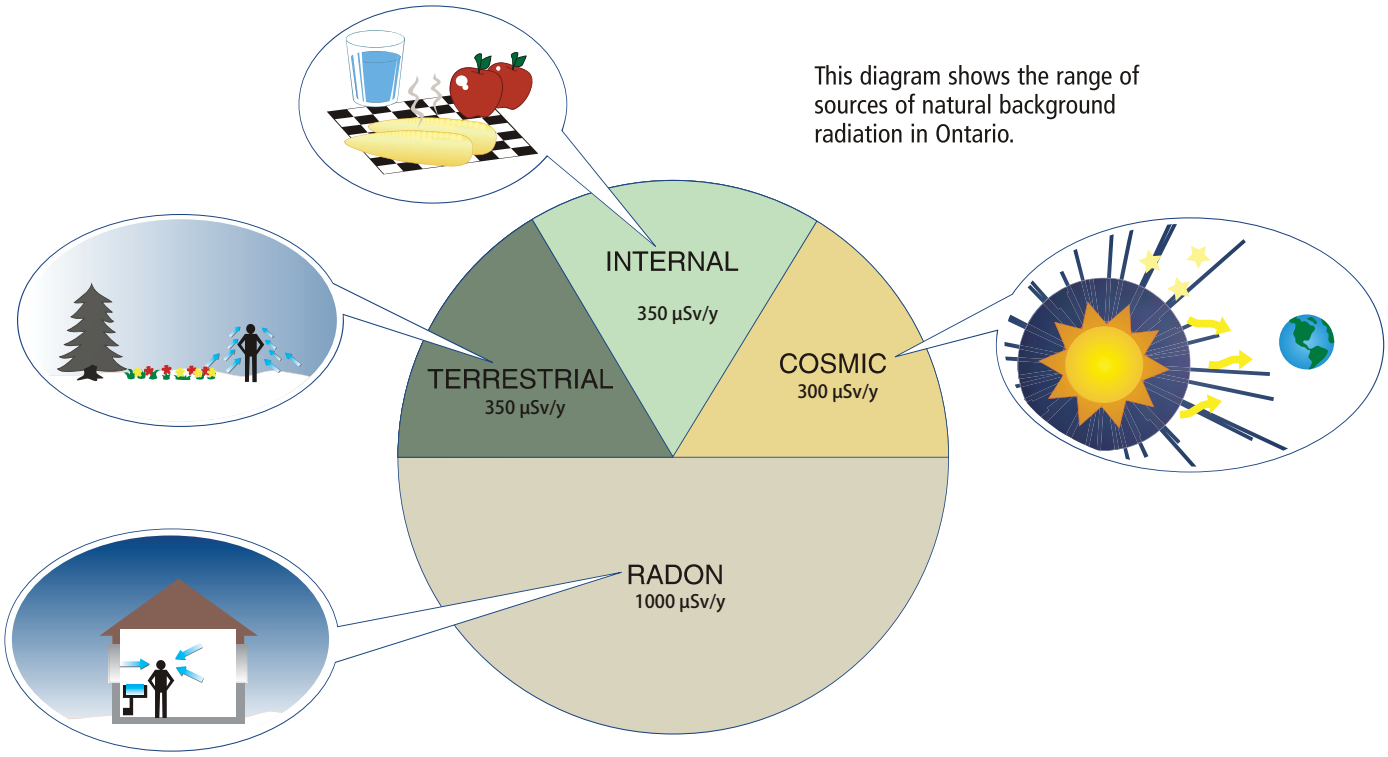
Waste volumes



Total DGR Radioactivity decreases with time



WHAT IS RADIATION?



This diagram shows the range of sources of natural background radiation in Ontario.

Sources of Radiation in Our Environment

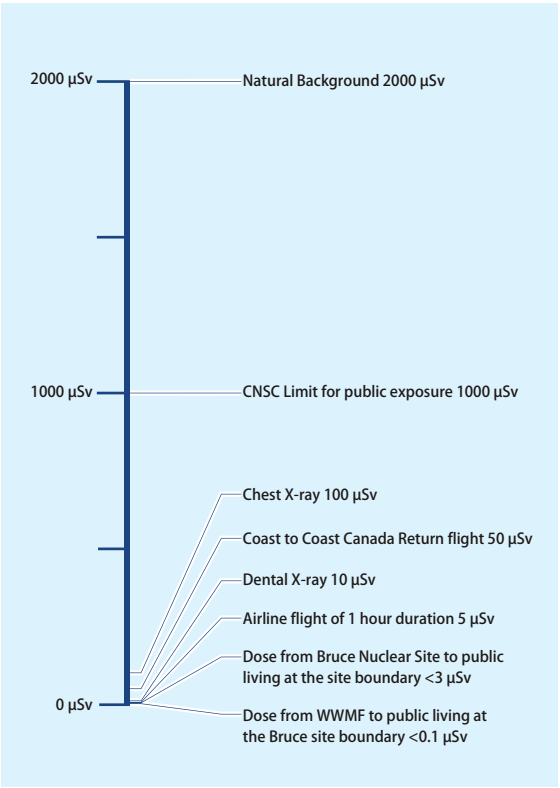
People are exposed to radiation from a number of natural sources such as the bedrock, and also from human activities such as medical examinations, smoke detectors and power generation.

Radiation dose is measured in Sieverts, and the dose of radiation received by people is often expressed in millionths of a Sievert, or microSievert (µSv). The amount of radiation that the average person in Canada is exposed to, from all natural sources, is about 2,000 µSv per year. A chest x-ray gives you about 100 µSv, a dental x-ray set about 10 µSv.

Radiation Exposure Regulations

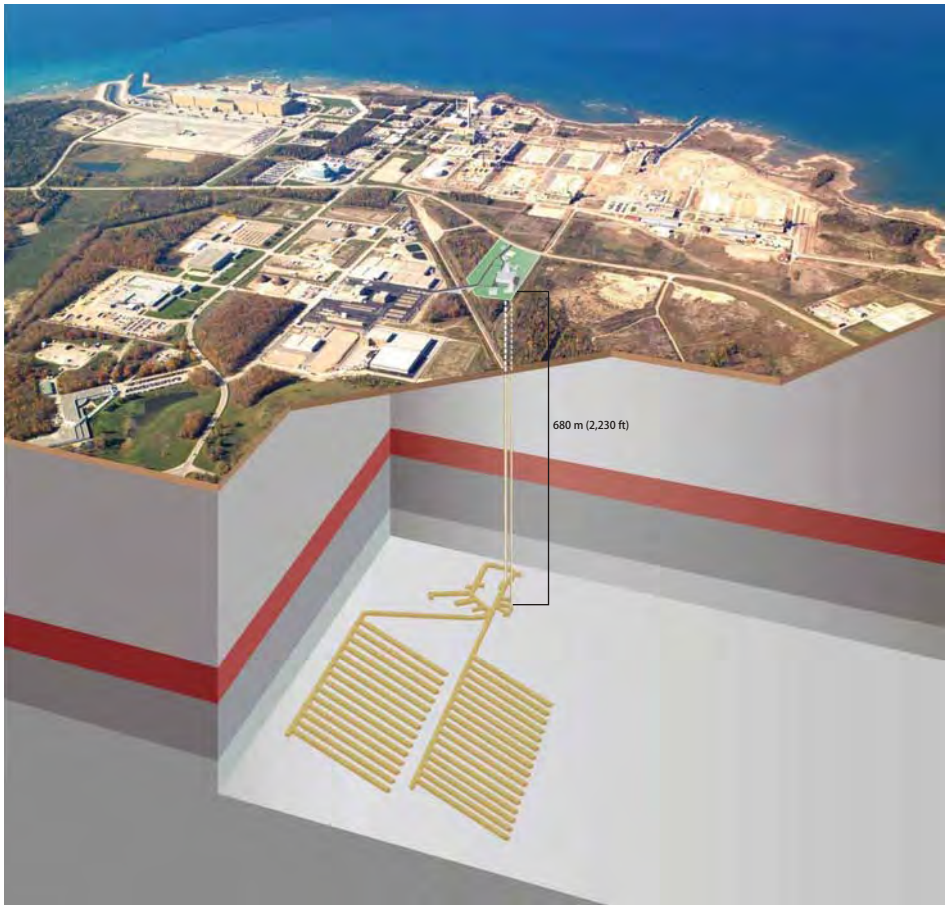
The nuclear industry adheres to both national regulations and international recommendations. The limit for public radiation exposure from nuclear facilities is 1,000 µSv per year. For nuclear waste repositories, the International Commission on Radiological Protection recommends a dose constraint of 300 µSv per year after closure.

Results from careful monitoring of all nuclear activities at the Bruce site show that the public exposure is less than 3 µSv per year to a person living at the fenceline. Waste handling and storage at the WWMF contribute a fraction of this dose. Emplacing the waste in the DGR will also further reduce this dose after closure.



OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

DGR ENGINEERING DESIGN CONCEPT



Current design philosophy includes:

- Approximate five year construction period
- On-site storage of excavated rock
- On-site retention pond for surface water runoff
- Above-ground facilities for waste receipt and hoist headframes
- Access to the repository by shaft; one shaft for personnel and waste transfer and another for ventilation
- Underground facilities for waste receipt, waste emplacement, equipment maintenance, monitoring and refuge stations in case of emergency
- Emplacement rooms constructed through the rock with shotcrete walls and ceilings, and concrete floors
- Emplacement rooms dedicated to either low or intermediate level waste
- Closure of rooms once full
- Capacity to operate for minimum 35 to 40 years
- Sealing of shafts at end of DGR life, subject to regulatory approval

MAJOR PROJECT WORKS AND ACTIVITIES

Site Preparation Phase

Time: Approximately six months
Work Force: Approximately 30 positions

Site preparation would begin after receipt of a Site Preparation Licence and would include clearing approximately 15 ha (37 acres) of the DGR project site and preparing the construction laydown areas.

Activities would include:

- Removal of brush and trees and transfer by truck to on-site storage
- Excavation for removal of topsoil and truck transfer to stockpile on site
- Grading of sites, including roads, construction laydown areas, stormwater management area, ditches
- Paving of roads
- Receipt and installation of construction trailers and associated temporary services
- Install and operate fuel depot for construction equipment

Construction Phase

Time: Approximately five years
Work Force: Approximately 75 positions per year average

It will include the construction of the surface facilities including the Waste Package Receipt Building, material handling, shaft headframes and all other temporary and permanent facilities at the site, as well as excavation and construction of access ways to the repository (i.e., shafts), and underground infrastructure (e.g., ventilation system, the underground excavation of the emplacement and non-storage rooms).

Activities would include:

- Excavation for and construction of footings for permanent buildings, and for site services such as domestic water, sewage, and electrical
- Construction of permanent buildings, including headframe buildings associated with main and vent shafts
- Receipt and set up of equipment for shaft sinking
- Construction of bridge/crossing over the railway ditch between WWMF and the DGR site
- Construction of electrical substation and installation of standby generators
- Construction of main and vent shafts, and access tunnels and emplacement rooms
- Placement of rock in on-site storage area
- Dewatering of the shaft construction area to an above-ground stormwater management facility
- Possible temporary day storage of small quantities of explosives underground for construction of emplacement rooms and tunnels

Front End Loader

Drill Carriage

Scaling Machine

MAJOR PROJECT WORKS AND ACTIVITIES

Operations Phase

Time: Approximately 35 to 40 years
Work Force: Approximately 30 positions

The operations phase will include receipt of L&ILW from WWMF at the staging area in the DGR Waste Package Receiving Building (WPRB) and on-site transfer to shaft. Underground handling of wastes includes receipt of the waste at the repository level and transfer of the waste to the emplacement rooms.

Activities include:

- Receipt of disposal-ready waste packages from the WWMF by forklift or transport truck
- Offloading of waste packages at the DGR waste receiving building
- Handling of resin liners and placement of resin liners in shielding
- Transfer of waste packages within the WPRB by forklift
- Temporary storage of waste packages at the waste receipt building
- Administrative activities involving office space, lunch room and amenities space
- Operation and maintenance of hoists
- Receipt of waste packages at the base of the main shaft
- Offloading from cage and transfer of waste packages by forklift to emplacement rooms
- Rail cart transfer of some large packages (THE Liners, Heat Exchangers/Shield Plug Containers) to emplacement rooms
- Installation of shielding walls on full emplacement rooms
- Remedial rock bolting and rock wall scaling, as required
- Fuelling and maintenance of underground vehicles and equipment
- Receipt and storage of fuel for underground vehicles
- Maintenance of services (e.g., communications, ventilation, and fire protection systems)

Emplacement activities will be followed by a period of monitoring to ensure that the DGR facility is performing as expected prior to decommissioning.

Waste Isolation Pilot Plant in New Mexico

Precompacted Bentonite Blocks

Decommissioning Phase

Time: Approximately five years
Work Force: Approximately 75 positions

The decommissioning phase would be preceded by an environmental assessment process. If approved, the decommissioning would include removal of the surface facilities and installation of seals in each of the shafts.

Activities would include the following:

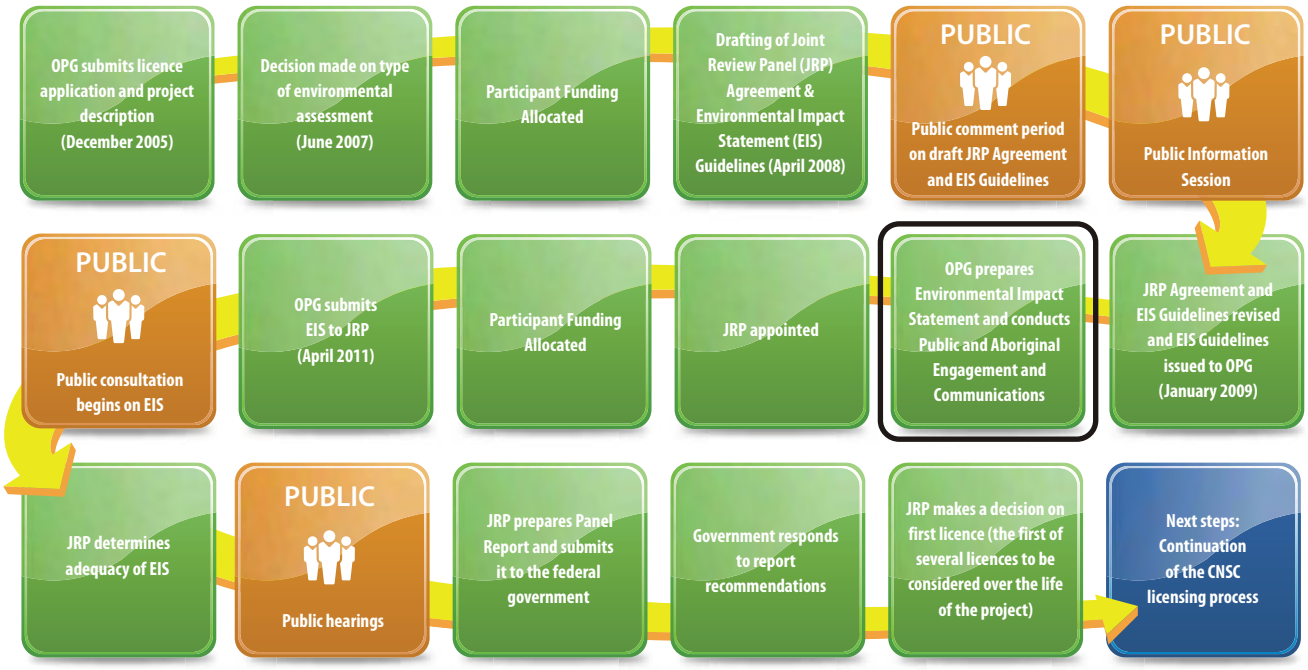
- A concrete monolith will be installed at the base of the shafts
- Shaft liner will be removed and shaft seal will be installed
- Surface structures will be removed
- Infrastructure will be disconnected and access ways will be sealed

OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

ENVIRONMENTAL ASSESSMENT (EA) REGULATORY PROCESS

FEDERAL JOINT ENVIRONMENTAL ASSESSMENT PROCESS

OPG DEEP GEOLOGIC REPOSITORY



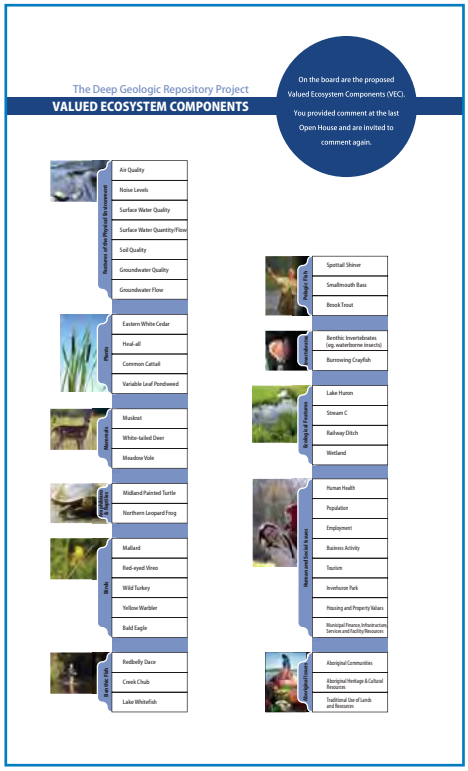
Adapted from Canadian Environmental Assessment Agency (CEAA) and Canadian Nuclear Safety Commission (CNSC).

☐ Current Status

OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

ENVIRONMENTAL ASSESSMENT METHODOLOGY

The method used for identifying and assessing the potential effects of the proposed DGR Project is:



PROJECT DESCRIPTION

↓

ENVIRONMENTAL IMPACT STATEMENT GUIDELINES — (Issued by CNSC and CEAA)

↓

CONCEPTUAL ENGINEERING DESIGN

↓

DEVELOPMENT OF PROJECT SCOPE

↓

STUDY AREA IDENTIFICATION

↓

BASELINE ENVIRONMENT CHARACTERISTICS — (Including geoscientific site characterization, environmental studies and safety assessment)

↓

VALUED ECOSYSTEM COMPONENTS — (Used to assess effects on the environment, may be species or valued environmental characteristics)

↓

IDENTIFY PROJECT-ENVIRONMENT INTERACTIONS — (How do the DGR and environment interact)

↓

ASSESS ENVIRONMENTAL EFFECTS

↓

IDENTIFY MITIGATION MEASURES

↓

DETERMINE RESIDUAL EFFECTS

↓

CUMULATIVE EFFECTS

↓

SIGNIFICANCE

↓

EFFECTS OF ENVIRONMENT ON THE PROJECT AFTER MITIGATION

↓

MALFUNCTIONS AND ACCIDENTS

↓

FOLLOW UP AND MONITORING PROGRAMS

↓

CONCLUSIONS

OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

THE ROLE OF SAFETY ASSESSMENT

The role of safety assessment:

- Considers both the operating and after closure periods
- Analyses the DGR behavior under expected and abnormal conditions
- Quantifies potential impacts on public, workers and the environment
- Compares the potential impacts with regulatory criteria
- Provides feedback to help improve the site characterization and design

The Safety Assessment follows:

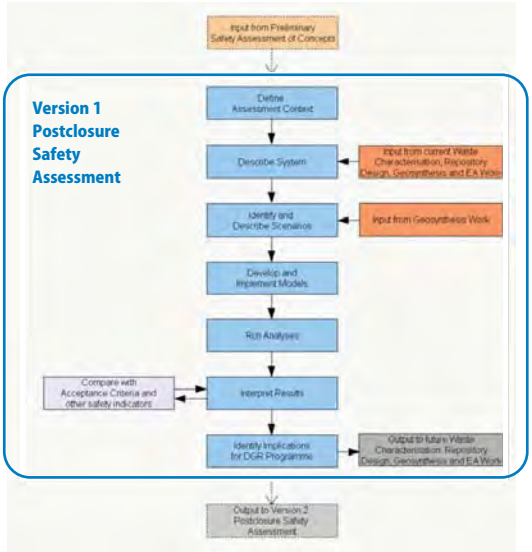
- Federal Environmental Assessment Guidelines for the DGR project
- Canadian Nuclear Safety Commission, policy and guidance, including:
  - CNSC P-290 – Managing Radioactive Wastes
  - CNSC G-320 – Assessing the Long Term Safety of Radioactive Waste Management
  - Nuclear Safety and Control Act and associated regulations
  - International best-practices

The interim "Version 1" Safety Assessment has been published, and is currently undergoing review by the regulator (CNSC) as well as international experts. To read the reports, go to www.nwmo.ca/dgrprojectdocuments.

Safety assessment is an iterative process:

Site Characterization	Waste Inventory	Design	Safety Assessment
Generic data (not site specific)	Draft inventory report	Early conceptual design	"Version 0" Initial assessment
Phase I Geosynthesis (2 boreholes)	Reference inventory report	Conceptual Design	"Version 1" Interim reports for peer review
Phase II Geosynthesis (6 boreholes)	2010 update	Preliminary Design	"Version 2" Construction license application
Construction Phase Verification	Future update	Final Design	Operating license application

We are here.

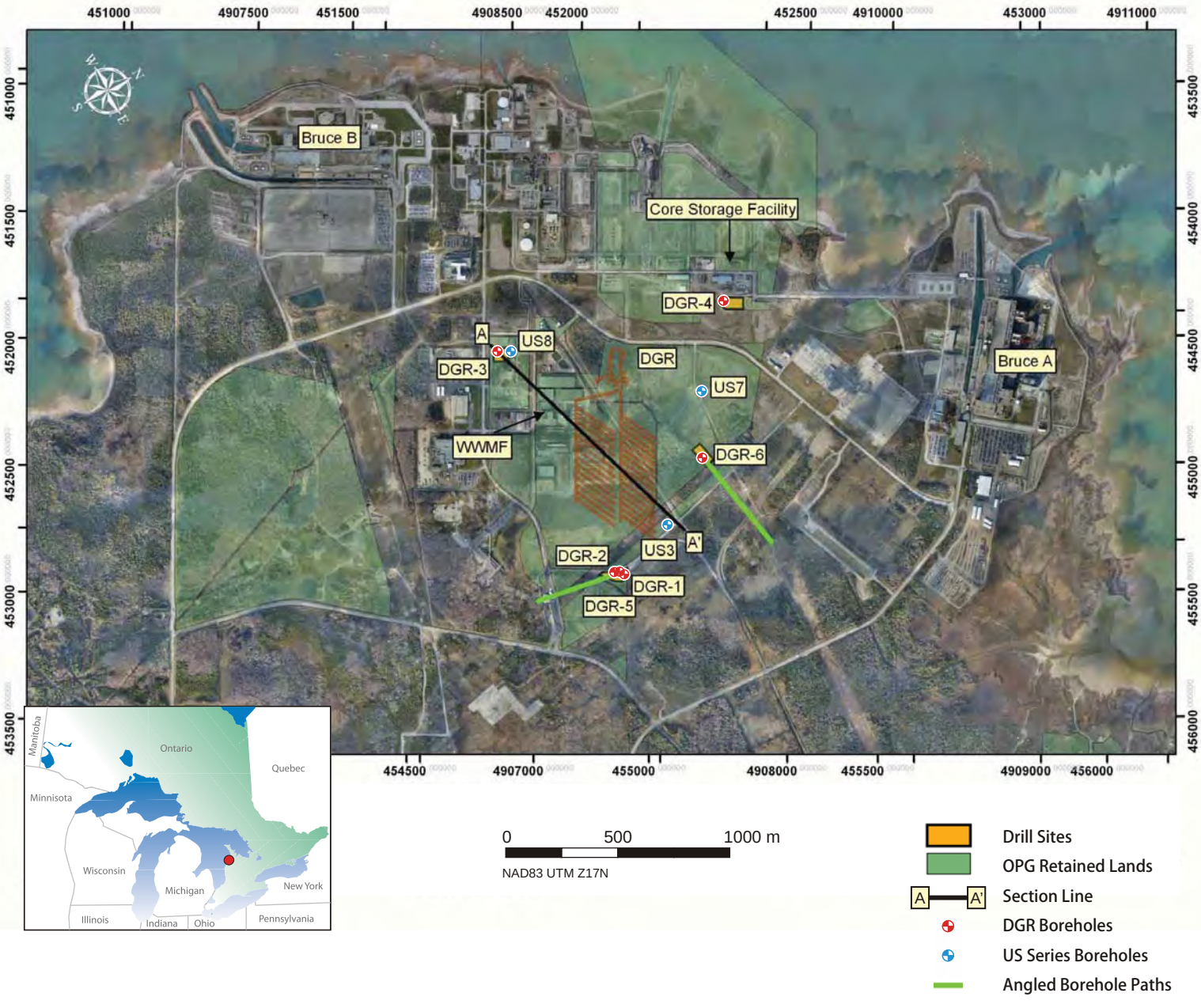


Safety Assessment follows a methodical process

OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

SITE MAP

Bruce Site Borehole Locations

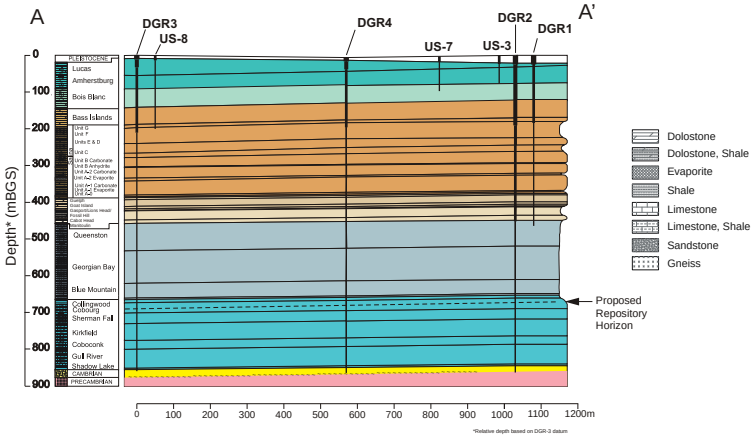


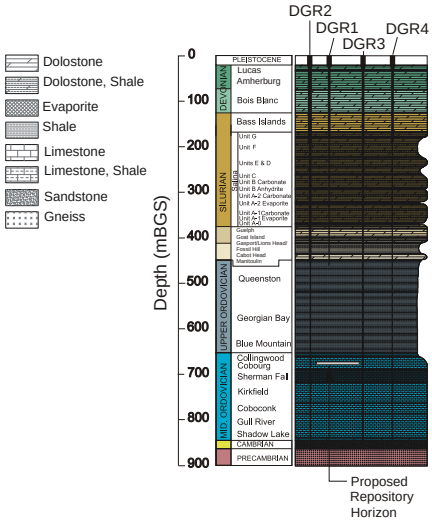
OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

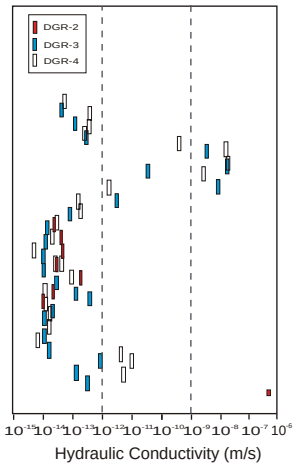
GEOSCIENCE ATTRIBUTES

PREDICTABILITY

- Borehole coring indicates a consistent bedrock 'column' beneath the Bruce site comprised of 34 individual near-horizontally layered, laterally extensive bedrock formations of Cambrian to Devonian age (543 – 350 Million yrs)
- Sedimentary bedrock layering observed beneath the Bruce site is as understood from regional geologic knowledge extending laterally for 10's of kilometres





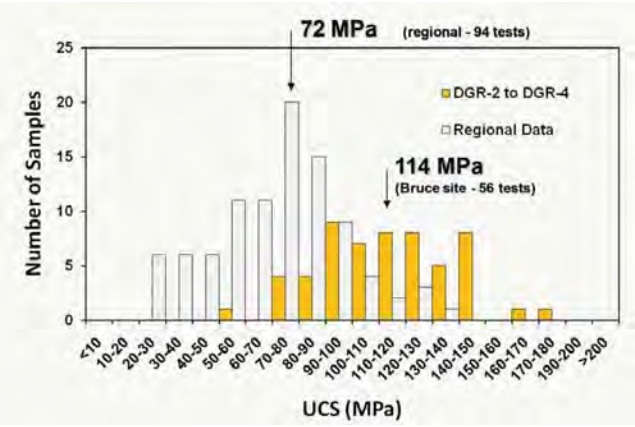


MULTIPLE NATURAL BARRIERS

- The DGR is surrounded by multiple layers of low permeability sedimentary rock. The horizon immediately above the repository is comprised of a ~200 m layer of low permeability ($\leq 10^{-13}$ m/sec) Ordovician age (450 Million yrs) shale located about 440 m below ground surface
- A sequence of shales, dolostones and evaporites comprising the Salina Formation (about 190 m thick) above the Ordovician shale possess low permeabilities

GEOMECHANICALLY STABLE

- The compressive strength of the Cobourg Formation as determined from core samples obtained during deep drilling exceeds that understood from regional experience
- DNGS's cooling water intake tunnel, which provided a stable, dry opening with minimal rock support, was excavated in the Cobourg Formation 30 m beneath Lake Ontario



Darlington (DNGS) Cooling Water Intake Tunnel

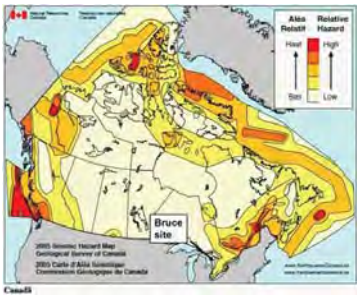
OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

GEOSCIENCE ATTRIBUTES

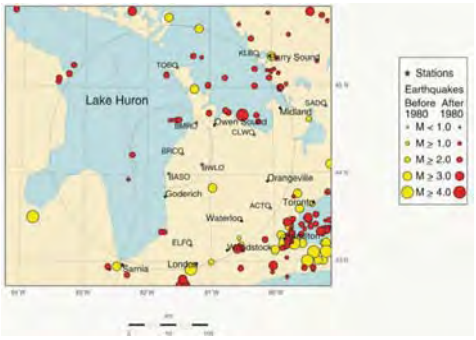
SEISMICALLY QUIET

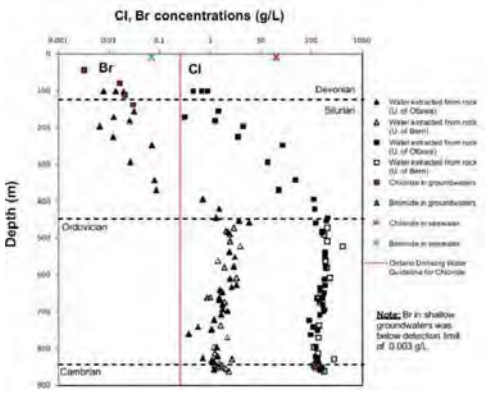
- The Bruce region is located in an area of known low Seismic Hazard consistent with that occurring on the stable Canadian Shield
- Historic records of seismic activity do not reveal events exceeding M5, within a radius of more than 150 km of the Bruce site, in the past 100 years
- The recently installed micro-seismicity monitoring network has not detected natural seismic (>M2.5) activity within a radius of 150 km of the site

SEISMIC HAZARD MAP



SEISMIC MONITORING



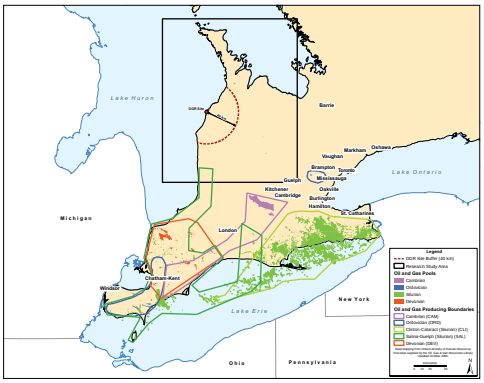


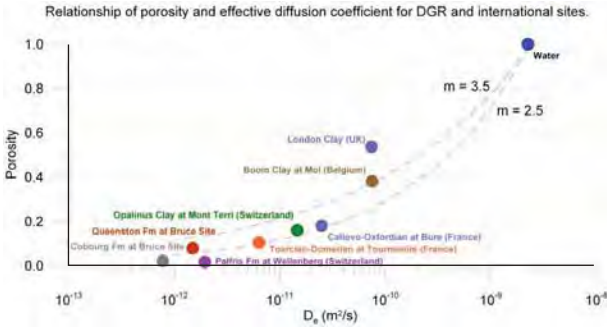
SHALLOW GROUNDWATER RESOURCES ISOLATED

- Local fresh groundwater resources are obtained from shallow overburden or near surface bedrock wells (<100 m depth)
- The chemistry of the waters found in the bedrock become progressively more saline (Total Dissolved Solids (TDS) 100 to 300 g/L) with depth which aids in defining shallow, intermediate and deep groundwater systems
- The chemistry of the ground and pore waters encountered during drilling indicate that the deep groundwater system within the Ordovician sediments is very old and has not mixed with glacial or present-day freshwater

LOW NATURAL RESOURCE POTENTIAL

- No significant oil or gas was encountered in three vertical boreholes drilled on site, nor in several historic oil and gas wells drilled within 10 km of the Bruce site
- There are no known industrial minerals (limestone, shale, etc.) that are unique to the site and cannot be obtained from elsewhere
- Salt deposits that occur in the Kincardine region and south were not intersected beneath the Bruce site





TRANSPORT DIFFUSION DOMINATED

- The distribution of natural tracers within the pore fluid of the hosting and enclosing Ordovician sediments suggests the existence of a diffusion dominated transport regime
- The low bedrock permeabilities measured in the deep boreholes are consistent with a diffusion dominant environment
- Numerical simulations of the regional groundwater system conducted by the University of Waterloo support the notion of a stable diffusion dominant system enclosing the repository

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GEOSCIENTIFIC INVESTIGATIONS AT THE BRUCE SITE

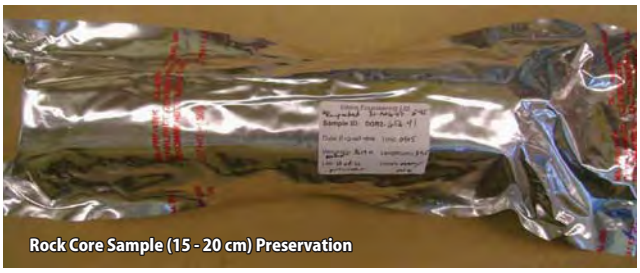

Drill Site View Bruce Site

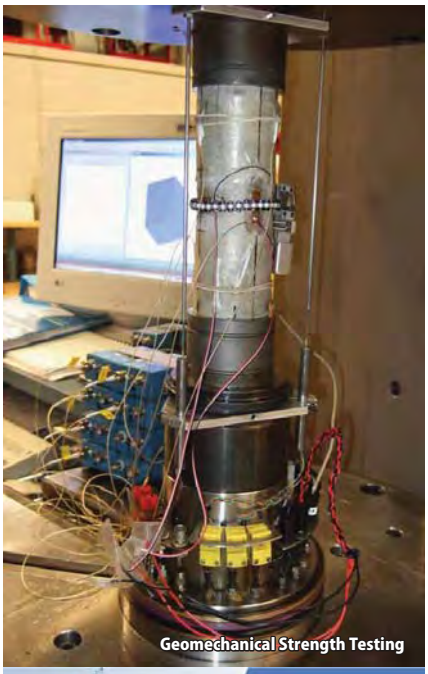

Diamond Core Drill Bit

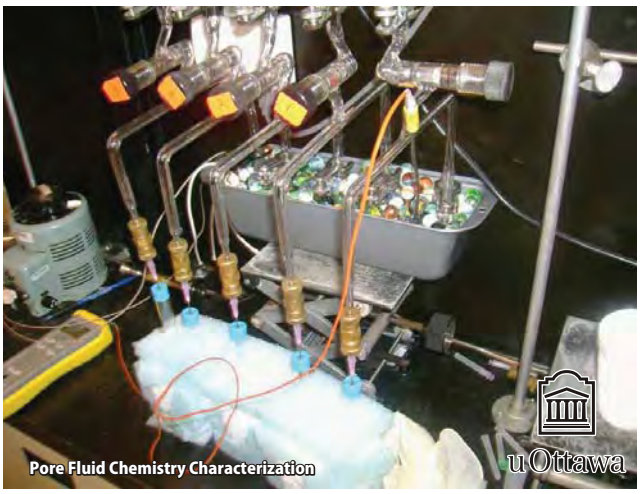

Rock Core Queenston Shale (Length 3 m)

Correlation Between Boreholes Aids Definition of Site Stratigraphy
Bentonite Ash Marker Bed Coboconk Formation


Core Logging Workshop


Rock Core Sample (15 - 20 cm) Preservation


Geomechanical Strength Testing



Pore Fluid Chemistry Characterization

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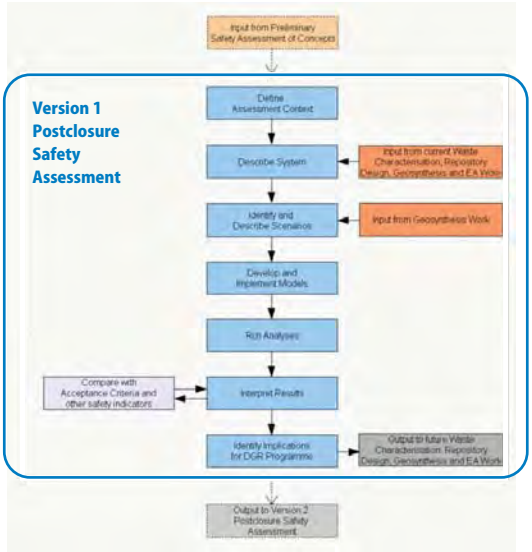


Safety Assessment follows a methodical process

OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

OPERATIONAL (PRECLOSURE) SAFETY ASSESSMENT

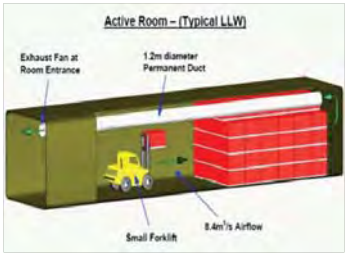
Focus on radiological safety – handling and storage of low & intermediate level waste packages – under normal operations and accident conditions. Conventional safety considered separately, primarily under the engineering design work.

Normal Operation

Waste packages received at DGR receipt building

Waste packages moved and placed in rooms underground

Rooms initially monitored and ventilated, and eventually closed.



Normal Operation Safety

- DGR waste handling operations will be similar to current operations at WWMF
- Small release of tritium and C-14 primarily as off-gas from packages until rooms are closed
- Public impact negligible – similar to WWMF
- External dose from waste packages
  - No public exposure due to distance and shielding – as with WWMF
  - Worker dose within OPG targets, controlled by shielding and task planning – as with WWMF

OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

LONG-TERM (POSTCLOSURE) SAFETY ASSESSMENT - APPROACH

The Postclosure Safety Assessment addresses the safety of the repository after the underground portion has been closed and sealed. It looks far into the future. In the near-term, the site is expected to remain under institutional control. However, the safety assessment assumes that beyond a few hundred years, the site reverts to a green-field use.

Assessing the Future:

- Postclosure safety assessment is not a prediction of the future.
- Rather, it assesses a range of likely and unlikely futures or scenarios.
- Uncertainties are addressed through use of a range of scenarios, models and data.
- Uncertainties are also addressed through use of worst-case or cautious assumptions.
- Methodology follows Canadian regulatory guidance and international practice.

Scenarios Assessed:

Normal Evolution Scenario: Considers what is likely to happen within and around the repository in the future

Normal Evolution Scenario

– includes eventual glaciation across the site.
– assumes that people live on the repository site in the future.

Disruptive ("what if") Scenarios:
Unlikely scenarios that test the robustness of the repository.

Human Intrusion

What if someone accidentally drilled a deep borehole into the DGR and brought waste material to surface?

Severe Shaft Seal Failure

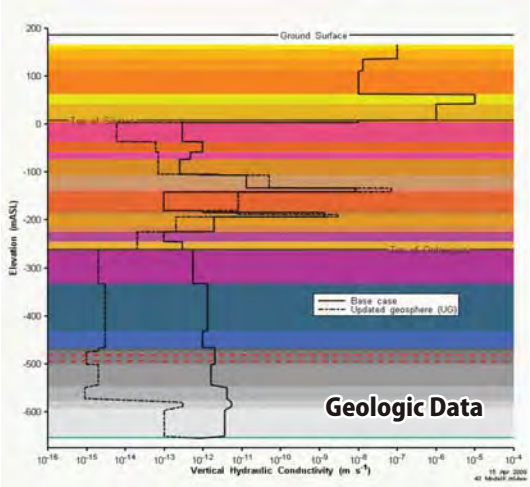
What if the main shaft seals failed completely?

