July 23, 2012

Mr. Albert Sweetnam
Executive Vice President
Deep Geologic Repository Project
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Subject: Information Request Package #4 from the Deep Geologic Repository Joint Review Panel

Dear Mr. Sweetnam,

In the attached document, please find information requests from the Deep Geologic Repository Joint Review Panel (the Panel). The Panel has determined that responses to these information requests are required to ensure that the available information adequately responds to the Environmental Impact Statement Guidelines issued for the project.

The Panel requests that Ontario Power Generation address the information requests and provide the responses to the Panel in a complete and timely manner. To ensure a consistent approach, the responses should follow the Panel's numbering system and framework as set out in the attached document. The evaluation of information received will include, but not be limited to, a determination of compliance with the Environmental Impact Statement Guidelines and applicable legislation, an assessment of the supporting data and analysis submitted, the clarity and completeness of the information and, where applicable, the credibility of the scientific and engineering principles applied.

If you require clarification with regard to these requests, do not hesitate to contact either of the Panel's Co-Managers. The Panel would appreciate receiving confirmation with respect to the anticipated date of your responses as soon as possible.

Yours truly,

<original signed by>

Dr. Stella Swanson
Chair, Joint Review Panel

cc. Dr. James F. Archibald, Joint Review Panel Member
Dr. Gunter Muecke, Joint Review Panel Member
Frank King, Nuclear Waste Management Organization
Allan Webster, Ontario Power Generation

/Attachment

Attachment 1
Deep Geological Repository Project
Joint Review Panel EIS Information Requests
Package 4 – July 23, 2012

IR #	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
EIS 04-99	▪ Section 8.1, General Information and Design Description	▪ *EIS:* Section 4.5, Waste to Be Placed in the DGR	Discuss the technical and regulatory factors that would prevent the transformation and use of the DGR for high-level waste disposal.	No context required.
EIS 04-100	▪ Section 8, Description of the Project ▪ Section 10.1.1, Geology and Geomorphology ▪ Section 10.1.3, Groundwater ▪ Section11.4.1, Geology and Geomorphology ▪ Section 11.4.2, Surface Water ▪ Section 11.4.3, Groundwater	▪ *EIS:* Section 6.2.7.4, Environmental Heads and Hydrologic Conductivity	Explain why the hydraulic head in the Precambrian bedrock was not measured and therefore could not be included in groundwater models.	The hydraulic head is measured for other stratigraphic horizons but not the Precambrian bedrock.
EIS 04-101	▪ Section 8.1, General Information and	▪ *EIS*: Section 4.7, Construction Waste	Provide the calculations, assumptions and confidence limits behind the estimates of maximum excavation water discharge	No context required

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	Design Description ▪ Section 8.2, Site Preparation and Construction ▪ Section 8.3, Operation ▪ Section 10.1.1, Geology and Geomorphology ▪ Section 10.1.2, Surface Water ▪ Section 10.1.3, Groundwater	Management ▪ Section 7.2, Geology ▪ Section 7.3, Hydrology and Surface Water Quality	and sump water pumping.	
EIS 04-102	▪ Section 1.2.1.4, Scope of Project	▪ *Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository Report:* Executive Summary	Clarify whether Low and Intermediate Level Waste from pending or approved OPG new build, refurbishment or closure operations will be placed in the DGR.	Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository Report specifically notes in Section 1.3 page 9 that "waste projections from any proposed new-build reactors in Ontario are not included in this report". The Executive Summary states on page 7, that: "future operational L&ILW will be shipped" (to WWMF for processing). This statement could be interpreted as including waste from any new build
EIS 04-103	▪ Section 1.2.4.1, Scope of the Project	▪ *EIS Summary*: Cumulative Environmental Effects page 40	What will the status of the WWMF be during the various phases of the proposed Project? Explicitly describe plans for WWMF over all phases of the proposed Project, including what "upgrading" the facility involves, and how this activity will be done while waste is also being removed from the facility to be placed in the proposed	The EIS Summary, page 40, indicates that the facility is to be "upgraded", and then decommissioning is to begin around 2045.

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			DGR.	
EIS 04-104	▪ Section 8.1, General Information and Design Description	▪ *EIS Summary:* Waste Volumes, page 10-11	Clarify whether incineration is currently used for reduction of waste volume, and if so, whether this is taking place on-site at the WWMF. If incineration is currently taking place on-site, or is planned for future DGR site operations, provide an assessment of the potential environmental effects.	The EIS Summary, page 10, states that "the majority of these wastes are processed through incineration or compaction for volume reduction". The statement in the EIS, page 3-2 states: "The waste is transported to the WWMF (see fig . 3.1-1) for processing, which may include compaction or incineration".
EIS 04-105	▪ Section 8.1, General Information and Design Description	▪ *Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository Report*: Section 2.0 Projected Operational Low and Intermediate Level Waste Inventory and Characteristics	Provide an analysis of how radiological hazards (not simply activity) from the DGR Project will change over time.	According to the EIS Guidelines, information in the EIS must include (among other items) "a 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".
EIS 04-106	▪ Section 8.1, General Information and Design Description	▪ *Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository Report*: Appendix E, pages 76 and 78	Are all "potential hazardous constituents" of bottom ash included in the description on pages 76 and 78 of Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository Report?	In the Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository Report, there is an inconsistency in the description of waste types in the volume of bottom ash in 2018. Tables 2.4 on page 15 and Table 2.5 on page 17 indicate 1352 m^3 while on pages 76 and 78 of Appendix E of the Report indicate a different volume of bottom ash for 2018.

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EIS 04-107	▪ Section 8.1, General Information and Design Description	▪ *Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository Report*: Section 2.0 Projected Operational Low and Intermediate Level Waste Inventory and Characteristics Report. Table 2.8 (page 23)	Clarify whether some of the substances listed in Table 2.8, page 23, are stable end products of the decay of the radionuclides in the wastes?	In the Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository Report on page 23, Table 2.8 shows the inventory of non-radioactive components in the waste (in kg at the year 2052).
EIS 04-108	▪ Section 8.1, General Information and Design Description	▪ *Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository Report*: Section 3.1, Waste Volumes and Package Inventory ▪ Section 3.2, Radionuclide Inventory	a) Clarify what is meant by “hotter” in reference to newer pressure tube wastes arising from future refurbishment. b) What is meant by "hot" in reference to the “hot” ends of end fittings?	In the Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository Report on page 28, reference is made to uncertainties related to the packages for newer “hotter” pressure tube wastes that will arise from future refurbishment. Likewise, in on page 29 in Section 3.2 Radionuclide Inventory, refers to the “hot” ends of end fittings.
EIS 04-109	▪ Section 13.4, Confidence in Mathematical	▪ *EIS Summary:* Potential Effects on the DGR during	Explain how predictive numeric models used to support the post-closure safety assessment can be validated given the	Predictive modeling is neither infallible nor exclusive. Therefore, each model should, at a minimum, be carefully calibrated.