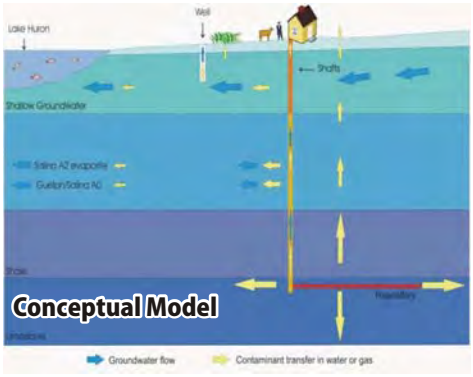
Open Borehole

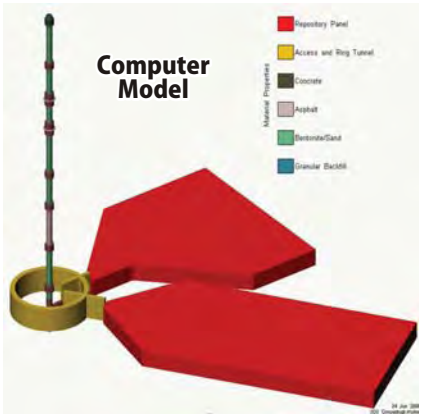
What if a site characterization or monitoring deep borehole accidentally became unsealed, or the seal failed completely?

Extreme Earthquake

What if a very large earthquake occurred and was able to open up an assumed nearby but presently closed vertical fault in the rock?





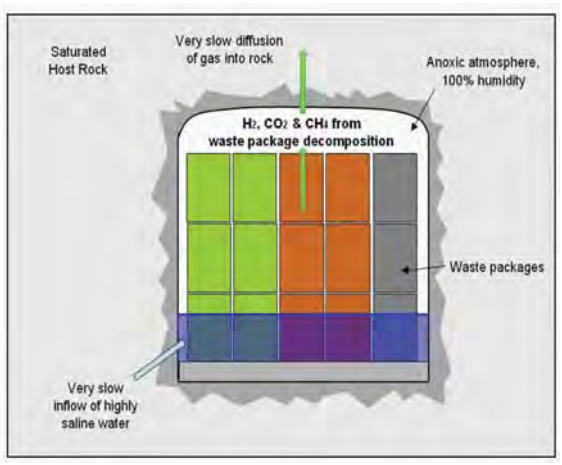


Assessment Method:

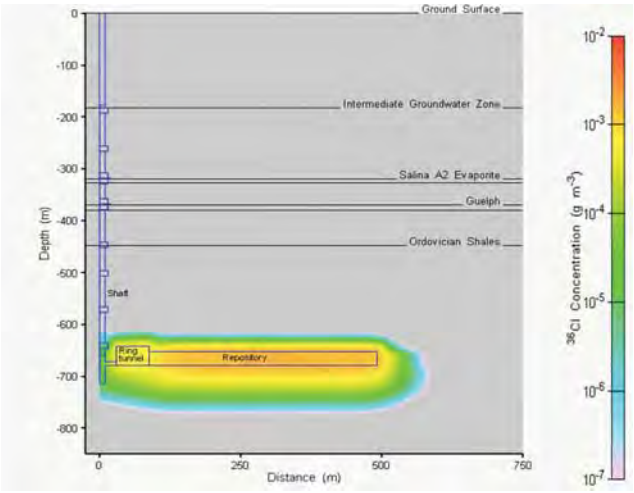
Site, design and waste inventory data is used to construct a conceptual model of possible pathways and to develop a computer model. The computer model is used to quantify what could happen under various scenarios.

OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

LONG-TERM (POSTCLOSURE) SAFETY ASSESSMENT - RESULTS

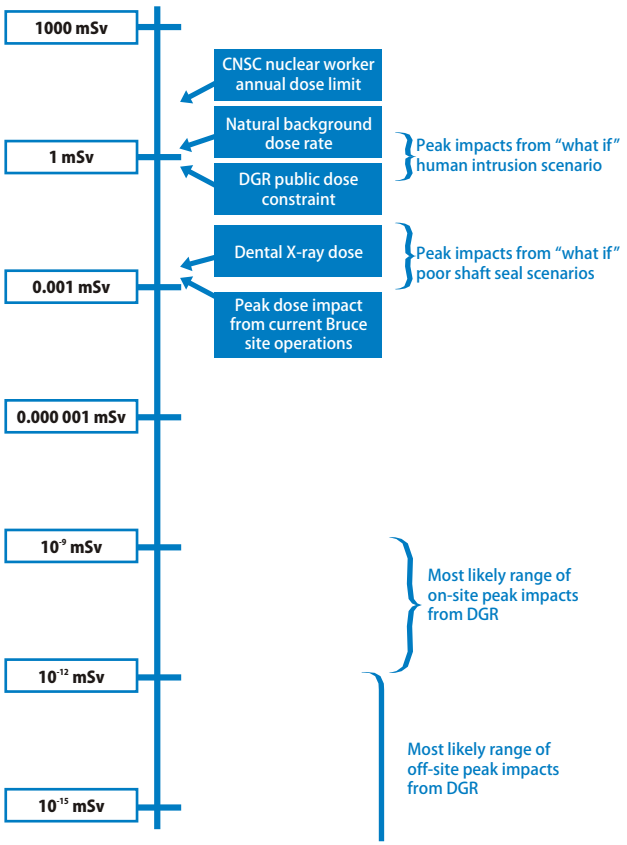


Repository resaturation will be very slow. Waste packages will degrade to produce gases, mostly methane, which will be trapped within the rock.



Radioactivity will be trapped within and around the repository. The figure shows the calculated distribution of Cl-36 after 100,000 years, assuming fast resaturation of repository.

Calculated impacts



Interim Safety Assessment Conclusions:

- Detailed safety assessment has been completed using interim data and design
- Approach is consistent with Canadian regulations and international practice
- Normal evolution scenario results:
  - Low to extremely low dose rates
  - Meets dose criterion
- Disruptive "what if" scenarios results:
  - Unlikely scenarios, cautiously modelled
  - Meet dose or risk criterion
- Interim conclusion – this is a good site

OPG'S DEEP GEOLOGIC REPOSITORY FOR LOW & INTERMEDIATE LEVEL WASTE

AN INTERNATIONAL PERSPECTIVE

Concept of planned facility in Germany

Around the world, research on the long-term management of nuclear waste has engaged thousands of scientists and involved billions of dollars in research.

NWMO collaborates with several international organizations concerned with nuclear waste management and has cooperative agreements with many countries that are in the forefront of nuclear waste management research and development. These links facilitate the exchange of technical information, joint research and development activities, and in some instances the exchange of technical staff. The DGR is no exception.

SFR, Sweden

In addition to the stringent regulatory review process that the proposed DGR will be subject to, a number of independent technical review groups have been established to provide oversight and the benefit of their knowledge and experience from other similar projects.

Headframe at Waste Isolation Plant, New Mexico

The Geoscience Review Group (GRG) includes representation from France, Switzerland, United States and Canada. The members have, between them, nearly one hundred years of experience and have worked on nuclear waste programs in Japan, Hungary, Switzerland, Sweden, Finland, Korea, United States, and the United Kingdom. The GRG independently assesses the adequacy of all aspects of the geoscientific investigations and the geosynthesis.

The Technical Review Group (TRG) was formed to advise NWMO on matters relating to the design and engineering of the DGR. The proposed DGR has many of the attributes of a mine. The TRG is comprised of independent technical experts who have extensive experience in the fields of deep underground mine construction, mine ventilation, mine hoisting, geomechanics and radioactive waste material handling.

The International Peer Review Group comprises safety assessment experts who have experience in the low and intermediate level waste management programs in Belgium, France and the United Kingdom. They will review safety assessment studies and advise whether the assessment is based on credible scientific and technical approaches and methodologies, and is consistent with international practices.

Examples of Other Facilities Around the World for Low and Intermediate Level Waste

The DGR would employ technology similar to that used at sites in United States, Sweden, and Finland. Each of these international sites has unique differences in site characteristics.

Waste Isolation Pilot Plant (WIPP) New Mexico, U.S.

- Located in the desert
- The underground repository was excavated in 250 million year-old bedded salt approximately 660m below surface
- Status: Began disposal operations in 1999

Forsmark Facility Sweden

- Located at the Forsmark nuclear power station site
- The underground repository is in crystalline rock about 60m below the Baltic Sea
- Status: Began operation in 1988

Olkiluoto (VLJ) Facility Finland

- Located near the Olkiluoto nuclear power station
- The underground repository was excavated to a depth of 70 to 100 m in crystalline rock
- Status: Began operation in 1992

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OUR ANSWERS TO SOME OF YOUR PREVIOUS QUESTIONS:

Will used nuclear fuel be stored in the DGR?	The DGR will not manage used nuclear fuel. The Municipality of Kincardine has passed a resolution indicating that no used fuel will be placed in the DGR. OPG is seeking regulatory approval for site preparation and construction of a DGR for low and intermediate level waste only.
Will waste from other producers be stored in the DGR?	No. The DGR will manage low and intermediate level waste currently managed by OPG at the Bruce site and wastes produced during the remaining operating lives of OPG owned nuclear generating stations in Ontario, including Darlington, Pickering and Bruce.
Have the potential effects of abnormal events and terrorist activities been evaluated?	Yes. The documentation provided for the regulatory approvals process will include an assessment of potential malfunctions and accident scenarios, as a result of unintentional and intentional acts and accidental or abnormal events that could impact the public and the environment throughout the DGR's lifetime and after its closure. A few examples of abnormal events being evaluated include fire or container breach, unintentional intrusion into the repository, and failure of the shaft seal.
Why is the DGR located in proximity to Lake Huron?	The DGR is located more than 1 km distant from the shore of Lake Huron at the surface and a distance greater than 400 metres below the deepest near-site point of Lake Huron. The DGR is separated from Lake Huron by a low permeability layer of shale, which isolates the waste.
How will Great Lakes water quality be protected?	Great Lakes water quality will not be adversely affected by the DGR. The low and intermediate level waste is being placed in low permeability limestone, overlain by about 200 metres of low permeability shale. The characteristics of these rocks, including their age, stability and their position well below the level of the bottom of Lake Huron will virtually eliminate the migration of radionuclides to the lake. Any migration that does take place will be over a period of hundreds of thousands of years and the radionuclide concentrations will be orders of magnitude below the current regulatory limits.
Did OPG consider other sites for the DGR?	Experience in other countries has shown that success in siting a waste disposal facility is greatly improved in situations where the community supports the proposal. The Municipality of Kincardine approached OPG asking to jointly assess the feasibility of hosting a long-term low and intermediate level waste management facility. Once the results of these feasibility studies indicated that the Bruce site could be a safe and technically feasible site, the Kincardine Municipal Council volunteered to host a DGR for low and intermediate level waste. Results of a telephone poll indicated that a majority of residents support the DGR. No other sites volunteered to participate in the feasibility studies or to host the facility.
How do other countries manage their low and intermediate level nuclear waste?	Several other countries use similar technology for managing low and intermediate level waste. • United States stores transuranic waste in a deep repository in New Mexico • Sweden manages its low and intermediate level waste in an underground repository approximately 60 metres under the seabed, in rock situated below the Baltic Sea and near a nuclear power station • Finland manages low and intermediate level waste in an underground repository located near a nuclear generating station and excavated in rock 110 metres below ground.

Appendix E

Sign-in Sheets and Comment Cards

(sign-in sheets removed)

Comments/Questions?
Let us know.

PLACE
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Comments/Questions?
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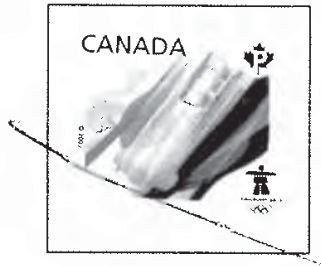
Name: Mike Smith

Address:

Phone:

Email:



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Comments/Questions?
Let us know.

Thank you kindly for sharing this educational info.

Name: Fely Clarke

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Comments/Questions?
Let us know.

- VERY INFORMATIVE.
- WELL EXPLAINED.
- SEEMS SAFE

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I knew nothing so it was a start

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Comments/Questions?
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Comments/Questions?
Let us know.

A list of websites of ~~party~~ parties involved would be helpful

Name: Roxy Bairaman

Address:

L

Phone:

Email:

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Comments/Questions?
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I would be interested in the correlation between seismic activity detected by the monitoring sites + BRCO + BASO * BMRO * BWLO and the operation of wind turbines at Enbridge/Ripley/Kingsbridge I. Compare background seismic activity and wind turbine output available from IESO. Is there any correlation between electrical output of ~~acte~~ wind turbines and seismicity. I have seen papers at the Wind Turbine Noise Conference this year and seismic activity— If you'd like copies of these papers, contact me.

Thanks
Bill Palmer

Name: William K. G. Palmer

Address:

Phone:

Email:

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KINCARDINE

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email: dgrinfo@nwmo.ca mwilson@nwmo.ca
Phone: 519-368-1639

nwmo NUCLEAR WASTE MANAGEMENT ORGANIZATION / SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

ONTARIOPOWER GENERATION

Comments/Questions?
Let us know.

PLACE
STAMP
HERE

Name: PAUL PRIMEAU

Address:

Phone:

Email:

Nuclear Waste Management Organization
Media Relations Manager
P.O. Box 7000, B21
Tiverton, Ontario
N0G 2T0

email: dgrinfo@nwmo.ca mwilson@nwmo.ca Phone: 519-368-1639

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Comments/Questions?
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PLACE
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Name: [signature]

Address:

Phone:

Email:

Nuclear Waste Management Organization
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Tiverton, Ontario
N0G 2T0

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Comments/Questions?
Let us know.

Well Done!

PLACE
STAMP
HERE

Nuclear Waste Management Organization
Media Relations Manager
P.O. Box 7000, B21
Tiverton, Ontario
N0G 2T0

Name: Rob Percival
Mrs. Percival

Address:

Phone:

Email:

email: dgrinfo@nwmo.ca mwilson@nwmo.ca Phone: 519-368-1639

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Comments/Questions?
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PLACE
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Name: UMAR AFZAAL

Address:

Phone:

Email:

Nuclear Waste Management Organization
Media Relations Manager
P.O. Box 7000, B21
Tiverton, Ontario
N0G 2T0

email: dgrinfo@nwmo.ca mwilson@nwmo.ca Phone: 519-368-1639

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PLACE
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Name: Jaclyn Clements

Address:

Phone:

Email:

Nuclear Waste Management Organization
Media Relations Manager
P.O. Box 7000, B21
Tiverton, Ontario
N0G 2T0

email: dgrinfo@nwmo.ca mwilson@nwmo.ca Phone: 519-368-1639

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PLACE
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Name: ERIC HOWARD

Address:

Phone:

Email:

Nuclear Waste Management Organization
Media Relations Manager
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Tiverton, Ontario
N0G 2T0

email: dgrinfo@nwmo.ca mwilson@nwmo.ca Phone: 519-368-1639

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Comments/Questions?
Let us know.

PLACE
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HERE

Name: Mary Norcliffe

Address:

Phone:

Email:

Nuclear Waste Management Organization
Media Relations Manager
P.O. Box 7000, B21
Tiverton, Ontario
N0G 2T0

email: dgrinfo@nwmo.ca mwilson@nwmo.ca Phone: 519-368-1639

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ONTARIO POWER GENERATION

Comments/Questions?
Let us know.

GREAT JOB!

Name: JACKIE PAWLIKOWSKI

Address:

Phone:

Email:

PLACE
STAMP
HERE

Nuclear Waste Management Organization
Media Relations Manager
P.O. Box 7000, B21
Tiverton, Ontario
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Name: _____

Address: _____

_____

Phone: _____

Email: _____

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Comments/Questions?
Let us know.

Staff should stress the fact that this NW solution is much lower risk than leaving it where it is now. Also, successful DGR type projects elsewhere should be referenced more. Lastly, I am interested in Env. Job opportunities

Name: Barry Moss

Address:

Phone:

Email:

PLACE STAMP HERE

Nuclear Waste Management Organization
Media Relations Manager
P.O. Box 7000, B21
Tiverton, Ontario
N0G 2T0

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Comments/Questions?
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PLACE
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Name: JIM BROWN

Address:

Phone:

Email:

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ONTARIO POWER GENERATION

DEEP GEOLOGIC
REPOSITORY
FOR OPG's LOW & INTERMEDIATE LEVEL WASTE

OPG's Deep Geologic Repository Project Communications and Consultation Report: Community Open Houses Summer/Fall 2010

December 2010

Prepared by: AECOM

NWMO DGR-REP-07723-0002

AECOM

Note:
The Nuclear Waste Management Organization (NWMO) is managing the development of a Deep Geologic Repository for low and intermediate level radioactive waste, at the Bruce nuclear site, on behalf of Ontario Power Generation (OPG).

Nuclear Waste Management Organization
22 St. Clair Avenue East, Toronto, Ontario M4T 2S3 Canada
Toll Free: 1.866.249.6966
www.nwmo.ca

OPG's DEEP GEOLOGIC
REPOSITORY
FOR LOW & INTERMEDIATE LEVEL WASTE

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December 2010

Prepared by: AECOM

NWMO DGR-REP-07723-0002 R00

Document History

Title:	OPG's Deep Geologic Repository Project Communications and Consultation Report: Community Open Houses Summer/Fall 2010		
Report Number:	NWMO DGR-REP-07723-00001		
Revision:	R00	**Date:**	December 2010
AECOM Canada Ltd.			
Prepared by:	L. Taylor		
Approved by:	D. Richardson		
Nuclear Waste Management Organization			
Reviewed by:	D. Barker		
Accepted by:	A. Castellan		

Table of Contents

Appendices

1. Introduction

This report documents a series of nine Community Open Houses hosted by the Nuclear Waste Management Organization (NWMO) on behalf of Ontario Power Generation (OPG) in August, September and October 2010. The report was prepared by AECOM and contains materials prepared by NWMO and AECOM, and local media reports.

Open House Scheduling

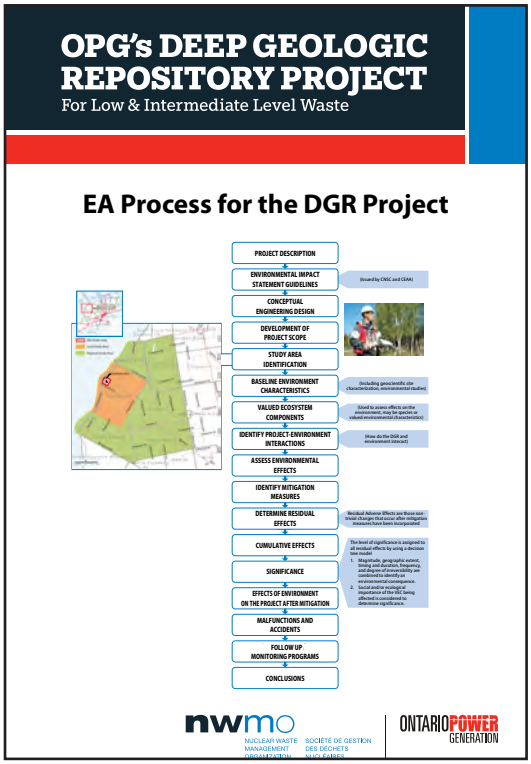
Open Houses were held in August to provide an opportunity for seasonal residents and summer visitors, who may not be available to attend fall Open Houses, to obtain information about the DGR Project and to discuss it with NWMO staff. The September/October Open Houses were available to all residents and visitors.

2. Community Open House Topics

This is the fourth round of Community Open Houses held to provide interested community members with opportunities to become informed and updated, ask questions, provide input and engage in discussions about the DGR Project. This round, the information presented focussed on the following:

- an overview of the proposed OPG Deep Geologic Repository (DGR) Project for Low and Intermediate Level Waste, and updates since previous Open Houses;
- the preliminary results of the Environmental Assessment (EA) undertaken as an integral part of the planning and approval process;
- an update on the geoscientific characterization work done to date;
- an update on the safety assessment work done to date;
- the preliminary design of the DGR; and
- the community engagement activities related to the project and feedback from that process.

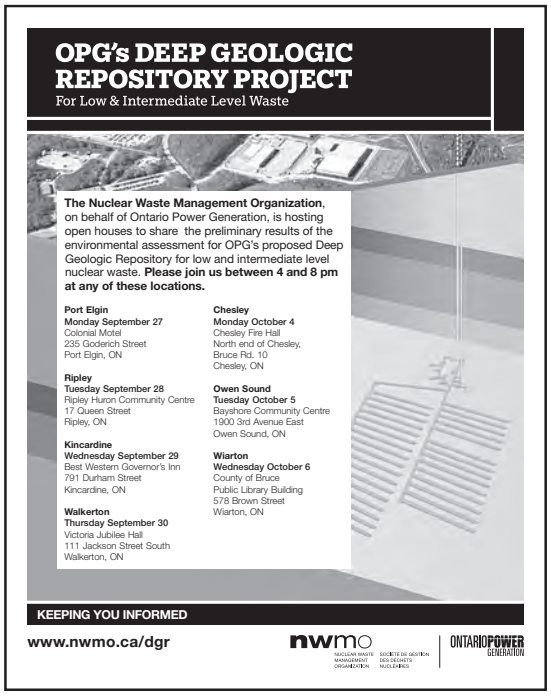
The Open Houses offered a venue for community members to provide comments on the preliminary results of the EA, the open house format and the proposed project.



3. Notification

Notification to community members was provided by the following:

- A postcard-format invitation, delivered by Canada Post's Unaddressed Admail to approximately 50,000 households in the communities where the Open Houses were held—Kincardine, Ripley, Walkerton, Port Elgin, Owen Sound, Chesley and Wiarton—and in the surrounding communities (see Appendix A for a list of community distribution).
- A newspaper announcement, published as an advertisement in the Kincardine News, Kincardine Independent, Lucknow Sentinel, Walkerton Herald Times, Owen Sound Sun Times, Port Elgin Shoreline Beacon, and the Wiarton Echo, prior to the Open Houses. Appendix A includes a copy of the advertisement and the placement schedule.
- Addressed letters, sent to those on the Stakeholder list, including local elected officials, City and County municipal staff leaders (including police, fire and emergency services), local and regional non-governmental organizations with a potential interest, local and regional media outlets, and others who have expressed an interest in the DGR Project. Invitations were sent to a number of organizations in the United States as well (see Appendix A for the mailing list).
- Radio spots, purchased for six local radio stations that serve the open house communities. Seven different announcements, specific to each open house, were prepared and aired prior to and on the day of each Open House (Appendix A).
- An advertorial, placed in the September 2010 edition of Marketplace, a local advertising publication (Appendix A). The September issue was issued on September 1, 2010.
- The dates, times and locations of the Open Houses were posted on the DGR page of the NWMO website (www.nwmo.ca/dgr) prior to and during the Open Houses.
- The September 2010 DGR Newsletter, distributed by Canada Post Unaddressed Admail to nearly 35,000 residences, included the dates, times and locations of the Open Houses. The newsletter was distributed the week of September 20th.



4. Dates and Venues

The Community Open Houses were held at the following locations:

Bruce County Museum - Monday August 23
33 Victoria Street North
Saugeen Shores, Southampton, ON

MacGregor Point Provincial Park
Tuesday August 24
R.R. #1
Port Elgin, ON

Port Elgin - Monday September 27
Colonial Motel
235 Goderich Street
Port Elgin, ON

Ripley - Tuesday September 28
Ripley Huron Community Centre
17 Queen Street
Ripley, ON

Kincardine - Wednesday September 29
Best Western Governor's Inn
791 Durham Street
Kincardine, ON

Walkerton - Thursday September 30
Victoria Jubilee Hall
111 Jackson Street South
Walkerton, ON

Chesley - Monday October 4
Chesley Fire Hall
North end of Chesley,
Bruce Rd. 10
Chesley, ON

Owen Sound - Tuesday October 5
Bayshore Community Centre
1900 3rd Avenue East
Owen Sound, ON

Wiarton - Wednesday October 6
County of Bruce
Public Library Building
578 Brown Street
Wiarton, ON

5. Number of Participants

A total of 95 persons registered their names as attendees of the Community Open Houses:

Summer 2010
Bruce County Museum - 16
MacGregor Point Provincial Park - 11

Fall 2010
Port Elgin - 13
Ripley - 2
Kincardine - 17
Walkerton - 6
Owen Sound - 15
Chesley - 3
Wiarton - 12

It is estimated that more than 90% of attendees signed in. Sign-in lists are provided in Appendix E.

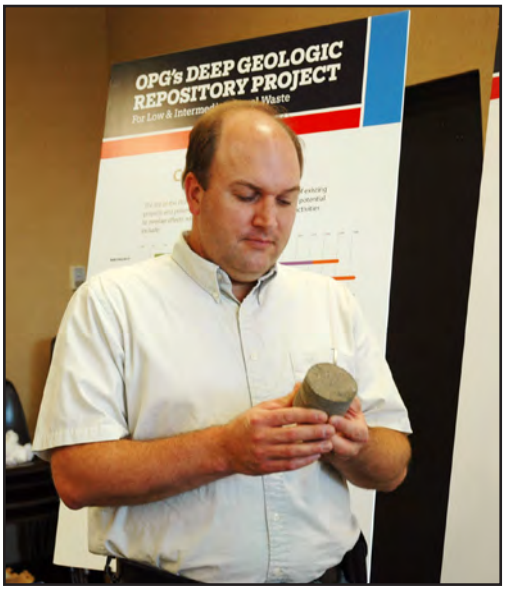
6. Community Open House Format

The Community Open Houses provided an informal opportunity for community members to learn about the proposed project, to have their questions answered and to provide feedback on the preliminary results of the Environmental Assessment and discuss any other aspects of the DGR Project. Participants viewed display materials, had discussions with NWMO and OPG representatives and enjoyed light refreshments.

The Bruce County Museum summer Open House was open between 2:00 and 8:00 p.m., while the MacGregor Point Open House, which included a formal presentation about the DGR, was open from 5:00 to 9:30 p.m. The fall Open Houses ran from 4:00 p.m. to 8:00 p.m.

Copies of the May 2010 and September 2010 NWMO project newsletters, the 2009 DGR Annual Report, a brochure describing the DGR Project for Low and Intermediate Level Waste as well as copies of the Open House display panels were available for participants to take away (Appendix C).

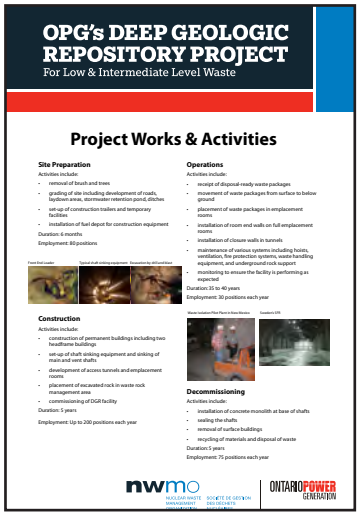
Participants were encouraged to fill out comment cards.

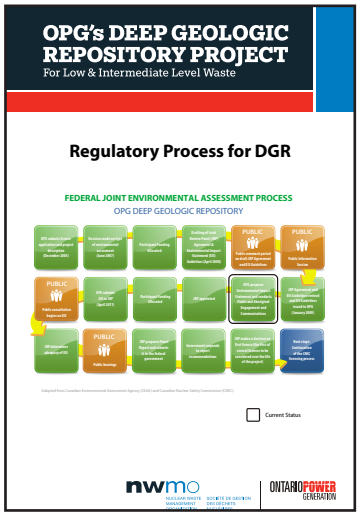


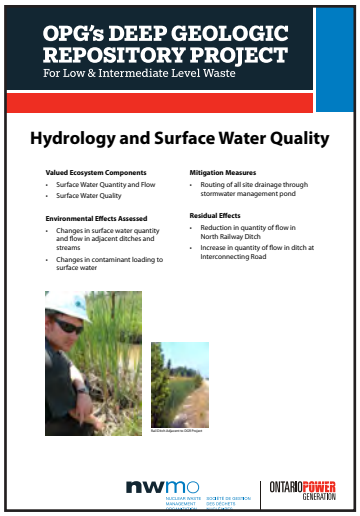
Display Panels

Twenty-three 30” x 40” display panels provided the following information:

1. “Welcome” – panel showing a map and conceptual site images
2. “Chronology of the Project”– showing a timeline of project milestones from 2001 to 2011
3. “The Project” – explaining the current design philosophy
4. “Regulatory Process for the DGR” – describing and illustrating the decision and approval process
5. “Project Works and Activities” – describes the site preparation, construction, operations and decommissioning activities
6. “EA Process for the DGR Project” – uses a flow chart to illustrate steps in the EA process
7. “Atmospheric Environment” – describes the effects assessed, mitigation measures and residual effects to the atmospheric environment
8. “Aquatic Environment” – describes the effects assessed, mitigation measures and residual effects on the aquatic environment
9. “Terrestrial Environment” – describes the effects assessed, mitigation measures and residual effects on the terrestrial environment
10. “Hydrology and Surface Water Quality” – describes the effects assessed, mitigation measures and residual effects on hydrology and surface water quality
11. “Geology” – describes the effects assessed, mitigation measures and residual effects on geology
12. “Radiation and Radioactivity” – describes the mitigation measures and residual effects of releases of radiation to air and water
13. “Malfunctions and Accidents” – considers the consequences of potential accidents
14. “Social and Economic Effects” – describes the social and economic effects assessed, mitigation measures and residual effects
15. “Aboriginal Interests” – describes the Aboriginal interests assessed, mitigation measures and residual effects

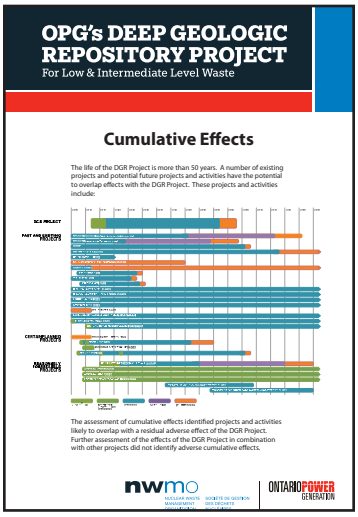


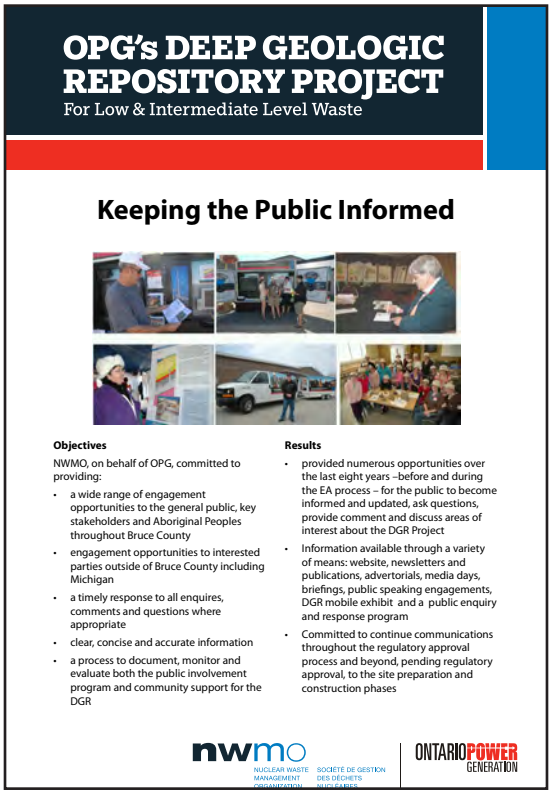




16. “Human Health” – describes the health effects assessed, mitigation measures and residual effects
17. “Effects of the Environment on the Project” – describes the potential effects and mitigation for natural hazards
18. “Cumulative Effects” – uses a timeline to illustrate the exising and potential future projects that have the potential to overlap effects, and to summarize the potential for effects of these projects
19. “Follow-up Monitoring” – describes proposed monitoring for the site preparation, operations and decommissioning phases
20. “Keeping the Public Informed” – describes the objectives and results of NWMO’s commitment to public engagement opportunities
21. “Keeping the Public Informed” – second board describing results of 2009 Evaluation of Public Involvement Program
22. “Safety Case for the Project” – a description of natural barriers to protect the public, and groundwater
23. “FAQs and NWMO Responses” – a panel listing public comments and OPG responses

See Appendix D for images of each of the display panels.





7. Opportunities for Input

Comment Cards

Comment cards in the style of large sized postcards were available for Open House for participants to rate their experience at the Open House, and to write comments. Cards could be filled out at the Open House, or mailed in afterwards.

In total, ten comment cards were returned. Of those, three included written comments, and all responded to the questions evaluating the Open House. All comment card feedback is provided in Appendix E.

Comments/Questions?
Let us know.

PLACE STAMP HERE

Name:

Address:

Phone:

Email:

Nuclear Waste Management Organization
Media Relations Manager
P.O. Box 7000, B21
Tiverton, Ontario
N0G 2T0

email: dgrinfo@nwmo.ca mwilson@nwmo.ca Phone: 519-368-1639

Please leave this card with our open house staff, or mail it back to us at your convenience. You can also email us with your comments at dgrinfo@nwmo.ca or visit our website for more information at www.opg.com/dgr.

Open House Evaluation

Please rank the following statements on a scale of 1 to 5 where "1" is "strongly disagree","3" is neutral or "no opinion" and "5" is "strongly agree".

a. The open house panels helped me to understand the deep geological repository (DGR) proposal.
1 2 3 4 5

b. The open house location and hours were convenient for me.
1 2 3 4 5

c. The open house staff were helpful.
1 2 3 4 5

d. Overall, the open house helped me to satisfy the information needs I had.
1 2 3 4 5

e. I will recommend to my friends and family members that they should come to a future DGR open house.
1 2 3 4 5

email: dgrinfo@nwmo.ca mwilson@nwmo.ca
Phone: 519-368-1639

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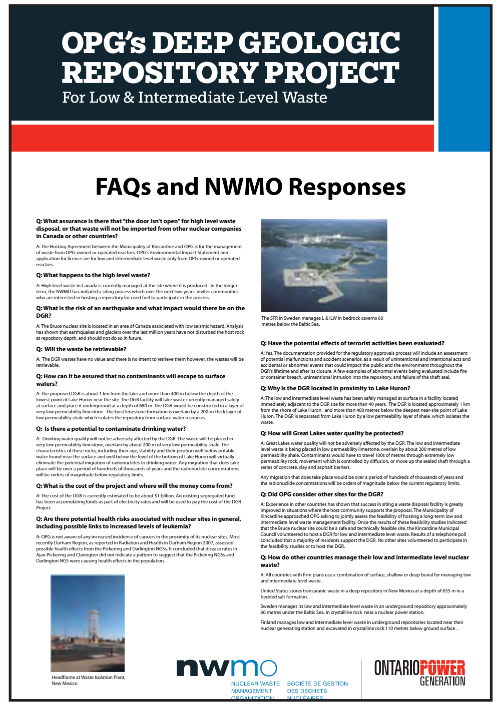
ONTARIO POWER GENERATION

AECOM

8. Key Areas of Discussion



Typically, Open House attendees were already familiar with the proposed DGR Project, having participated in other stakeholder communications events. Many of those who attended the Open Houses expressed support for the project. One of the primary reasons for attending the Open Houses was to obtain an update on the progress of the project and to hear about the preliminary results of the Environmental Assessment. Visitors tended to stay for between 20 and 40 minutes on average. Comments and questions received from prior Open Houses were also presented on a display panel with NWMO/OPG responses (presented in Appendix D).

The discussions at the 2010 Open Houses covered a broad range of subjects. The questions most frequently asked are grouped below into key topic areas:

Questions relating to waste characteristics and the wastes that will be managed in the DGR

- Will used fuel be stored in the DGR?
- Why are you going to such lengths for what is mainly low level waste?
- The DGR Project is being designed to meet criteria for used fuel; isn't it only a matter of time before used fuel is coming to this DGR?
- How can the public be assured that used fuel will not be emplaced in the DGR?
- Describe the different nuclear streams and how long each remains radioactive.
- What is the difference between low, intermediate and high level waste?
- What are the half lives of these wastes?
- Where does the waste come from?
- Are the effects of incineration being considered?
- Will the DGR receive waste / fuel from other countries?

NWMO/OPG response:

The DGR will store low and intermediate level waste (L&ILW) from OPG-owned or operated nuclear generating stations. This waste is currently managed on an interim basis at the Western Waste Management Facility in the Municipality of Kincardine. These ongoing activities, including incineration, are not a part of the scope of the environmental assessment for the DGR Project. Waste from other producers and other countries will not be managed in the DGR.

The Hosting Agreement between the Municipality of Kincardine and OPG relates to the management of OPG's L&ILW in the DGR. The Municipality of Kincardine has passed a resolution indicating that no used fuel will be placed in the DGR. OPG's Environmental Impact Statement and application for a licence are for a DGR for nominally 200,000 m^3 of L&ILW only from OPG-owned or operated reactors.

Low level waste has low levels of radioactivity, consists primarily of paper, plastics, metal, rubber and

cotton, and includes protective clothing, floor sweepings, mops, and rags. It can be handled without special radiation protection. Typically, low level waste has a half life of less than 30 years, though it may contain small quantities of longer lived radionuclides.

Intermediate level waste includes used reactor core components, and resins and filters. It requires shielding to protect workers during handling. The intermediate level waste includes radionuclides with much longer half lives.

Refurbishment waste consists of low and intermediate level waste generated from the refurbishment of nuclear reactors. It consists of irradiated core components such as pressure tubes, calandria tubes, end fittings and steam generators.

Questions relating to management of used fuel

- How is used fuel managed now?
- How will used fuel be managed over the long-term?
- What are you doing with used fuel in the long-term?

NWMO/OPG response:

Used fuel is managed in irradiated fuel bays at the generating station where it is produced for approximately ten years. After that time it can be loaded into a dry storage container and moved to a used fuel dry storage building at the generating station site where it was produced. It will remain in the used fuel dry storage building until such time as a long-term solution is available.

In the future, the used fuel will be moved to a deep geologic repository, which is designed and constructed for that purpose, located in a community which is a volunteer host. The NWMO initiated the Learn More Program in 2010, which makes resources available to communities who are interested in participating in the early steps of the siting process for a repository for used fuel. The DGR for used fuel will be located in a willing and informed host community.

Questions relating to siting and alternatives

- Why is the DGR proposed for the Bruce nuclear site instead of sending it up north somewhere away from the public?
- Why locate the DGR in Southern Ontario…would it not be better to locate it in sparsely populated Northern Ontario?
- Is this the best alternative of several options?
- What alternatives were considered, for example, was sending the waste into the sun considered?
- Why is the DGR located close to the lake?
- What other sites were assessed to know this is the best site?
- What other sites were considered?

NWMO/OPG response:

The Municipality of Kincardine approached OPG in 2001 expressing an interest in assessing the feasibility of hosting a long-term facility for low level waste management. Experience in other countries has shown that success in siting a waste disposal facility is greatly improved in situations where the community supports

the proposal. Kincardine was both a willing host and based on the results of the feasibility study, was technically suitable for a DGR. Much of the waste to be emplaced in the DGR is currently stored on site at the WWMF.

An independent assessment study, completed in 2004, considered several different proven technologies for long-term management of low level waste, including deep geologic repository, near surface concrete vault, and enhanced processing. The results of this study indicated that all three technologies could safely manage some or all of the low and intermediate level waste. The DGR is the only technology that could manage all of the low and intermediate level waste. The Municipality of Kincardine preferred the DGR because it is consistent with international best practice and offers a greater margin of safety than the other technologies considered.

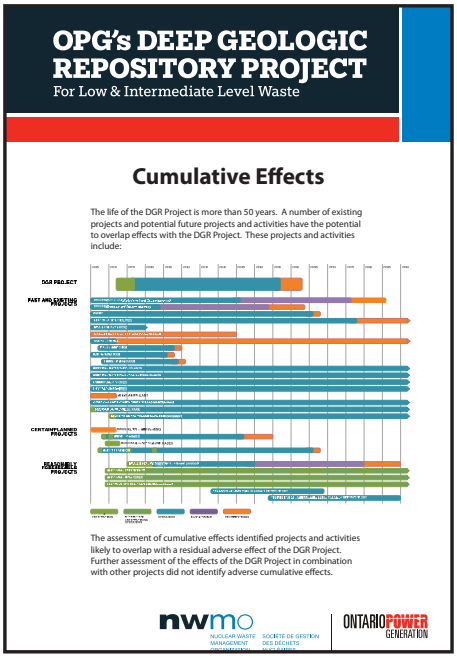
A four-year stepwise geoscientific site characterisation of the geology beneath the Bruce Nuclear Site provides site-specific evidence, gained over four years of investigations, studies and analyses, that supports the existence of passive multiple natural barriers that will safely isolate and protect the waste from the public and environment for thousands of years and beyond.

Questions relating to human health and environmental effects

- A study in the Durham Region concluded that disease rates in Ajax-Pickering and Clarington did not indicate a pattern to suggest that the Pickering NGSs and Darlington NGS were causing health effects in the population. It was suggested that a similar study in the Bruce Region would be helpful to provide information on health effects.
- What about the effects of the DGR on human health – have any studies been done in this area to see if there are higher levels of cancer here, define the emissions that are stated as a residual effect in the atmospheric environment?
- Where does acrolein come from and how does it affect workers and would it be monitored?
- I am concerned about the use of the term “no residual effects”; you say there are measurable effects so how can be there no residual effects?
- Where is Stream C and where does it drain?
- How much noise will there be during site preparation and construction and will the blasting during construction trip the generating stations at the Bruce nuclear site?
- What is benthic?
- What do you mean by cumulative effects?
- When will the TSDs and EIS be available for review?