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	Models	the Long-term Period; Postclosure Assessment , page 43-46	uniqueness of this Project. Distinguish among model validation, verification, and calibration.	Verification is the next step regarding examination of the degree of confidence in model predictions. Validation is the most challenging step, but can be accomplished, in part, via inter-model comparison.
EIS 04-110	▪ Section 14, Cumulative Effects	▪ *EIS Summary*: Cumulative Environmental Effects Chart, page 40	a) Clarify why "the DGR for decommissioning Bruce Power waste" is "not a planned activity, but is included to meet guideline requirements". b) Explain why the following other operations and potential projects were not included in the cumulative effects assessment: ▪ Wastes from any new build of nuclear reactors; ▪ The potential for storing L&IL wastes from reactors other than OPG's fleet; ▪ Possible changes to the operations for minimizing waste, particularly incineration.	The EIS Guidelines indicate that the management of decommissioning waste would be a potential future project that should be included in an assessment of cumulative effects. In the EIS Summary, page 40, the chart lists cumulative impacts with other projects over the lifespan of the DGR. Past, Existing and Planned Projects (certainty) identified include for example, Decommissioning Bruce A and B, "WWMF upgrades" and Reasonably Foreseeable Projects.
EIS 04-111	▪ Section 11.4.6, Radiological Conditions	▪ *Radon Assessment Report*	Provide information on the amount and diffusion of radon from the L & IL waste materials in the DGR.	The Radon Assessment Report only examines diffusion of radon from host rock and waste rock piles.
EIS 04-112	▪ Section 2.5, Precautionary Approach ▪ Section 4.1, Scope of the Project ▪ Section 11.5.6, Human Health	▪ *EIS.* ▪ *Post Closure Safety Assessment.*	Provide a succinct description of the uncertainty analysis associated with **all numeric models** used in the EIS and PSA (e.g., 3D geological framework model, hydrogeological modeling, dose to human receptors modeling). The succinct description must include all sources of uncertainty: ▪ Data limitations (data gaps and measurement error); ▪ Natural variability; and	Section 2.5 of the EIS Guidelines state 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 4.1 of the EIS Guidelines state the long term performance of the facility must conform to CNSC Regulatory Policy P-290, Managing Radioactive Waste. For instance the proponent needs to be able to show that it is able to accurately predict the impacts of the facility on the health and safety and the environment and to

IR #	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
	▪ Section 13.1, Demonstration of the long-term Safety of the DGR ▪ Section 13.2, Selection of Assessment Scenarios		▪ Model error. The description must then describe how each of the above sources of uncertainty was addressed in the modeling exercises. This can include the use of sensitivity analysis, conservative assumptions, and probabilistic approaches. If particular statistics have been chosen to represent a variable with a wide natural range, justification for the selection of that variable must be provided (e.g., median, average, or a percentile). If uncertainty has been addressed primarily via robust engineering design and institutional assurances, this should be stated clearly. The above succinct description will help address concerns regarding the level of confidence in predictions made over a very long time span.	demonstrate that they are no greater than permissible. Section 11.5.6 of the EIS Guidelines state the EIS must provide “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 13.1 of the EIS Guidelines state the safety case should “provide confidence in the long-term safety of the facility.” As well, Section 13.2 of the EIS Guidelines indicates that” Long-term assessment scenarios should be sufficiently comprehensive to account for all of the potential future states of the site and the environment.”
EIS 04-113	▪ Section 2.5, Precautionary Approach ▪ Section 4.1, Scope of the Project ▪ Section 11.5.6, Human Health ▪ Section 13.1, Demonstration of the long-term Safety of the DGR ▪ Section 13.2, Selection of	▪ *EIS*: Section 6.2.7, Hydrogeology	Explain why hydrologic underpressures in the formations overlying the repository and overpressures in the underlying strata would persist for 1 million years. If changes in these conditions are anticipated, evaluate how this would impact the model results. Evaluate the uncertainties associated with these predictions.	A key element of the deep bedrock groundwater zone is an overpressure. The origin of the overpressure is uncertain, but is modelled as a driver of upwards groundwater flow. Another element is underpressures that exist above the deep bedrock and groundwater zone. The origin and future behaviour these underpressures also are uncertain.

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	Assessment Scenarios			
EIS 04-114	▪ Section 13.2, Selection of Assessment Scenarios	▪ *EIS:* Section 4.5.3, Chemical Inventory of Wastes	Provide an evaluation of uncertainties in the sorption/desorption of contaminants on seal materials and host rocks, and mineral precipitation/dissolution reactions. Discuss the impact of these uncertainties on model predictions. Describe how the interactions of contaminants with organic compounds in the rocks of the cap rock seal have been addressed. These interactions would include microbiological processes.	Section 13.2 of the EIS Guidelines states: "Long-term assessment scenarios should be sufficiently comprehensive to account for all of the potential future states of the site and the environment."
EIS 04-115	▪ Section 13.2, Selection of Assessment Scenarios	▪ *Post Closure Safety Assessment TSD:* Box 1: Key Aspects of the Conceptual Model for the Normal Evolution Scenario, page 102 ▪ Section 6.2.1.1, Waste and Repository, page 109 ▪ Section 7.3.2.2, Waste Inventory, page 198	Explain why carbon-14 was singled out for modeling.	In the Post Closure Safety Assessment TSD, in Box 1**:** Key Aspects of the Conceptual Model for the Normal Evolution Scenario, page 102, it is stated that only carbon is given a solubility limitation factor. However, in Section 6.2.1.1, page 109, it states: "solubility limits have not been applied to contaminant releases, except for C-14". As well, in Section 7.3.2.2, page 198, it states the more complex repository behaviour of C-14 is modelled.
EIS 04-116	▪ Section, 13.2 Selection of	▪ *Post Closure Safety*	Clarify where and how natural analogues have been used in the safety case.	The use of natural analogues is a tool in uncertainty assessment.

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	Assessment Scenarios	*Assessment TSD:* Table 7.24: Addressing the EIS Guidelines for the DGR in the Current Safety Assessment , page 225-229		
EIS 04-117	▪ Section, 13.2 Selection of Assessment Scenarios	▪ *Post Closure Safety Assessment TSD:* Table 3.5: Confidence Building Measures and Attributes, page 23)	Provide a detailed comparison of the proposed DGR with other international L&ILW repositories. Explain significant differences between the proposed DGR and these international repositories. Compare key features of the design, including: ▪ depth; ▪ excavation size; ▪ development techniques; ▪ safety; ▪ waste containment; ▪ water management; ▪ use of backfill; and ▪ community engagement and acceptance.	In the Post Closure Safety Assessment TSD, Table 3.5: Confidence Building Measures and Attributes, page 23, it states confidence in the overall safety of the DGR requires the use of a systematic approach consistent with international practice and recommendations.
EIS 04-118	▪ Section, 13.2 Selection of Assessment Scenarios	▪ *Post Closure Safety Assessment TSD:* Section 3.7, Building Confidence	Describe how OPG's management system for the DGR will document iterative changes to the safety case.	In the Post Closure Safety Assessment TSD, section 3.7, page 22, it states confidence can be built by using an iterative approach that allows the results of previous assessments to be used to inform the current assessment.

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EIS 04-119	▪ Section, 13.2 Selection of Assessment Scenarios	▪ *Geosynthesis TSD:* Section 6.3.3, Repository Resaturation	Provide the evidence and associated uncertainties that produce the predictions that the proposed DGR may take many hundreds of thousands, or even millions, of years to resaturate. Evaluate and describe different saturation scenarios (25%, 50%, 75%, 100%) with respect to the long-term performance of the proposed DGR.	The Post Closure Safety Assessment: Analysis of the Normal Evolution Scenario, section 2.1, page 22 states that "the low permeability of the shaft seals and the host rock, plus the gas pressure in the repository and the water consumption by corrosion reactions, all limit the resaturation of the repository. The repository might take many hundreds of thousands or even millions of years to resaturate completely".
EIS 04-120	▪ Section 4.1, Scope of the Project ▪ Section 8.1, General Information and Design Description ▪ Section 14, Cumulative Effects	▪ *EIS:* Section 2.2.1.3, DGR Hosting Agreement, page 2-9 ▪ *EIS:* Section 4.10.2, Additional Emplacement Rooms, page 4-71 ▪ *EIS:* Figure 10-4.2, Cumulative Effects assessment Timeline, page 10-21. ▪ *EIS:* Table 10-7-1, Summary of Likely Adverse Cumulative Effects, page 10-38. ▪ *Deep Geologic Repository for Low and Intermediate*	Provide a description of conceptual DGR extension plans that will be used to accommodate storage of additional L&ILW materials, or other permitted decommissioning wastes, beyond those volumes currently estimated for the DGR operation. The description should include both temporal and spatial extension plans to the current proposed DGR design.	In the EIS (Section 4.10.2. p. 4-71) it is noted that: "there may be a need to increase the number of emplacement rooms …" and "The decommissioning waste from OPG-owned or operated reactors will, at some point in the future, be relocated to a suitable long-term management site … DGR Hosting Agreement includes provision for decommissioning waste to be placed in the DGR Project … in an extension of the DGR (approximately doubling the underground capacity)." In Fig. 10.4-2 (EIS, p. 10-21) the timeline shown indicates that decommissioning waste from the Bruce Nuclear site will be placed into the DGR between 2054 and 2088, for an extended additional operational period approximating 35 years. Inasmuch as current DGR operation is planned for completion by 2063, it may be anticipated that cumulative impacts created by extension of DGR operations will result. At a minimum, it may be anticipated that: (a) in order to extend panels within the DGR to permit construction of new rooms, the placement of planned shaft closure/sealing walls may have to be postponed in order to extend drifts away from shaft sites, if rooms progress in similar directions to those currently shown; (b) different ventilation strategies will be required to accommodate different excavation layouts; (c) room and drift walls, left open for longer periods and not reinforced using planned monolith materials, may suffer more extensive structural degradation during manned operations that may result in enlargement of excavation damage zones.

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		Level Radioactive Waste, Project Description, OPG, November 2005 ***(****CEAR #191)****:*** page 1		Additionally, the need to have workers operate within an underground facility of greater extent and that may suffer extended degradation in physical character for longer intervals than initially planned may present additional occupational hazards from ground falls and the like. There are also implications to surface operations. There will be a requirement for more waste rock storage space. There will also be an extension to the requirement for surface water management and treatment. The extensions to surface operations may in turn trigger requirements for additional mitigation of environmental impacts, e.g., habitat loss. The "extension of the DGR (approximately doubling the underground capacity)" may present detrimental impacts on repository structural performance and worker safety. No consideration of these effects has been provided in the cumulative effects assessment review section of the EIS, as in Table 10.7-1 (Summary of Likely Adverse Cumulative Effects), EIS, p. 10-38.
EIS 04-121	▪ Section 2.5, Precautionary Approach ▪ Section 11.5.6, Human Health	▪ *EIS:* Section 3.4.1, Radioactive Waste Reduction at Source	Explain the criteria used to determine whether to proceed with waste volume reduction, as well as the methods to be used for this reduction.	In the EIS, Section 3.4.1, page 3- 21, it is stated that OPG and Bruce Power will also investigate and apply new waste processing technologies and disposal approaches to reduce stored radioactive waste volume.
EIS 04-122	▪ Section 12, Accidents, Malfunctions, and Malevolent Acts	▪ *Post Closure Safety Assessment TSD:* Section 4.1.5, Safety Relevant Features, page 33	Will the integrity of the waste packages exceed the proposed operational phase of the DGR? If not, what is the contingency plan to address compromised packages? What would be the potential period during which the waste would be retrievable?	Section 12 of the EIS Guidelines says 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. Packaging is not credited with any barrier function in the Postclosure Safety Assessment, since the packages are not