NWMO/OPG response:

Durham Region, in Radiation and Health in Durham Region 2007, assessed possible health effects from the Pickering and Darlington NGSs. It concludes that disease rates in Ajax-Pickering and Clarington did not indicate a pattern to suggest that the Pickering NGSs and Darlington NGS were causing health effects in the population. Each year the results of a Radiological Environmental Monitoring Program are reported to the Canadian Nuclear Safety Commission. This report includes an assessment,



based on conservative assumptions, of the dose a member of the public would receive from the Bruce nuclear site. The dose historically has been orders of magnitude below the allowable dose. The DGR Project is not expected to contribute to a change to this dose.

Acrolein may be formed from the breakdown of certain pollutants found in outdoor air, or from the burning of fuels such as gasoline or oil. No effects on worker health are expected at the concentrations at the DGR Project site. Short-term inhalation exposure can result in upper respiratory tract irritation and congestion.

The term “residual effects” is associated with the predicted effects of the project taking into account implementation of mitigation measures. For example, while there may be increased sediment in surface run-off from the DGR Project, implementation of a stormwater management pond would reduce the sediment prior to discharge, resulting in no “residual effect.”

Stream C, which drains to Baie du Dore, crosses the east corner of the DGR Project site; however, is it well removed from the construction activity.

The term “benthic” refers to the bottom of a body of water.

Cumulative effects are effects which result from activities that overlap in time and space. For example, the Environmental Assessment Act requires that the effects of a proposed project be considered in combination with those of existing and reasonably foreseeable projects — these are cumulative effects.

Noise levels during construction will be similar to those associated with use of heavy equipment. The majority of the blasting will be below ground surface. Blasting will not trip the Bruce reactors.

The EIS and TSDs are expected to be submitted to the Joint Review Panel in the first quarter of 2011. The Panel will issue the documents for public review.

Questions relating to geoscience

- How do you know the DGR will protect Lake Huron and groundwater?
- How is the DGR going to protect the lake and the groundwater?
- How will the geology protect the surface and groundwater?
- How will the DGR protect the environment when people are no longer around to provide institutional control?
- Would earthquakes affect the DGR, for example, the October 2005 Georgian Bay Magnitude 4.3?
- Recently earth quakes have been less frequent but have been of higher magnitude; since there hasn’t been a major earthquake in the area does this mean that the area is due for a major earthquake?
- Will the DGR impact the geothermal properties at 680 metres?

NWMO/OPG response:

The proposed DGR is about 1 km inland from the lake shore and more than 400 m below the depth of the lowest point of Lake Huron near the site.

The DGR Project will store L&ILW, currently managed safely at surface, underground at a depth of 680 m in a layer of very low permeability limestone. This limestone is overlain by a 200 m thick layer of low permeability shale. These rock formations are very old, laterally extensive and at longer timeframes will provide passive barriers which to contain and isolate the wastes from surface water resources. Once closed, the DGR will contain and isolate the L&ILW in the absence of institutional controls well into the future.

The Bruce nuclear site lies within the tectonically stable interior of the North American continent, an area with very low seismic potential. Historic records indicate that in 180 years there have been no recorded earthquakes of magnitude greater than 5. The overlying and underlying formations will provide passive barriers to isolate the waste in the event of seismic events and glacial episodes. A Seismic Hazard Assessment of the Bruce nuclear site, as part of the geoscientific site characterisation for the DGR, considered the influence of earthquakes ranging from magnitude 5.25 to 7.5 on the site. The assessment concluded that earthquakes will not impact the safe operation or long-term ability of the DGR to safely isolate and contain the L&ILW. The temperature at the repository level is approximately 18°C. The L&ILW gives off little heat. Geothermal properties at the repository level will not be impacted.

Questions relating to long-term safety

How much radioactivity will leave the DGR site?

How can the public be assured that this will be safe?

How long can the DGR safely manage waste?

How will the proponent know when it is safe to close the site?

How will monitoring results be used to make the decision to close the facility?

NWMO/OPG response:

An ongoing radiological monitoring program is conducted by Bruce Power in the vicinity of the Bruce nuclear site to assess the effect of all operations at the site including Bruce Power, Ontario Power Generation and Atomic Energy of Canada Limited. The program includes specific sampling conducted within a 20-km radius of the Bruce nuclear site. The results of this monitoring are reported annually to the Canadian Nuclear Safety Commission. Any contribution of the DGR would be included in this monitoring program. Once waste currently in storage at the WWMF is isolated in the DGR, the amount of radioactivity leaving the site will be reduced.

The doses to workers underground from low level waste will be comparable to those currently experienced in the above-ground storage buildings. Similarly, doses to workers handling the intermediate level waste will be about the same as to those handling the waste above ground. OPG will have monitoring programs in place to assure that workers and the public are not exposed to unacceptable doses. The CNSC licensing process requires that the proponent obtain a licence to decommission the DGR and a licence to abandon the facility. It will be the CNSC that will determine whether it is safe to close the DGR. A comparison of monitoring results with predicted effects is typically used to verify performance.

Questions relating to security

- What type of security forces are there at the Bruce nuclear site?
- Do they have armed guards?
- How do you protect against terrorism-spies on tours?
- What about terrorist attacks?

NWMO/OPG response:

The DGR is located on the Bruce nuclear site, which is enclosed by a security fence and has security personnel on site. Staff working at the site are subject to security clearance. Programs are in place to ensure site visitors are sponsored by security-cleared staff. Visitors adhere to very strict restrictions, and must be within close proximity of their sponsor at all times.

Questions relating to DGR engineering and operations

- How long will the facility be in operation?
- What kind of employment opportunities will be created as a result of the DGR?
- What is the construction technique for the shaft; drill and blast or roadheader?
- Has NWMO considered a wetland treatment system for all or part of the stormwater management pond?
- What about into the future and how much will it cost?
- How much will the DGR cost and who is going to pay for it?

NWMO/OPG response:

Based on current projections, the earliest a construction licence could be granted is late 2012. Construction is expected to take approximately five to seven years with an average of 200 construction jobs each year. Many of the construction jobs would be associated with the excavation. Operations would start in 2017 or 2018 with approximately 40 jobs. Waste is expected to be emplaced in the DGR for approximately 35 to 40 years, based on the current nuclear program.

The current preferred construction method is controlled drill and blast. A wetland treatment system has not been considered in the preliminary design; however, it may be considered in the detailed design phase.

The cost of DGR construction is currently estimated to be about $1 billion. A more detailed cost estimate will be developed as part of detailed engineering. An existing segregated fund, which has been accumulating funds as part of electricity rates, will be used to pay the cost of the DGR Project.

Other questions

- How is radioactive material transportation regulated in Canada?
- Will the Red Cross have any role in responding to any situations at the site?
- Is this project associated with the steam generator project?
- Does New Brunswick have a facility similar to this?
- What communications have been done in Michigan?

- Having a long-term waste site helps the utility, but how does it help the public who live near the site?
- Does this project have anything to do with the steam generators?
- Do you conduct tours?

NWMO/OPG response:

The CNSC and Transport Canada regulate the transport of radioactive and other hazardous materials.

The Red Cross would not have a role in responding to situations at the Bruce nuclear site.

The current proposal to transport steam generators is a Bruce Power initiative. The DGR would manage steam generator waste in the form in which it is provided by Bruce Power.

New Brunswick manages its L&ILW in interim surface facilities. It does not have a deep geologic repository or other long-term management facility at this time.

The current interim waste management facility is safe. A long-term waste site, in particular a DGR, provides safer long-term management, even in the absence of institutional controls.

A number of Michigan stakeholders and interested parties are on the DGR designated mailing list, which provides access to current information about the DGR Project. Media briefings were held with several newspapers in Michigan. A team of representatives from NWMO and OPG also provided key stakeholders in Michigan with DGR briefings in the fall of 2009.

Briefings covered NWMO/OPG profiles, background and history of the DGR, Canada's regulatory process, geoscience and communication efforts to date. Stakeholders were able to ask questions, provide comment and discuss areas of interest about the DGR. Participating stakeholder groups included political representatives, Department of Environmental Quality, a representative from Macomb County Board of Commissioners and three environmental groups: National Wildlife Federation, Michigan Environmental Council and Michigan United Conservation Clubs.

The DGR is consistent with international best practice. If approved, it would emplace the waste in a facility where it can be safely managed in the very long term, even in the absence of institutional controls.

9. Media Coverage of the Open Houses

Journalists interviewed NWMO and OPG representatives and Open House attendees during the open houses.

Following the community open houses, the following articles, editorials and letters-to-the-editor appeared in local newspapers and radio stations (see Appendix B):

- Bayshore Broadcasting Centre (Owen Sound) - Tuesday, September 28th, 2010: “Open House for DGR,” by reporter John Divinski
- Saugeen Times - Friday, October 1st, 2010: “NWMO hosts open houses on preliminary results of EA into Deep Geologic Repository,” by Liz Dadson
- Toronto Star - Saturday, October 2nd, 2010: Letters: “Misunderstanding “clean” power; Taking aim at nuclear power”
- Kincardine News - Tuesday, October 5th, 2010: Editorial: “DGR project can learn from Bruce”
- Kincardine News - Tuesday, October 5th, 2010: “Preliminary EA on OPG’s Deep Geological Repository released,” by Troy Patterson

10. Appendices

Appendix A: Notification Materials

- Letter of Invitation (addressed mail)
- Mailing List for Invitation Letters
- Postcard Invitation (unaddressed admail)
- Distribution Breakdown for Postcard Invitation
- Newspaper Announcements
- Placement of Newspaper Announcements
- Distribution of Radio Scripts
- Radio Scripts
- Marketplace Announcement

Appendix B: Newspaper Coverage

Appendix C: Open House Handouts

- DGR 2009 Annual Report
- Information Booklet: Keeping You Informed
- DGR Newsletter, May and September 2010
- Western Waste Management Facility Booklet

Appendix D: Open House Display Panels

Appendix E: Open House Sign-in Sheets and Comment Cards

Appendix A

Notification Materials

Contact List Not Provided

Angelo Castellan
Vice President
Environmental Assessment &
Corporate Support
Tel 647.259.3018
Email acastellan@nwmo.ca

DGR-07723-T10

September 16, 2010

Mr. Ken Kilpatrick
News Reporter
Blackburn Radio Inc.
215 Carling Terrace
Wingham, ON N0G 2W0

Dear Mr. Kilpatrick:

Subject: Community Consultation for OPG's Deep Geologic Repository Project for Low and Intermediate Level Waste

Consistent with the requirements of the Canadian Environmental Assessment Act, Ontario Power Generation (OPG) is pursuing completion and acceptance of an Environmental Impact Statement (EIS) for the proposed Deep Geologic Repository (DGR) Project for Low and Intermediate Level Radioactive Waste at the Bruce nuclear site. The Nuclear Waste Management Organization (NWMO) has been contracted by OPG to undertake the regulatory approvals process for the DGR.

As a part of that environmental assessment process, NWMO and OPG are seeking opportunities to communicate with interested stakeholders on the proposed DGR Project. To further these communication efforts, open houses have been scheduled in communities in the vicinity of the proposed project at the Bruce nuclear site during late September and early October 2010. At these open houses, we look forward to providing preliminary results of the environmental assessment, responding to questions, and hearing the views of stakeholders on the proposed project. This feedback will be considered in the environmental impact statement submitted to the Joint Review Panel (that will preside over the hearings for the EIS and the site preparation/ construction licence application).

Open Houses are being held at the locations listed below and will be open between the hours of 4 p.m. and 8 p.m. each evening.

Elgin
Monday September 27
Colonial Motel
235 Goderich Street
Port Elgin, ON

Ripley
Tuesday September 28
Ripley Huron Community Centre
17 Queen Street
Ripley, ON

Kincardine
Wednesday September 29
Best Western Governor's Inn
791 Durham Street
Kincardine, ON

Walkerton
Thursday September 30
Victoria Jubilee Hall
111 Jackson Street S
Walkerton, ON

Chesley
Monday October 4
Chesley Fire Hall
North end of Chesley, Bruce Rd. 10

Owen Sound
Tuesday October 5
Bayshore Community Centre
1900 3rd Avenue E
Owen Sound, ON

Wiarton
Wednesday October 6
County of Bruce Public Library Building
578 Brown Street
Wiarton, ON

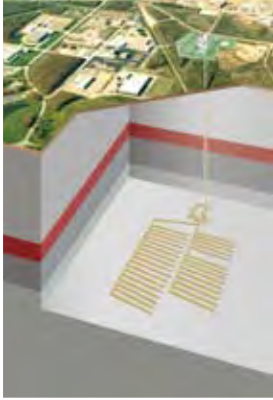
We look forward to seeing you at one or more of the Open Houses. If you would like further information on the proposed DGR Project please refer to our web site at: www.nwmo.ca/dgr or call Marie Wilson at 519-368-1639.

Sincerely,

A. Castellan

Angelo Castellan
Vice President, Environmental Assessment & Corporate Support

YOU ARE INVITED TO A DGR OPEN HOUSE



Keeping you informed about OPG's DEEP GEOLOGIC REPOSITORY PROJECT for Low & Intermediate Level Waste

On behalf of Ontario Power Generation (OPG), the Nuclear Waste Management Organization (NWMO) invites you to participate in our Open Houses on the Deep Geologic Repository (DGR) Project for low and intermediate level radioactive waste.

At this fourth round of Open Houses we look forward to providing you with updated information on the DGR Project, including the preliminary results of the environmental assessment, to answering your questions, and hearing your views. Your comments will be addressed in the Environmental Impact Statement (EIS) submitted under the Canadian Environmental Assessment Act for the project.

The next major DGR Project milestone is the filing of the regulatory submission anticipated in early 2011, which includes the EIS, Preliminary Safety Report and supporting documents.

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NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

ONTARIO POWER GENERATION

Open Houses will be held at the locations listed below. Open House hours of operation are 4:00 p.m. to 8:00 p.m. We look forward to seeing you there.

Port Elgin
Monday September 27
Colonial Motel
235 Goderich Street
Port Elgin, ON

Ripley
Tuesday September 28
Ripley Huron Community Centre
17 Queen Street
Ripley, ON

Kincardine
Wednesday September 29
Best Western Governor's Inn
791 Durham Street
Kincardine, ON

Walkerton
Thursday September 30
Victoria Jubilee Hall
111 Jackson Street S
Walkerton, ON

Chesley
Monday October 4
Chesley Fire Hall
North end of Chesley, Bruce Rd. 10
Chesley, ON

Owen Sound
Tuesday October 5
Bayshore Community Centre
1900 3rd Avenue E
Owen Sound, ON

Wiarton
Wednesday October 6
County of Bruce Public Library Building
578 Brown Street
Wiarton, ON

FOR MORE INFORMATION

Please call Marie Wilson at (519) 368-1639, or write to us at the Nuclear Waste Management Organization (NWMO), Box 7000, B21, Tiverton, ON, N0G 2T0 or visit our project website at: www.nwmo.ca/dgr

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SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

ONTARIO POWER GENERATION

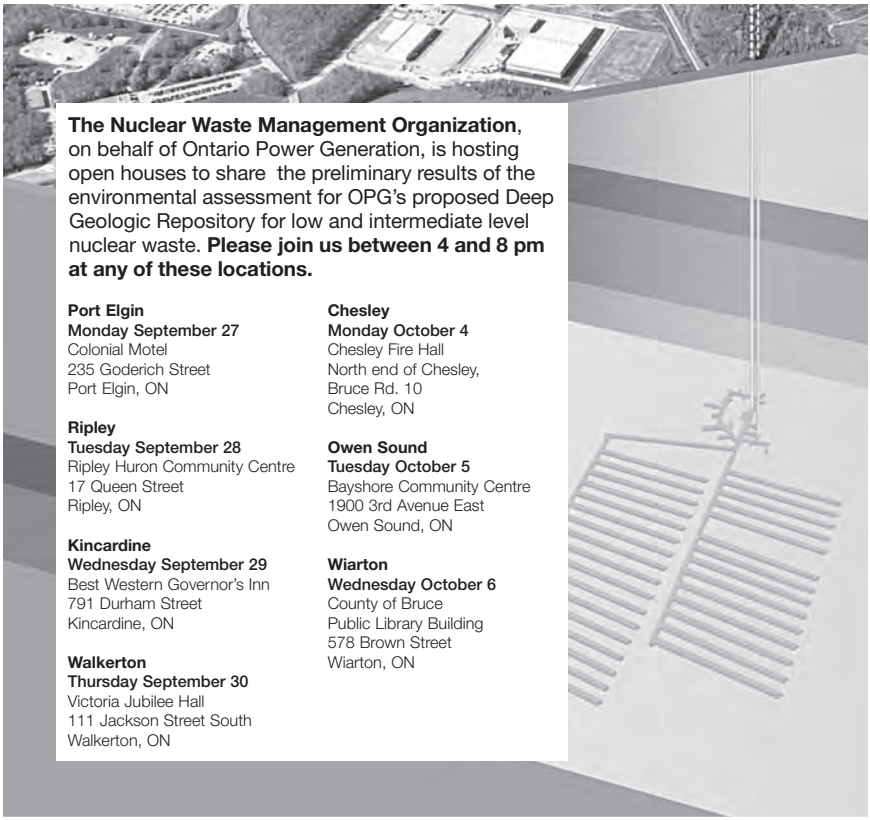
www.nwmo.ca/dgr

Printed on 100% recycled stock

2010 DGR Open House Post Card Mailing List		
Kincardine P.O.	All Postal Codes	5339
Owen Sound P.O.	All Postal Codes	14029
Chepstow P.O.	N0G 1L0	146
Clifford P.O.	N0G 1M0	941
Elmwood P.O.	N0G 1S0	720
Formosa P.O.	N0G 1W0	255
Holyrood P.O.	N0G 2B0	208
Mildmay P.O.	N0G 2J0	1007
Chesley P.O.	N0G 1L0	1429
Neustadt P.O.	N0G 2M0	403
Paisley P.O.	N0G 2N0	958
Ripley P.O.	N0G 2R0	791
Teeswater P.O.	N0G 2S0	1989
Tiverton P.O.	N0G 2T0	1325
Walkerton P.O.	N0G 2V0	3710
Allenford P.O.	N0H 1A0	499
Annan P.O.	N0H 1B0	393
Bognor P.O.	N0H 1E0	212
Kemble P.O.	N0H 1S0	426
Leith P.O.	N0H 1V0	100
Lions Head P.O.	N0H 1W0	1059
Mar P.O.	N0H 1X0	537
Miller Lake P.O.	N0H 1Z0	267
Port Elgin P.O.	N0H 2C0	4499
Shallow Lake P.O.	N0H 2K0	666
Southampton P.O.	N0H 2L0	2406
Stokes Bay P.O.	N0H 2M0	90
Tara P.O.	N0H 2N0	1427
Tobermory P.O.	N0H 2R0	712
Wiarton P.O.	N0H 2T0	4915
TOTAL		51,458

OPG's DEEP GEOLOGIC REPOSITORY PROJECT

For Low & Intermediate Level Waste



The Nuclear Waste Management Organization, on behalf of Ontario Power Generation, is hosting open houses to share the preliminary results of the environmental assessment for OPG's proposed Deep Geologic Repository for low and intermediate level nuclear waste. **Please join us between 4 and 8 pm at any of these locations.**

Port Elgin
Monday September 27
Colonial Motel
235 Goderich Street
Port Elgin, ON

Ripley
Tuesday September 28
Ripley Huron Community Centre
17 Queen Street
Ripley, ON

Kincardine
Wednesday September 29
Best Western Governor's Inn
791 Durham Street
Kincardine, ON

Walkerton
Thursday September 30
Victoria Jubilee Hall
111 Jackson Street South
Walkerton, ON

Chesley
Monday October 4
Chesley Fire Hall
North end of Chesley,
Bruce Rd. 10
Chesley, ON

Owen Sound
Tuesday October 5
Bayshore Community Centre
1900 3rd Avenue East
Owen Sound, ON

Wiarton
Wednesday October 6
County of Bruce
Public Library Building
578 Brown Street
Wiarton, ON

KEEPING YOU INFORMED

www.nwmo.ca/dgr

nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

ONTARIO POWER GENERATION

Print Schedule for 2010 Open House Advertising

PAPER	SPEC	SIZE- Width by Height	INSERTION DATES	Deadline for copy
Kincardine News	B&W	4.9 x 6.2 inches	Sept. 22, Sept. 29	Sept. 17 - 2 pm Sept. 24 - 2 pm
Kincardine Independent	B&W	5 x 7 ¾ inches	Sept. 22, Sept. 29	Sept. 17 – 2 pm Sept. 24 – 2 pm
Lucknow Sentinel	B&W	4.9 x 6.2 inches	Sept. 15, Sept. 22	Sept. 10 – noon Sept. 17 - noon
Shoreline Beacon	B&W	4.9 x 6.2 inches	Sept. 15, Sept. 22	Sept. 10 – 2 pm Sept. 17 – 2 pm
Wiarton Echo	B&W	4.9 x 6.2 inches	Sept. 29, Oct. 6	Sept. 23 – noon Sept. 30 - noon
Walkerton Herald Times	B&W	5.1 x 6.2	Sept. 22, Sept. 29	Sept. 17 – 3 pm Sept. 24 – 3 pm
Sun Times (Owen Sound)	B&W	5 11/16 x 6 ¾ inches	Sept. 24, Sept. 27, Oct. 4	Sept. 22 – 3 pm Sept. 23 – 3 pm Sept. 30 – 3 pm

AD:

We are doing a round of open houses (as per the post card) from September 27 to October. We will need the first ads ready for insertion the week of Sept. 15 – note deadline dates. The ads will have exactly the same format as the open house ad we did recently for the open house held at the Bruce County Museum; however the times and locations will be different. The specifications and insertion dates are listed above. I will book the ad space and insert.

Open House Schedule: Print the schedule as per the postcard with the same time, dates and locations; however, as the open houses occur, some will fall off the schedule, necessitating a change in the copy – see below:

Kincardine News –Advertise all of the open houses in Sept. 22 edition; drop Port Elgin open house in Sept. 29 edition.

Kincardine Independent – Advertise all of the open houses in Sept. 22 edition; drop Port Elgin open house in Sept. 29 edition.

Lucknow Sentinel – Advertise all of the open houses in both Sept. 15 and Sept. 22 editions.

Shoreline Beacon – Advertise all of the open houses on in Sept. 15 and Sept. 22 editions.

Wiarton Echo – Only advertise the Wiarton and Owen Sound open houses on Sept. 29 and then drop Owen Sound for Oct. 6 edition

- Note the Oct. 6 edition will have to say open house as opposed to open houses

Walkerton Herald Times – Advertise all of the open houses on Sept. 22 and drop Port Elgin and Ripley for the Sept. 29 edition

Sun Times – Advertise all for the Sept. 24 edition, all for the Sept. 27 edition and just Chesley, Owen Sound and Wiarton for Oct. 4.

Let me know if there are any issues.

Thanks a lot,

M.W.

CIYN-FM Invoice

myFM
(a division of My Broadcasting Corporation)
Box 961, 321-B Raglan St. S.
Renfrew, Ontario
K7V 4H4
Tel: 613-432-6936

Invoice ID: 10091035
Invoice Date: 9/26/2010
Account ID: 4239
Order ID: 4239-003
Account Rep: Rob Mise

Amount Due: $1,808.00

Amount Paid: _____

NUCLEAR WASTE MANAGEMENT ORGANIZATION
BOX 7000, B21
TIVERTON, ONTARIO N0G 2T0

G.S.T. # 864297940-RT0001
Further Invoice Detail Available Upon Request
Terms are net 30 Days

Sponsor: Nuclear Waste Management Organization / Nuclear Waste Manage
Nuclear Waste Management Organization- Open Houses

Dates	Qty	Description	Rate	Cost
9/22/2010 - 9/26/2010	50	:30 Spot	[Package]	[Package]
9/26/2010 - 9/26/2010	1	Package	1,600.00	1,600.00
		50 Total Items	**Total Cost:**	**1,600.00**
			+ 13% HST:	208.00
			Net Total:	**1,808.00**

Amount Due: 1,808.00

baysh re br adcasting
CORPORATION

Box 280 270 Ninth Street East Owen Sound ON N4K 5P5
Phone: 519-376-2030 Fax: 519-371-4242
bayshore@bayshorebroadcasting.ca

STATEMENT

DATE: 9/30/10

FOR YOUR CONVENIENCE PAY BY VISA, MASTERCARD OR ON LINE

ANY QUESTIONS ON YOUR STATEMENT PLEASE CONTACT LEEANN BARFOOT ACCOUNTS RECEIVABLE @ EXT 210 OR YOUR MARKETING REP

NUCLEAR WASTE MANAGEMENT (NWMO
BOX 7000 B21
TIVERTON ONTARIO
N0G 2T0

ACCOUNT NUMBER	66430

AMOUNT DUE	AMOUNT PAID
$3,135.75	

TERMS: **Net. A finance charge of 2% per month (24% annual rate) will be charged on the unpaid balance of past due accounts.**

INVOICE NUMBER	INVOICE DATE	DESCRIPTION	AMOUNT	BALANCE
134151	8/25/10	Contract #0052554 8/19/10 to 8/23/10	CIXK-FM	
		AUGUST 23 OPEN HOUSE		
		Beginning Balance	$1,356.00	
		BALANCE OF INVOICE #134151		$1,356.00
134152	8/25/10	Contract #0052556 8/16/10 to 8/23/10	CFPS-FM	
		AUGUST 23RD OPEN HOUS		
		Beginning Balance	$1,017.00	
		BALANCE OF INVOICE #134152		$1,017.00
135992	9/30/10	Contract #0053393 9/24/10 to 9/26/10	CKYC-FM	
		NGR OPEN HOUSES		
		9/26 10 30's @ $50.00	$500.00	
		9/26 HST Tax	$65.00	
		BALANCE OF INVOICE #135992		$565.00
135993	9/30/10	Contract #0053391 9/24/10 to 9/26/10	CFPS-FM	
		NGR OPEN HOUSES		
		9/26 7 30's @ $25.00	$175.00	
		9/26 3 30's No Charge	$0.00	
		Total Charge:	$175.00	
		9/26 HST Tax	$22.75	
		BALANCE OF INVOICE #135993		$197.75

DATE	PREVIOUS BALANCE		
9/30/10	$2,373.00		Bayshore Broadcasting Corp

CURRENT	30 DAYS	60 DAYS	90+ DAYS	PAY THIS AMOUNT
$762.75	$2,373.00	$0.00	$0.00	→ $3,135.75

CKYC-FM
Bayshore Broadcasting Corp
Box 280
270 Ninth Street East
Owen Sound ON N4K 5P5
Phone: 519-376-2030
Fax: 519-371-4242
bayshore@bayshorebroadcasting.ca **HST# R100424316**

INVOICE NUMBER: 135992

CKYC-FM Owen Sound ONT

INVOICE DATE: 9/30/10
PAGE: 1 TYPE: Complete
ACCOUNT: 66430
CONTRACT: 53393
PRODUCT:

Salesperson: Rick Zacharewicz

NUCLEAR WASTE MANAGEMENT (NWMO
BOX 7000 B21
TIVERTON ONTARIO
N0G 2T0

Terms: Net. A finance charge of 2% per month (24% annual rate) will be charged on the unpaid balance of past due accounts.

PAY THIS AMOUNT:	BY:
$565.00	10/30/10

Date		Number	CKYC-FM Times			
Fr	9/24/10	4	7:20a	11:39a	2:50p	5:48p
Sa	9/25/10	3	7:18a	9:18a	3:39p	
Su	9/26/10	3	8:05a	1:18p	3:38p	

Contract #0053393 9/24/10 to 9/26/10
NGR OPEN HOUSES

A:	9/26	10 30's @ $50.00	$500.00
	9/26 HST Tax		$65.00
BALANCE OF INVOICE #135992			$565.00

LISTEN IN...BARB JELLY AND DAN MCLEAN ON MIX 106 5 ! SPREAD THE NEWS!

ACCOUNTS RECEIVABLE
LEEANN BARFOOT EXT 210

98 the Beach
serving the lighthouse coast

CFPS-FM **Bayshore Broadcasting Corp**
Box 280 270 Ninth Street East Owen Sound ON N4K 5P5
Phone: 519-376-2030 Fax: 519-371-4242
bayshore@bayshorebroadcasting.ca
HST# R100424316

INVOICE NUMBER: 135993

CFPS-FM Port Elgin, ON
INVOICE DATE: 9/30/10
PAGE: 1 TYPE: Complete
ACCOUNT: 66430
CONTRACT: 53391
PRODUCT:

Salesperson: Rick Zacharewicz

NUCLEAR WASTE MANAGEMENT (NWMO
BOX 7000 B21
TIVERTON ONTARIO
N0G 2T0

Terms: **Net. A finance charge of 2% per month (24% annual rate) will be charged on the unpaid balance of past due accounts.**

PAY THIS AMOUNT:	BY:
$197.75	10/30/10

Times are preceded by the item designator A-Z.

Date	Number	CFPS-FM Times			
Fr 9/24/10	4	A--8:52a	A-10:52a	A-12:52p	A--3:42p
Sa 9/25/10	3	A--7:50a	A--3:40p	A--5:40p	
Su 9/26/10	3	B-12:40p	B--3:40p	B--5:20p	

Contract #0053391 9/24/10 to 9/26/10
NGR OPEN HOUSES

A:	9/26 7 30's @ $25.00	$175.00
B:	9/26 3 30's No Charge	$0.00
Total Charge:		$175.00
	9/26 HST Tax	$22.75
BALANCE OF INVOICE #135993		$197.75

LISTEN IN...BARB JELLY AND DAN MCLEAN ON MIX 106 5 ! SPREAD THE NEWS!

ACCOUNTS RECEIVABLE
LEEANN BARFOOT EXT 210

Blackburn Radio Inc.
215 Carling Terrace, Wingham, Ontario N0G 2W0
Tel. 519-357-1310 Fax 519-357-1897
GST #R892978552

INVOICE

NUMBER: 105114

CKNX AM/FM Wingham, ON

INVOICE DATE: 9/27/10
PAGE: 1 TYPE: Complete
ACCOUNT: 69850
CONTRACT: Combined
PRODUCT: Open Houses-Generic
Salespeople: Gary Ballagh
Telephone: 519-385-1451

TERMS: Net. A finance charge of 1.5% per month (18% annual rate) will be charged on the unpaid balance of past due accounts

PAY THIS AMOUNT: $2,034.00 **BY:** 10/27/10

NWMO
C/O MARIE WILSON
BOX 7000 B21
TIVERTON, ONTARIO
N0G 2T0

Times for 9/22/10-9/26/10 — Times are approximate within 10 minutes.

Day/Date		Time	Len	Rate	Product	Comments
We 9/22	A	6:35a	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
We 9/22	A	9:42a	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
We 9/22	A	9:55a	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
We 9/22	A	12:40p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
We 9/22	A	1:52p	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
We 9/22	A	1:55p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
We 9/22	A	2:54p	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
We 9/22	A	3:40p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
We 9/22	A	3:54p	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
We 9/22	A	4:25p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Th 9/23	A	6:24a	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Th 9/23	A	7:14a	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Th 9/23	A	9:54a	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Th 9/23	A	10:22a	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Th 9/23	A	10:53a	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Th 9/23	A	11:21a	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Th 9/23	A	1:28p	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Th 9/23	A	1:55p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Th 9/23	A	2:22p	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Th 9/23	A	4:41p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Fr 9/24	A	6:24a	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Fr 9/24	A	8:27a	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Fr 9/24	A	11:39a	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Fr 9/24	A	11:55a	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Fr 9/24	A	2:21p	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Fr 9/24	A	2:41p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Fr 9/24	A	3:21p	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Fr 9/24	A	3:59p	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Fr 9/24	A	5:42p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Fr 9/24	A	6:25p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Sa 9/25	A	6:04a	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Sa 9/25	A	8:37a	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Sa 9/25	A	9:04a	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Sa 9/25	A	10:52a	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Sa 9/25	A	11:38a	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Sa 9/25	A	12:09p	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Sa 9/25	A	12:39p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Sa 9/25	A	3:34p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Sa 9/25	A	6:01p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Sa 9/25	A	6:17p	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Su 9/26	A	6:04a	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Su 9/26	A	6:04a	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Su 9/26	A	8:05a	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421

Blackburn Radio Inc.
215 Carling Terrace, Wingham, Ontario N0G 2W0
Tel. 519-357-1310 Fax 519-357-1897
GST #R892978552

INVOICE NUMBER: 105114

CKNX AM/FM Wingham, ON

INVOICE DATE: 9/27/10
PAGE: 2 TYPE: Complete
ACCOUNT: 69850
CONTRACT: Combined
PRODUCT: Open Houses-Generic
Salespeople: Gary Ballagh
Telephone: 519-385-1451

TERMS: Net. A finance charge of 1.5% per month (18% annual rate) will be charged on the unpaid balance of past due accounts

PAY THIS AMOUNT:	BY:
$2,034.00	10/27/10

NWMO
C/O MARIE WILSON
BOX 7000 B21
TIVERTON, ONTARIO
N0G 2T0

Day/Date	Time	Len	Rate	Product	Comments
Su 9/26 A	9:35a	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Su 9/26 A	12:04p	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Su 9/26 A	1:03p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Su 9/26 A	1:29p	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421
Su 9/26 A	4:17p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Su 9/26 A	5:03p	30	$36.00	Open Houses-Generic	CKNX-FM Contract 519903
Su 9/26 A	6:27p	30	$36.00	Open Houses-Generic	CKNX-AM Contract 18421

Contract #0018421 9/22/10 to 9/26/10 Station: CKNX-AM
MEETINGS/UPDATES Est=09-10
A: 9/26 25 30's @ $36.00 $900.00
Net Due: $1,017.00

Contract #0519903 9/22/10 to 9/26/10 Station: CKNX-FM
MEETINGS/UPDATES Est=09-10
A: 9/26 25 30's @ $36.00 $900.00
Net Due: $1,017.00

SUMMARY OF INVOICE #105114
Total Charges for invoice #105114: $1,800.00
BALANCE OF INVOICE #105114: $2,034.00

Billed as aired as per the traffic logs

Radio Advertising for 2010 DGR open houses: CFOS – Country 93 and 97.7 The Beach

Radio script for the following dates to be: **Sept. 22, 23, 24, 25, 26.**

You're invited. The Nuclear Waste Management Organization, on behalf of Ontario Power Generation, is hosting a series of open houses in seven Bruce communities. This is your opportunity to discuss the preliminary results of the Environmental Assessment for OPG's proposed deep geologic repository for low and intermediate level nuclear waste. For details of where and when, look in your local newspaper or visit the DGR project website at www.nwmo.ca/dgr

Sept. 27

You're invited. The Nuclear Waste Management Organization, on behalf of Ontario Power Generation, is hosting an open house. This is your opportunity to discuss the preliminary results of the Environmental Assessment for OPG's proposed deep geologic repository for low and intermediate level nuclear waste. Visit NWMO's open house **today in Port Elgin at the Colonial Motel from** 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

Sept. 28

You're invited. The Nuclear Waste Management Organization, on behalf of Ontario Power Generation, is hosting an open house. This is your opportunity to discuss the preliminary results of the Environmental Assessment for OPG's proposed deep geologic repository for low and intermediate level nuclear waste. Visit our open house **today in Ripley at the Ripley Huron Community Centre** from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

Sept. 29

You're invited. The Nuclear Waste Management Organization, on behalf of Ontario Power Generation, is hosting an open house. This is your opportunity to discuss the preliminary results of the Environmental Assessment for OPG's proposed deep geologic repository for low and intermediate level nuclear waste. Visit our open house **today** in **Kincardine at the Best Western Governor's Inn** from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

Sept. 30

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opportunity to discuss the preliminary results of the Environmental Assessment for OPG's proposed deep geologic repository for low and intermediate level nuclear waste. Visit our open house **today** in **Walkerton at Victoria Jubilee Hall Inn** from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

Oct. 4 - You're invited. The Nuclear Waste Management Organization, on behalf of Ontario Power Generation, is hosting an open house. This is your opportunity to discuss the preliminary results of the Environmental Assessment for OPG's proposed deep geologic repository for low and intermediate level nuclear waste. Visit our open house **today** in **Chesley at the Chesley Fire Hall** from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

Oct. 5 - You're invited. The Nuclear Waste Management Organization, on behalf of Ontario Power Generation, is hosting an open house. This is your opportunity to discuss the preliminary results of the Environmental Assessment for OPG's proposed deep geologic repository for low and intermediate level nuclear waste. Visit our open house **today** in **Owen Sound at the Bayshore Community Centre** from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

Oct. 6 - You're invited. The Nuclear Waste Management Organization, on behalf of Ontario Power Generation, is hosting an open house. This is your opportunity to discuss the preliminary results of the Environmental Assessment for OPG's proposed deep geologic repository for low and intermediate level nuclear waste. Visit our open house **today** in **Wiarton at the County of Bruce Public Library Building** from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

Radio Advertising for 2010 DGR open houses: CKNX – FM102 and AM920

Radio script for the following dates to be: **Sept. 22, 23, 24, 25, 26.**

You're invited. The Nuclear Waste Management Organization, on behalf of Ontario Power Generation, is hosting a series of open houses in seven Bruce communities. This is your opportunity to discuss the preliminary results of the Environmental Assessment for OPG's proposed deep geologic repository for low and intermediate level nuclear waste. For details of where and when, look in your local newspaper or visit the DGR project website at www.nwmo.ca/dgr

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Radio Advertising for 2010 DGR open houses:

Radio script for the following dates to be broadcast by **My FM**: **Sept. 22, 23, 24, 25, 26.**

You're invited. The Nuclear Waste Management Organization, on behalf of Ontario Power Generation, is hosting a series of open houses in seven Bruce communities. This is your opportunity to discuss the preliminary results of the Environmental Assessment for OPG's proposed deep geologic repository for low and intermediate level nuclear waste. For details of where and when, look in your local newspaper or visit the DGR project website at www.nwmo.ca/dgr

Sept. 27– MY FM

You're invited. The Nuclear Waste Management Organization, on behalf of Ontario Power Generation, is hosting a series of open houses in seven Bruce communities. This is your opportunity to discuss the preliminary results of the Environmental Assessment for OPG's proposed deep geologic repository for low and intermediate level nuclear waste. Visit NWMO's open house **today in Port Elgin at the Colonial Motel from** 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

Sept. 28 – MY FM

You're invited. The Nuclear Waste Management Organization, on behalf of Ontario Power Generation, is hosting a series of open houses in seven Bruce communities. This is your opportunity to discuss the preliminary results of the Environmental Assessment for OPG's proposed deep geologic repository for low and intermediate level nuclear waste. Visit our open house **today in Ripley at the Ripley Huron Community Centre** from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

Sept. 29 – MY FM

You're invited. The Nuclear Waste Management Organization, on behalf of Ontario Power Generation, is hosting a series of open houses in seven Bruce communities. This is your opportunity to discuss the preliminary results of the Environmental Assessment for OPG's proposed deep geologic repository for low and intermediate level nuclear waste. Visit our open house **today** in **Kincardine at the**

Best Western Governor's Inn from 4PM to 8PM. For more information, please visit www.nwmo.ca/dgr

Keeping you connected to the DGR

Marie Wilson

Ontario Power Generation's (OPG) proposed Deep Geologic Repository (DGR) Project for the long-term management of low and intermediate level nuclear waste (L&ILW) at the Bruce nuclear site is the subject of an environmental assessment (EA) process, which began in the fall of 2005 with the submission of the project description. Work programs in support of the EA were undertaken in the areas of geoscience, safety assessment, environmental field work, engineering/design and public consultation. After more than four years of investigations, studies and analysis, preliminary results of the assessment of the effects of the DGR Project on the environment are being presented to the public for discussion.

In summary, the potential residual effects identified include:

•Small increase in air emissions at Bruce nuclear site during all project phases;

•Increase in noise levels during site preparation, construction and decommissioning;

•Loss of some eastern white cedar on DGR project site

•Reduced flow in the north railway ditch;

•Increase in quantity of stormwater flow at the Interconnecting Road on the Bruce nuclear site;

•Loss of some habitat quantity and quality for Redbelly Dace, Creek Chub, burrowing crayfish and Variable Leaf Pondweed;

•Positive socio-economic effects for the local and regional areas because of an increase in employment, income, business activity, and municipal revenue during all of the phases; and

•Air and noise emissions may result in a temporary loss of enjoyment of property for those in near proximity to the DGR Project during construction and decommissioning.

Further evaluation resulted in these residual adverse effects being considered not significant.

These results were arrived at through application of a thorough, traceable, step-wise assessment process.

NWMO, on behalf of OPG, will be hosting a series of open houses in September/October to provide members of the public with detailed information about these preliminary results as well as the assessment methodology. All are welcome to attend these sessions where friendly staff will be on hand to answer questions and listen to comments.