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		▪ *EIS:* Section 4.8, Operations Phase		designed to provide any long-term isolation and containment of wastes. EIS Section 4.8, page 4-56, states: “Materials placed in the DGR are considered waste and the need for retrieval is not anticipated; however, retrieval can be achieved.”
EIS 04-123	▪ Section 12, Accidents, Malfunctions, and Malevolent Acts	▪ EIS Section 4.5.1, Waste Volumes ▪ *Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository Report*: Executive Summary, page 7	Is the shielding to be in place for ILW and LLW waste expected to provide any incidental barrier function? Will the additional shielding used during waste transport be retained during emplacement in the proposed DGR?	In the Reference Low and Intermediate Level Waste Inventory for the Deep Geologic Repository Report, Executive Summary, on page 7, it is stated that no extra processing/packaging will be required with the exception of shielding of most of the ILW and overpacking of a small portion of the LLW for waste retrieved from various storage structures at the Western Waste Management Facility (WWMF) and transferred to the DGR for emplacement.
EIS 04-124	▪ Section 8.1, General Information and Design	▪ *Post Closure Safety Assessment TSD:* Section 4.1.5 Safety Relevant Features, page 33	Explain the absence of waste containers as a possible remobilization barrier in the design of the proposed DGR.	In the EIS Guidelines Section 8.1, page 33, it is stated that information should be provided in the EIS on: “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. Because of the uncertainty associated with very long-term predictions of repository performance, the use of an additional barrier would be consistent with the application of the precautionary principle. Waste containers have been utilized as barriers in other international waste repositories.
EIS 04-125	▪ Section 10.1.3, Groundwater	▪ *Hydrogeologic Modelling, NWMO DGR-TR-2011-16*:	Use refined vertical discretization in the numerical hydrogeologic models to ensure explicit representation of thin permeable units where horizontal advective solute transport may	The coarse vertical resolution of hydrostratigraphic units 4A and 4B implemented in the numerical groundwater flow and transport model does not ensure an accurate representation of horizontal

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	▪ Section 11.4.3, Groundwater	Section 4.1; ▪ *Geosynthesis, NWMO DGR-TR-2011-11:* Section 5.4.5; ▪ *Descriptive Geosphere Site Model, NWMO DGR-TR-2011-24:* Section 4.13	be significant based on the results of site characterization, and provide the modelling results Evaluate the influence of averaging the hydrogeologic parameters of two distinct lithologies on the modelling of the vertical diffusive solute transport through the cap rock sequence (i.e are the consequences of using average parameters conservative?). Explain how average hydrogeologic parameters for the Queenston and Georgian Bay/Blue Mtn. formations were obtained (PSR, Table 4-4).	advective mass flux in these units. The averaging of hydraulic properties of thin permeable layers with those of adjacent low-permeability layers causes an underestimation of horizontal porewater velocities and, therefore, of solute mass transport. Hydrostratigraphic unit 5 encompasses the Upper Ordovician cap rock sequence. Porosity data for this interval shows a bimodal distribution (Geology TSD Fig. 5.6.1-9), as may diffusion coefficient (Fig. 5.6.1-10) and permeability (Descriptive Geosphere Fig. 4.16) if more data were available. The two sample populations reflect the presence of shale beds and 'hard beds' (limestone and/or siltstone) in the unit. For the modelling the hydraulic properties of the two populations are averaged.
EIS 04-126	▪ Section 10.1.3, Groundwater ▪ Section 11.4.3, Groundwater	▪ *Hydrogeologic Modelling, NWMO DGR-TR-2011-16*: Sections 2.6 and 4.1; ▪ *Geosynthesis, NWMO DGR-TR-2011-11:* Section 5.4.5 ▪ *Descriptive Geosphere Site Model, NWMO DGR-TR-2011-24:* Section 4.13	Use revised hydraulic parameters to represent the Shadow Lake layer in the numerical hydrogeologic model in order to reflect a continuous basal permeable unit across the model domain, and provide the results.	Hydrostratigraphic Unit 8, consisting of Cambrian sandstones and overlying Shadow Lake deposits, forms a permeable basal unit that is continuous over the domain of the hydrogeologic model. The permeability of the Shadow Lake Formation may be significantly enhanced beyond the erosional limit of the Cambrian, where it un-conformably overlies the Precambrian on the flanks of the Algonquin Arch.
EIS 04-127	▪ Section 10.1.3, Groundwater ▪ Section 11.4.3,	▪ *Hydrogeologic Modelling, NWMO DGR-TR-2011-16:* Sections 2.6 and	Use revised boundary conditions in the regional hydrogeologic model to ensure that observed hydraulic gradients and porewater velocities, both updip (Guelph, Cambrian) and downdip (Salina A1 Upper Carbonate), are reproduced, and	The lateral “no-flow” boundary conditions imposed on the regional hydrogeologic model preclude influx across the western boundary and updip flow from the Michigan Basin in the high-permeability Niagaran and Cambrian Formations, despite observations to the

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	Groundwater	4.4; ▪ *Geosynthesis, NWMO DGR-TR-2011-11:* Section 5.4.5;	provide the modelling results.	contrary at the Bruce site (DGR-TR-2011-24, Table 4.16, p.291). Horizontal advective mass transport in these units cannot be considered negligible with respect to vertical diffusive transport in the intervening Ordovician Formations.
EIS 04-128	▪ Section 10.1.3, Groundwater ▪ Section 11.4.3, Groundwater	▪ Geosynthesis, NWMO DGR-TR-2011-11: Section 4.5; ▪ *Geology TSD:* Section 5.7.3.	Explain and justify why the conceptual model of solute transport that is described in Sudicky and Frind (WRR, 18(6), 1634-1642, 1982), featuring horizontal advective-dispersive transport along high-conductivity layers with diffusive vertical transport into adjacent low-conductivity “matrix” formations, was not used.	Given that significant horizontal advective-dominated transport of tracers is occurring in the permeable Salina Upper A1 Carbonate, Guelph and Cambrian units, as well as in the Devonian, the proponent’s purely 1D conceptualization of the tracer transport problem is questionable. In particular, the model ignores lateral mass fluxes in the intermediate and deep groundwater systems at the Bruce site.
EIS 04-129	▪ Section 10.1.3, Groundwater ▪ Section 11.4.3, Groundwater	▪ Postclosure Safety Assessment: Groundwater Modelling NWMO DGR-TR-2011-30, Section 4.2; ▪ Hydrogeologic Modelling, NWMO DGR-TR-2011-16, Section 4.5	Use a base of the 3D simplified hydrogeologic model lowered to the top of the Precambrian in order to assess lateral advective radionuclide transport in the Cambrian unit, as was done for the Salina A1 Carbonate and Guelph units in the NE-HG calculation case, and provide the results.	Placing the lower boundary of the 3DS model at the top of the Cambrian sandstone effectively precludes consideration of horizontal advective transport of radionuclides within this unit.
EIS 04-130	▪ Section 8.1, General Information and Design Description ▪ Section 11.2, Mitigation	▪ *EIS*, Section 4.4.1.5: Stormwater Management System	Provide additional information regarding the design and operation of the stormwater management system. At a minimum, include the following: ▪ Minimum, maximum, and average flows through the stormwater system from all sources during the site preparation/construction phase, the operating phase,	The overall design and operation is not well described. The information in the various EIS documents, and the response to previous IRs, is sparse and scattered such that it is difficult to understand how this system will be designed and operated. A separate stand-alone document should be provided. Furthermore, strictly speaking this is not a stormwater management system in the conventional sense, since it will

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	Measures ▪ Section 11.4.2, Surface Water ▪ Section 11.4.3, Groundwater		and the post-closure phase: • stormwater • repository de-watering (seepage) • process water from construction (see Section 4.7.4.3) • any other source ▪ Basic design parameters (e.g. flows, volumes, retention times, return periods).Hydrological modelling will be required to support these estimates and to ensure appropriate sizing of the stormwater management system. Consistent with advice that EChas provided to OPG for other projects, additional storage capacity should be built into the design to account for the potential impacts (and associated uncertainty) of a changing climate on extreme rainfall intensity over the lifetime of the Project (see proposed IR#1-21 for additional detail). ▪ Justification for the design storm event selected (i.e. 6 hour, 25 mm precipitation). ▪ Clarify whether seepage water from the repository will be pumped continuously or periodically. ▪ Clarify whether stormwater is intended to discharge continuously or through periodic batch release. If continuous, explain how minimum retention times (described as 24 hours) will be achieved. ▪ Outline the specific water quality criteria that are intended to be met based on the list of parameters that are of most likely concern (e.g. salinity, metals, TSS, explosives residues, etc.). Identification of the water	receive contaminated water from the following sources: ▪ seepage water from the repository ▪ construction process water ▪ runoff and seepage from waste rock Additional information is required to understand what potential effects this system will have on downstream water quality and aquatic biota.

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			quality criteria will be essential for determining the adequacy of proposed stormwater management measures. ▪ Explain how the need for treatment will be monitored, and how treatment will be undertaken prior to discharge. Will treatment be undertaken on a batch basis? If not, explain how the treatment system will be operated to meet effluent criteria with a continuous flow? ▪ Provide details on how the stormwater management system will be operated during storm events and in between storm events. For example, will the flow gate (identified in the last paragraph of Section 6.2.4.8 of the Preliminary Safety Report) be manually closed during storm events? Is the flow gate the same thing as the weir? ▪ Provide design information for the intermediate settling pond (identified only in Drawing H333000-WP404-10-042-0001) and explain its intended purpose. ▪ Explain what water treatment is being referred to in the 3rd paragraph of EIS Section 4.4.1.5. Is it the two stormceptors and the intermediate settling pond? Will the stormceptors and the intermediate settling pond be used for the duration of the DGR operation? ▪ How will the proponent or contractor determine when the temporary water treatment plant (EIS Section 4.7.5.4) should be used to remove excess oil, grease and grit before discharge into the drainage network? ▪ Describe the maintenance program that will be used to ensure that stormwater pondsettling, retention capacity, and drainage networks will continue to operate as designed. Considering the potential flooding risk posed	

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			by the Probable Maximum Precipitation event (see Maximum Flooding Hazard Assessment document), and the fact that the culverts in the Unnamed Drainage Ditch (2nd paragraph, Section 6.3.4.3) are partially blocked with sediment and aquatic plants, there does appear to be a need for a formal maintenance program during the site preparation/construction and operating phase. Where storm water ponds are planned, sediment handling should be taken into account, with respect to accumulation and frequency of removal, and considerations of disposal. Such frequency can be reduced by oversizing sediment storage in the pond.	
EIS 04-131	▪ Section 10, Existing Environment ▪ Section 10.1.7, Climate, Weather Conditions and Air Quality	▪ *Atmospheric Environment TSD:* Sections 5.3.1, Data Sources ▪ Section 5.3.2, Temperatures ▪ Section 5.3.3, Precipitation ▪ Section 5.3.4, Wind Speed and Direction ▪ Appendix C, Meteorology and Climate	Provide information regarding the use of Wiarton Airport meteorological observations to fill onsite meteorological monitoring data gaps. The additional information should supplement the response to IR EIS 01-10. In addition to air temperature, wind direction and speed, provide inclusion of the proportion of missing data for other parameters, especially for precipitation. Include a t-test that describes similarities and differences between the two stations. If precipitation data from the two stations are not statistically similar, an additional analysis of the relationship between the precipitation data for the two stations is required.	Data from the MSC station at the airport in Wiarton, Ontario were used to provide the additional meteorological observations that were not available from the on-site station. For some meteorological parameters, such as 2-metre air temperature and 10-metre winds, the replacements can be supportive since the monthly and seasonal normal values for both sites are very similar (Appendix C of the Atmospheric Environment Technical Support Document). However, for some other parameters, such as precipitation, the replacements are questionable since the spatial variation of precipitation is usually much greater than temperature (even for nearby stations), which is reflected in the differences between the monthly and seasonal precipitation normal values shown in Appendix C. If a large proportion (e.g., ≥10%) of precipitation data at the on-site station is missing, the replacements from Wiarton are questionable.