DGR Open Houses

DATE	LOCATION	TIME
September 27	Colonial Motel 235 Goderich Street Port Elgin	4 - 8 pm
September 28	Ripley Huron Community Centre 17 Queen Street Ripley	4 - 8 pm
September 29	Best Western Governor's Inn 791 Durham Street Kincardine	4 - 8 pm
September 30	Victoria Jubilee Hall 111 Jackson Street S Walkerton	4 - 8 pm
October 4	Chesley Fire Hall Bruce Rd. 10 (North end of Chesley)	4 - 8 pm
October 5	Bayshore Community Centre 1900 3rd Avenue E Owen Sound	4 - 8 pm
October 6	County of Bruce Public Library Building 578 Brown Street Wiarton	4 - 8 pm

For more information about the DGR Project, please visit **www.nwmo.ca/dgr** or call Marie Wilson at 519-368-1639.

Appendix B

Newspaper Coverage

The reality is that nuclear shipments of all kinds, large and small, are on the move in different parts of the world every day. Like all things nuclear, these shipments each need relentless prudence, expert supervision, and high security. What they emphatically do not need is hysteria.

The Kincardine News

DGR project can learn from Bruce

Editorial - October 5, 2010

The gative and inaccurate coverage of the Bruce Power Steam Generator Recycling plan from the Canadian Nuclear Safety Commission hearing should a lesson for both the Nuclear Waste Management Organization and Ontario Power Generation to address with the proposed Deep Geologic Repository.

With certain environmentalists, community groups, First Nations and other non-nuclear supporters proceeding with protests without all the facts and their minds made up, it's just the tip of the iceberg as to what our community will face with the DGR once it receives the same attention. Will it be negative, most likely from the attention the Bruce Power project garnered. Can it be avoided? Not likely, but it can be cushioned by using the Bruce Power momentum to inject it into the public domain before the six month Environmental Impact Statement (EIS) comment period begins next year.

If not, these groups will scream that it's a cover up, non-transparent project that's trying to be slipped under the radar, even though our community has been involved in seeing its progress from the start. It's those who don't understand it from out of area that will be screaming nuclear holocaust. The community must stand behind OPG and the NWMO to demonstrate how well educated a community can be about a nuclear project once all the details come to light.

If we thought Bruce Power faced a tough crowd with its project, just wait until the mainstream media twists and distorts the DGR project. Inaccurately calling it a 'nuclear waste dump' will be just the tip of the iceberg.

The Kincardine News

Preliminary EA on OPG's Deep Geologic Repository released

October 5, 2010 - By TROY PATTERSON , KINCARDINE NEWS STAFF

The Nuclear Waste Management Organization (NWMO) is continuing to step up its public consultation for Ontario Power Generation's (OPG) Deep Geologic Repository, with the preliminary results of its Environmental Assessment (EA) made available during open houses last week.

NWMO received questions from visitors at events in Kincardine, Ripley, Port Elgin, Owen Sound, Chesley, Walkerton and Wiarton over the last two weeks in an effort to educate the public on the plan to store low and intermediate-level nuclear waste indefinitely, in 680 metres of sedimentary rock below the Bruce nuclear site.

NWMO's Marie Wilson said they've been walking concerned residents through the "step-wise and traceable" EA proposal, that it's looking upon as promising as the work towards submitting the Environmental Impact Statement (EIS) to the Canadian Nuclear Safety Commission's (CNSC) Joint Review Panel early in 2011.

"The site is looking stable and predictable, with low seismic activity," said Wilson, noting the study of this June's 5.0 magnitude earthquake was monitored over the last four years, along with 180 years of recorded low seismicity.

Four years of geo-science site characterization wrapped up on June 20, with geologists concluding the science supports the case to build the site about 1km from the shores of Lake Huron. The site would be sealed by concrete in low permeability stone, over 400-metres below the lowest part of the lake. In terms of drinking water, the site would use freezing or capping techniques to prevent any condensation at the water levels within the first 100 metres from the surface, said NWMO EA manager Diane Barker.

"We're committed to protecting Lake Huron and the ground water and have heard some very significant questions," said Wilson.

The main issues identified in the EA are surface impacts to habitats, plant and animal life during construction, as well as increased air and noise emissions that could have an impact on neighbouring residents during construction.

The positive included the socioeconomic effects for local and regional areas from the increase in employment, income, business activity and municipal revenue during each phase.

Once the EIS is released to the public, a six month public comment period will begin, with the CNSC public hearing planned for 2012. Pending approvals, Wilson said they anticipate the DGR could be completed by 2018, based on a five-year construction period.

TORONTO STAR

Misunderstanding 'clean' power; Taking aim at nuclear power, Letters, Oct. 2

Toronto Star
Wed Oct 6 2010
Page: A18
Section: Editorial

Taking aim at **nuclear** power,

Letters, Oct. 2

Judging by the responses to the notion that **nuclear** power might be "clean," there is significant misunderstanding of this technology.

Nothing is 100 per cent clean, but some things are called clean if they achieve a result (e.g. electricity supply) at a small fraction of the conventional environmental impact.

Renewable energy, for example, is far from clean, but it's called clean because of the above distinction.

Nuclear power deserves the clean title because it has almost no emissions during operation. Even considering the entire life cycle, its CO2 output is on par with that of wind power.

NWMO hosts open houses on preliminary results of EA into Deep Geologic Repository

By Liz Dadson

The Nuclear Waste Management Organization (NWMO) had staff on hand at several open houses in the area, to field questions about the preliminary results of the Environmental Assessment (EA) into Ontario Power Generation's Deep Geologic Repository proposed for the Bruce Nuclear site.

Open houses were held in Port Elgin, Ripley, Kincardine and Walkerton last week to obtain feedback from the public about the project.

Three more open houses are scheduled for this week, all running 4-8 p.m.: tonight (Oct. 4) at the Chesley Fire Hall; tomorrow (Oct. 5) at the Bayshore Community in Owen Sound; and Wednesday (Oct. 6) at the Bruce County Public Library building in Wiarton.

At the open house Wednesday afternoon at the Best Western Governor's Inn in Kincardine, Marie Wilson, NWMO media relations manager, said the preliminary results of the EA indicates there will be increased noise and increased air emissions at Bruce Nuclear during site preparation, construction and decommissioning.

However, none of those potential residual effects is deemed to be significant, she said.

Wilson said a geoscientific site characterization and assessment of safety and environmental effects has been completed and supports the safety case for the project. The rock formations are stable and of low-permeability - ideal for containing the repository for low- and intermediate-level nuclear waste.

She noted that the repository is isolated from Lake Huron and the groundwater in the area, because of multiple natural barriers.

Gary Senior (L) of the Saugeen Valley Conservation Authority, asks questions of Diane Barker of NWMO

Marie Wilson (R) of NWMO answers questions posed by Eugene Bourgeois of Inverhuron

Once the open houses are complete and public comments gathered, NWMO can proceed with its submission of the Environmental Impact Statement and Preliminary Safety Report in 2011, in support of the licensing process.

These documents will go to a joint review panel and then there will be a six-month public comment period, said Wilson. Public hearings would be scheduled for 2012. If given the green light, construction would take about five years and the repository would be up and running by 2018, she said.

Wilson said the proximity of the project to Lake Huron is often questioned during open house sessions.

"We explain to people that the DGR (Deep Geologic Repository) is isolated from Lake Huron by low-permeability rock formations," she said. "The DGR will be located 400 metres from the deepest point of the lake and about one kilometre inland from the lake. And it will be way below the groundwater level."

A member of the public checks out the panels, describing the Deep Geologic Repository

baysh re br adcasting
NEWS CENTRE

Open House for DGR

September 28, 2010 - by John Divinski

The Environmental Assessment for the Deep Geologic Repository (DGR) project for low and intermediate level radioactive waste at the Bruce nuclear site has kicked off a series of open houses.

Marie Wilson -- the OPG media relations manager for the Nuclear Waste Management Organization -- says this is the fourth round of public meetings where updates on the project are provided.

Wilson says it's an opportunity for the public to have its say as well.

In Saugeen Shores on Monday -- Wilson says although the environmental assessment goes on -- they do have preliminary results.

Wilson says there will a couple of residual effects during the construction, such as noise and dust in the area however, they are not deemed to be significant.

She says they did get a couple of calls from people wondering if the meeting was about Bruce Power's plan to ship de-commissioned steam generators through the area.

She confirms the two issues are separate and distinct.

DGR open houses continue Tuesday night in Ripley, followed by meetings in Kincardine on Wednesday, Walkerton on Thursday.

Chesley will host an open house next Monday, October 4th, followed by a similar meeting in Owen Sound on October 5th and Wiarton, October 6th.

The Daily Observer

Investing in new facilities

The Pembroke Observer
Wed Sep 29 2010
Page: A1
Section: News
Byline: STEPHEN UHLER

Appendix C

Open House Handouts

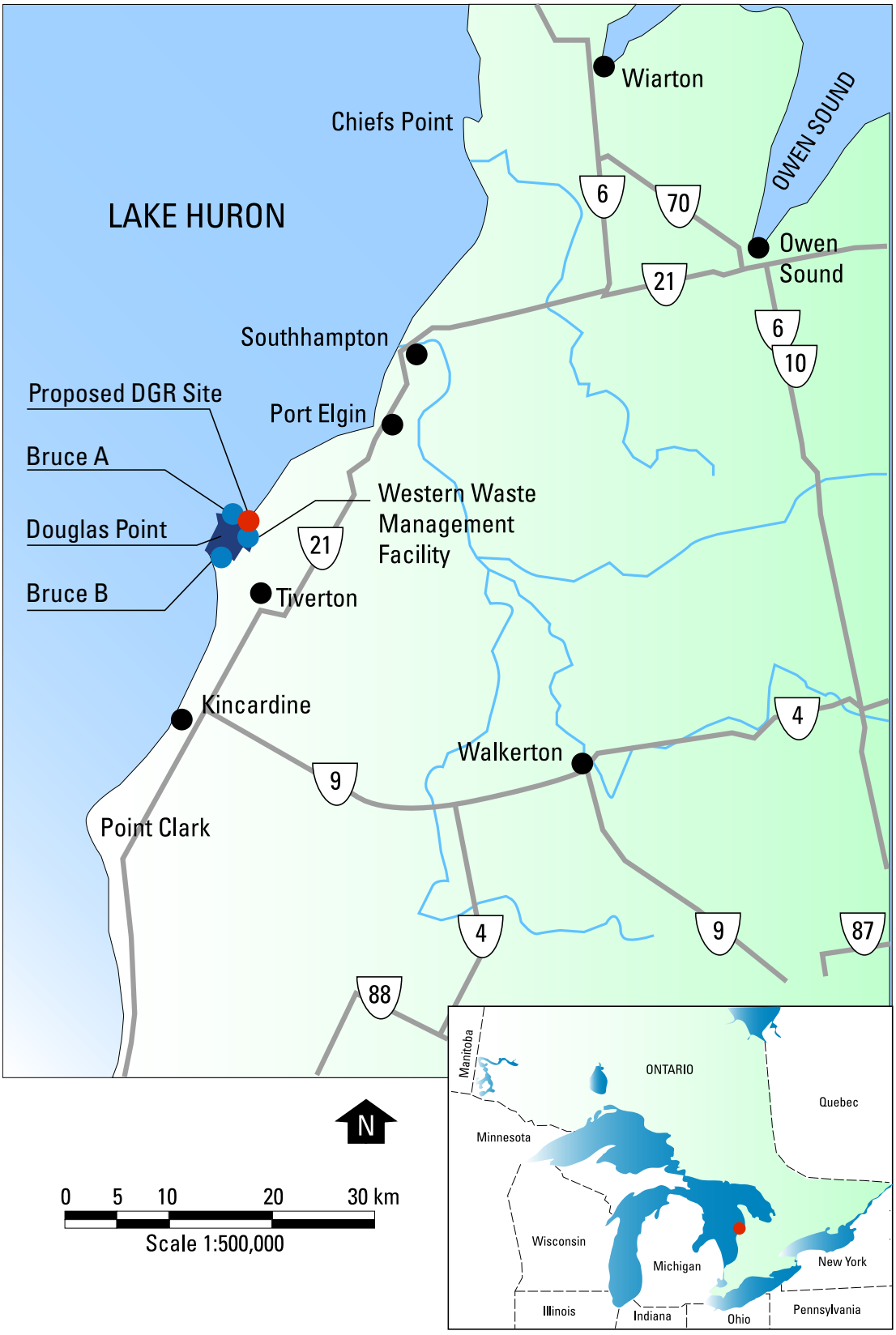
OPG's DEEP GEOLOGIC REPOSITORY PROJECT

For Low & Intermediate Level Waste

2009 Annual Report

nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

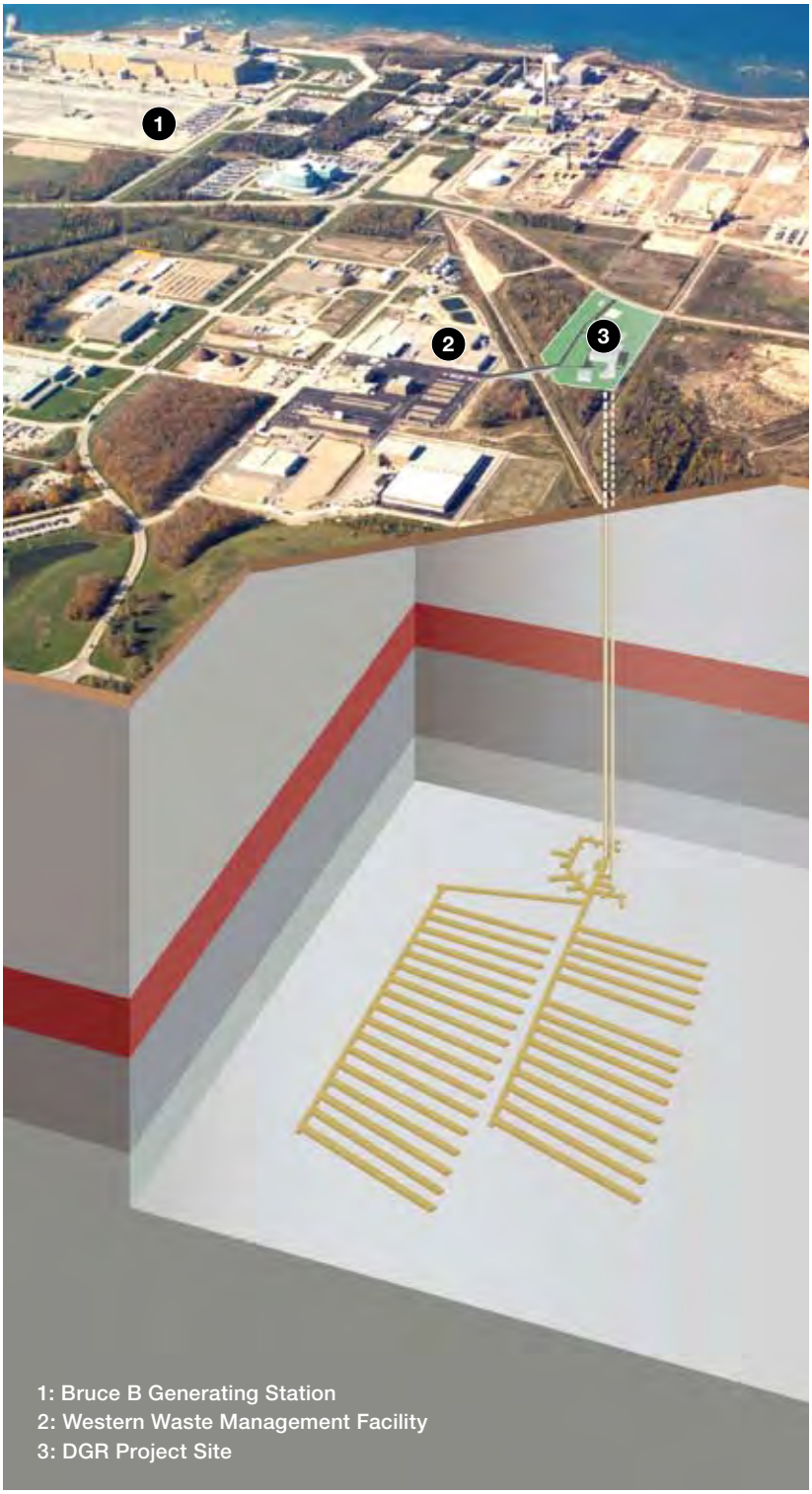
ONTARIO POWER GENERATION



OPG's Deep Geologic Repository Project for Low & Intermediate Level Waste is proposed adjacent to the Western Waste Management Facility in the Municipality of Kincardine

CONTENTS

KEY FEATURES



1: Bruce B Generating Station
2: Western Waste Management Facility
3: DGR Project Site

DGR surface facilities

Low level waste emplacement room

Intermediate level waste emplacement room

OPG'S DEEP GEOLOGIC REPOSITORY PROJECT FOR LOW & INTERMEDIATE LEVEL WASTE

Ontario Power Generation (OPG), with the support of the local Bruce County municipalities, is proposing to construct a Deep Geologic Repository (DGR) for the long-term management of low and intermediate level radioactive waste at the Bruce nuclear site. OPG has contracted the Nuclear Waste Management Organization (NWMO) to manage the DGR project through the regulatory approvals process.

The DGR is proposed to be situated about 680 m (2230 feet) below ground surface in low permeability limestone, beneath a 200 m (660 feet) thick layer of low permeability shale. These sedimentary bedrock formations provide natural barriers that will safely isolate the radioactive waste for many thousands of years and beyond.

The DGR would be located adjacent to OPG's Western Waste Management Facility (WWMF) at the Bruce nuclear site, in the Municipality of Kincardine. The DGR facility would manage about 200,000 cubic metres of low and intermediate level packaged waste. Only low and intermediate level waste from OPG-owned nuclear generating stations in Ontario would be placed in the DGR. Used fuel will not be stored in the DGR.

OPG's Western Waste Management Facility (WWMF) currently manages and provides interim storage for the low and intermediate level waste that is received from OPG's Pickering and Darlington nuclear stations and the Bruce Power stations. Much of the waste that will be placed in the DGR is already at the WWMF.

In 2009, activities conducted in support of the regulatory approvals process for a DGR site preparation and construction licence included: geoscientific site characterization, safety assessment, preliminary facility engineering design, environmental studies, and community engagement. Significant progress was made in all areas, keeping NWMO on target to deliver a licensing submission in early 2011.

2009 DGR HIGHLIGHTS

- Effective January 1, 2009 OPG contracted the NWMO to manage the DGR project through the regulatory approvals process.
- On January 26, 2009 the Canadian Nuclear Safety Commission and Canadian Environmental Assessment Agency issued final Guidelines for the Environmental Impact Statement and the final Joint Review Panel Agreement.
- On May 11, 2009 the Major Projects Management Office (MPMO) issued a Project Agreement, outlining federal roles and responsibilities during the regulatory review of the DGR project.
- Geoscientific site characterization work conducted in 2009 further verified that the site has excellent geology which will provide a high level of safety.
- Updated Preclosure and Postclosure safety assessment reports were completed. The results indicate that impacts are low and that the DGR will safely isolate and contain the waste.
- Design activities advanced from the conceptual engineering to the preliminary engineering level.
- Field studies to update baseline environmental data were completed. This information provides the starting point from which the potential effects of the DGR will be assessed.
- Extensive DGR communications continued throughout the Bruce community, with the project continuing to enjoy strong community support.
- OPG and NWMO completed a series of engagement activities in Michigan.
- A protocol agreement was signed with Saugeen Ojibway Nation.
- Discussions continued with the Métis Nation of Ontario and Historic Saugeen Métis for their participation in the regulatory review process.


REPOSITORY


079

TRANSITION OF THE DGR PROJECT TO THE NWMO

On January 1, 2009 OPG contracted NWMO to manage development of the DGR. The NWMO is responsible for taking the DGR project through the regulatory approvals process, on behalf of OPG. As part of the agreement, most OPG staff that had been working on the DGR project became NWMO employees.

OPG remains the sole owner of the DGR and the DGR project will continue to proceed as originally planned with all commitments being honoured, including that the DGR will only accommodate low and intermediate level waste from OPG-owned nuclear facilities.

The NWMO is a not-for-profit company established by OPG, Hydro Québec and New Brunswick Power, the nuclear power utilities in Canada, to implement a long-term solution for Canada's used nuclear fuel.

The NWMO's Adaptive Phased Management (APM) plan for the safe management of Canada's used nuclear fuel will involve the construction of a deep geologic repository in an informed and willing host community in a location in Canada yet to be determined. OPG's proposed Deep Geologic Repository (DGR) for low and intermediate level waste is a completetely separate project and will remain so. Combining the expertise of key staff in a single organization provides significant benefit from mutual experiences and lessons learned in the application of technology for deep geologic repositories, community consultation, and the collaboration with international partners. The Adaptive Phased Management program will benefit from skills, knowledge and relationships developed in the DGR project.

Aerial view of OPG's Western Waste Management Facility

REGULATORY APPROVAL PROCESS

In January 2009, following a public review and comment period in 2008, the Canadian Nuclear Safety Commission (CNSC) and the Canadian Environmental Assessment Agency (CEAA) released the final guidelines for the Environmental Impact Statement (EIS) for the DGR project and the final Joint Review Panel (JRP) Agreement. The EIS guidelines identify the information needed to examine the potential environmental effects of the proposed project as well as requirements for a licence to prepare a site and construct the DGR. The JRP Agreement establishes how the panel will function, including procedures for appointing the JRP members, the proposed terms of reference (i.e. responsibilities) for the panel and the process for conducting the reviews. These documents are available on the CEAA website at **www.ceaa-acee.gc.ca**

In May 2009, the Major Project Management Office (MPMO) – a Government of Canada organization whose role is to provide oversight for the federal environmental assessment and regulatory process for major resource projects – issued a Project Agreement. The Project Agreement outlines the process by which the federal departments or agencies will carry out their roles and responsibilities during the federal regulatory review of the proposed DGR project. The DGR MPMO Project Agreement is available at the Major Project Management Office website at **www.mpmo-bggp.gc.ca**

The DGR Environmental Impact Statement, along with the Preliminary Safety Report, is expected to be submitted to the Joint Review Panel in early 2011. Based on the schedule provided in the DGR MPMO Project Agreement, the full regulatory review and approval process for a site preparation and construction licence is expected to take at least 21 months. The process includes a public review of the documentation and a public hearing where stakeholders will have the opportunity to present their feedback on the project.

After the hearing the Panel makes a recommendation to the Minister of the Environment who takes it to the federal Cabinet for the final decision. The Environmental Impact Statement must be accepted before a site preparation and construction licence can be issued by the CNSC.

Ongoing public consultation

GEOSCIENTIFIC SITE CHARACTERIZATION PROGRAM

Geoscientific site characterization activities entered their final phase in 2009 as part of a step-wise four-year program to assess and confirm the suitability of the site to safely host the DGR. The Geoscience work program is divided into two key areas; site-specific characterization studies that involve a multi-disciplinary deep drilling program at the Bruce site; and a Geosynthesis program that combined with information from the site-specific studies describes the geoscientific basis for understanding the past, present and future geologic evolution of the site as it influences DGR safety.

Geoscience Activities

During 2009, field activities included the drilling and coring of two deep inclined boreholes (DGR-5 and DGR-6) that were oriented primarily to assess and verify the nature of vertical bedrock structure and its effect on DGR implementation. Consistent with the Phase II Geoscientific Site Characterization Plan, prepared in 2008, geophysical and hydrogeologic testing in these boreholes will be completed by spring 2010. The completion of the two inclined boreholes concludes the planned DGR drilling program, with four deep vertical boreholes having been completed in 2007 and 2008. The information from these six deep boreholes will provide the necessary information to establish the current site conditions and expected future evolution as it influences the DGR's long-term performance and Safety Case.

Further field activities in 2009 involved the completion of a groundwater monitoring network within deep vertical boreholes DGR-1, DGR-2, DGR-3 and DGR-4. Within each of these boreholes multi-level casing systems have been installed to depths of 840 m that combined, provide over 130 isolated intervals to observe groundwater conditions. A similar monitoring network (US-series) within the shallow (<200 m depth) bedrock groundwater regime adds an additional 31 measurement

Top left: NWMO engineer Dylan Luhowy examining rock core

Top right: Multi-level monitoring system installation

Bottom: Inclined borehole drilling

points. Routine monitoring of groundwater pressures and quality provides a 3-dimensional understanding of site conditions that supports, among other studies, the ongoing Geosynthesis and Environmental Assessment.

Progress continues toward completion of a final Geosynthesis document scheduled for the fall of 2010. The Geosynthesis will be a peer-reviewed document that provides a description of both the regional and site-specific geologic, hydrogeologic, hydrogeochemical, and geomechanical conditions and how such conditions influence estimates of long-term DGR performance. Particularly important will be the interpretation of future evolution and barrier performance of the bedrock formations hosting and enclosing the DGR site as influenced by perturbations such as repository excavation, glaciations and possible seismicity.

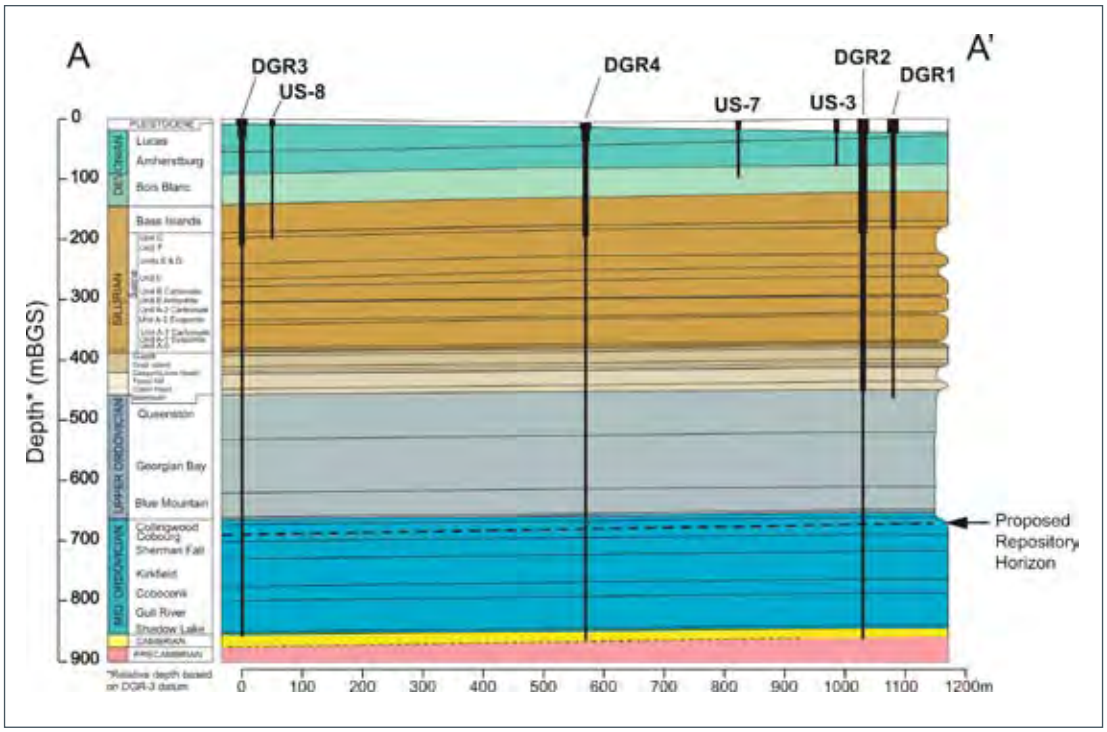
The case for the geoscientific suitability of the Bruce site is organized around several key principles, which are consistent with international experience in repository development. A brief explanation of these principles and some examples of recent work follow.

Geoscience Review Group

During 2009 the Geoscience Review Group (GRG) continued to provide guidance and oversight on all aspects of the geoscientific investigations and the geosynthesis. The four member GRG comprises internationally renowned scientists and engineers. Together they have between them nearly one hundred years of experience and have worked on nuclear waste programs in Japan, Hungary, Switzerland, Sweden, Finland, Korea, the United States and the United Kingdom.

PREDICTABLE GEOLOGY

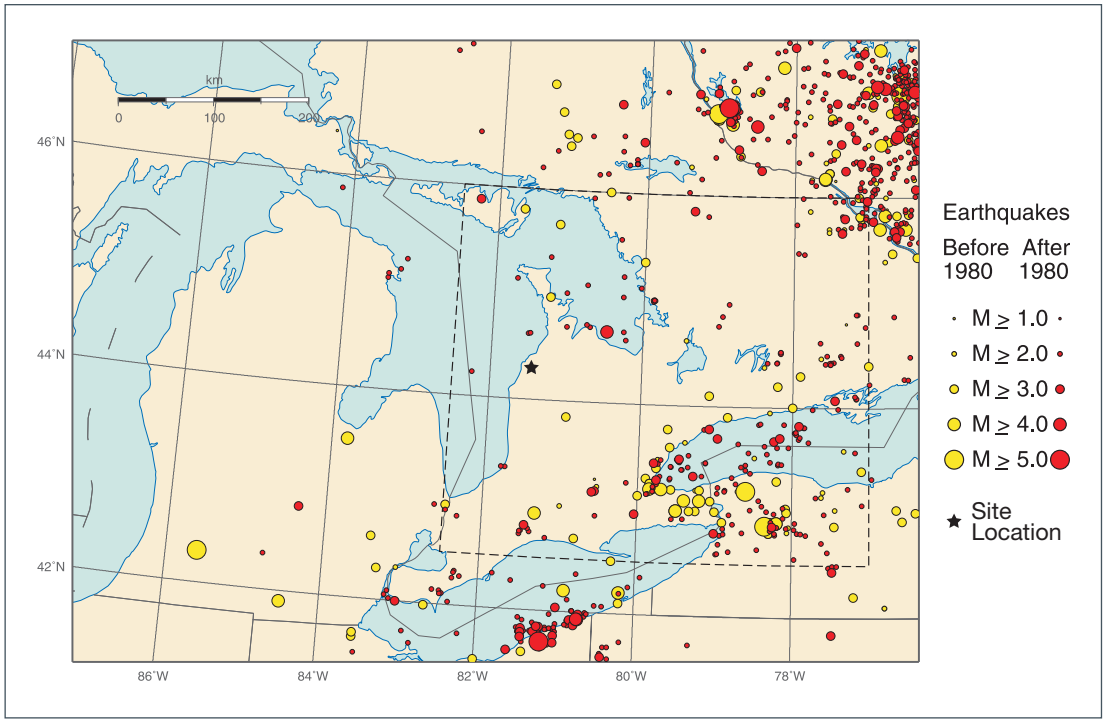
Examination of drill core obtained during the deep drilling program, a 2-dimensional seismic survey and downhole testing, has provided a basis to verify the bedrock stratigraphy beneath the Bruce site. In total 34 individual bedrock formations, Cambrian (543 million years old) to Devonian (350 million years old) in age, exist in the 840 m thick sedimentary sequence underlying the site. This includes 200 m of shale that lie above the Cobourg Formation, a clay rich limestone that will host the proposed DGR. Over distances of kilometres the elevation of bedrock formation contacts and formation thicknesses are predictable to within metres or less. The properties of bedrock formations including rock mass permeabilities, rock matrix porosity, mechanical strength and saline pore fluid composition also reveal consistency at site scale.



Geologic cross-section showing bedrock formations/stratigraphy beneath the Bruce nuclear site

SEISMICALLY QUIET SITE

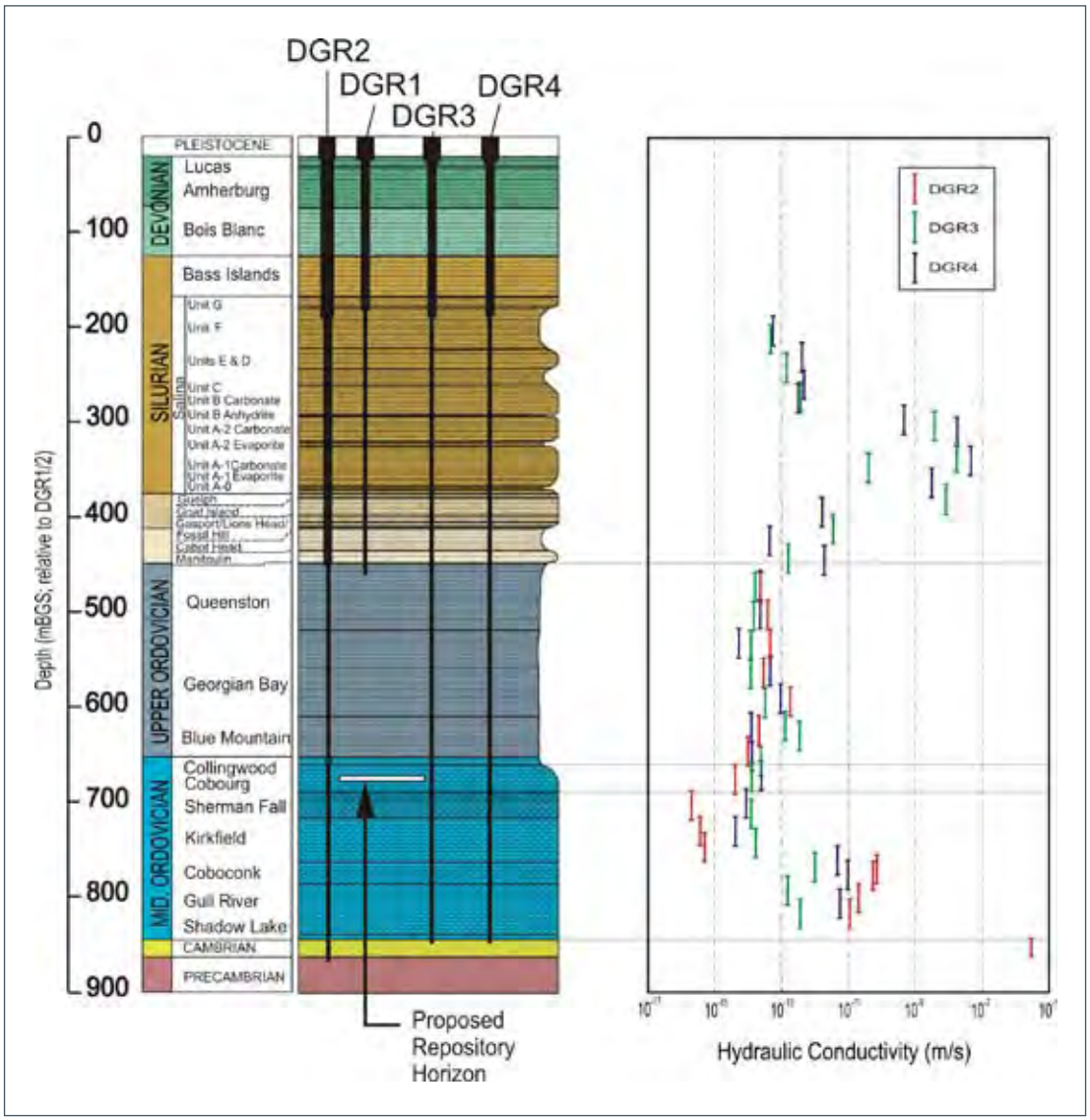
Southwestern Ontario and the Bruce region lie within the tectonically stable interior of the North American continent; a region characterized by low rates of seismicity. The historic seismicity record over 180 years shows most recorded events have magnitudes that do not exceed M5. As part of the DGR project a network of borehole seismographs was established in the summer of 2007 to allow monitoring of micro-seismicity (M=1) within a 50 km radius of the Bruce site. Monitoring results through 2009, reported by the Geologic Survey of Canada's Canadian Hazard Information Service, continue to indicate that the Bruce site is located in a seismically quiet region.



Seismic activity (start of historic records – 2009).

MULTIPLE NATURAL BARRIERS

Evidence from the deep borehole testing program reveals that the proposed DGR will be enclosed by multiple near-horizontally layered low permeability bedrock formations. This evidence includes the results of over 100 hydraulic borehole tests that yielded very low rock mass hydraulic conductivities on the order of $<10^{-13}$ m/sec in the bedrock formations proposed to host and enclose the DGR. This indicates that fluid would move through the rock at a rate of less than 1mm/yr.



Hydraulic conductivity in deep boreholes at the Bruce nuclear site.

GEOMECHANICALLY STABLE HOST ROCK

An assessment of the geomechanical stability of the DGR openings both during operations and at long-term timeframes indicates that the repository will remain safe. A comprehensive set of analyses using the site-specific data reveals that the openings within the Cobourg Formation will be stable during construction and operation. At longer time frames associated with future glacial episodes and possible seismic events, the overlying and underlying formations will provide passive barriers to contain and isolate the waste.

TRANSPORT IS DIFFUSION DOMINATED

Within the bedrock formations that will host and enclose the repository the groundwater regime appears ancient and has been resilient to external perturbations, such as glaciations, over hundreds of thousands of years. Multi-discipline evidence includes: the predictable nature and lateral extent of the thick and near-horizontally bedded sediments beneath the Bruce site, the very low rock mass permeabilities measured in the sediments, the consistent brine (300 g/L) composition of pore fluids in the low porosity rock and the distribution of environmental tracers vertically in the sedimentary column that reflect a slowly evolving groundwater system. Numerical simulations illustrate that even under cyclic glacial loading the groundwater system remains in a state in which mass transport is diffusion dominant. This is a very, very slow process and is the preferred situation for long-term waste isolation and containment.

SHALLOW GROUNDWATER RESOURCES ARE ISOLATED

In the Regional Study Area the shallow, fresh permeable groundwater system from which potable water resources are obtained is limited to depths of approximately 100 m. Geoscientific data gathered during site investigations, as described above, provide a reasoned basis to confirm that overlying ground and surface water resources are isolated from the proposed repository location, and have been for thousands of years.

NATURAL RESOURCE POTENTIAL IS LOW

Evaluation of published studies, historical records, and the results of the deep drilling program on the Bruce site strongly suggests that viable commercial oil and gas reserves do not exist beneath or adjacent to the Bruce nuclear site. Commercially viable base metal deposits have not been identified in the study area.

DESIGN OF THE DGR

The design of the DGR facility has continued to evolve, incorporating improvements at each stage. In 2009 many of the changes to the design were made to enhance the overall operational safety of the facility. Recent design work also addressed expert third-party comments on the earlier conceptual design.

The most significant change to the DGR design was the realignment of underground emplacement rooms so that rooms within each of the two panels are now parallel to each other. This new underground layout is better suited to rock conditions that are expected to exist deep underground and as such, this arrangement will enhance the long-term stability of the waste emplacement rooms.

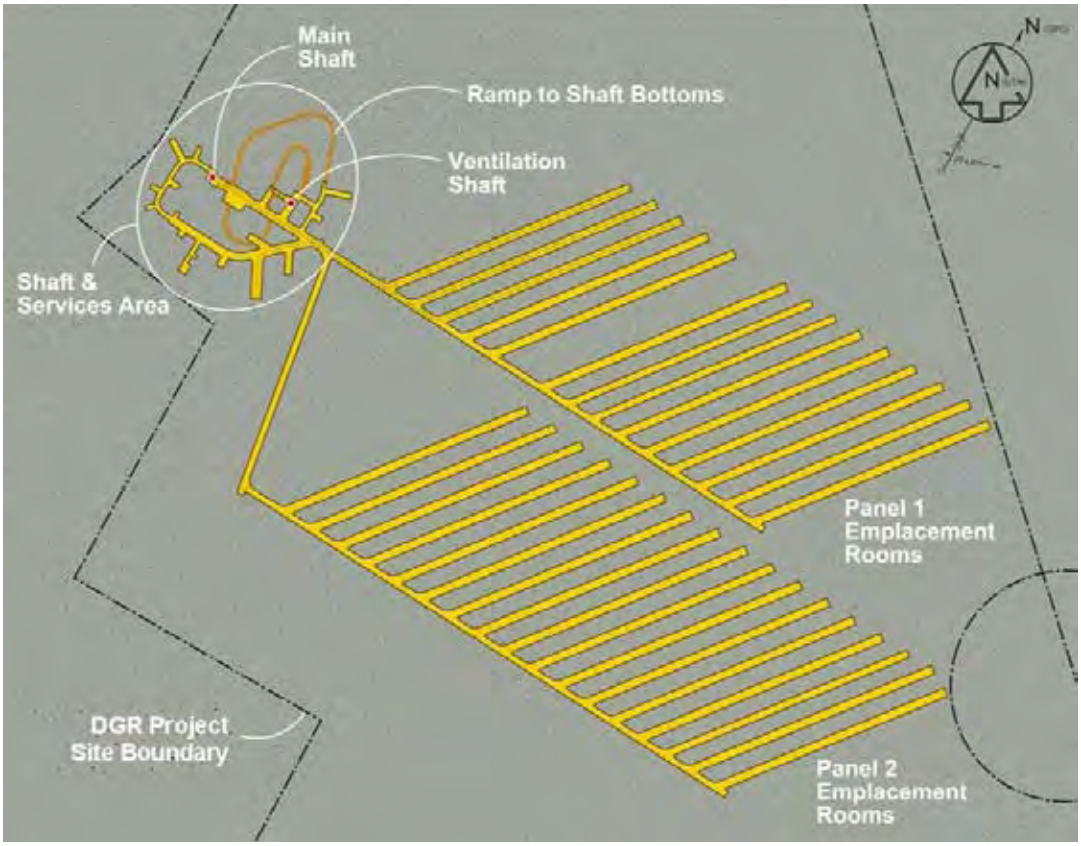
The general layout of the surface facilities has not changed from the layout developed in 2008. The surface features of the DGR include the main shaft, ventilation shaft and waste rock management area. The main shaft area will have a headframe equipped with a hoist to handle a 44-tonne payload, a waste package receiving building, and buildings housing equipment to heat air to be delivered underground for winter operations. The waste package receiving building and shaft offices will be directly connected to the main shaft headframe building. The ventilation shaft area will include a headframe building, hoist house, waste rock chute, and exhaust fan building. A crossing will be constructed to provide a link between the existing WWMF and the DGR.