IR #	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
EIS 04-132	▪ 10 Existing Environment ▪ 10.1.7 Climate, Weather Conditions and Air Quality	▪ *Atmospheric Environment TSD:* Section 5.3.5, Other Meteorological and Climate Parameters ▪ Appendix C, Meteorology and Climate	Provide definitions and additional information regarding key atmospheric dispersion modelling parameters. This information should include: ▪ Definitions of unstable, neutral, and stable atmospheric conditions used in the report; ▪ An explanation of how the mixing heights were obtained and calculated; and ▪ Identification of the data sources used to determine atmospheric stability and mixing heights.	The atmospheric stability and mixing heights are very important parameters in the dispersion modeling. The definition of the key parameters is critical to their interpretation. In the report, the dispersion modelling results have been described and illustrated; however, the relevant references and explanatory information are insufficient. In sections *C7 Atmospheric Stability* and *C8 Inversions and Mixing Heights* (Atmospheric Environment Technical Support Document) no sounding data sources were indicated for determination of stabilities and mixing heights. Data sources were mentioned elsewhere in the report (e.g. upper-air sounding data from Buffalo, New York and Gaylord, Michigan were described in C2.2 Meteorological Data Sources; while in section 5.3.1 Data Sources only upper-air data from Gaylord were mentioned). However, it is not clear which sources may have been used to determine stabilities and mixing heights.
EIS 04-133	▪ Section 10, Existing Environment ▪ Section 10.1.7, Climate, Weather Conditions and Air Quality	▪ *Atmospheric Environment TSD:* Section, 5.3.1 Data Sources ▪ Section 5.3.4, Wind Speed and Direction	Describe a proposed anemometer maintenance and quality control program.	There are two onsite meteorological stations at the Bruce nuclear site: one at 50 m height and the other at a 10 m height. According to the AETSD, the data from 50 m is more reliable. Wind measurements from the 10 m height are appropriate for the dispersion modelling for the Project. Considering the importance of the 10 m station, OPG should implement a maintenance and quality control program to ensure the future quality of these wind measurements. New data might be required in support of this environmental assessment or other studies.

IR #	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
EIS 04-134	▪ Section 11.4.7, Atmosphere	▪ *EIS*, Section 4.4.3.1: Ventilation System and Dust Control ▪ Section 4.7.4.1: Shaft Excavation	Provide additional information regarding emissions from the ventilation exhaust system. The following information is required: ▪ plans to monitor emissions from this source; ▪ mitigation measures to ensure that emissions do not exceed air quality standards or objectives under normal operation; and ▪ details of the ventilation design that would prevent the capture of exhaust air by intake fans.	Emissions may occur from the repository ventilation system during the construction phase and operating phase of the repository. Insufficient information has been provided to characterize these emissions.
EIS 04-135	▪ Section 11.4.7, Atmosphere	▪ *Preliminary Safety Report:* Section 6.3.8.1, Ventilation System and Operation ▪ *EIS:* Section 8.3.2, Potential Effects	Discuss the potential implementation of a part-time or emergency exhaust ventilation filtration system that could be used to capture dust and aerosol releases in the event of accident scenarios such as underground fires or explosions.	In the description of the ventilation system design, it is stated that no exhaust air filtration will exist due to the rationale that radioactive gases existing in this airflow will not be captured by a filtration system. It is stated, however, that condensate water from the exhaust airflow stream will be recovered in order to sequester and treat tritium contaminants. Under exceptional circumstances, however, as would exist in the event of underground fires, explosions or other events, aerosols and fugitive dusts may be liberated and transported by the airflow that could potentially contaminate the surface environment if they were not filtered.
EIS 04-136	▪ Section 11.4.7, Atmosphere	▪ *EIS:* Section 4.4.3.1, Ventilation System and Dust Control ▪ Section 4.7.4.1, Shaft Excavation	a) Incorporate air emissions generated from blasting into modelled emissions for various stages of the construction phase. b) Clarify whether explosives other than ANFO will be used for blasting, and, if so, under which circumstances. Provide emission estimates that include both the quantity and type of explosive.	Environment Canada has suggested that the USEPA`s AP42, Fifth Edition, Volume I document provides emission factors according to the type of explosives and their uses.

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EIS 04-137	▪ Section 11.2, Mitigation Measures	▪ *EIS:* Section 7.7.2.2: In-design Mitigation ▪ *Atmospheric Environment TSD:* Section 8.2.2: In-design Mitigation	Provide the mitigation plans and Best Management Practices that will be implemented to minimize effects to air quality. Mitigation plans should include site specific design elements, operating practices, specific technologies, products and equipment that will be applied to prevent or control emissions. These plans should also identify any measuring, monitoring and record keeping that will take place over the course of the Project. The Air Quality in-design mitigation shown in Table 7.7.2-1 should include more details and specific information on: ▪ Objectives to be achieved through air quality mitigation measures; ▪ Listing of methods to be applied and the conditions that trigger mitigation measures; and ▪ Record keeping to demonstrate adoption of actions. Explain how a 75% reduction of particulate matter will be achieved by watering unpaved areas during construction.	During site preparation and construction, potential air quality effects have been identified. Various measures can be implemented to reduce dust and particulate emissions/formation from site preparation/construction activities, including those from machinery/vehicles. Environment Canada has recommended that the Best Management Practices outlined in the following document be implemented as a component of these mitigation plans: ▪ "*Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities*" prepared for Environment Canada by Cheminfo Services (March 2005).
EIS 04-138	▪ Section 11.4.7, Atmosphere	▪ *Atmospheric Environment TSD*: Section 7.2.1, Site Preparation ▪ Section 7.2.2, Construction of Surface Facilities ▪ Section 7.2.4, Excavation and Construction of Underground	Provide the rationale for not including other relevant substances such as VOCs (benzene, formaldehyde, acetaldehyde, acrolein, acetone, 1, 3-butadiene) and PAHs as air quality indicators for assessment of the Project. Maximum ground level concentrations for the above substances must be predicted for at least the bounding stage (identified as Stage 1) and, where applicable, be compared with ambient air quality criteria (which should also include comparisons to the 24 hour criteria).	VOCs and PAHs are particularly relevant to the assessment of the site preparation and construction phase, considering the length of that phase (5-7 years), and that this is the bounding case when emissions are highest from mobile sources, blasting and other construction activities. Note: EIS 01-09 requested baseline information on acrolein.

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		Facilities		
EIS 04-139	▪ Section 11.4.7, Atmosphere	▪ *Atmospheric Environment TSD*: Section: 8.2.3.1, Emissions	Provide detailed sample calculations for the NO_x daily emission rate (243.5 kg/d) that was used as input to the dispersion model for the Stage 1 bounding case. Provide and support all assumptions made and references used to calculate the emission rate for each component (e.g. shafts 31.91 kg/d, vehicles 5.25 kg/d and site equipment 206.31 kg/d). Use sample calculations similar to those provided in Appendix F.	The sample calculations that have been provided in Appendix F are mainly for mobile sources for particulate matter. These do not adequately outline the calculation of all emissions that contribute to the 243.5 kg/d emission rate (cited in Table 8.2.3-1 of the AETSD). It is important to show how the NOx emissions were calculated and combined as a total, since this is the input for the dispersion model.
EIS 04-140	▪ Section 11.4.7, Atmosphere	▪ *Atmospheric Environment TSD: Section*: 8.2.3.1, Emissions	Clarify the sulphur content used for fuel and the rationale for SO_2 concentrations remaining unchanged during the construction phase as compared to baseline.	The sulphur content in fuel is a basic parameter that determines SO_2 emissions from vehicles/equipment, which is the basis for SO_2 emissions arising from the project. Activities during construction would be expected to increase SO_2 levels.
EIS 04-141	▪ Section 11.4.7, Atmosphere	▪ *Atmospheric Environment TSD:* Section: 8.2.3.1, Emissions	Provide a figure, showing maximum construction phase concentrations (i.e. bounding case) for indicator compounds (from Table 8.2.3-6, AETSD) and other contaminants (to be predicted as requested in IR EIS 04-138) in the Local Study Area. Provide the distance to the nearest human receptor in km relative to the location of maximum ground level concentration.	A visual representation of the requested information is important to understanding air quality effects.
EIS 04-142	▪ Section 11.4.7, Atmosphere	▪ *Atmospheric Environment TSD:* Appendix B, Basis for the EA ▪ Appendix F, Air Modelling Methods	Clarify and justify which phase of the construction air emissions modelling includes the air emissions from the concrete batch plant.	Table B1 (Appendix B, AETSD) states that the concrete batch plant would be established during construction of surface facilities (Stage 1), whereas Table F4-2 (Appendix F, AETSD) suggests that air emissions from the batch plant are occurring during excavation and construction of underground facilities (Stage 2,3). The distinction is important since Stage 1 is the bounding case (i.e. highest emissions). Incorporation of batch plant emissions in Stage 1 will result in higher emissions of indicator compounds than what is currently shown in the AESTD report.

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EIS 04-143	▪ Section 11.4.9, Effects of the Environment on the Project	▪ *Atmospheric Environment TSD:* Section 5.3.6, Climate Change ▪ Appendix D, Climate Change	Provide an updated evaluation of the potential for climate change to affect precipitation, including extreme events. Provide an evaluation of how this may affect the design of the Project.	Potential increases in extreme precipitation from peer-reviewed climate modeling should be included in the report rather than only considering mean precipitation in the assessment. The implication of the potential changes to extreme values should be taken into consideration when adjusting engineering infrastructure requirements and calculating flood design standard values. At a minimum, this has implications for the design of the stormwater management system and for the design of the repository shaft collar elevations (i.e. OPG indicated it would design the repository shaft collars to be above the water levels arising from a Probable Maximum Precipitation/Probable Maximum Flood event). Climate modeling points to a greater increase in the frequency and intensity of extreme precipitation events than annual mean precipitation quantities under a changing climate (Kharin et al. Journal of Climate, Vol. 20, 2007 pp. 1419–1444; Kharin and Zwiers. Journal of Climate, Vol. 18, 2005 pp. 1156–1173). These studies found the annual mean precipitation rate over North America is projected to increase by less than 3% by the end of this century, however, the corresponding increase in the 20-year return values of annual extremes of 24-hour precipitation rates is projected to be 15% (A2 scenario). A more recent study focusing on Southern Ontario found that the return values of annual maximum 3-day accumulated rainfall totals in the study area are projected to increase by 25–60% for the period 2051–2100 (Cheng et al. Journal of Climate, Vol. 24, 2011 pp. 3667–3685).
EIS 04-144	▪ Section 11.4.9, Effects of the Environment on the Project	▪ *Atmospheric Environment TS:* Section 5.3.6 Climate Change ▪ *Atmospheric Environment TSD:*	Provide updated calculations regarding change per decade for future temperature and precipitation. Include most recent climate data for the decade interval 2001-2011 that utilizes (units/decade) measurements for parameters such as temperature and precipitation trend information in generating potential climate change predictions.	The calculations in the report on the basis of change per decade for future temperature and precipitation are not correct. In the report, four time periods were considered: 1971–2000 for the baseline period, 2011–2040, 2041–2070, and 2071–2100 for three future periods. The calculation for future relative change during the first future period (2011–2040) from the baseline (1971– 2000) should be the difference divided by the number of

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		Appendix D: Climate Change		decades between the center years of two periods. The number of decades for this case is 4; however, 5 was used in the report. Similarly, for other two future periods, the corresponding number of decades is 7 and 10 rather than 8 and 11 used in the report, respectively. Under the EIS Guidelines, "the proponent must consider the current baseline environment and environmental trends within the study areas." (S. 9.2, p. 29). The EIS document states that "The climate of an area is described using normals … averages … over a 30 year period (the latest accepted normal period is from 1971 to 2000) … reliance is shifting to global climate models …" In the trend modelling descriptions provided in Tables 7.14-1 and 7.14-2, climate behaviour is shown in terms of (units/decade) up to the year 2000, and then is forecasted beyond that only for the period 2011-2040. The interval period between 2001 and 2011 (most recent decade) is that which best demonstrates current changes in climate that can be expected to continue into the future, and which therefore should bear closer observation. No climate information for the single most recent decade (2001-2011) has been compiled and presented in the EIS for the purpose of climate modeling and effects prediction. This decade interval is likely the most observed and measured one in terms of monitoring of climate data, and should thus be included in climate effects prediction modeling even though it does not comply with the typical "normals" time frame.
EIS 04-145	▪ Section 8.4, Modifications	▪ *EIS:* Section 4.10.1 Design Changes, page 4-71.	Provide a description of the space that is available for expansion in the host geological formation and what impact this will have on the surface waste rock and surface water management capabilities.	The EIS (page 4-71) states that: "there may be a need to increase the number of emplacement rooms". It is unclear that there would be sufficient capacity, both underground and above ground, to accommodate additional waste and associated water and waste rock management.