The procedures for handling waste packages were reviewed in 2009 and it was decided to introduce self-propelled electric rail-carts into the waste handling system. Waste packages will be loaded onto the rail-cart by forklift inside the waste package receiving building and then moved, in a highly controlled manner, into the waste-handling cage. Once underground, the rail-cart loaded with waste packages will be moved from inside the cage to a staging location where the carts will be unloaded by forklift. The forklifts will then transport the packages to the appropriate rooms where they will be stacked in their final position. The majority of waste packages will be moved underground by this procedure. The major exception will be large and heavy waste packages which will remain on their rail-cart until the cart arrives at the emplacement room. These waste packages will be off-loaded by gantry crane from the rail cart and then transferred to a final location inside the room.

The systems associated with the waste handling cage were modified to further enhance the overall safety of waste handling operations in the main shaft. This includes the safety mechanisms for securing the main cage for loading/unloading activities and the cage arresting systems.

It is currently assumed that the DGR will be fully developed during initial construction to avoid mining activities during emplacement of waste operations. It is now assumed that the shafts, access tunnels and emplacement rooms will be excavated by precision drill and blast methods. It is estimated that about 900,000 m^3 of waste rock will be produced during excavation and this rock will be stored at surface to the northeast of the two shafts.

In 2009, NWMO established the Technical Review Group (TRG) to review and to provide expert advice on DGR design and construction. The TRG is comprised of independent technical experts who collectively have extensive experience in the fields of deep underground mine construction, mine ventilation, mine hoisting, tunneling, geomechanics and radioactive waste material handling.



Left top: An example of a drill jumbo creating underground openings in rock

Left middle: Construction of Darlington cooling water intake tunnel in Cobourg limestone

Right top: DGR underground layout

Bottom: DGR surface facilities

SAFETY ASSESSMENT

The DGR is intended to safely isolate and contain the low and intermediate level radioactive waste. Confidence in meeting this objective is summarized in a "Safety Case". The safety case synthesizes and presents the evidence for safety. Safety case elements include geological evidence from the site, design features and quantitative safety analyses.

Safety Case Elements

The safety case is based on the geologic site and waste characteristics including:

- The repository will be isolated from surface waters by its depth of about 680 m.
- There are multiple layers of low-permeability rock above the repository.
- The rock formations are 450 million years old. They have remained stable through tectonic events and climate changes during this period, including several ice ages within the past one million years. These rocks are expected to remain stable for at least the next few million years.
- The area is seismically quiet. Large magnitude earthquakes are unlikely, and would have little to no impact on the DGR.
- The properties of the deep bedrock limit the rate of contaminant movement through the rock to very slow rates.
- The waste contains primarily shorter-lived radionuclides and the radioactivity decreases with time.
- Almost all of the radioactivity would decay within or near the repository.

The DGR safety assessment: considers both the operating period and after closure, analyzes the facility behaviour under normal conditions and unlikely events or accidents, quantifies potential impacts on the public and workers, and compares the potential impacts with regulatory criteria.

Safety assessment is being carried out as an iterative process, taking account of new information. In 2009, the "Version 1" assessment was completed. Two further major iterations are planned before an operating licence could be authorized by the federal nuclear regulator.

The "Version 1" Safety Assessment follows:

- Federal Environmental Assessment Guidelines for the DGR project
- Canadian nuclear safety regulations, policy and guidance, including:
  - CNSC P-290 – *Managing Radioactive Wastes*
  - CNSC G-320 – *Assessing the Long Term Safety of Radioactive Waste Management*
  - Nuclear Safety and Control Act
- International best-practices.

Although "Version 1" is an interim assessment, the results have been presented to various technical experts for review, including an international peer review team of safety assessment experts from the United Kingdom, France, Switzerland and Belgium. To read the interim reports, go to **www.nwmo.ca/dgrprojectdocuments.**

NWMO engineers Kelly Sedor and Helen Leung review safety assessment results

Operational Safety

The preclosure safety assessment covers the start of operations to the closure of the facility. The focus is on radiological safety – handling and storage of low & intermediate level waste packages under normal operations and accident conditions.

The DGR design incorporates a variety of features to ensure it is safe during the operations period. Examples of safety features include the following:

- Waste packages will meet the DGR waste acceptance criteria; for example, no surface contamination.
- The higher level radioactive wastes will be in robust concrete-and-steel packages.
- The DGR will be close to the WWMF, so waste package do not need to be moved off the Bruce site.
- All underground construction will be completed prior to the start of waste emplacement.
- The shaft hoist is based on a proven reliable multi-rope Koepe drum design.
- Combustible materials and ignition sources will be minimized.
- Emergency response system includes fire detection and suppression, two shaft exits, and underground safety refuge stations.

Based on experience from the WWMF operations, small amounts of tritium and carbon-14 are expected to be released as outgassing from the waste packages in the DGR under normal operating conditions, dropping to zero as the DGR is closed.

These emissions will be monitored. The potential doses due to these small releases are estimated to be similar to the low doses from WWMF operations, where much of the waste is currently stored. These results indicate that there are no concerns with respect to exposure to members of the public during normal operations of the DGR.

Accident scenarios were postulated for the DGR facilities, both above and below ground. These accidents were screened for likelihood and credible worst-case scenarios were identified for analysis. The accidents considered included breach of waste package and fire. The preliminary analyses indicate that radioactivity released from above or below ground accidents is low and will not harm members of the public.

Postclosure

The Postclosure Safety Assessment addresses the safety of the repository after the underground portion has been closed and sealed. It looks far into the future. In the near-term, the site is expected to remain under institutional control. However, the safety assessment assumes that beyond a few hundred years, the site reverts to a green-field use.

The safety assessment, however, is not a prediction of the future. Rather, it assesses a range of likely and unlikely futures or scenarios. Uncertainties in how things may develop in the future are addressed by using a range of scenarios, models and data and also through the use of cautious or worst-case assumptions. The methodology follows Canadian regulatory guidance and international practice.

In postclosure, the main scenarios assessed are the following:

Normal Evolution Scenario

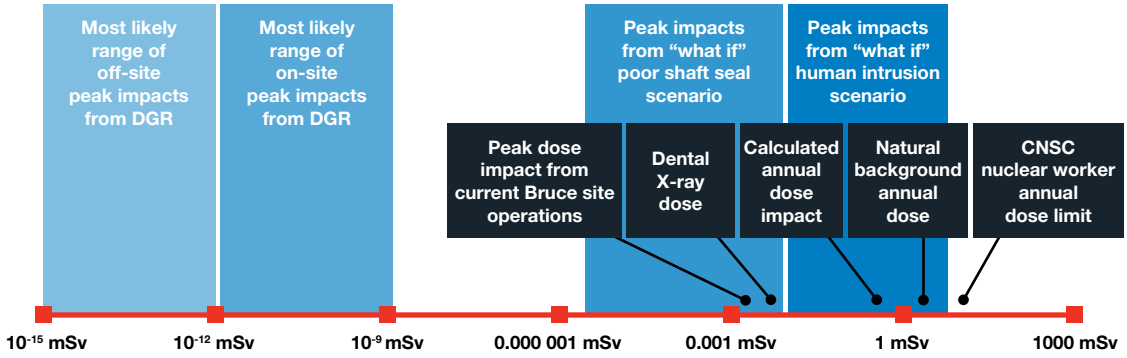
Considers what is likely to happen within and around the repository in the future

Normal Evolution	• Includes eventual glaciation across the site. • Assumes that after the site is released from institutional controls in a few hundred years and beyond people live on the repository site.

Disruptive ("what if") Scenarios

Unlikely scenarios that test the robustness of the repository.

Human Intrusion	*What if* someone accidentally drilled a deep borehole into the DGR and brought waste material to surface?
Severe Shaft Seal Failure	*What if* the main shaft seals failed?
Open Borehole	*What if* one of the existing deep site characterization boreholes was not sealed, or the seals failed completely?
Extreme Earthquake / Vertical Fault	*What if* there was a vertical fault close to the repository possibly created in the future by a very large earthquake?



Interim Safety Assessment calculated impacts

The assessment approach uses site, design and waste inventory information to construct a conceptual model of possible release pathways to develop a numerical (or computer) model. The computer model is used to quantify what could happen under various scenarios.

The interim safety assessment results indicate that there would be little to no impact from the repository. This is largely because the rock is very effective in retarding the movement of radionuclides. Key observations which will be considered further in ongoing work include the importance of the sealed shafts as a potential pathway for radionuclides, and the importance of C-14 containing methane gas generated from decomposing waste.

Waste Inventory

The amount of waste to go into the DGR is based in part on the amount of wastes currently stored at WWMF, as well as projections of future wastes. A significant portion of the wastes are already at the WWMF.

The estimated amount of waste and its total radioactivity was updated in 2009. At 2062, the assumed repository closure date, the total activity is about 17 PBq (1.7×10^{16} Bq) (taking into account new waste being emplaced as well as decay of already stored wastes).

The total radioactivity will decrease with time due to radioactive decay. During operation, key radionuclides are H-3, C-14, Co-60 and Fe-55. At long times, the residual radioactivity is primarily due to Zr-93.

COMMUNITY ENGAGEMENT

In 2009, an extensive DGR communications program continued throughout the Bruce community. Communication activities included issuing DGR project newsletters and other publications, a new DGR website, speaking engagements and presentations, Open Houses, briefings to key stakeholders and attendance at public events with the DGR mobile exhibit.

A successful strategy for engaging people in discussion on the DGR project has been to go to events where the public would already be gathering. Events that DGR staff participated in with the DGR mobile exhibit included the Port Elgin, Kincardine and Wiarton Home Shows, Mid Western AgriFair, Kincardine Scottish Games, Chippewas of Nawash PowWow, Port Elgin Pumpkinfest, Clarington Family Safety Day, and summer Farmers' Markets in Kincardine, Port Elgin and Walkerton. Overall the DGR mobile exhibit was at local community events more than 40 days.

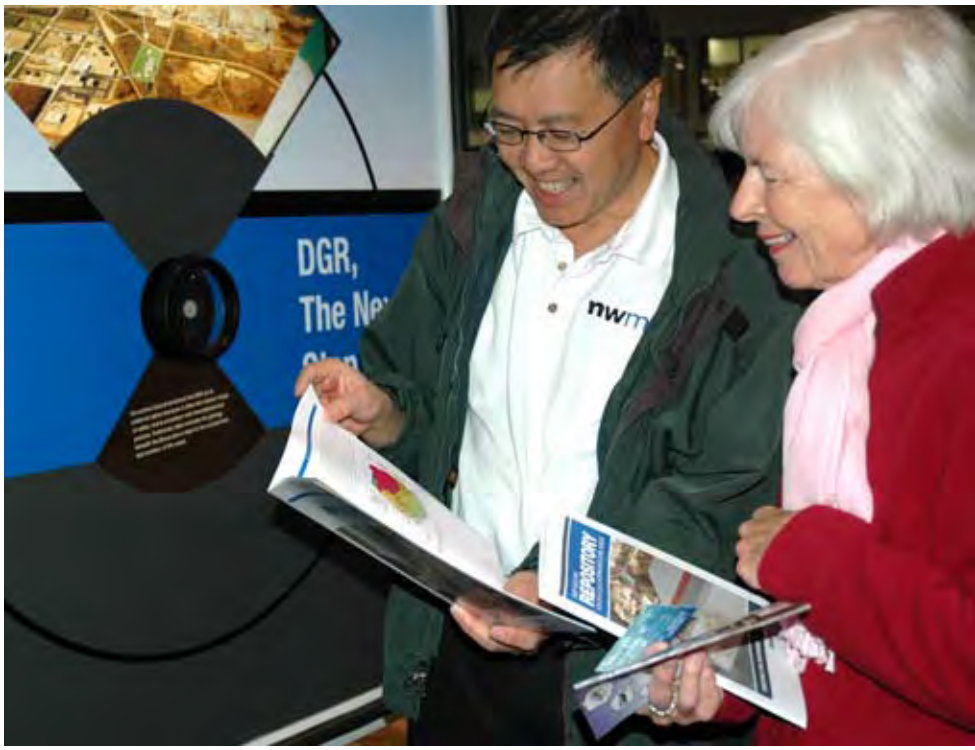
This year DGR staff also tried a new outreach activity. NWMO hosted two movie nights in Kincardine and South Bruce Peninsula, in conjunction with community partners. NWMO sponsored the viewing of an outdoor family feature film and played the DGR video on the big screen prior to the main feature. Plans to repeat and grow these "DGR Movie Nights" are scheduled for 2010.

Throughout the year, project staff made more than 45 presentations on the DGR project to local community and service groups, and professional organizations. Many of these presentations provided updates on the DGR project to groups previously addressed, but who are still keenly interested in the progress of the project.

NWMO, in conjunction with OPG, also undertook a series of engagement activities in Michigan in September to provide key politicians, officials and environmental groups with information on the DGR.

Three DGR Project newsletters were published and distributed by mail to more than 35,000 local residences. Distribution was expanded in 2009 to include all of the communities in South Bruce Peninsula and North Bruce Peninsula. The newsletters focused on the transition of the project to NWMO, DGR guidelines, safety assessment, environmental field work, preliminary design of the DGR and the Open Houses.

In 2009 NWMO initiated a DGR Community Partnership Program (CPP) to maintain and build community partnerships in Bruce County and to build NWMO's reputation and profile in its role managing the DGR project. The program supports local community initiatives in the following areas: Environment, Education, Community and Aboriginal Communities.



NWMO engineer Tom Lam discusses the DGR at the Port Elgin Home Show

Ongoing public consultation at DGR open houses and community events

In 2009 over half of the funds were directed to environmental initiatives. The majority of the balance of the funds supported municipal projects and Aboriginal community initiatives.

A third round of Open Houses was held in the local communities of Kincardine, Ripley, Walkerton, Port Elgin, Chesley, Owen Sound and Wiarton during November. Approximately 90 people attended the Open Houses. Many of the attendees were already familiar with the proposed DGR project, having participated in other stakeholder communication events. One of the primary reasons cited for attending the Open House was to obtain an update on the progress of the project and the studies associated with it. The majority of Open House attendees indicated support for the project.

At the Open Houses and throughout the year at community events the key questions and comments received on the project continued to be associated with whether used nuclear fuel or waste from other producers will be stored in the DGR, the proximity of the DGR to Lake Huron, and the potential for contamination of drinking water. The DGR Open Houses and community events provided an opportunity to respond to the questions and comments.

Aboriginal Engagement

In March a Protocol between Saugeen Ojibway Nation (SON), OPG and NWMO was signed. The protocol provides a process for SON to participate in the DGR regulatory review. Subsequent meetings with SON focused on DGR updates, upcoming project milestones, and exchange of information relevant to the project. These discussions are expected to continue in 2010.

Métis Nation of Ontario (MNO), including representatives of local Métis community councils, visited the Bruce site in November to tour the Western Waste Management Facility and receive a presentation on the DGR. Discussions with MNO are expected to continue in 2010, aimed at reaching agreement and facilitating MNO engagement on the DGR project.

Meetings were also held with the Historic Saugeen Métis to discuss developing a Protocol for their participation in the regulatory review process.

ENVIRONMENTAL ASSESSMENT PROCESS

The final guidelines for the Environmental Impact Statement (EIS) and Joint Review Panel Agreement were released by the Canadian Nuclear Safety Commission (CNSC) and Canadian Environmental Assessment Agency (CEAA) in January. The EIS guidelines list the information needed to examine the potential environmental effects of the proposed project as well as requirements for a licence to prepare a site and construct the DGR.

Baseline Environment Studies

Collection and documentation of baseline environmental data to support the EIS continued in 2009. Field work was undertaken to update the information previously compiled on surface water quality, aquatic and terrestrial species populations, social and economic conditions, and public attitude, and to obtain information on light conditions.

Baseline environmental data provides the basis on which potential environmental effects of the proposed project are predicted and which future monitoring results are compared to verify the accuracy of the environmental assessment and determine the effectiveness of mitigation measures in minimizing environmental effects.

Environmental Assessment Methodology

The assessment of effects includes a detailed description of the project, specifying project works and activities comprising the project. This description, along with the identification of the Valued Ecosystem Components (VECs) is the basis for consideration of the potential effects of the project. The Valued Ecosystem Components were identified in the EIS Guidelines and have also been displayed and discussed with community members at DGR Project Open Houses in 2007, 2008 and 2009.

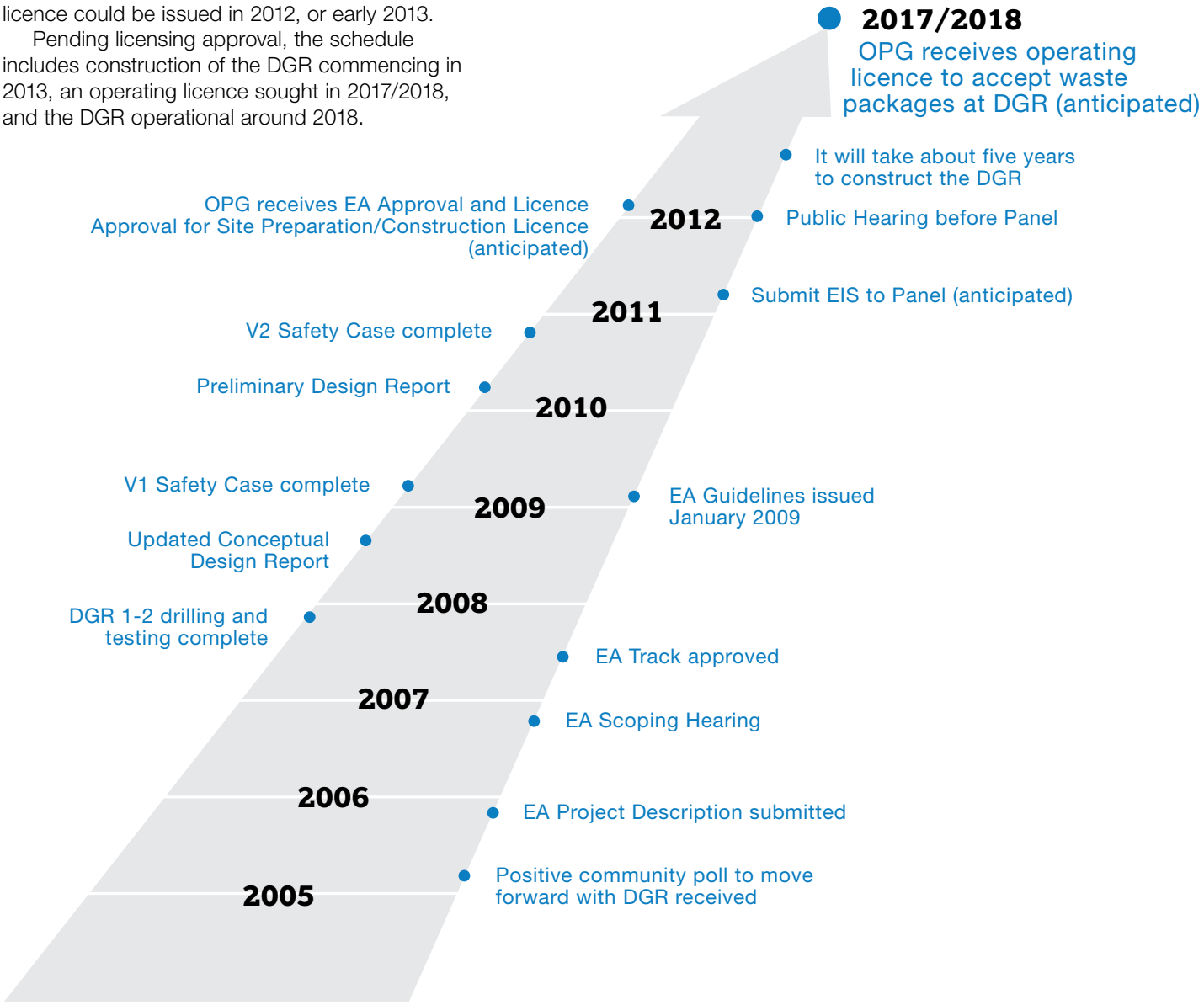
For each project activity, the potential interactions with the various components of the environment are identified, and those interactions are carried forward for further evaluation. These interactions are then assessed for the potential for there to be a measurable change in the environment. Potential measurable effects are carried forward for further evaluation to determine whether those effects are adverse. If the assessment of effects indicates a potential adverse effect, mitigation measures are proposed to address the identified potential effect. Residual effects, with the mitigation in place, are then determined.

Golder Associates staff conducting baseline field studies

PROJECT SCHEDULE

The DGR project continues to be on schedule with the geoscientific site characterization work and other technical activities to be completed in mid-2010 and to form the basis for the Preliminary Safety Report, the Environmental Impact Statement and other supporting documents, which are expected to be submitted to the Joint Review Panel in early 2011. The Panel Hearing is expected to take place in 2012. If the review panel accepts the EIS, the site preparation and construction licence could be issued in 2012, or early 2013.

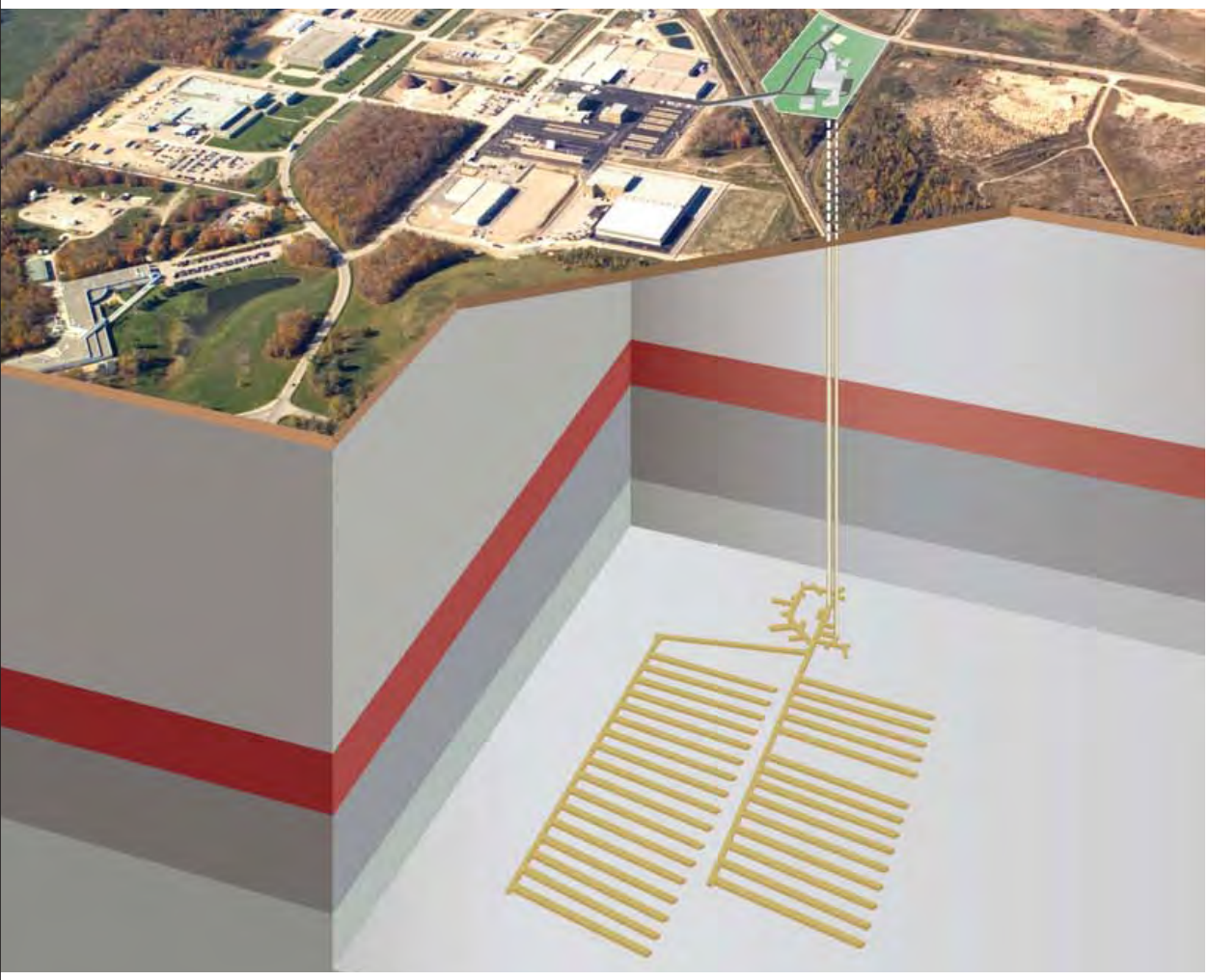
Pending licensing approval, the schedule includes construction of the DGR commencing in 2013, an operating licence sought in 2017/2018, and the DGR operational around 2018.



OPG's DEEP GEOLOGIC REPOSITORY PROJECT

For Low & Intermediate Level Waste

KEEPING YOU INFORMED



nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

ONTARIO POWER GENERATION

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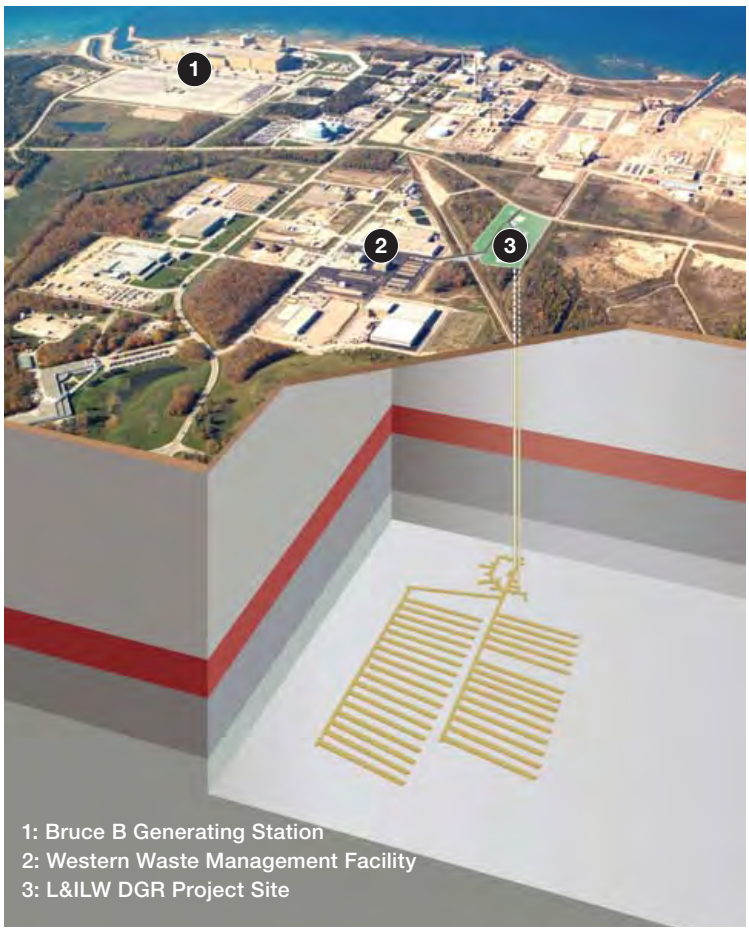
ONTARIO POWER GENERATION (OPG)'s DEEP GEOLOGIC REPOSITORY PROJECT FOR LOW AND INTERMEDIATE LEVEL WASTE (L&ILW DGR)

OPG, with the support of the Bruce County municipalities, is proposing to construct and operate a deep geologic repository for the long-term management of low and intermediate level nuclear waste. The L&ILW DGR would be located on lands adjacent to OPG's Western Waste Management Facility (WWMF) located within the Municipality of Kincardine. The Nuclear Waste Management Organization (NWMO) is managing the regulatory approvals process on behalf of OPG. Numerous opportunities will be provided throughout the regulatory process for citizens to become informed, ask questions and provide comment on the L&ILW DGR, which will only be constructed if it is safe to do so and with regulatory approval and public support.



1: Bruce B Generating Station
2: Western Waste Management Facility
3: L&ILW DGR Project Site

L&ILW DGR surface facilities

Low level waste emplacement room

Intermediate level waste emplacement room

IMPORTANT FACTS ABOUT OPG, NWMO AND THE L&ILW DGR PROJECT

OPG is owned by the people of Ontario, has been generating electricity from nuclear fuel and safely managing the nuclear waste and used nuclear fuel from its operations for more than 40 years. OPG will be the owner, licence holder and operator of the proposed L&ILW DGR.

NWMO is an independent, not-for-profit Canadian company, formed by the nuclear utilities, with specialized expertise in the long-term management of nuclear waste. NWMO is under contract to OPG to manage the L&ILW DGR Project through the regulatory approvals process. NWMO is also, in a completely separate role, implementing Adaptive Phased Management (APM) – an approach for the long-term management of Canada's used nuclear fuel. APM will involve the construction of a deep geologic repository in an informed and willing host community in a location in Canada yet to be determined.

OPG'S L&ILW DGR AND NWMO'S APM WILL CONTINUE TO BE SEPARATE PROJECTS.

Facts about the L&ILW DGR Project:

- A long-term management facility for **only low and intermediate nuclear waste** from OPG-owned reactors.
- The Municipality of Kincardine passed a resolution in 2004 to request the L&ILW DGR as its preferred option for the long-term management of low and intermediate level nuclear waste based on an independent assessment study that examined several alternatives.
- An extensive regulatory process is one of several mechanisms to ensure safety of the public and the environment.
- Consistent with OPG's long-standing record of safety excellence.
- Geoscientific Site Characterization is providing site specific information that is verifying the suitability of the Bruce nuclear site to host the L&ILW DGR.
- Construction and operation of the L&ILW DGR is fully funded by OPG.
- L&ILW DGR geoscience, safety assessment and engineering/design work programs benefit from independent peer review and oversight.

OPG'S WESTERN WASTE MANAGEMENT FACILITY (WWMF)

- OPG's WWMF, located within the Municipality of Kincardine, has safely managed low and intermediate level nuclear waste since 1974 and can continue in this role whether or not the L&ILW DGR proceeds.
- The WWMF manages all of the low and intermediate level nuclear waste from the Bruce, Pickering and Darlington generating stations. It also manages the low and intermediate level nuclear waste resulting from the previous operation of the now shutdown Douglas Point reactors at the Bruce nuclear site.
- The WWMF also manages high level nuclear waste from Bruce Power, while Darlington and Pickering have facilities for managing their own high level nuclear waste.
- The L&ILW DGR will provide safe long-term management for all of the low and intermediate level nuclear waste currently managed at the WWMF including waste from the future operation of OPG-owned reactors.

Western Waste Management Facility

1 10 low level storage buildings
2 Waste volume reduction building
3 Transportation package maintenance building
4 In-ground intermediate level storage containers
5 Intermediate level waste quadricells
6 Western used fuel dry storage facility
7 Steam generator storage building
8 Refurbishment waste storage building
9 Low level storage building #11
10 Future low level storage building #12
11 Proposed site of L&ILW DGR

WHAT IS LOW LEVEL NUCLEAR WASTE?

Low level waste is received at the WWMF

- Low level nuclear waste consists of common industrial items that have become contaminated with low levels of radioactivity during routine clean-up and maintenance at the nuclear generating stations.
- It includes mops, rags, paper towels, temporary floor coverings, floor sweepings, protective clothing and hardware items such as tools.
- It consists of paper, plastics, metal, rubber, cotton and other miscellaneous materials.
- Low level nuclear waste can be safely handled using normal industrial practices and equipment without any special radiation protection.

WHAT IS INTERMEDIATE LEVEL NUCLEAR WASTE?

- Intermediate level nuclear waste requires shielding to protect workers during handling.
- Intermediate level nuclear waste typically includes ion exchange resins and filters utilized to clean the reactors' water systems.
- Approximately 290 cubic metres of intermediate level nuclear waste is received each year at the WWMF.
- Approximately five per cent of all waste (excluding used fuel) received at the WWMF is intermediate level nuclear waste.

Intermediate level nuclear waste is inserted into an in-ground storage container at the WWMF

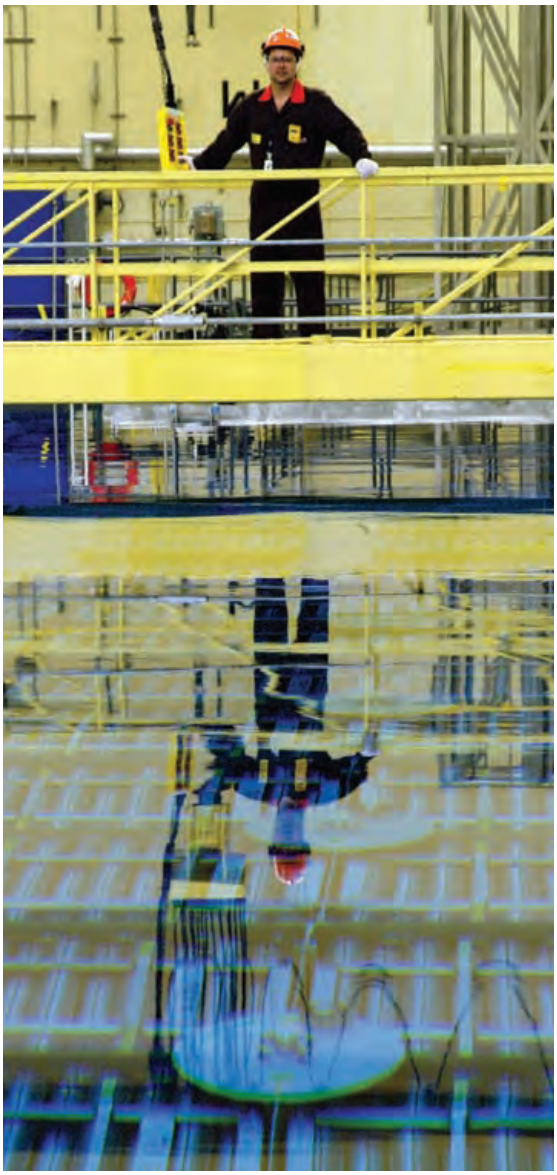
WHAT IS REFURBISHMENT NUCLEAR WASTE?

- Refurbishment waste consists of low and intermediate nuclear waste generated from the refurbishment of nuclear reactors.
- Intermediate refurbishment nuclear waste consists of irradiated core components such as pressure tubes, calandria tubes and end fittings that are safely managed in shielded containers inside a concrete refurbishment waste building.
- Low level refurbishment nuclear waste consists of steam generators that are safely managed in a concrete refurbishment waste building.

WHAT IS HIGH LEVEL NUCLEAR WASTE?

- High level nuclear waste consists of fuel bundles that have been used in the reactors to produce electricity.
- Fuel bundles spend a minimum of 10 years in large, pool-like structures filled with water, called fuel bays, before they are placed in robust dry storage containers made of steel and concrete that provide shielding.
- **Used Fuel will not be placed in the L&ILW DGR.** It is stored on an interim basis at the site where it is generated.
- The NWMO has the responsibility for implementing Adaptive Phased Management – a long-term management approach that is intended to, with collaboration, continuous learning and adaptability, lead to the construction of a geologic repository for all of Canada's used fuel.
- NWMO will seek an informed and willing community, in a location in Canada yet to be determined, to host a centralized deep geologic repository for all of Canada's used nuclear fuel.

NWMO's repository for Canada's used fuel is a separate project from OPG's L&ILW DGR



FOR MORE INFORMATION ABOUT THE NWMO AND ADAPTIVE PHASED MANAGEMENT, PLEASE VISIT www.nwmo.ca

TRANSPORTATION OF NUCLEAR WASTE

- Low and intermediate level nuclear waste has been transported from the Pickering and Darlington generating stations to the WWMF for over 40 years.
- Transportation of nuclear waste is regulated by the Canadian Nuclear Safety Commission (CNSC).
- No release of nuclear materials has ever occurred during transportation of the waste.
- OPG has an emergency response plan in place with highly trained responders.
- Training about the transportation of nuclear materials is provided to First Responders all along the transportation routes.
- Used fuel is NOT transported for interim storage but remains at the generating site where it was produced; Pickering, Darlington and Bruce generating stations have their own wet and dry storage facilities for used fuel.

A COMMUNITY PARTNERSHIP

In 2002, the Municipality of Kincardine and OPG signed a **Memorandum of Understanding (MOU)**. The MOU set out terms to assess the feasibility of the long-term management of low and intermediate level nuclear waste at the WWMF located within the Bruce nuclear site.

- Under the MOU, Golder Associates conducted an Independent Assessment Study, which looked at the feasibility of various long-term management options for low and intermediate level nuclear waste at the Bruce nuclear site. It also included a preliminary safety assessment, and took into account information from a study based on existing geological, groundwater and geotechnical information related to the Bruce nuclear site.

- Three options were deemed to be technically feasible, safe and without significant social, economic or environmental impacts: enhanced storage and processing, above-ground concrete vaults and deep geologic repository.

- The Independent Assessment Study compared the options and included consultation with the local community and stakeholders.

- In 2004, Council for the Municipality of Kincardine requested the L&ILW DGR over all of the other options, by council resolution, because of its greater safety margin.

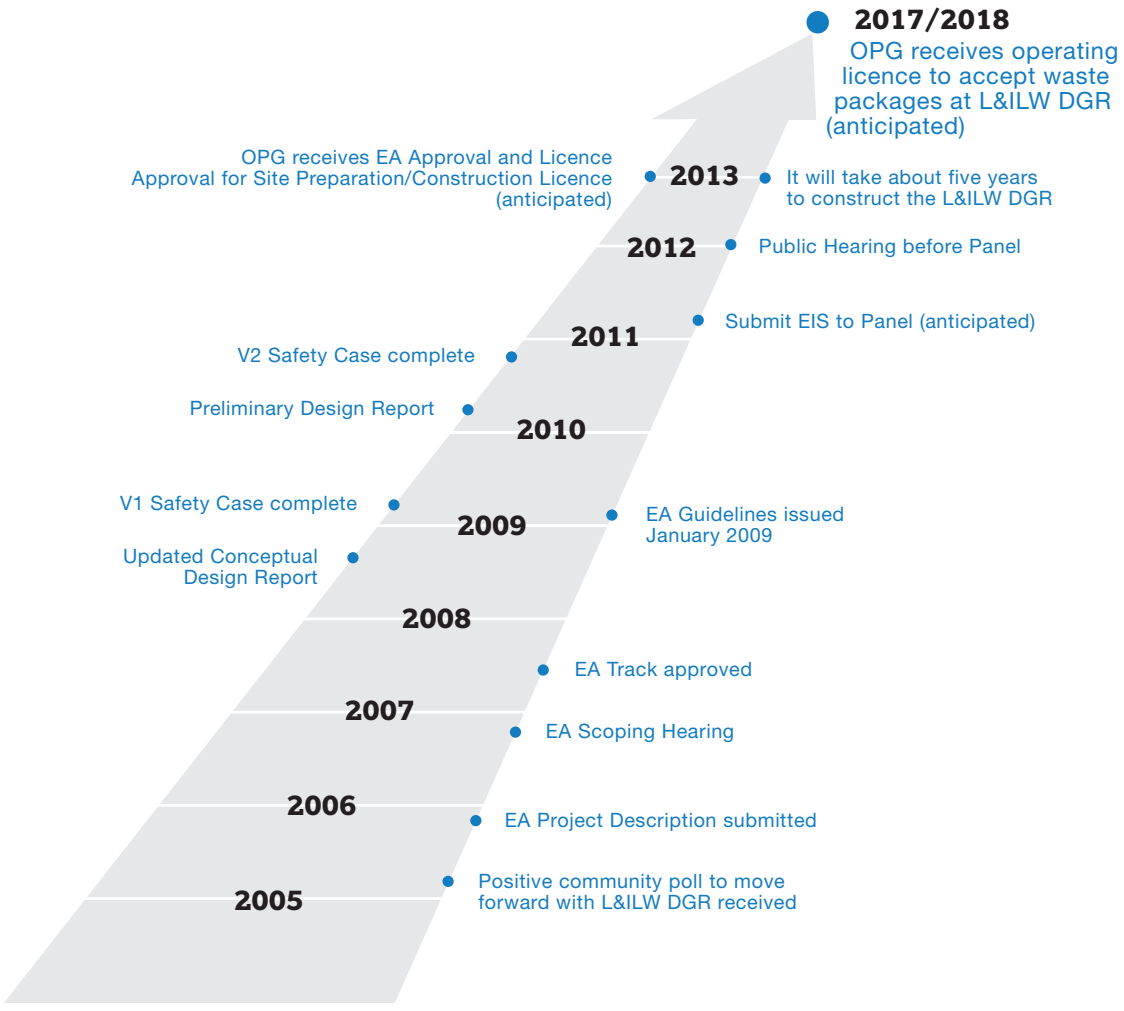
- In 2005, an independent polling of both permanent and seasonal residents was conducted in the Municipality of Kincardine, which showed a majority of residents supported moving forward with the L&ILW DGR.

HOSTING AGREEMENT

Key features

- With the support of the community, OPG will obtain regulatory approvals to construct the L&ILW DGR.
- Kincardine, Saugeen Shores, Huron-Kinloss, Arran-Elderslie and Brockton to receive $35 million (2004 dollars, inflation protected) paid over 30 years subject to achieving key milestones:
  – Environmental Assessment Guidelines
  – Environmental Assessment Approval
  – Construction Licence
  – Operating Licence
- The Municipalities will choose how to use the funds for the benefit of their communities.
- No used nuclear fuel will be placed in the L&ILW DGR.
- Property Value Protection Plan.

PROJECT SCHEDULE AND REGULATORY PROCESS



FOR MORE INFORMATION ABOUT THE L&ILW DGR REGULATORY APPROVAL PROCESS VISIT www.nuclearsafety.gc.ca OR www.ceaa-acee.gc.ca

L&ILW DGR ENVIRONMENTAL ASSESSMENT (EA) AND LICENCING PROCESS

2005	Regulatory process to obtain a licence to construct a L&ILW DGR began with the submission of the L&ILW DGR Project Description to the Canadian Nuclear Safety Commission (CNSC) who review and approve all nuclear licencing applications. Public engagement program in support of EIS began.
2006	Geoscientific site characterization to verify site conditions began.
2007	L&ILW DGR project was referred to a Joint Review Panel under the *Canadian Environmental Assessment Act* in June by the federal Environment Minister. The Joint Review Panel process will establish a panel of three to consider both the Environmental Impact Statement (EIS) and the applications for site preparation/construction licence(s).
2008	Participant funding awarded to six parties to assist with participation in the public review of draft guidelines for EIS and Joint Review Panel Agreement. Environment Minister and CNSC jointly issued draft EIS guidelines and draft Joint Review Panel Agreement in April for public review.
2009	Final guidelines and Joint Review Panel Agreement issued in January.
2010	Work completed to verify the Bruce nuclear site as a suitable location for the L&ILW DGR and to analyze any potential effects on the environment from the L&ILW DGR.
2011	Results from geoscience, engineering and design, safety assessment, environmental field work and communications will be reflected in the EIS to be submitted to the Joint Review Panel along with the Preliminary Safety Report (PSR). EIS and PSR will be available for public review.
2012	The Joint Review Panel will convene a public hearing to hear comments about the EIS from individuals and groups. The panel will make a recommendation to the Minister of Environment on the suitability of the EIS. The Environment Minister takes panel recommendation/report to Cabinet for the final decision.
2012+	If the EIS is accepted, and following licensing approval by the panel, construction will take about five years. OPG would then seek regulatory approval for an operating licence. The L&ILW DGR is anticipated to be operational in 2018.

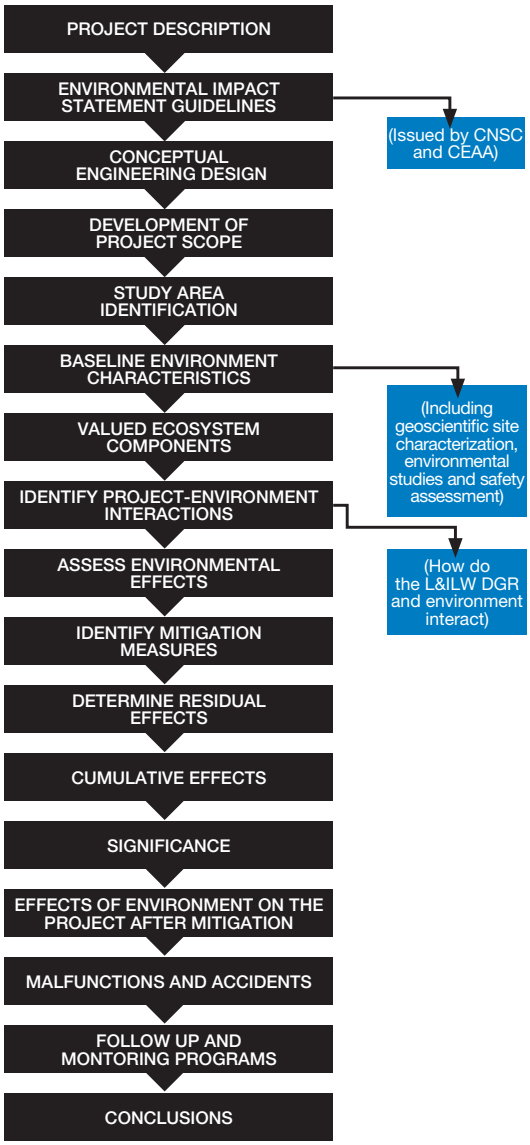
EA METHODOLOGY

Guidelines for the EA, issued by the CNSC and the Canadian Environmental Assessment Agency (CEAA), prescribes exactly what information is required to be contained within the EIS, which will be reviewed by the public and a Joint Review Panel.

The assessment of effects includes a detailed description of the project, specifying project works and activities comprising the project. This description, along with the identification of the Valued Ecosystem Components (VECs), is the basis for consideration of the potential effects of the project. The VECs were identified in the EIS Guidelines and have also been displayed and discussed with community members at L&ILW DGR Project Open Houses in 2007, 2008 and 2009.

For each project activity, the potential interactions with the various components of the environment are identified, and those interactions are carried forward for further evaluation. These interactions are then assessed for the potential for there to be a measurable change in the environment. Potential measurable effects are carried forward for further evaluation to determine whether those effects are adverse. If the assessment of effects indicates a potential adverse effect, mitigation measures are proposed to address the identified potential effect. Residual effects, with the mitigation in place, are then determined.

The following flow chart explains the steps taken in the development of the Environmental Assessment for the L&ILW DGR.

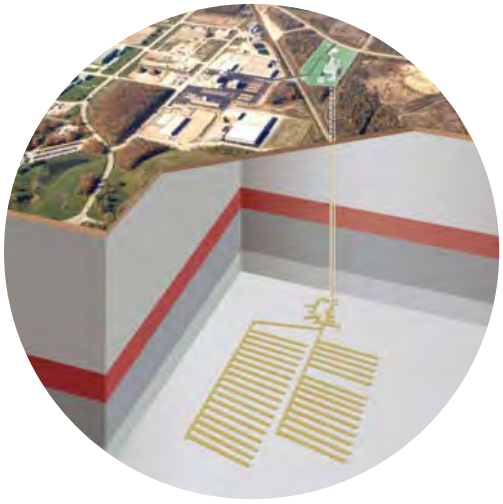


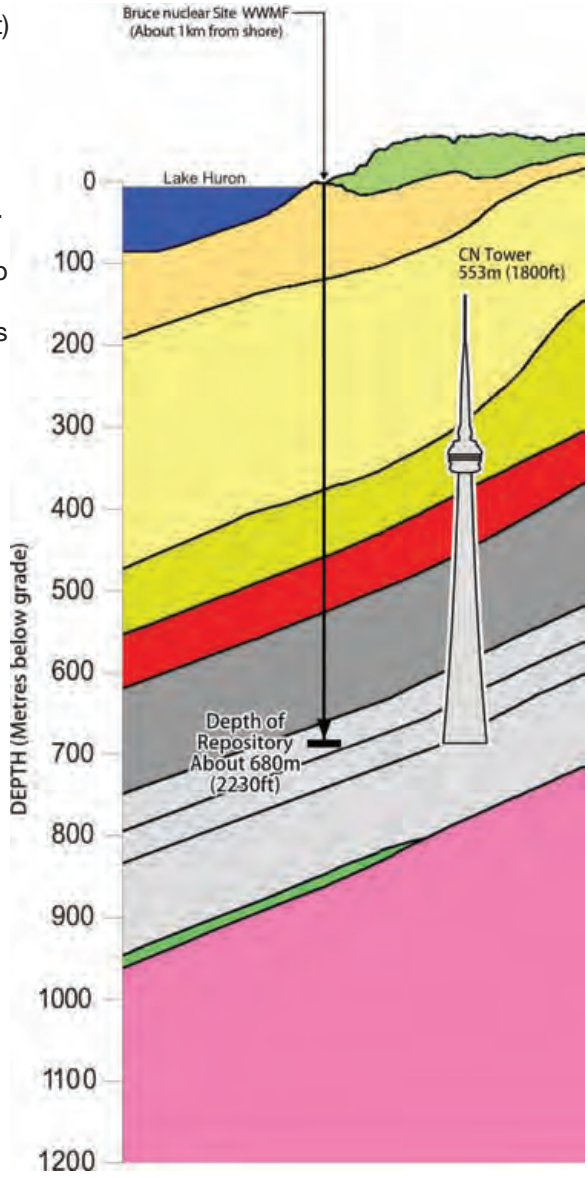
Field studies provided baseline data and were undertaken as part of the EA process for the L&ILW DGR. Studies included: light assessment, water quality sampling, sediment sampling, stream geomorphic studies (physical features of earth's surface), stream aquatic habitat study, amphibian study and surveys of burrowing crayfish, vegetation, basking turtles, breeding birds, meadow voles and the deer population. Public attitude research was also completed as part of the investigations.

OPG'S L&ILW DGR : DEEPER THAN THE CN TOWER IS TALL

Key features

- Constructed about 680 metres (2,230 feet) deep within low permeability limestone in the Cobourg Formation – deeper than the CN Tower is tall.
- Designed to isolate and contain about 200,000 cubic metres of packaged waste.
- A 200-metre-thick (660 feet) protective cap of low permeability shale directly above and low permeability limestone formations at the repository horizon provide multiple natural barriers for the safe management of the waste for many tens of thousands of years and beyond.
- At closure, shafts will be sealed with clay-based and concrete materials.





L&ILW DGR PRELIMINARY ENGINEERING DESIGN ELEMENTS

- Rock excavation will use controlled drill and blast technology.
- Main shaft (6.5-metre finished diameter) will provide personnel access and waste handling to the L&ILW DGR. The ventilation shaft (5-metre finished diameter) will provide exhaust ventilation and a secondary exit for emergency purposes.
- Surface facilities include a Main Shaft Headframe with an adjoining building for waste package receiving and staging, Ventilation Shaft Headframe and Ventilation Shaft Hoist House.
- The main shaft hoist with a capacity of 44-tonnes will move waste packages between the surface and repository levels. A separate hoist will move personnel.
- Low and intermediate level nuclear waste will be managed in separate emplacement rooms excavated in low permeability limestone.
- Underground facilities include a lunchroom, washroom, office, equipment storage area and refuge stations.
- Once filled, a group of emplacement rooms will be closed by a thick wall in adjacent access tunnel.
- The wastes are without value so there is no intent to retrieve them; however, the wastes remain retrievable. As emplacement rooms are filled and isolated, retrieval will still be possible though more difficult.

An example of a drill jumbo creating underground openings in rock

L&ILW DGR PHASES: SITE PREPARATION, CONSTRUCTION, OPERATIONS, DECOMMISSIONING

Project Factor	Estimated Time	Estimated Work Force	Scope of Phase	Key Phase Activities
Site Preparation Phase	6 months	80 positions	Site preparation begins after receipt of licence and would include clearing about 20 hectares of the L&ILW DGR site and preparing construction laydown areas	- removal of brush and trees and excavation of topsoil for on-site storage - grading of sites including roads, laydown areas, stormwater management area, ditches - paving of roads - set-up of construction trailers and temporary services - install and operate fuel depot for construction equipment
Construction Phase	5 years	200 positions	Will include the construction of the surface facilities as well as excavation and construction of access ways to the repository (i.e. shafts) and underground infrastructure	- construction of permanent buildings including two headframe buildings - receipt and set-up of shaft sinking equipment - construction of crossing between WWMF and L&ILW DGR site - construction of main and vent shafts, and access tunnels and emplacement rooms - placement of excavated rock in on-site storage area
Operations Phase	35–40 years	30 positions	Operations include the receipt of waste packages from the WWMF at the staging area in the L&ILW DGR Waste Package Receiving Building and transfer to the shaft for emplacement in the repository	- receipt of disposal-ready waste packages - receipt of waste packages at base of the main shaft - offloading from elevator cage by forklift and transfer of waste packages to emplacement rooms - rail cart transfer of large packages to emplacement rooms - installation of shielding walls on full emplacement rooms - rock bolting and rock wall scaling as required - transfer, operation and maintenance of hoists - maintenance of services such as communications, ventilation and fire protection systems - period of monitoring to ensure facility is performing as expected
Decommissioning Phase	5 years	75 positions	Decommissioning, if approved following an EA, will include the removal of the surface facilities and installation of seals in each of the shafts	- concrete monolith will be installed at the base of the shafts - surface structures will be removed - shafts will be sealed

INTERIM SITE CHARACTERIZATION RESULTS

Six boreholes are positioned outside of the L&ILW DGR footprint to maintain the integrity of the proposed L&ILW DGR site

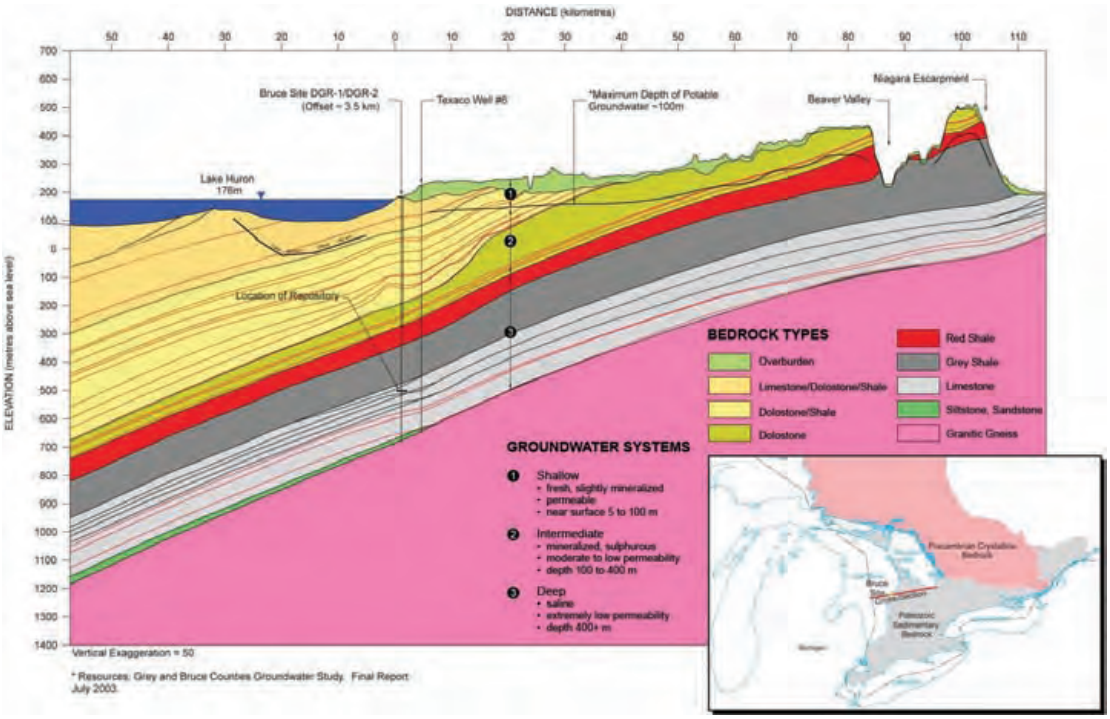
Geoscientific investigations, in support of the existing regional and historical information about the proposed site for the L&ILW DGR, have shown that the geology is:

- predictable
- geomechanically stable
- seismically quiet
- characterized by natural barriers which can isolate and contain the waste
- with low natural resource potential

GEOSCIENCE ATTRIBUTES

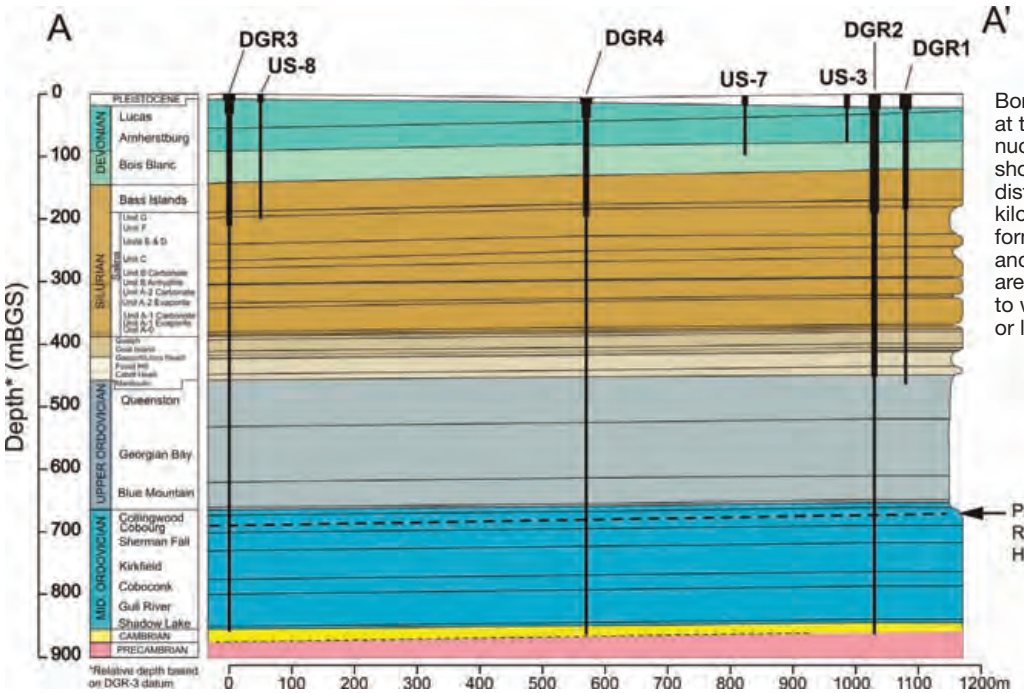
MULTIPLE NATURAL BARRIERS TO PROTECT GROUNDWATER AND SURFACE WATER

- The L&ILW DGR will be sited about 1 kilometre inland from Lake Huron.
- Potable groundwater occurring in the upper 100 metres is isolated from the L&ILW DGR.
- The L&ILW DGR is surrounded and overlain by multiple layers of low permeability sedimentary rock, which will provide multiple natural barriers to isolate and contain the waste.
- The only water at the repository depth is ancient and has been trapped within the rock for millions of years. This has been confirmed by a series of scientific tests including analyzing its salt content, which is many times that of seawater.
- Lake Huron is well isolated from the L&ILW DGR by over 400 metres (1320 feet) of low permeability rock layers.



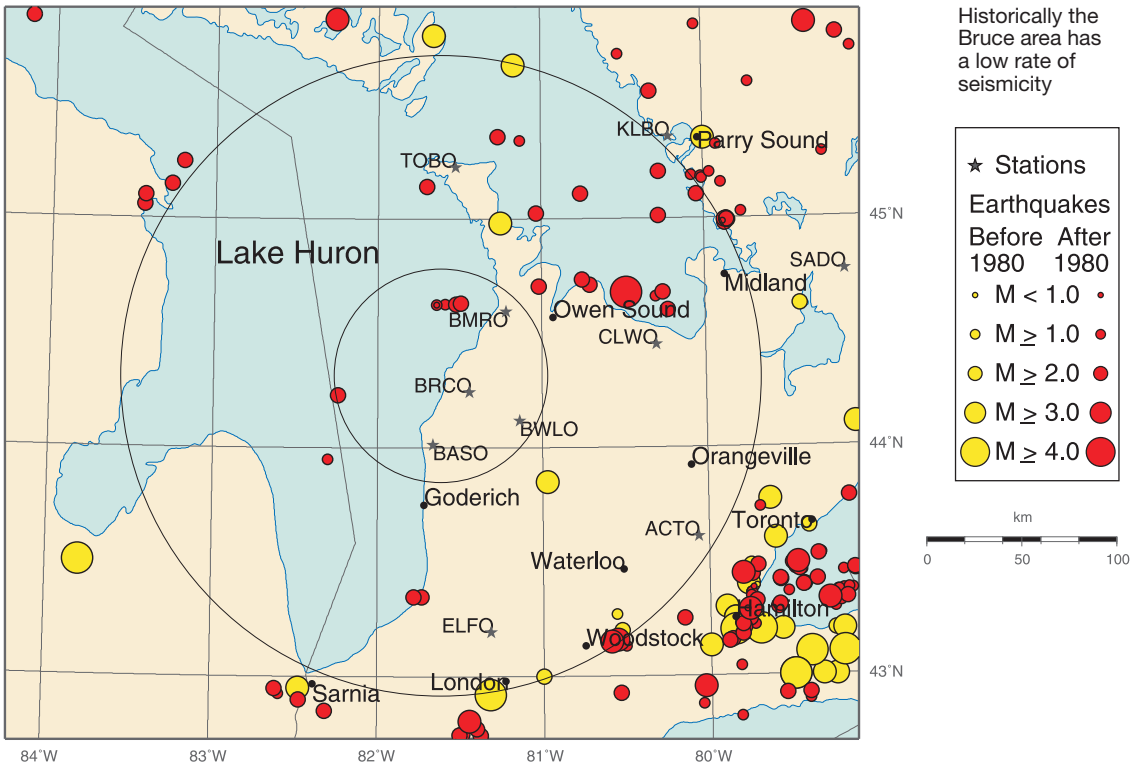
PREDICTABILITY

Examination of drill core obtained during the deep drilling program, a two-dimensional seismic survey and downhole testing, has provided a basis to verify the bedrock stratigraphy beneath the Bruce nuclear site. In total 34 individual bedrock formations, Cambrian (543 million years old) to Devonian (350 million years old) in age, exist in the 840-metre-thick sedimentary sequence underlying the site. This includes 200 metres of shale that lie above the Cobourg Formation, a clay-rich limestone that will host the proposed L&ILW DGR. Formation contacts and formation thicknesses are predictable over distances of kilometres to within metres or less. The properties of bedrock formations, including rock mass permeabilties, rock matrix porosity, mechanical strength and saline pore fluid composition, also reveal consistency at site scale.



Borehole coring at the Bruce nuclear site shows that at distances of kilometres, the formation depths and thicknesses are predictable to within metres or less

SEISMICALLY QUIET



Southwestern Ontario and the Bruce region lie within the tectonically stable interior of the North American continent, which is a region characterized by low rates of seismicity. The historic seismicity record over 180 years shows most recorded events have magnitudes that do not exceed M5. As part of the L&ILW DGR project, a network of borehole seismographs was established in the summer of 2007 to allow monitoring of micro-seismicity (M=1) within a 50-kilometre radius of the Bruce nuclear site. Monitoring results through 2009, reported by the Geologic Survey of Canada's Canadian Hazard Information Service, continue to confirm that the Bruce nuclear site is located in a seismically quiet region.

TRANSPORT IS DIFFUSION DOMINATED

Within the bedrock formations that will host and enclose the repository, the groundwater regime appears ancient and has been resilient to external perturbations, such as glaciations, over hundreds of thousands of years. Multi-discipline evidence includes: the predictable nature and lateral extent of the thick and near-horizontally bedded sediments beneath the Bruce nuclear site, the very low rock mass permeabilities measured in the sediments, the consistent brine (300 g/L) composition of pore fluids in the low porosity rock and the distribution of environmental tracers vertically in the sedimentary column that reflect a slowly evolving groundwater system. Numerical simulations illustrate that even under cyclic glacial loading the groundwater system remains in a state in which mass transport is diffusion dominant. This is a very, very slow process and is the preferred situation for long-term waste isolation and containment.

NATURAL RESOURCE POTENTIAL IS LOW

Evaluation of published studies, historical records and the results of the deep drilling program on the Bruce nuclear site strongly suggests that viable commercial oil and gas reserves do not exist beneath or adjacent to the Bruce nuclear site. Commercially viable base metal deposits have not been identified in the study area.

GEOMECHANICALLY STABLE HOST ROCK

An assessment of the geomechanical stability of the L&ILW DGR openings both during operations and at long-term timeframes indicates that the repository will remain safe. A comprehensive set of analyses using the site-specific data reveals that the openings within the Cobourg Formation will be stable during construction and operation. At longer time frames associated with future glacial episodes and possible seismic events, the overlying and underlying formations will provide passive barriers to contain and isolate the waste.

Construction of the cooling water intake tunnel at Darlington in the Cobourg Formation provided evidence that the formation can sustain a stable, dry opening

GEOSCIENTIFIC SITE CHARACTERIZATION

PHASE ONE

A four-year, stepwise series of scientific investigations began in 2006 to verify the ability of the geology at the Bruce nuclear site to safely isolate and contain low and intermediate level nuclear waste. Phase One included the following test programs:

- 2D seismic reflection survey to image the sedimentary bedrock layers.
- Three low-level seismographs installed at three locations within a 50-kilometre radius of the Bruce nuclear site to monitor low level seismic activity.
- Drilling and coring of vertical boreholes DGR-1 to 463 metres and DGR-2 to 863 metres to provide rock core samples for laboratory tests to measure physical and chemical rock properties.
- Downhole geophysical logging of boreholes with various instruments to determine the different layers (formations), rock density and porosity.
- Hydraulic borehole testing to measure bedrock formation permeabilities.
- Installation of multi-level groundwater monitoring equipment to allow long-term monitoring of deep groundwater conditions.

PHASE TWO

- Phase Two of the Geoscientific Site Characterization began in April 2008 with the drilling, coring and instrumentation of two additional vertical boreholes, DGR-3 and DGR-4, at separate sites to triangulate about the proposed L&ILW DGR site.
- DGR-3 and DGR-4 were drilled to about 860 metres in 2008.
- The drilling and coring of two additional steeply inclined deep boreholes, DGR-5 and DGR-6, were completed early in 2010, with further testing underway in 2010.
- Results from the boreholes provided evidence as to the nature and predictability of the stratigraphic, geochemical and hydrogeologic properties of horizontally-layered limestone and shale rock formations.

Above: Inclined drilling verifies the nature of vertical bedrock structure and its effect on L&ILW DGR implementation

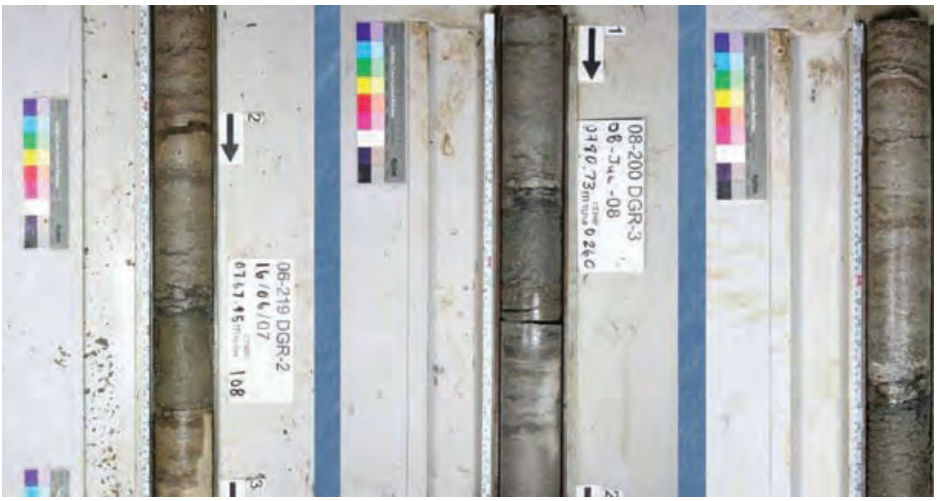
Right: Data from the drilling program supports the original understanding of the geologic attributes beneath the Bruce nuclear site

BOREHOLE DRILLING, TESTING AND MONITORING

About 1,200 core samples from six deep boreholes have been sent to labs in Canada and internationally to undergo a variety of tests including geomechanical strength, density, geochemical analysis and porosity

Far left:
Hydraulic testing utilizes specialized equipment to measure the very low permeabilities of the rock layers

Left:
The installation of multi-level groundwater monitoring systems provides baseline data on existing groundwater systems



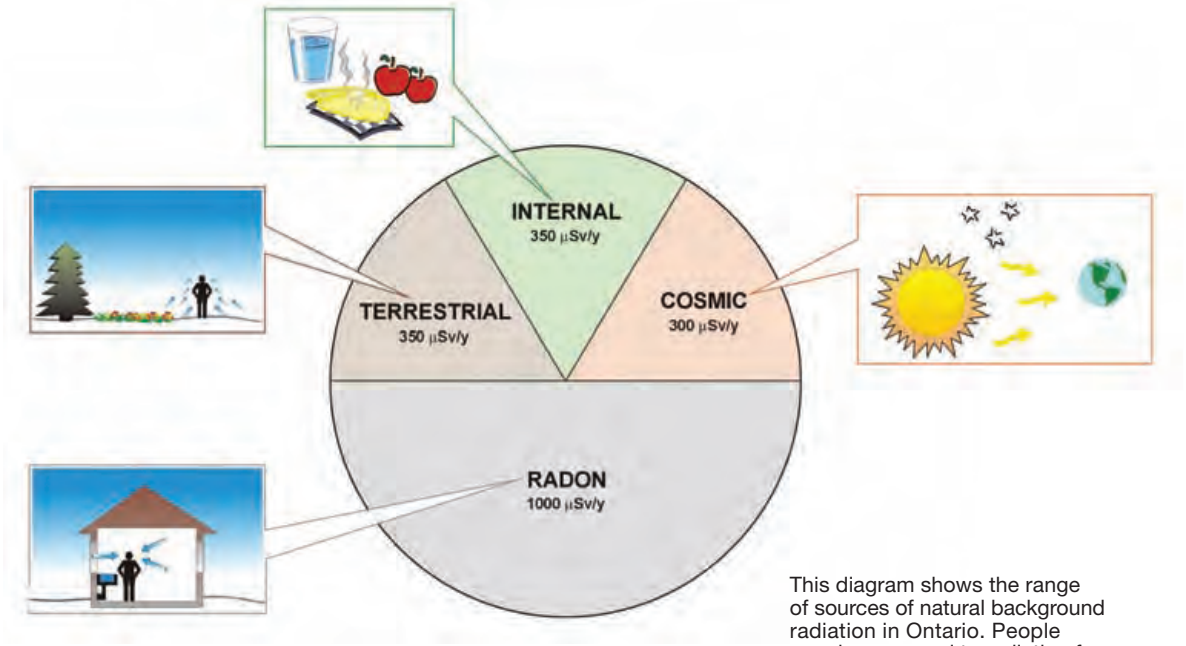
The layer of Bentonite found in core samples from three different boreholes speaks to the consistency of the geologic layers

Far left: Samples of tiny bits of moisture called pore water, taken from 680 metres, reveal a salinity content that is about nine times that of seawater, which is reflective of the water's long residence time in the rock formations

Left: Geologists meet to review formation depths in L&ILW DGR boreholes

RADIATION SAFETY BACKGROUND

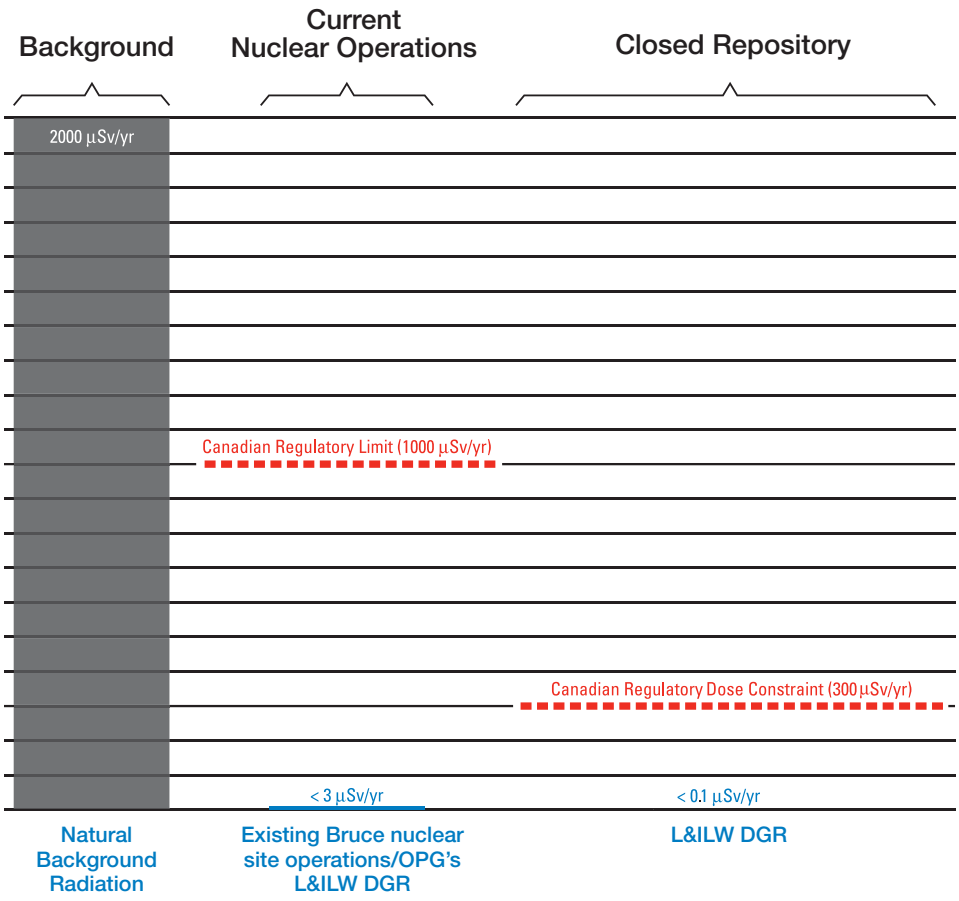
- A sievert is the unit of measure that describes the amount of ionizing radiation received by people. Dose is often expressed in millionths of a Sievert, or microSievert (μSv).
- Natural background radiation averages about 2,000 microSieverts per year. This represents the amount of radiation dose that the average person in Canada receives each year from all natural sources.
- Examples of radiation doses from common sources include: standard dental x-rays at 2 – 20 microSieverts, transcontinental flight from Toronto to London at 50 microSieverts, and a chest x-rays at 60 – 140 microSieverts depending on the type of x-ray.
- The dose rate to the public from all of the Bruce nuclear site activities, if they lived at the site boundary, would be less than 3 microSieverts per year. Dose rate to the public, living at the site boundary, from the WWMF is less than 0.1 microSieverts per year.



This diagram shows the range of sources of natural background radiation in Ontario. People are also exposed to radiation from human activities such as medical examinations and power generation

PRELIMINARY SAFETY ASSESSMENT

- The safety assessment of the L&ILW DGR is being completed by a team led by Quintessa Limited, a consulting firm based in the United Kingdom, which specializes in safety assessment of nuclear waste management facilities.
- This chart shows the dose rate estimates for the L&ILW DGR. Maximum estimated doses to humans are well below the international standards and natural background levels.



EVALUATING L&ILW DGR SAFETY

Safety Case Elements

The safety case is based on the geologic site and waste characteristics including:

- The repository will be isolated from surface waters by its depth of about 680 metres.
- There are multiple layers of low permeability rock above the repository.
- The rock formations are 450 million years old. They have remained stable through tectonic events and climate changes during this period, including several ice ages within the past one million years. These rocks are expected to remain stable for at least the next few million years.
- The area is seismically quiet. Large magnitude earthquakes are unlikely and would have little to no impact on the L&ILW DGR.
- The properties of the deep bedrock limit the rate of contaminant movement through the rock to very slow rates.
- Most of the waste volume contains primarily shorter-lived radionuclides, and the radioactivity decreases with time.
- Almost all the radioactivity would decay within or near the repository.

The safety assessment for the L&ILW DGR:

- Analyzes the facility behavior under normal and accident conditions.
- Quantifies potential impacts on the public and workers.
- Compares the potential impacts with regulatory criteria.

NWMO engineers review a report on L&ILW DGR safety

INTERIM SAFETY ASSESSMENT RESULTS

OPERATIONAL (PRECLOSURE)

Preclosure covers the start of operations to the closure of the facility with the focus on radiological safety during the handling and storage of low and intermediate level waste packages under normal operations and accident conditions.

Preliminary Results:

- Based on experience from the WWMF operations, small amounts of tritium and carbon-14 are expected to be released from the L&ILW DGR under normal operating conditions, dropping to zero as the L&ILW DGR is decommissioned.
- Public impact is negligible – similar to WWMF (emissions are less than 0.1 per cent of the regulatory limit).
- Accident scenarios including breach of waste package and fire were considered and the preliminary analyses indicate that any radioactivity released from above or below ground accidents is low and will not impact members of the public.

Examples of Safety Features:

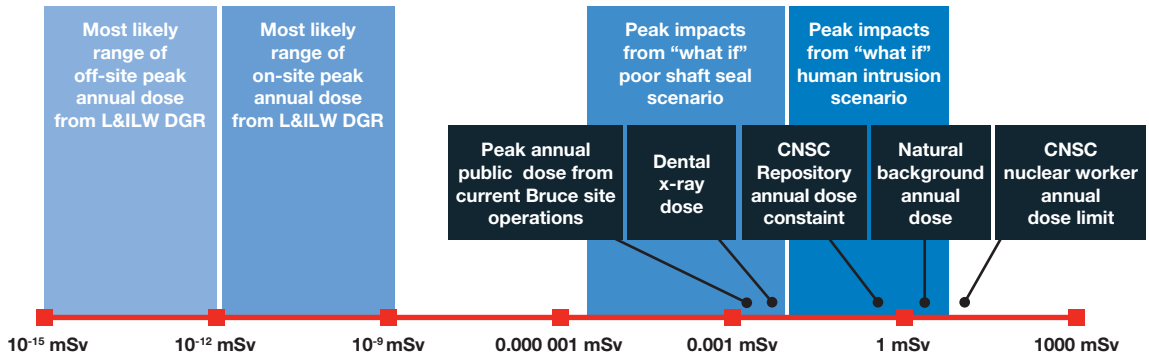
- Waste packages will meet the L&ILW DGR waste acceptance criteria; for example, no surface contamination.
- The intermediate level nuclear wastes will be in robust, concrete-and-steel packages.
- The L&ILW DGR will be close to the WWMF, so waste packages do not need to be moved off the Bruce nuclear site.
- All underground construction will be completed prior to the start of waste emplacement.
- The shaft hoist is based on a proven reliable multi-rope Koepe drum design.
- Combustible materials and ignition sources will be minimized.
- Emergency response system includes fire detection and suppression, two shaft exits and underground safety refuge stations.

LONG-TERM (POSTCLOSURE)

The Postclosure Safety Assessment addresses the safety of the repository after the underground facilities have been closed and sealed. It assesses a range of likely and unlikely future outcomes and scenarios through the use of site specific data and computer modelling to quantify specific outcomes under various scenarios.

Preliminary Results:

- Preliminary safety assessment results indicate there would be little or no impact from the repository in any of these scenarios – low to extremely low dose rates well below regulatory limits.



Interim Safety Assessement calculated impacts where mSv = milliSievert, one thousandth of a Sievert

INTERNATIONAL EXPERIENCE WITH REPOSITORIES

L&ILW DGR IS CONSISTENT WITH INTERNATIONAL BEST PRACTICES

The L&ILW DGR Project has benefited from first-hand visits to long-term management facilities including those in countries such as Sweden, Finland and the United States. Information learned about surface facilities, repository access, hoisting, lay-out and material handling is being utilized in the design of the L&ILW DGR. Such international collaboration is extremely beneficial in terms of experience, the exchange and analysis of reports and visits with key personnel.

L&ILW DGR technology is used internationally:

- The Forsmark facility in Sweden opened in 1988 and is located at the Forsmark nuclear power station site. The Swedish underground repository was excavated to a depth of 60 metres in crystalline rock below the bottom of the Baltic Sea.
- The Olkiluoto (VLJ) facility in Finland began operation in 1992 and was excavated to a depth of 70 to 100 metres underground in crystalline rock. It is located near the Olkiluoto nuclear power station.
- The Waste Isolation Pilot Plant (WIPP) located in New Mexico, United States is excavated to a depth of 600 metres in a bedded salt formation and has been operating safely since 1999.

Left: Sweden's Forsmark Repository

Right: Waste Isolation Pilot Plant in New Mexico

KEEPING YOU INFORMED

Consultation with the public has continued throughout the six to eight year regulatory process at an intense level through newsletters and publications, open houses, website, speaking engagements, attendance at public events with mobile exhibit, briefings with key stakeholders including municipal, provincial and federal politicians, and media.

Consultation with Aboriginal Peoples

- A Protocol agreement, signed by Saugeen Ojibway Nations (SON), OPG and NWMO in 2009, provides a framework for SON's participation in the regulatory approval process for the L&ILW DGR project.
- Discussions with the Historic Saugeen Métis and the Métis Nation of Ontario are underway for the proposed L&ILW DGR project to facilitate their participation in the regulatory approval process.

Above: Members of the Historic Saugeen Métis learn more about the proposed L&ILW DGR as they examine core samples taken as part of the geoscientific site characterization

Left: The regulatory process provides many opportunities for public engagement and comment

For more information please visit **www.nwmo.ca/dgr**

OPG's DEEP GEOLOGIC REPOSITORY PROJECT

For Low & Intermediate Level Waste

Keeping You Informed

May 2010

UNDERSTANDING THE DIFFERENCES BETWEEN OPG'S L&ILW DGR PROJECT AND NWMO'S APM PROJECT

NWMO is under contract to OPG to seek regulatory approval for the L&ILW DGR

Ontario Power Generation (OPG) and the Nuclear Waste Management Organization (NWMO) are two different companies with complimentary roles in the development of the proposed Deep Geologic Repository (DGR) Project for the long-term term management of low and intermediate level nuclear waste (L&ILW) at the Bruce nuclear site.

OPG is proposing, with the support of the Bruce municipalities, to construct the L&ILW DGR. OPG will be the owner, licence holder and operator of the L&ILW DGR. OPG is also financing the project from segregated funds controlled under the Ontario Nuclear Funds Agreement (ONFA) for the long-term management of nuclear waste.

NWMO is an independent, not-for-profit Canadian company established by the nuclear utilities, under the Nuclear Fuel Waste Act in 2002, with specialized expertise in the long-term management of nuclear waste. NWMO, in a completely different and separate role, is also responsible for implementing a long-term management approach for all of Canada's used

(continued on page 4)

NWMO's Kevin Orr poses in front of the L&ILW DGR mobile exhibit, which was recently on display at five local home shows within the Bruce area. NWMO delivers the L&ILW DGR engagement program on behalf of OPG.

PARTNERSHIP WITH HISTORIC SAUGEEN MÉTIS FOR GREATER UNDERSTANDING OF L&ILW DGR

NWMO provides support for storefront office

Information about OPG's L&ILW DGR is available at the storefront office

The Nuclear Waste Management Organization (NWMO) recently provided the Historic Saugeen Métis (HSM) with some additional office equipment and furnishings for their storefront office at 204 High Street in Southampton.

Patsy L. McArthur, HSM Secretary-Treasurer, who has spent years researching the HSM, said the meeting place, which opened in February 2009, is helping to heighten the profile of the HSM both within the local community and with visitors, while ensuring them a place to conduct their business.

"People come in and want to know about us, our history… they are fascinated by our story," she said.

NWMO's contribution to the storefront is a reflection of the company's commitment to developing long-term relationships with Aboriginal groups as well as ensuring local groups are able to participate in the regulatory process for Ontario Power Generation (OPG)'s proposed Deep Geologic Repository (DGR) for low and intermediate level nuclear waste (L&ILW).

Patsy noted that HSM citizens, as part of their right to be consulted with respect to development that could impact their traditional way of life, are currently commenting on several projects. The storefront office provides them with a much needed resource for conducting this business, which for years was done in members' dining rooms.

They can also use the facility as an information centre from which to disperse knowledge about their heritage and legacy, as well as knowledge about the projects they are reviewing.

For instance, one can find information about OPG's proposed L&ILW DGR on the book shelves. An Open House about the proposed long-term management facility was also held in the storefront office in March to encourage citizens from the HSM to become informed about the L&ILW DGR. A new flat screen, wall-mounted TV can be utilized for presentations and videos including the new L&ILW DGR video.

Patsy said the HSM's relationship with NWMO and other groups is based on respect and co-operation.

"They have shown such respect for our need to be involved in these projects from our perspective as stewards of the land," she said. "We really appreciate these partnerships."

Anyone who would like to learn more about the HSM is invited to visit the office in Southampton, which is open Monday – Friday from 9 a.m. – 4 p.m.

Patsy McArthur (left) and Tammy Schummelketel, secretary-treasurer and office coordinator respectively for the Historic Saugeen Métis, encourage members of the community and visitors to stop by the storefront office in Southampton.

NWMO AWARD OF MERIT RECOGNIZES HIGH SCHOOL PROGRAM FOR YOUNG WOMEN

Program emphasizes self esteem, goal-setting, planning a positive future

Amy Snobelen and Kathie Hackney, two Kincardine District Secondary School (KDSS) teachers, are this year's recipients of the Nuclear Waste Management Organization (NWMO) Award of Merit. The award – one of eleven community achievement awards presented annually by the Kincardine and District Chamber of Commerce – recognizes a business, group or individual who makes an outstanding contribution to the community. The teachers were nominated for the NWMO Award of Merit by the Kincardine Economic Development Committee in recognition of a new program at KDSS, which is already yielding positive results.

Recognizing the need to provide alternative resources for teenage girls who were experiencing limited success in high school because of poor attendance and low academic achievement, Amy and Kathie developed, secured funding and implemented a new initiative designed specifically for these young women who weren't responding to mainstream programming.

Students spend two periods a day in a special classroom setting where the emphasis is on positive reinforcement by encouraging and developing self esteem, teamwork and goal setting. If the girls are behind in their courses, they are in an environment where they can get caught up without feeling stigmatized by being in a classroom with younger students. Special speakers from various vocations are brought in as a means to inspire the girls to set realistic career goals. Although the program is only in its infancy, the attendance rate of the first 16 students has improved and according to Snobelen, "sixty per cent of the participants are on track to graduate."

Congratulations to: Front, KDSS teachers Amy Snobelen (left) and Kathie Hackney (right) with students (back left) Katie Creighton, Kate-Lyn Fry, Vicky Marsh and Lisa Graham.

Several of the students said the program provided them with the incentive to attend class because they enjoyed the support they received from their classmates and the overall sense of belonging. One girl noted that she had thought about leaving school, but being in the program gave her the confidence to seek a CO-OP position in a local restaurant, and now she is on track for graduation, and thinking about various career options. Of the four girls who were interviewed for this story, all had positive experiences with the program and said they fully expect to graduate from high school.

As for Snobelen and Hackney, they are very appreciative of the award, and wanted to express their thanks to the Kincardine and District Chamber of Commerce, NWMO and the various community partners who helped them through donations and funding to get the program started; however as Snobelen said, "it's nice to get the recognition, but Kathie and I feel we are just doing our jobs."

OPG's L&ILW DGR

(continued from page 1)

nuclear fuel called Adaptive Phased Management (APM). This will involve the construction of a deep geologic repository in an informed and willing host community in a location in Canada yet to be determined.

The NWMO, as contractor and technical expert to OPG, is managing the Environmental Assessment process under the Canadian Environmental Assessment Act for the L&ILW DGR and is also assisting OPG in the seeking of licensing from the Canadian Nuclear Safety Commission (CNSC).

It must be stressed that OPG's L&ILW DGR Project and NWMO's APM Project for used fuel will continue to be separate and distinct projects; NWMO's role as OPG's contractor for the L&ILW DGR Project is completely separate from NWMO's role with the APM Project.

AMEC engineer Peter Nimmrichter measures the elevation change across a culvert at the Bruce nuclear site as part of the mapping of the site drainage network. The information will be used in the safety assessment currently being compiled by NWMO on behalf of OPG.

GEOSCIENCE STUDIES ALMOST COMPLETE

The gathering of data from a four-year, stepwise geoscientific site characterization program for Ontario Power Generation (OPG)'s proposed Deep Geologic Repository (DGR) for low and intermediate level nuclear waste (L&ILW), initiated in the fall of 2006, is drawing to a close with the hydraulic testing of inclined borehole DGR-6.

The hydraulic testing of DGR-6 (one of six boreholes drilled beneath the site) is expected to be completed by the end of June 2010. This milestone will signal the completion of the geoscience field work, as set out under the Geoscientific Site Characterization Plan, for the L&ILW DGR at the Bruce nuclear site.

The initial results from the current work at DGR-6 are consistent with the hydraulic testing results of four deep vertical boreholes and DGR-5 (inclined borehole). Consistent findings indicate the low-permeability limestone bedrock found at the repository horizon coupled with the 200-metre-thick cap of low-permeability shale bedrock directly above, will provide multiple natural barriers for the safe management of low and intermediate nuclear waste for many tens of thousands of years and beyond.

The Nuclear Waste Management Organization (NWMO), on behalf of OPG, continues to move forward with all of its work programs in the areas of geoscience, safety assessment, engineering and preliminary design, environmental field work and community engagement. These work programs, along with their results, will be documented in an Environmental Impact Statement (EIS), which is expected to be submitted to the Joint Review Panel early in 2011, and distributed for public comment prior to the anticipated public hearing in 2012.

L&ILW DGR TECHNICAL REPORTS AVAILABLE IN EIGHT LOCAL LIBRARIES

A wealth of technical documentation in support of the environmental assessment and licensing process for Ontario Power Generation's (OPG) proposed Deep Geologic Repository (DGR) Project for the long-term management of low and intermediate level nuclear waste (L&ILW) is available on the NWMO website at www.nwmo.ca/dgr. However, we would also like to remind you that hard copies of technical reports including early feasibility studies, the project description and technical documents for work programs in the areas of geoscience, safety assessment and engineering/design – 20 documents in all – can be viewed at libraries located in: Southampton, Port Elgin, Kincardine, Ripley, Walkerton, Chesley, Wiarton and Tobermory. Additional documents will be made available in these libraries as they become available.

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NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

ONTARIO POWER GENERATION

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Printed on 100% recycled stock

OPG's DEEP GEOLOGIC REPOSITORY PROJECT

For Low & Intermediate Level Waste

Keeping You Informed

September 2010

PRELIMINARY RESULTS OF EA ARE AVAILABLE FOR PUBLIC DISCUSSION

NWMO to host open houses to discuss environmental assessment

Ontario Power Generation (OPG)'s proposed Deep Geologic Repository (DGR) Project for the long-term management of low and intermediate level nuclear waste (L&ILW) at the Bruce nuclear site is the subject of an environmental assessment (EA) process, which began late in 2005 with the submission of the project description. After more than four years of investigations, studies and analyses, preliminary results of the assessment of the effects of the DGR Project on the environment are being presented to the public for discussion.

In summary, the potential residual effects identified include:

- Small increase in air emissions at Bruce nuclear site during all DGR project phases;
- Increase in noise levels during site preparation, construction and decommissioning;
- Loss of some Eastern White Cedar trees on DGR project site;
- Reduced flow in the north railway ditch;
- Increase in quantity of stormwater flow at the Interconnecting Road on the Bruce nuclear site;

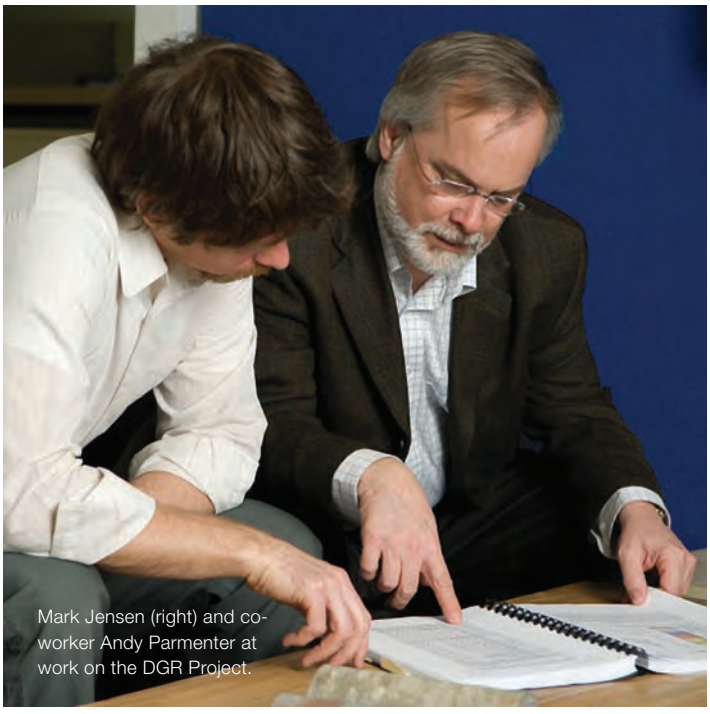
(continued on page 4)

DGR EXHIBIT MAKES THE ROUND OF SUMMER EVENTS

Summer engagement activities for the DGR mobile exhibit included the Kincardine Scottish Festival where this future heavy events participant checked his form with a piece of limestone core taken from beneath the Bruce nuclear site.

FOUR-YEAR INVESTIGATION OF GEOLOGY BENEATH THE BRUCE NUCLEAR SITE FOR DGR SUCCESSFULLY COMPLETED

The field studies for the geoscientific site characterisation of Ontario Power Generation (OPG)'s proposed Deep Geologic Repository (DGR) Project for low and intermediate level waste (L&ILW) were completed at the end of June. Mark Jensen, Director of Low and Intermediate Level Waste Repository Geoscience for NWMO, discusses the results of the four-year program designed to verify the suitability of the geology beneath the Bruce nuclear site to safely isolate and contain low and intermediate level nuclear waste.



Mark Jensen (right) and co-worker Andy Parmenter at work on the DGR Project.

Q: Why is geology so important to the safety case for OPG's proposed DGR for L&ILW?

A: The geologic conditions beneath the Bruce nuclear site must be able to provide a stable and secure environment to prevent impacts on surface and groundwater resources. The geologic column of sedimentary rock beneath the site is approximately 840 metres thick and comprises 34 near horizontally-layered bedrock formations. As envisioned, the repository would be constructed within the clay-rich Ordovician age (450 million-year-old) limestone Cobourg Formation at a depth of approximately 680 metres. A 200-metre-thick layer of low permeability shale provides a protective cap directly above the DGR horizon, which is enclosed with low permeability limestone layers. Together, the low permeability limestone and shale layers provide multiple natural barriers to safely isolate and contain the L&ILW. In fact, the permeability of the bedrock layers is so low that contaminants would move very slowly in the subsurface – a situation that appears to have existed for geologic periods of time despite past glacial and geologic events. The geotechnical properties of the Cobourg Formation are favorable for excavation and it must be noted that the DGR will be located in an area of low seismic activity (see story on page four). Combined, the attributes of the geology beneath the Bruce nuclear site contribute to the understanding and assurance of long-term DGR safety.

Q: From a geologic point of view, why was the Bruce nuclear site chosen for further investigation as a site for the DGR?

A: The decision to conduct further investigations of the Bruce nuclear site as a future host for the DGR was made on the basis of existing historical and regional information about the Bruce area and Southwestern Ontario as well as the consensus of a body of Canadian and international geoscientists.

An initial Geotechnical Feasibility Study was conducted in the fall of 2002 by Golder Associates, which provided evidence from past exploratory oil and gas drilling in the Bruce region and elsewhere in the province. This study supported an understanding of the suitability of the Ordovician age (450 million-year-old) bedrock formations beneath the Bruce nuclear site to isolate and contain L&ILW.

A second review was conducted by the University of Bern, Switzerland in 2004 that looked more broadly at the sedimentary rock formations in Southwestern Ontario. The studies utilized an approach to document and prioritize a list of geoscience/characteristics called FEPCAT (Features, Events, Processes Catalogue) based on decades of international geoscience research in the area of nuclear waste management. It identified the geology of southern Ontario as promising for nuclear waste management purposes.

The geologic setting at the Bruce nuclear site consistently demonstrated favourable attributes necessary for the

long-term management of nuclear waste. The information available before site-specific investigations began, allowed for the development of a conceptual model of the site's geology, which served as a basis to develop and implement the site characterisation program.

Q: What was done to ensure and verify that the geology beneath the Bruce nuclear site will safely isolate and contain L&ILW for tens of thousands of years and beyond?

A: The Geoscience program was conducted as a four-year, stepwise program that was designed, under the guidance of the International Geoscience Review Group (four geoscientists with extensive experience in international nuclear waste management programs who provided peer review and oversight), to answer specific questions, or tenets, regarding the suitability of the Bruce nuclear site to host the proposed DGR. Questions were posed about the stability and predictability of the sediments beneath the site, the ability of the bedrock formations to protect water resources and prevent environmental impacts, the potential for the occurrence of natural resources that might lead to future exploration, seismic activity and the ability of the geology to allow for the safe excavation of openings in the bedrock to implement the DGR.

The Geoscientific Site Characterisation Plan addressed these and other issues. This program described coordinated activities such as deep drilling, borehole and laboratory testing and borehole instrumentation, which were designed to test the conceptual understanding of the geology underlying the Bruce nuclear site.

The work program conducted to date has seen the successful completion of six deep boreholes that intersected more than 4.7 km of sedimentary rock and obtained more than 3.8 km of rock core from beneath the site. The field and laboratory testing was conducted under a quality assurance program and has involved a variety of Canadian and International groups selected because of specialized skills.

Q: After almost four years of geoscientific investigations at the Bruce nuclear site, what can you tell us about the geology as it relates to the safety case for the DGR?

A: Site characterisation activities at the Bruce nuclear site began in fall 2006. The field work for the geoscientific site characterisation was completed by the end of June 2010. The results from the laboratory and field testing are favorable and provide strong evidence that the DGR concept can be safely implemented. The sedimentary sequence beneath the Bruce nuclear site is 840 metres thick and is comprised of 34 bedrock formations that range in age from 543 million years (Cambrian) to 385 million years (Devonian). The depth, thickness and orientation of these bedrock layers show remarkable consistency across the site – with formation contacts predictable to within metres or less at distances of more than a kilometre. At the repository horizon the bedrock formations have extremely low permeabilities and the pore fluids are extremely saline – many times more saline than seawater – indicative of an ancient groundwater system, which isn't mixing with the drinking water found in the upper 100 metres. The mechanical strength of the rock, particularly within the limestone Cobourg Formation in which the proposed DGR would be excavated, exceeds that understood from regional investigations at the onset of site investigations. The installation of seismography and monitoring of micro-seismicity is proving consistent with the region's assigned low seismic hazard rating.

The site-specific data set, perhaps the best gathered in Canada in such low permeability rocks, is providing strong evidence that the bedrock formations proposed to host and enclose the repository are stable and have remained so for geologic periods of time. Perhaps most important now is that we have the necessary site information to confirm the ability of the sedimentary bedrock formations to isolate and contain the L&ILW nuclear waste for time periods of 100,000 years and beyond. This information strongly supports the DGR safety case in terms of the existence of multiple natural barriers, a stable groundwater system over periods of geologic time and a resilient deep groundwater regime in which contaminant transport would occur at extremely slow rates preventing impact to surface or groundwater resources.

Q: How has the DGR benefited from international expertise and best practices?

A: The investigation of sedimentary rocks, such as those at Bruce nuclear site, for long-term radioactive waste management purposes has been on-going internationally for more than a decade. The experience gained and lessons learned from this have been of significant benefit to the DGR Project. For example, with respect to characterisation studies we've been able to apply tried and tested techniques from many international programs, including:

- specialized hydraulic borehole testing methods for low permeability sediments developed by Sandia National Laboratories during the licensing of the Waste Isolation Pilot Plant in New Mexico;
- laboratory techniques to characterize the chemistry of pore fluids within the rock core samples obtained during drilling developed at the University of Bern, Switzerland, for the French and Swiss programs in the Callovo-Oxfordian and Opalinus shale formations; and
- techniques to estimate the diffusive properties of limestone and shale developed at the Paul Scherrer Institute in Switzerland.

The DGR Project has also benefitted from collaborative international research in areas such contaminant mobility, sub-surface excavation and rock mass response, and glacial ice-sheet erosion rates to mention a few examples. While Canadian geoscientists have played a principal role in the Bruce nuclear site investigations, the ability to access international expertise and experience has made important contributions to the success of the DGR site characterisation and Geosynthesis work programs.

EA conducted in a thorough, traceable, stepwise manner

(continued from page 1)

- Loss of some habitat quantity and quality for Redbelly Dace, Creek Chub, Burrowing Crayfish and Variable Leaf Pondweed;
- Air and noise emissions may result in a temporary loss of enjoyment of property for those in near proximity to the DGR Project during construction and decommissioning; and
- Positive socio-economic effects for the local and regional areas because of an increase in employment, income, business activity, and municipal revenue during all of the phases.

Residual effects, after further evaluation, were not considered significant.

These results were arrived at through the application of a thorough, traceable, step-wise assessment process. Potential interactions between the DGR Project and the environment were assessed and screened for measurable change on the environment and adverse effects on the Valued Ecosystem Component (VEC)s – components of the environment which are valued or sensitive and have the potential to be affected by the DGR Project. VECs are identified by scientists, the regulator, the proponent and the public. Where necessary, mitigation measures were proposed to reduce or eliminate an adverse effect and the effect was then reassessed with mitigation in place. For example, in the case of the increase in dust and vehicle emission levels at the Bruce nuclear site, proposed mitigation will include the implementation of dust control measures and quality maintenance practices to ensure transportation and vehicle equipment are in good condition. Residual adverse effects (those that would remain after reasonable mitigation measures were put in place) were assessed relative to a number of criteria including length of effect, geographic extent of effect and reversibility of effect to determine whether or not the residual effect was significant.

Monitoring programs are proposed to verify the predictions made in the assessment and to confirm whether mitigation measures were effective. For example, ambient monitoring of air quality will take place during construction of the DGR and air quality monitoring for the DGR's ventilation system will take place during operations to ensure there aren't any adverse effects from the DGR Project on air.

Possible effects on the environment as a result of the DGR Project were looked at in conjunction with other projects to see if there were any potential cumulative effects; no cumulative effects were identified.

Detailed information about the Preliminary Results for the DGR Project will be available at the series of fall open houses listed below:

DATE	LOCATION	TIME
September 27, 2010	Colonial Motel, 235 Goderich Street, Port Elgin	4:00 – 8:00 pm
September 28, 2010	Ripley Huron Community Centre, 17 Queen Street, Ripley	4:00 – 8:00 pm
September 29, 2010	Best Western Governor's Inn, 791 Durham Street, Kincardine	4:00 – 8:00 pm
September 30, 2010	Victoria Jubilee Hall, 111 Jackson Street S, Walkerton	4:00 – 8:00 pm
October 4, 2010	Chesley Fire Hall, Bruce Rd. 10, (North end of Chesley)	4:00 – 8:00 pm
October 5, 2010	Bayshore Community Centre, 1900 3rd Avenue E, Owen Sound	4:00 – 8:00 pm
October 6, 2010	County of Bruce, Public Library Building, 578 Brown Street, Wiarton	4:00 – 8:00 pm

EARTHQUAKES WILL NOT IMPACT LONG-TERM SAFETY OF DGR

One of the most frequently asked questions about Ontario Power Generation (OPG)'s proposed Deep Geologic Repository (DGR) Project for the long-term management of low and intermediate level nuclear waste (L&ILW) is "What about earthquakes?" A 5.0 Magnitude earthquake on June 23, which originated about 56 kilometres north of Ottawa added even more interest to the discussion. Given the recent profile of seismicity in the media, here are some key facts:

- Southwestern Ontario and, in particular, the Bruce region are located within an area characterized by low levels of seismicity;
- Historic seismicity records show that in over 180 years of observation there have been no recorded earthquakes in the Bruce region with a magnitude greater than five;
- The network of three seismographs established in 2007 within a 50-kilometre radius of the Bruce nuclear site to monitor low-level seismicity continues to confirm the site is located in a seismically quiet region;
- A Seismic Hazard Assessment of the Bruce nuclear site, as part of the site characterisation for the DGR, considered the influence of earthquakes on the site ranging from 5.25 – 7.5 Magnitude. The assessment concluded that earthquakes will not impact the safe operation or long-term ability of the DGR to safely isolate and contain the L&ILW.

nwmo NUCLEAR WASTE MANAGEMENT ORGANIZATION / SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

ONTARIO POWER GENERATION

www.nwmo.ca/dgr

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Western Waste Management Facility

Our commitment to safe, responsible management

The electricity generated by nuclear power emits virtually no greenhouse-gas causing emissions. The by-product of electricity generated from nuclear power is nuclear waste, which is managed in a contained and controlled manner.

Every employee of OPG's Nuclear Waste Management Division recognizes and accepts the responsibility for the management of our waste in an environmentally, socially and financially-responsible manner. We are dedicated, uncompromising and absolute in our commitment to the safety of fellow employees, the public, the communities where we operate, and the environment.

Our commitment to safety and the environment

OPG has been safely storing nuclear waste from the Bruce, Pickering and Darlington generating stations for more than 40 years and we are proud of our operating record and the progress we have made towards long-term solutions for the future.

Western Waste Management Facility (WWMF) employees are well trained and regard safety for employees, the public and the environment as their top priority. They have accomplished significant milestones in these areas, such as achieving long-standing records of no "Lost Time Accidents" and excellent environmental performance. Safe work planning, safe work practices and attention to detail, along with a safety-conscious work attitude, has led to this excellent safety performance.

The WWMF has an Environmental Management System (EMS) that establishes strategies, objectives and targets for the facility to improve environmental performance. The EMS is based on the International ISO 14001 Standard, which provides a tool for ensuring and demonstrating a high standard of environmental responsibility. The WWMF was initially certified to the ISO environmental standard in 1999 and has successfully re-certified every year since.

- **OPG has been safely managing radioactive waste for more than 40 years**
- **The WWMF manages and provides interim storage of low and intermediate level waste from OPG's Pickering and Darlington nuclear stations and the Bruce Power stations**
- **The WWMF's Used Fuel Dry Storage Facility stores used fuel from the Bruce site only.**

Through employing highly qualified employees, careful planning, development of technology and equipment and the use of sound operating procedures, OPG has ensured that radioactive waste is managed safely and poses no significant risk to employees, the public or the environment.

ONTARIO POWER GENERATION

Regulatory authority

The nuclear industry is one of the most strictly regulated in Canada. The overall regulation of nuclear reactor operation and nuclear waste management in Canada is the responsibility of the Canadian Nuclear Safety Commission (CNSC). Every aspect of the management of low and intermediate level waste and used nuclear fuel is regulated by the CNSC.

What is nuclear waste?

During the operation of nuclear generating stations, waste is produced much like any other industry. Some of this waste becomes radioactive and must be handled using special procedures. OPG categorizes the radioactive waste into low, intermediate and used fuel.

Low level waste

Low level waste consists of minimally radioactive materials that have become contaminated during routine cleanup and maintenance such as mop heads, cloths, paper towels, floor sweepings and protective clothing. These items make up about 95 percent of the total non-fuel waste volume.

Low level waste at the WWMF is handled by trained personnel to process for volume reduction or to store as is.

Low level waste from the Bruce, Pickering and Darlington nuclear generating stations is received at the Waste Volume Reduction Building at the WWMF where it may be processed through either incineration or compaction to reduce its volume or to be stored as is. Following processing, the low level waste is placed into above-ground concrete warehouse-like structures called Low Level Storage Buildings. About 3000 m^3 of low level waste is stored annually (just over the volume of an Olympic swimming pool). Storage for refurbishment waste (fuel channel waste and steam generators) from the Bruce reactors is also provided at the WWMF. The WWMF has about 70,000 m^3 (25 Olympic swimming pools) of low level waste in storage as of 2010.

Intermediate level waste

Intermediate level waste consists primarily of used reactor core components and resins and filters used to keep reactor water systems clean. Intermediate level waste is more radioactive than low level waste and requires shielding to protect workers during handling.

Intermediate level waste, because of its radiological and physical properties, is not processed for volume reduction. It is stored mainly in steel lined concrete containers that have been set into the ground. About 290 m^3 of intermediate level waste is stored annually and in total about 9000 m^3 (three and a half Olympic swimming pools) is in storage as of 2010. Intermediate level waste makes up about five percent of the total volume of non-fuel waste produced from the nuclear generating stations.

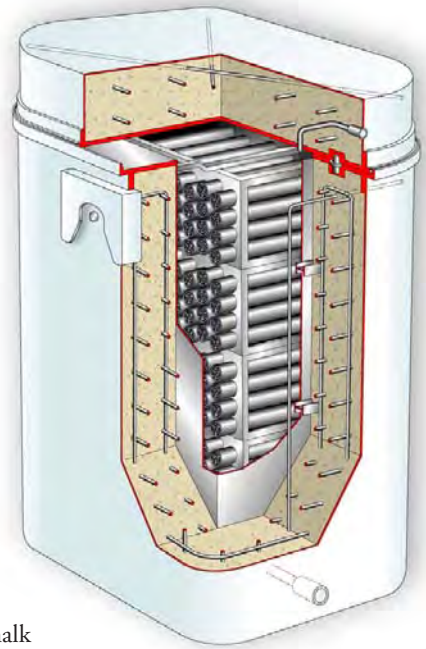
Low and intermediate level waste stored at the WWMF is continually monitored to ensure the integrity of the storage containers and can be retrieved at some future date for transfer to a long-term storage facility. The WWMF will continue to add storage structures as required (subject to applicable regulatory approvals). OPG is currently in the planning stages of a Deep Geologic Repository for the long-term storage of low and intermediate level waste at the Bruce site.

Ontario Power Generation employees carefully lower intermediate level waste into an in-ground storage container.

Used nuclear fuel

Used nuclear fuel, sometimes called high level waste because it is much more radioactive, is stored at the nuclear station site where it was generated. It is stored in the station's spent fuel bay, within the station, for at least 10 years. After that time it can be transferred to above-ground storage containers.

At the Western Waste Management Facility location, only used fuel from the Bruce Power stations is stored at the interim used fuel dry storage facility. The facility consists of a processing building and storage buildings. This facility went into operation in 2002 and is designed to provide storage space for about 2000 Dry Storage Containers (DSC). The overall Western Used Fuel Dry Storage Facility (WUFDSF) design includes four DSC storage buildings, each having the capacity to store about 500 containers. Two buildings have been commissioned (2002 & 2007) and construction of future storage buildings will be staged as additional space is required, with a new storage building built about every four to seven years.



Each dry storage container (DSC) is made of reinforced high-density concrete approximately 510 mm (20 inches) thick and is lined inside and outside with 12.7 mm (half inch) thick steel plate. This thickness of concrete provides an effective barrier against radiation.

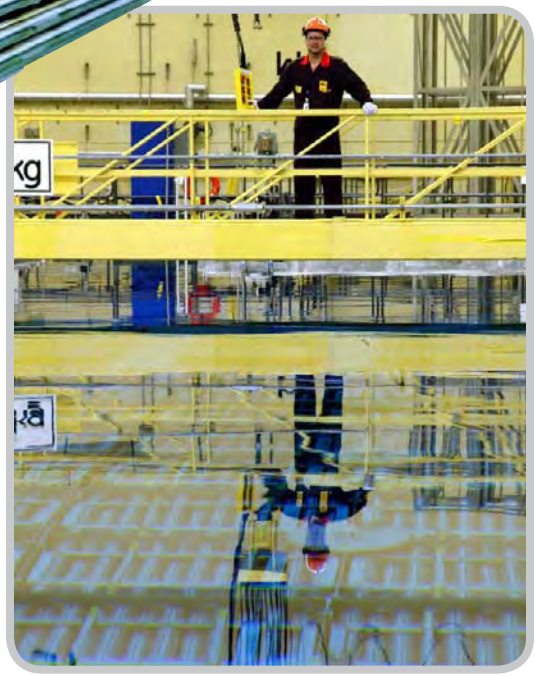
Dry storage is a proven technology in use around the world. In Canada, dry storage is used by Hydro Quebec at Gentilly, New Brunswick Power at Point Lepreau and Atomic Energy of Canada at Chalk River and Douglas Point (located at the Bruce site). In addition to the facility at WWMF, OPG also operates dry storage facilities at the Pickering and Darlington nuclear sites.

Dry storage process

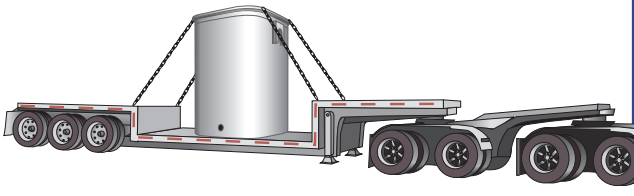
The process of loading a dry storage container with used nuclear fuel begins first by submerging a 63-tonne container into one of Bruce Power's water-filled used fuel storage bays. Once in the storage bay, four modules each containing 96 used fuel bundles are loaded into the container under water. The used fuel bundles have been stored in the water-filled bay for at least 10 years, during which time they have cooled and become less radioactive.

Used nuclear fuel bundles are cooled in the station's spent fuel bay for a period of at least 10 years before being transferred to dry storage.

The container, now holding 384 used fuel bundles, is removed from the bay and drained, decontaminated and vacuum dried. A transfer clamp secures the lid to the container which is moved to the dry storage facility with a large transport vehicle. Once received, the lid is welded to the container's base. After the inside of the container has been vacuum dried, it is filled with helium gas. The drain port is then seal-welded. The helium gas provides a means of leak detection for the sealed container and creates an inert atmosphere for the storage of used fuel. Before being placed into storage, the container undergoes rigorous testing to ensure that it is absolutely leak tight, and lastly, safeguard seals are applied by an inspector from the International Atomic Energy Agency (IAEA).

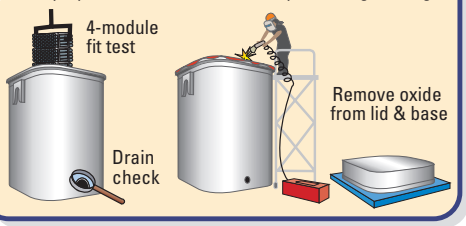


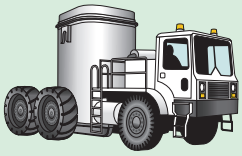
The used fuel dry storage process



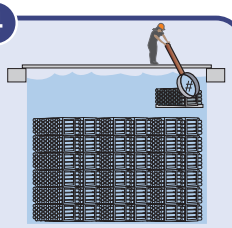
1 Dry Storage Container (DSC) delivered from manufacturer to an OPG Waste Management Facility

2 DSC preparation and checks at DSC processing building





3 Transfer of empty DSC to the station

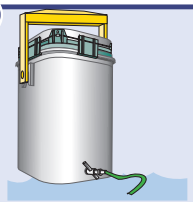


4 Verification of used fuel

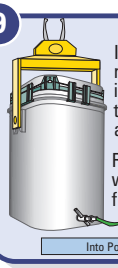
5 Remote loading

6 Lid placement with in-bay clamp

7 Water spray decontamination



8 Water drained from inside DSC back into bay



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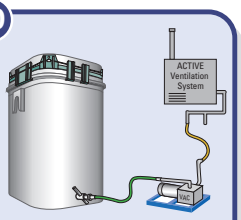
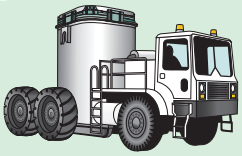
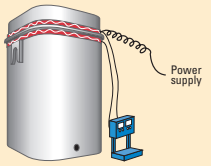


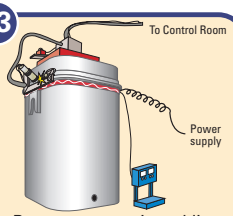
10 Initial vacuum drying



11 DSC transferred to processing building

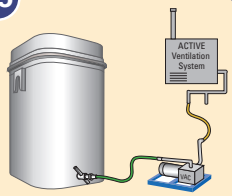


12 Transfer clamp removed; Weld pre-heater applied

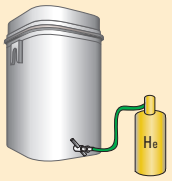


13 Remote automatic welding of DSC flange (lid to base)

14 Inspection of flange weld

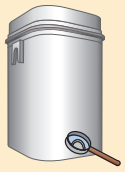


15 Final vacuum drying

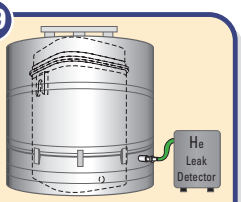


16 Helium backfill of DSC

17 Manual weld of DSC Drain Plug

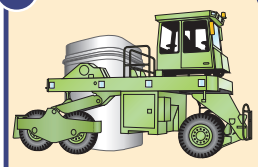


18 Inspection of drain plug welds



19 Helium leak test of DSC

20 Paint repair, safeguards seals applied by IAEA inspectors, DSC identification label attached



21 DSC transferred to storage building

22 Indoor secure storage

Operations at the Waste Management Facility (WMF)

Operations at the Nuclear Generating Station (NGS) used fuel storage bay area

Transfer operations between NGS and WMF

100%

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Radioactive material transportation

A record of safety

OPG has an exceptional safety record in the transportation of radioactive materials by road. In almost 40 years, there has never been a release of radioactive materials during transportation. Our drivers are some of the best trained in their field. OPG ensures that they have high-level defensive driving training.

In a typical year OPG makes about 750 radioactive material shipments, covering about 500,000 kilometres. Shipments (roughly 23 percent) involve the transportation of low and intermediate level waste to the WWMF. A smaller number (roughly 13 percent) involve transporting tritiated heavy water from Bruce and Pickering to the Darlington Tritium Removal Facility for processing and remaining shipments involve the transportation of empty packages to and from different nuclear stations.

All of these shipments are logged into an OPG computerized database. This program logs information about the type of material being transported, point of origin, destination, etc.

Built for safety

Many different types of packaging are used to transport radioactive materials. All of the transport packages are built to requirements specified by the Canadian Nuclear Safety Commission. For example, the intermediate level waste transportation packages used for shipping spent resins and tritiated heavy water are built to Type B standards. According to federal regulations all Type B packages must be able to withstand a nine-metre drop onto an unyielding surface; a one-metre drop onto a steel pin; 30 minutes in an 800 degree celsius fire; and eight hours immersed in 15 metres of water. Only after field testing and/or computer analysis has demonstrated the packages can survive these tests will a licence to use the packaging be issued by the Canadian Nuclear Safety Commission.

Radioactive materials transportation is also regulated by Transport Canada's Transportation of Dangerous Goods Regulation. These regulations specify the documentation and administrative requirements in order to transport radioactive material on public roadways. The documentation must include specification of the contents on the shipping document, the labeling and placarding requirements, driver training requirements and an approved transportation emergency response plan.

OPG's radioactive material transportation program is further supported by:

- **Regular audits and safety assessments of transportation practices**
- **An ongoing training program**
- **Routine package inspection and maintenance, and**
- **A transportation emergency response plan that is audited both internally and externally by authorities like Transport Canada.**

Commitment to the future

OPG has an obligation to plan for the eventual decommissioning of our nuclear facilities including the Bruce Power leased reactors, and the long-term management of our nuclear wastes. OPG makes annual contributions to special funds dedicated solely for this purpose.

Our partnership with the Municipality of Kincardine to develop a Deep Geologic Repository for low and intermediate level waste on the Bruce site was endorsed by the community in 2005 and is now entering the rigorous environmental assessment stage, led by the Nuclear Waste Management Organization.

OPG has made a significant contribution to the Nuclear Waste Management Organization, which has recommended Adaptive Phased Management to the Federal government for the long-term management of used nuclear fuel in Canada, and endorsed in 2007.

Communicating our program

Although we are proud of our contributions to these initiatives, there is nothing we value more than our relationship with the people of Ontario. The safe storage of nuclear waste is done in a very transparent manner and OPG provides information in a variety of methods on nuclear waste management to the public.

For more information on our activities visit www.opg.com or call 519-361-6414 ext. 2764.

OPG's Deep Geologic Repository Project

for low and intermediate level waste

A long-term storage solution

Ontario Power Generation (OPG) has contracted the Nuclear Waste Management Organization (NWMO) to seek regulatory approval for construction of a proposed Deep Geologic Repository (DGR). This DGR, for the long-term management of low and intermediate level radioactive waste will be constructed on lands adjacent to OPG's Western Waste Management Facility (WWMF) on the Bruce nuclear site in the Municipality of Kincardine.

For over 40 years the WWMF has safely stored low and intermediate level waste from the Bruce, Pickering and Darlington nuclear sites on an interim basis. In 2002 the Municipality of Kincardine approached OPG to jointly review options for a long-term storage facility for low and intermediate level radioactive waste at the Bruce site.

An Independent Assessment Study identified three options deemed to be technically feasible and capable of safely storing the waste: the Deep Geologic Repository (DGR), Enhanced Processing, Treatment and Long-Term Storage and Covered Above-Ground Concrete Vault. In 2004 the Municipality of Kincardine by resolution endorsed moving forward with the DGR because of its higher safety margins.

The proposed DGR would manage about 160,000 cubic metres of low and intermediate level waste in underground emplacement rooms (200,000 cubic metres emplaced volume).

Only low and intermediate waste from OPG's Bruce, Pickering and Darlington generating stations will be accepted for storage in the DGR. Used fuel will not be stored in the DGR.

Committed to safety

The stability and predictability of the rock formations, along with their isolating capabilities, make an ideal setting where the waste can be safely stored while the radioactivity decays.

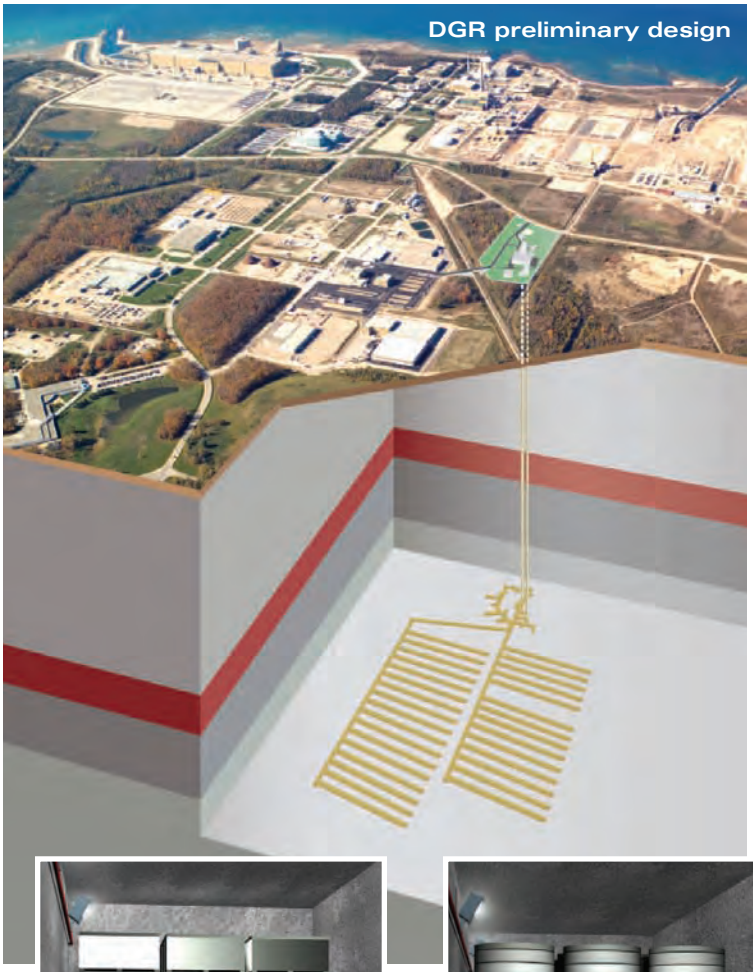
The proposed DGR location, 680 metres (2,230 feet) underneath the Bruce site, will be constructed in low permeability limestone capped by 200 metres of low permeability shale. These rock formations, thought to be in excess of 450 million years, have remained intact and without major faults or fractures through many geologic events.

In addition, the DGR is extremely isolated from all sources of groundwater, and the pore water at the level of the repository has a salt content more than eight times that of sea water indicating that it has been trapped at this level in excess of one million years. The salt content is also an indication that the pore water isn't mixing with the groundwater above.

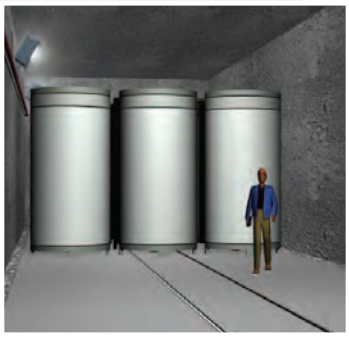
Verifying the site

A detailed four-year Geoscientific Site Characterization Program (GSCP) began in 2006 to verify the suitability of the DGR site. This scientific investigation, along with the information gained from environmental field studies, safety assessment and engineering/design, will assist in obtaining the necessary construction and operating licences from the Canadian Nuclear Safety Commission.

Formal environmental assessment and licensing processes began in 2005 and are expected to take six to eight years, with a public hearing to take place around 2012. Throughout this time period, there will be many opportunities for Kincardine and surrounding communities to learn more and to express their views on the proposed DGR.



Low level waste room



Intermediate level waste room

Appendix D

Open House Display Panels

OPG's DEEP GEOLOGIC REPOSITORY PROJECT

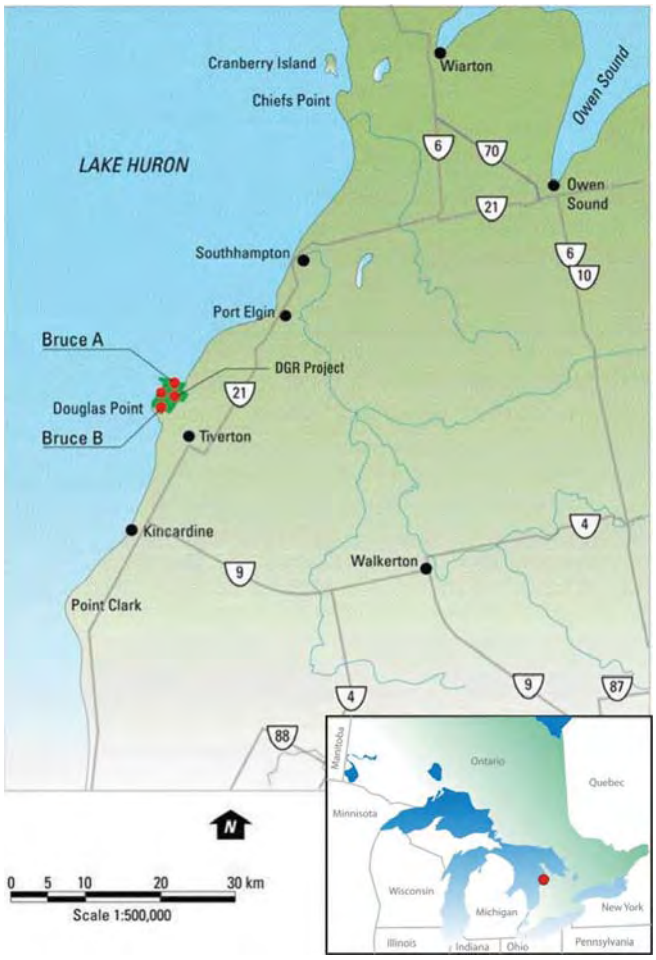
For Low & Intermediate Level Waste

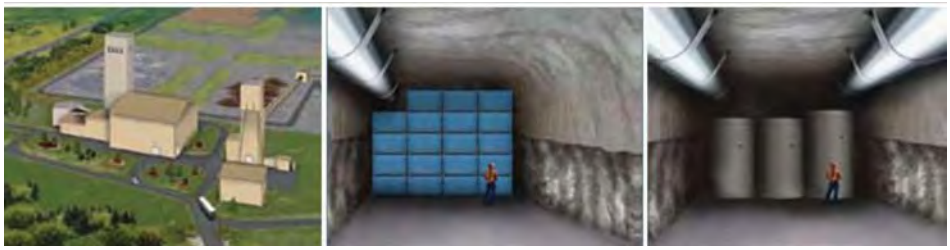
WELCOME

Welcome to an Open House for OPG's Deep Geologic Repository Project for Low and Intermediate Level Waste (L&ILW)

Purpose:

- Share information about the DGR Project
- Provide a status update on the Regulatory Approvals Process
- Obtain your feedback on the preliminary results of the environmental assessment
- Answer your questions about the Project





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For Low & Intermediate Level Waste

Chronology of the Project

2001	Kincardine proposes a joint study to assess the feasibility of long-term management of L&ILW at the Bruce nuclear site
2002	Kincardine and OPG sign Memorandum of Understanding
2003	Engagement with the Community and Aboriginal Peoples begins
2004	Independent Assessment Study concludes it is safe and technically feasible to develop long-term management of L&ILW at the Bruce nuclear site; Kincardine requests Deep Geologic Repository
	Kincardine and OPG sign Hosting Agreement
2005	Community Poll concludes majority of respondents support the Proposal for long-term management of L&ILW
	OPG submits a Project Description for the DGR Project; initiates the regulatory approvals process
2006	CNSC releases draft guidelines for the DGR Project and holds public hearing on the guidelines
	Geoscientific site characterization begins at the Bruce nuclear site
2007	Minister of Environment refers Project to a Joint Review Panel
2008	Draft guidelines for Environmental Impact Statement issued for public review
2009	Final guidelines issued
2010	Completion of the geoscientific site characterization and assessment of safety and environmental effects
2011	Planned submission of the Environmental Impact Statement and Preliminary Safety Report in support of the licensing process

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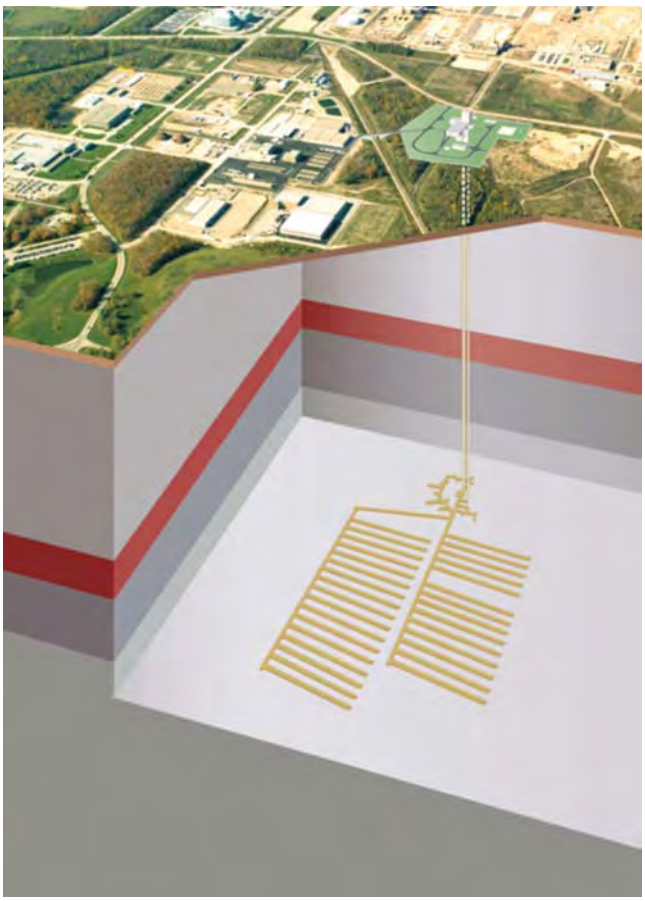
The Project

Current design philosophy includes:

- Approximate five-year construction period
- On-site storage of excavated rock
- On-site pond for stormwater runoff management
- Above-ground facilities for waste receipt and hoist headframes
- Access to the repository by shaft; one shaft for personnel and waste transfer, and another for exhaust ventilation and emergency escape
- Underground facilities for waste receipt, waste emplacement, equipment maintenance, and refuge stations in case of emergency
- Emplacement rooms constructed in rock with shotcrete walls and ceilings, and concrete floors
- Emplacement rooms dedicated to either low or intermediate level waste
- Closure walls to isolate waste-filled rooms
- Capacity to operate for a minimum of 35 to 40 years
- Sealing of shafts at end of DGR life, following regulatory approval



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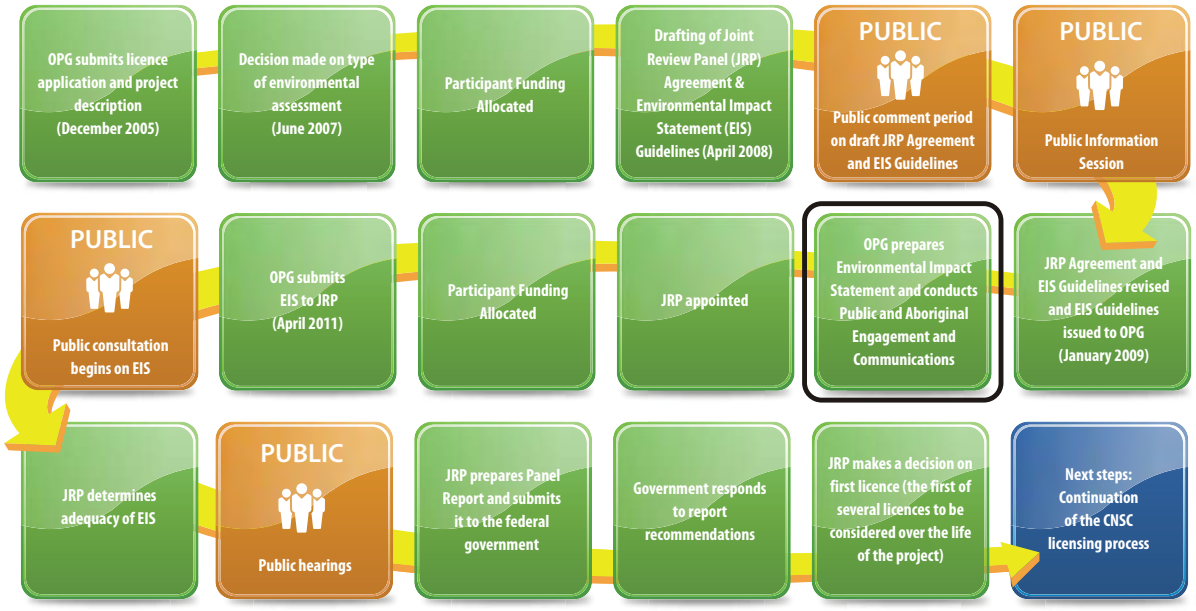
Regulatory Process for DGR

FEDERAL JOINT ENVIRONMENTAL ASSESSMENT PROCESS

OPG DEEP GEOLOGIC REPOSITORY



Adapted from Canadian Environmental Assessment Agency (CEAA) and Canadian Nuclear Safety Commission (CNSC).

☐ Current Status

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Project Works & Activities

Site Preparation

Activities include:

- removal of brush and trees
- grading of site including development of roads, laydown areas, stormwater retention pond, ditches
- set-up of construction trailers and temporary facilities
- installation of fuel depot for construction equipment

Duration: 6 months

Employment: 80 positions

Front End Loader

Typical shaft sinking equipment

Excavation by drill and blast

Construction

Activities include:

- construction of permanent buildings including two headframe buildings
- set-up of shaft sinking equipment and sinking of main and vent shafts
- development of access tunnels and emplacement rooms
- placement of excavated rock in waste rock management area
- commissioning of DGR facility

Duration: 5 years

Employment: Up to 200 positions each year

Operations

Activities include:

- receipt of disposal-ready waste packages
- movement of waste packages from surface to below ground
- placement of waste packages in emplacement rooms
- installation of room end walls on full emplacement rooms
- installation of closure walls in tunnels
- maintenance of various systems including hoists, ventilation, fire protection systems, waste handling equipment, and underground rock support
- monitoring to ensure the facility is performing as expected

Duration: 35 to 40 years

Employment: 30 positions each year

Waste Isolation Pilot Plant in New Mexico

Sweden's SFR

Decommissioning

Activities include:

- installation of concrete monolith at base of shafts
- sealing the shafts
- removal of surface buildings
- recycling of materials and disposal of waste

Duration: 5 years

Employment: 75 positions each year

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EA Process for the DGR Project

- PROJECT DESCRIPTION
- ENVIRONMENTAL IMPACT STATEMENT GUIDELINES
  - (Issued by CNSC and CEAA)
- CONCEPTUAL ENGINEERING DESIGN

- DEVELOPMENT OF PROJECT SCOPE
- STUDY AREA IDENTIFICATION
- BASELINE ENVIRONMENT CHARACTERISTICS
  - (Including geoscientific site characterization, environmental studies)
- VALUED ECOSYSTEM COMPONENTS
  - (Used to assess effects on the environment, may be species or valued environmental characteristics)
- IDENTIFY PROJECT-ENVIRONMENT INTERACTIONS
  - (How do the DGR and environment interact)
- ASSESS ENVIRONMENTAL EFFECTS
- IDENTIFY MITIGATION MEASURES
- DETERMINE RESIDUAL EFFECTS
  - Residual Adverse Effects are those non-trivial changes that occur after mitigation measures have been incorporated
- CUMULATIVE EFFECTS
- SIGNIFICANCE
  - The level of significance is assigned to all residual effects by using a decision tree model
    1. Magnitude, geographic extent, timing and duration, frequency, and degree of irreversibility are combined to identify an environmental consequence.
    2. Social and/or ecological importance of the VEC being affected is considered to determine significance.
- EFFECTS OF ENVIRONMENT ON THE PROJECT AFTER MITIGATION
- MALFUNCTIONS AND ACCIDENTS
- FOLLOW UP MONITORING PROGRAMS
- CONCLUSIONS

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Atmospheric Environment

Valued Ecosystem Components

- Air Quality
- Noise Levels

Environmental Effects Assessed

- Increase in air emissions at Bruce nuclear site fenceline during all phases of the DGR Project
- Increase in noise emissions

Mitigation Measures

- Maintain transportation and ventilation equipment in good condition
- Implement dust control such as watering, equipment washing
- Pave heavily travelled roads

Residual Effects

- Increase in some air quality indicators at Bruce nuclear site fenceline during all phases of the DGR Project
- Increase in noise levels during site preparation, construction and decommissioning

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Aquatic Environment

Valued Ecosystem Components

- Redbelly dace
- Creek chub
- Lake whitefish
- Smallmouth bass
- Brook trout
- benthic invertebrates
- Variable leaf pondweed
- Burrowing crayfish
- Spottail shiner

Environmental Effects Assessed

- Loss of habitat quantity and quality for Redbelly Dace, Creek Chub, Variable Leaf Pondweed, Burrowing Crayfish (VECs in the Railway Ditch)
- Loss of habitat for burrowing crayfish in the Project Area

Mitigation Measures

- Project set back from marsh areas
- Avoid discharge of runoff to the Railway Ditch and Stream C
- Discharges meet applicable regulatory criteria
- Measures to protect fish habitat in the South Railway Ditch during construction

Residual Effects

- Loss of habitat for VECs in the Railway Ditch

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Terrestrial Environment

Valued Ecosystem Components

- Eastern white cedar
- Heal all
- Common cattail
- Meadow vole
- Muskrat
- White-tailed deer
- Red-eyed vireo
- Yellow warbler
- Wild turkey
- Mallard
- Bald eagle
- Midland painted turtle
- Leopard frog

Environmental Effects Assessed

- Removal of vegetation from the Project Site
- Displacement or disruption of wildlife species using the area as habitat
- Mortality of wildlife due to vehicle strikes

Mitigation Measures

- Seek opportunities to retain trees
- Consider future opportunities for rehabilitation, perhaps following decommissioning

Residual Effects

- Removal of vegetation from the Project Site (eastern white cedar)

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Hydrology and Surface Water Quality

Valued Ecosystem Components

- Surface Water Quantity and Flow
- Surface Water Quality

Environmental Effects Assessed

- Changes in surface water quantity and flow in adjacent ditches and streams
- Changes in contaminant loading to surface water

Mitigation Measures

- Routing of all site drainage through stormwater management pond

Residual Effects

- Reduction in quantity of flow in North Railway Ditch
- Increase in quantity of flow in ditch at Interconnecting Road

Rail Ditch Adjacent to DGR Project

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Geology

Valued Ecosystem Components

- Soil Quality
- Overburden Groundwater Flow
- Overburden Groundwater Quality
- Shallow Bedrock Groundwater Flow
- Shallow Bedrock Groundwater Quality
- Intermediate Bedrock Groundwater Flow
- Intermediate Bedrock Groundwater Quality
- Deep Bedrock Groundwater Flow
- Deep Bedrock Groundwater Quality

Environmental Effects Assessed

- Changes in soil quality
- Dewatering during construction
- Long-term movement of groundwater

Mitigation Measures

- Repository constructed in competent sedimentary bedrock, isolated from surface
- Grouting during construction of shafts to reduce need for dewatering
- Shaft liners
- Seals

Residual Effects

- No residual adverse effects

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Radiation and Radioactivity

Valued Ecosystem Components

- Human
- Benthic Invertebrates
- Aquatic Vegetation
- Aquatic Birds
- Aquatic Mammals
- Terrestrial Birds
- Terrestrial Vegetation
- Terrestrial Mammals
- Pelagic Fish
- Benthic Fish
- Amphibians and Reptiles

Environmental Effects Assessed

- Releases of radiation to air and water

Mitigation Measures

- Shielding
- Ventilation
- Remote operation of equipment
- Sump and stormwater collection and management
- Emission control
- Zoning to prevent spread of contamination in the DGR
- Fencing and security
- Operating procedures and training to ensure that doses to workers and public are ALARA
- Closure walls

Residual Effects

- No residual adverse effects

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Malfunctions and Accidents

Considers Consequences of Potential Accidents during site preparation, construction and operation of the DGR; both above and below ground.

Radiological Accidents

- Inadvertent event that could release radioactive materials, i.e., fire in the waste package receiving building or underground, drop of a package

Conventional (non-radiological) Accidents

- Inadvertent release of hazardous material to the natural environment, i.e., spill of fuel, or event that may cause harm to a worker, i.e., vehicle accident

Malevolent Acts

- Intentional attempts to cause damage

Results:

- Radiological doses do not exceed established dose limits

Malfunctions and Accidents were also postulated for the Post-decommissioning period, including

- Inadvertant drilling into the site
- Failure of the shaft seal
- Open borehole
- Extreme earthquake

Results:

- Radiological doses to humans do not exceed established dose limits for accidents except for drilling into the repository, which has been modelled very conservatively and is very unlikely

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Social and Economic Effects

Valued Ecosystem Components

- Population and Demographics
- Employment
- Business Activities
- Tourism
- Residential Property Values
- Municipal Finance and Administration
- Housing
- Municipal Infrastructure and Services
- Inverhuron Park

Environmental Effects Assessed

- Changes in economic activity, including employment opportunities, housing, increased educational opportunities
- Changes in traffic on roads near site
- Changes in enjoyment of use of property during construction and decommissioning due to noise

Mitigation Measures

- Keep Municipal representatives informed of staffing levels at the site

Residual Effects

- Increased economic activity, including employment opportunities, housing
- Localized loss of enjoyment of use of property during construction and decommissioning due to noise

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Aboriginal Interests

Valued Ecosystem Components

- Aboriginal Communities
- Aboriginal Heritage Resources
- Traditional Use of Lands and Resources

Environmental Effects Assessed

- Potential benefit from worker, payroll and purchasing activity
- Potential disruption of archaeological sites or artifacts

Mitigation Measures

- Culturally sensitive areas are not located on the Project Site and development on culturally sensitive areas will be avoided for the DGR Project
- Continued dialogue with Aboriginal communities

Residual Effects

- Potential benefits from worker, payroll and purchasing for Aboriginal communities

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Human Health

Valued Ecosystem Components

- Physical Environment Determinants
- Socio-Economic Environment Determinants
- Cultural Determinants
- Emotional Determinants
- Overall Health for Local Residents
- Overall Health for Members of Aboriginal Community
- Overall Health for Seasonal Users

Environmental Effects Assessed

- Changes in air quality
- Changes in noise levels
- Changes in human exposure to radiation

Mitigation Measures

- Emission controls
- Maintain transportation and ventilation equipment in good condition
- Operating procedures and training to ensure doses to workers and public are As Low as Reasonably Achievable

Residual Effects

- Potential exposure to acrolein in air during site preparation and construction phase

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Effects of the Environment on the Project

The DGR Project, over its lifetime may be subject to natural environmental hazards. The potential effects of these natural hazards are assessed.

Hazards:

- Flooding: lake and surface
- Severe Weather: thunderstorms, lightning, tornadoes, ice storms
- Seismicity
- Climate Change

Mitigation:

- Top of shaft collar located above estimated Probable Maximum Flood levels
- Project location about 1 km from lake eliminates potential for wave runup
- Surface structures designed to meet requirements of latest National Building Code

Likely Residual Adverse Effects of the Natural Environment on the Project:

- None

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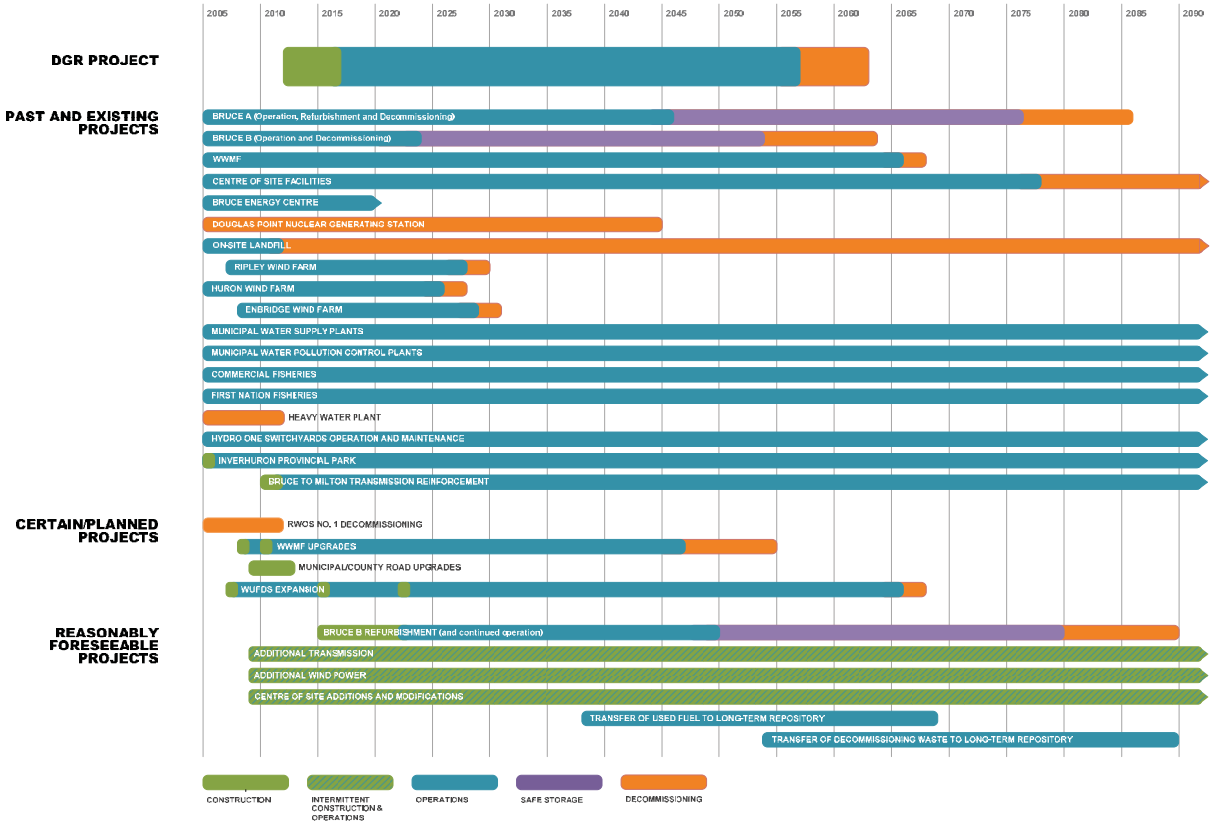
Cumulative Effects

The life of the DGR Project is more than 50 years. A number of existing projects and potential future projects and activities have the potential to overlap effects with the DGR Project. These projects and activities include:



The assessment of cumulative effects identified projects and activities likely to overlap with a residual adverse effect of the DGR Project. Further assessment of the effects of the DGR Project in combination with other projects did not identify adverse cumulative effects.

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Follow-up Monitoring

Follow-up monitoring is used during the construction and operation of the facility to:

- confirm assumptions made in the analyses of the EA studies
- verify predictions made about environmental effects of the project are accurate
- confirm the effectiveness of mitigation measures and whether new mitigation measures are needed

Monitoring at decommissioning ensures that contaminant levels on site are within acceptable levels.

Preliminary proposal for follow-up monitoring includes:

Site Preparation and Construction	Conventional Air Quality Surface Water Quality Aquatic Habitat Public Attitude
Operations	Conventional Air Quality Radionuclides in Air and Water Surface Water Quality Groundwater Quality Public Attitude
Decommissioning	Conventional Air Quality Radionuclides in Air and Water Contaminants in Soil Surface Water Quality Groundwater Quality

The Canadian Nuclear Safety Commission regulates the nuclear industry and will ensure the follow-up monitoring is implemented.

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Keeping the Public Informed

Objectives

NWMO, on behalf of OPG, committed to providing:

- a wide range of engagement opportunities to the general public, key stakeholders and Aboriginal Peoples throughout Bruce County
- engagement opportunities to interested parties outside of Bruce County including Michigan
- a timely response to all enquires, comments and questions where appropriate
- clear, concise and accurate information
- a process to document, monitor and evaluate both the public involvement program and community support for the DGR

Results

- provided numerous opportunities over the last eight years –before and during the EA process – for the public to become informed and updated, ask questions, provide comment and discuss areas of interest about the DGR Project
- Information available through a variety of means: website, newsletters and publications, advertorials, media days, briefings, public speaking engagements, DGR mobile exhibit and a public enquiry and response program
- Committed to continue communications throughout the regulatory approval process and beyond, pending regulatory approval, to the site preparation and construction phases

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Keeping the Public Informed

2009 Evaluation of Public Involvement Program

2009 Public Attitude Research:

- 800 residents polled by telephone
- DGR isn't listed as a top-of-mind issue by respondents – health care and economic issues dominate the Bruce agenda
- Majority of respondents have a high confidence level in the safety of the DGR
- Majority of respondents don't anticipate any change in attitudes or behavior because of the presence of the DGR with respect to the following:

	% Respondent Anticipate No Change	
Level of Satisfaction	**Local Study Area**	**Regional Study Area**
Level of commitment to living in their community	92%	86%
Level of satisfaction with living in the community	82%	77%
Feelings of personal health or sense of safety	79%	75%
Use and enjoyment of private property	96%	91%
Nature activities along shoreline	87%	80%
Use of beaches or boating	85%	76%

Community Leaders' Survey Results:

- DGR isn't listed as a top-of-mind issue – economic diversification and health care head a list of the top 11 issues
- Leaders are very familiar or somewhat familiar with the DGR project (96 per cent)
- Leaders rate support for DGR Project at 9 out of 10 on average
- 95 per cent of leaders believe NWMO, on behalf of OPG, is doing either an excellent or good job of addressing DGR questions and comments

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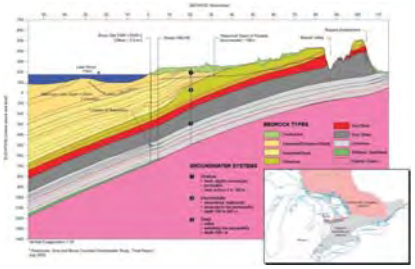
Safety Case for the Project

The DGR is isolated from surface and groundwater aquifers

- The repository is about 1 km from the lake and about 680 m below surface
- Lake Huron is separated from the DGR by more than 400 m of extremely low permeability rock units that are laterally continuous for 100s of kilometres
- Potable groundwater resources in the vicinity of the Bruce nuclear site are obtained from shallow wells extending to maximum depths of approximately 100 m. Potable groundwater resources do not exist at depths of 180 m below ground surface at the Bruce nuclear site
- There is no physical or geochemical evidence to demonstrate that fluids from the deep groundwater have mixed with the overlying shallow groundwater systems
- Full resaturation of the repository with groundwater will be very slow and is not expected to occur for more than 1 million years due to the low permeability of the host rock. Delay in resaturation limits the releases from the wastes to groundwater in the repository and allows time for radioactivity to decay

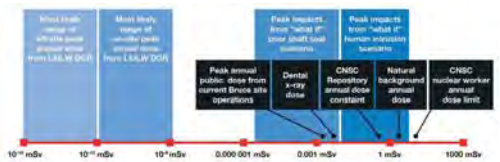


Multiple Natural and Engineered Barriers Provide Containment

- The DGR repository horizon is under- and overlain by multiple low permeability bedrock formations. There is over 200 m of low permeability shale directly overlying the host Cobourg Formation
- Observed vertical hydraulic head gradients strongly suggest that permeable transmissive vertical or subvertical faulting does not exist in the deep or intermediate groundwater regimes within or in proximity to the DGR footprint
- The waste packages for intermediate level waste (ILW) provide long-term engineered barriers. Most long-lived radioactivity is fixed in Zircaloy (pressure tubes). Zircaloy is corrosion resistant and will degrade very slowly over a million year timescale.
- Once the repository is filled, the shafts will be sealed with engineered low-permeability materials

No effect on people under normal evolution scenario

- The future potential impacts of the repository were assessed using a range of scenarios including a (likely) normal evolution scenario and various (unlikely) disruptive scenarios
- The calculated peak annual doses for the normal evolution scenario are much smaller than the 0.3 mSv criterion and the natural background radiation dose (2 mSv). The normal evolution base case is nine orders of magnitude (10^9) below the 0.3 mSv/year criterion.



Interim Safety Assessement calculated impacts where mSv = milliSievert, one thousandth of a Sievert

- For most of the disruptive scenarios, the peak dose impact of the repository is much less than natural background dose levels. In the case of inadvertent human intrusion into the repository, bringing waste to the surface and not handling it appropriately, the dose impacts could locally be comparable to natural background dose levels

Radioactivity will decline over time

- Wastes are dominated by relatively short-lived radionuclides. Approximately 80 per cent of the waste emplaced in the DGR is low level waste, which has a half life shorter than 30 years
- The total amount of radioactivity remaining in the repository after about 10,000 years is less than that of the naturally occurring radioactivity in the shale rock layer above the repository at the Bruce nuclear site

Host Rock is structurally sound

- The geomechanical properties of the rock, coupled with the engineering design and layout, will ensure that the excavated openings and operating environment remain safe during construction and operation.
- Analyses of long-term geomechanical stability with respect to perturbations by glacial loading/unloading, seismicity, and rock strength degradation indicate that long-term DGR containment and isolation will not be affected.

Seismically Quiet

- Southwestern Ontario and the Bruce region lie within the tectonically stable interior of the North American continent, a region characterized by low rates of seismicity. The historic seismicity record shows that there have been no seismic events exceeding magnitude 5 in the Bruce region in180 years.

Future inadvertent human intrusion into the DGR is unlikely

- Water at the depth of the repository is not potable and the bedrock formation cannot yield groundwater.
- Historical and site-specific evidence suggests that natural resource potential with respect to the occurrence of oil and gas, shale gas, salt and base metals is very low.

Operational safety features of the facility

- Waste packages delivered to the DGR must meet acceptance criteria, for example, packages must be in good condition, meet mass and dimensional limits and have no surface contamination on the outside of the packages
- Use of robust, concrete-and-steel packages for intermediate level waste
- Location of the DGR close to the WWMF so waste packages are not moved off the Bruce nuclear site

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OPG's DEEP GEOLOGIC REPOSITORY PROJECT

For Low & Intermediate Level Waste

FAQs and NWMO Responses

Q: What assurance is there that "the door isn't open" for high level waste disposal, or that waste will not be imported from other nuclear companies in Canada or other countries?

A: The Hosting Agreement between the Municipality of Kincardine and OPG is for the management of waste from OPG-owned or operated reactors. OPG's Environmental Impact Statement and application for licence are for low and intermediate level waste only from OPG-owned or operated reactors.

Q: What happens to the high level waste?

A: High level waste in Canada is currently managed at the site where it is produced. In the longer term, the NWMO has initiated a siting process which over the next two years invites communities who are interested in hosting a repository for used fuel to participate in the process.

Q: What is the risk of an earthquake and what impact would there be on the DGR?

A: The Bruce nuclear site is located in an area of Canada associated with low seismic hazard. Analysis has shown that earthquakes and glaciers over the last million years have not disturbed the host rock at repository depth, and should not do so in future.

Q: Will the waste be retrievable?

A: The DGR wastes have no value and there is no intent to retrieve them however, the wastes will be retrievable.

Q: How can it be assured that no contaminants will escape to surface waters?

A: The proposed DGR is about 1 km from the lake and more than 400 m below the depth of the lowest point of Lake Huron near the site. The DGR facility will take waste currently managed safely at surface and place it underground at a depth of 680 m. The DGR would be constructed in a layer of very low permeability limestone. The host limestone formation is overlain by a 200-m thick layer of low permeability shale which isolates the repository from surface water resources.

Q: Is there a potential to contaminate drinking water?

A: Drinking water quality will not be adversely affected by the DGR. The waste will be placed in very low permeability limestone, overlain by about 200 m of very low permeability shale. The characteristics of these rocks, including their age, stability and their position well below potable water found near the surface and well below the level of the bottom of Lake Huron will virtually eliminate the potential migration of radionuclides to drinking water. Any migration that does take place will be over a period of hundreds of thousands of years and the radionuclide concentrations will be orders of magnitude below regulatory limits.

Q: What is the cost of the project and where will the money come from?

A: The cost of the DGR is currently estimated to be about $1 billion. An existing segregated fund has been accumulating funds as part of electricity rates and will be used to pay the cost of the DGR Project.

Q: Are there potential health risks associated with nuclear sites in general, including possible links to increased levels of leukemia?

A: OPG is not aware of any increased incidence of cancers in the proximity of its nuclear sites. Most recently Durham Region, as reported in Radiation and Health in Durham Region 2007, assessed possible health effects from the Pickering and Darlington NGSs. It concluded that disease rates in Ajax-Pickering and Clarington did not indicate a pattern to suggest that the Pickering NGSs and Darlington NGS were causing health effects in the population.

Headframe at Waste Isolation Plant, New Mexico

The SFR in Sweden manages L & ILW in bedrock caverns 60 metres below the Baltic Sea.

Q: Have the potential effects of terrorist activities been evaluated?

A: Yes. The documentation provided for the regulatory approvals process will include an assessment of potential malfunctions and accident scenarios, as a result of unintentional and intentional acts and accidental or abnormal events that could impact the public and the environment throughout the DGR's lifetime and after its closure. A few examples of abnormal events being evaluated include fire or container breach, unintentional intrusion into the repository, and failure of the shaft seal.

Q: Why is the DGR located in proximity to Lake Huron?

A: The low and intermediate level waste has been safely managed at surface in a facility located immediately adjacent to the DGR site for more than 40 years. The DGR is located approximately 1 km from the shore of Lake Huron and more than 400 metres below the deepest near-site point of Lake Huron. The DGR is separated from Lake Huron by a low permeability layer of shale, which isolates the waste.

Q: How will Great Lakes water quality be protected?

A: Great Lakes water quality will not be adversely affected by the DGR. The low and intermediate level waste is being placed in low permeability limestone, overlain by about 200 metres of low permeability shale. Contaminants would have to travel 100s of metres through extremely low permeability rock, movement which is controlled by diffusion, or move up the sealed shaft through a series of concrete, clay and asphalt barriers.

Any migration that does take place would be over a period of hundreds of thousands of years and the radionuclide concentrations will be orders of magnitude below the current regulatory limits.

Q: Did OPG consider other sites for the DGR?

A: Experience in other countries has shown that success in siting a waste disposal facility is greatly improved in situations where the host community supports the proposal. The Municipality of Kincardine approached OPG asking to jointly assess the feasibility of hosting a long-term low and intermediate level waste management facility. Once the results of these feasibility studies indicated that the Bruce nuclear site could be a safe and technically feasible site, the Kincardine Municipal Council volunteered to host a DGR for low and intermediate level waste. Results of a telephone poll concluded that a majority of residents support the DGR. No other sites volunteered to participate in the feasibility studies or to host the DGR.

Q: How do other countries manage their low and intermediate level nuclear waste?

A: All countries with firm plans use a combination of surface, shallow or deep burial for managing low and intermediate level waste.

United States stores transuranic waste in a deep repository in New Mexico at a depth of 655 m in a bedded salt formation.

Sweden manages its low and intermediate level waste in an underground repository approximately 60 metres under the Baltic Sea, in crystalline rock near a nuclear power station.

Finland manages low and intermediate level waste in underground repositories located near their nuclear generating station and excavated in crystalline rock 110 metres below ground surface .

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Appendix E

Sign-in Sheets and Comment Cards

Sign in Sheets Not Provided

PORT ELGIN 2010

Please leave this card with our open house staff, or mail it back to us at your convenience. You can also email us with your comments at dgrinfo@nwmo.ca or visit our website for more information at www.opg.com/dgr.

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1 2 (3) 4 5

b. The open house location and hours were convenient for me.

~~1~~ 2 3 4 5 yes

c. The open house staff were helpful.

~~1~~ 2 3 4 5 yes

d. Overall, the open house helped me to satisfy the information needs I had.

1 2 3 4 5 quite

e. I will recommend to my friends and family members that they should come to a future DGR open house.

1 2 3 4 5 yes

email: dgrinfo@nwmo.ca mwilson@nwmo.ca
Phone: 519-368-1639

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Comments/Questions?
Let us know.

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Name: _____

Address: _____

_____

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Email: _____

Nuclear Waste Management Organization

Media Relations Manager

P.O. Box 7000, B21

Tiverton, Ontario

N0G 2T0

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Comments/Questions?
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IN FAVOUR OF THE DGR PROJECT.
NO QUESTION THAT IT IS NEEDED
TO MEET THE NEEDS OF THE
NUCLEAR UTILITIES IN ONTARIO

Name:

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Comments/Questions?
Let us know.

I WOULD LOVE TO WORK WITH PROJECT I HAVE 40 YEARS WORKING IN THE GENERATION THERMAL AND NUCLEAR I AM PRESENTLY TRAINING WORKER ON THE RESTART

Name:

Addres

Phone:

Email:

PLACE STAMP HERE

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Comments/Questions?
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BRUCE COUNTY

MUSEUM

AUG 23, 2010

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WIARTON

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Comments/Questions?
Let us know.

Recorded by Kevin Orr

MR GRUNDER'S QUESTIONS/COMMENTS INCLUDE:

- WHY IS THE DGR LOCATED CLOSE TO THE LAKE?
- CONCERNED THAT THE DGR WILL STORE USED FUEL
- WHY LOCATE THE DGR IN SOUTHERN ONTARIO? WOULDN'T IT BE BETTER TO LOCATE IT IN SPARSELY POPULATED NORTHERN ONTARIO.

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