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EIS 04-146	▪ Section 11.1, Effects Prediction	▪ *EIS*: Section 7.3.2.2, Identification and Assessment of Environmental Effects (Surface Water Quality), page 7-36; ▪ Table 7.3.2-2, page 7-36. ▪ *Hydrology and Surface Water Quality TSD:* Section 8.3, pages 92-99	Provide a clear and complete description of the calculations performed in support of the predictions in Table 7.3.2-2 regarding suspended solids and nitrate concentration in surface water due to atmospheric deposition. Discuss the uncertainty associated with these calculations.	The calculations in support of the predictions in Table 7.3.2-2 are not presented in either the EIS or the TSD. The calculations and uncertainty associated with the calculations are required for the evaluation of the defensibility and scientific credibility of the assessment of effects on water quality from atmospheric deposition.
EIS 04-147	▪ Section 8.1, General Information and Design Description	▪ *EIS:* Table 4.5.1-3, Summary of Waste Acceptance Criteria	Provide an explanation of what “leachate toxic wastes” consist of, including a listing of the anticipated most common compounds/elements and their relative toxicity to humans and the environment. Clarify whether such wastes will be placed in the DGR facility or sent elsewhere.	The inclusion of other classes of hazardous waste to be placed within the DGR facility would add another layer of complexity to the assessment. There is no indication in the EIS that other classes of “toxic waste” have been considered and assessed.
EIS 04-148	▪ Section 11.4.7, Atmosphere	▪ *EIS:* Section 7.7, Air Quality ▪ Section 7.7.2, Identification and Assessment of Effects	Demonstrate how dust generated by the trucking and dumping of waste rock has been incorporated into the air quality model. Provide the fraction of particle size that can contribute to fugitive dust generation which can be expected in the various waste rock types.	In the assessment of air quality no account appears to have been taken of the contribution of trucking and dumping to the generation of fugitive dust (SPM, P_{10}, $P_{2.5}$). The capacity to generate dust will be influenced by the fraction of waste rock that has a particle size amenable for dust generation. To judge the potential for fugitive dust generation, both factors need consideration.

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EIS 04-149	▪ Section 7.1, Purpose and Need for the Project	▪ *EIS:* Section 1.2.1, Purpose of the Project, p. 1-2	Provide information regarding the predicted margin of safety to be achieved by the DGR project relative to existing facilities for the storage of low and intermediate radioactive waste. Provide information concerning the safety hazards associated with operations at the Western Waste Management Facility that may compromise the health and safety of the public, workers and the environment.	Section 1.2.1 of the EIS, page 1-2 states that: "The DGR Project is proposed because… it provides a greater margin of safety than the existing facilities..."; and "…it provides a long-term management method for waste streams .. and (it) will do so in the absence of institutional controls." Little information regarding the "margin of safety" of existing facilities (i.e., WWMF) and/or safety hazards existing at the WWMF is provided to validate why the DGR is necessary other than that, through underground placement, no institutional controls may be required to maintain safe material management.
EIS 04-150	▪ Section 8.7, Malfunctions, Accidents and Malevolent Acts ▪ Section 12, Accidents, Malfunctions and Malevolent Acts	▪ *EIS:* Section 4.8.3.1, End Walls and Room Closure, p. 4-62.	Provide information relating to the design of closure walls, including specific dimensions, physical location with respect to access and exhaust drifts, and bearing capacity characteristics, that will be used to resist pressure effects from gas generation or potential gas explosions.	End walls will be placed on the access drift sides or rooms as each is completed in order to restrict entry by personnel. When groups of rooms are filled, "closure walls (will be) constructed in the access and exhaust ventilation tunnels to fully isolate this group of rooms … (and) In the very unlikely event that explosive gases build up behind the closure walls and an explosion occurs, the air blast from the explosion would be contained by the closure walls." (p. 4-62) The design of these walls has not been well described in terms of dimensions, concrete thicknesses to be used, keying of walls into the rock pillars, use of contact seal grouting materials as with shaft concrete bulkheads to be used – all of which provide pressure resistance or bearing capacity in the case of room-generated pressures.
EIS 04-151	▪ Section 8, Description of the Project	▪ *EIS:* Section 4.7.5.4, Water Management, page 4-52.	Describe how expected mine water flows were estimated for each phase of the project. Include a description of the level of confidence in these estimates and the use of the Precautionary Principle (if any) in derivation of these estimates.	On Page 4-52 of the EIS, the maximum underground water inflow rate is estimated as 5.4 L/s. The text does not include the basis for this estimate, nor the level of confidence associated with it. Since unexpected mine water inflows is a very common contingency in any mining endeavour (the DGR can be considered a mine project), it is important that information related to the estimation methods and confidence in estimates be provided in order that the adequacy of the design for the water

IR #	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
				management system can be evaluated. This is also relevant to the capacity requirements for any treatment plant that may be required.
EIS 04-152	▪ Section 8.1, General Information and Design Description	▪ *EIS:* Section 3.4.10, Waste Containment ▪ Figure 4.5.1-2, Examples of Waste Containers	Provide data on the integrity (time period) of each container type to be deposited in the DGR. The period of complete containment must be provided under external dry conditions and when exposed to the saline formation waters of the Cobourg Formation. Confirm that all waste containers to be deposited in the DGR, regardless of age, will meet the most up-to-date regulatory requirements.	There are currently in excess of 100 different waste containers that have been used for storage of L&ILW at the Western Waste Management Facility and that will be transferred to the DGR. The EIS states that the long-term safety of the DGR in no way relies on the integrity of the waste containers. The release of radionuclides will therefore vary with container type. An assessment of the consequences, over time, will require data on the anticipated resilience of each container type.
EIS 04-153	▪ Section 13, Demonstrating the Long term Safety of the DGR	▪ *EIS:* Section 4.11.4.2 Construction of Shaft Seal, page 4-77. ▪ *Postclosure Safety Assessment:* Section 4.2.4. Safety Relevant Features, page 43 ▪ Section 4.2.5, Uncertainties, page 43; ▪ Section 3.6, Treatment of Uncertainities, pages 19-21; ▪ Table 3.5,	Explain how long it will take for the bentonite/sand materials used as the primary shaft seal to saturate with groundwater, thus generating swelling pressures that aid the development of a tight seal against the shaft wall. Provide the relevant geologic and hydrogeologic data and assumptions. Include a discussion of the uncertainty associated with the time estimate. Include this information in an evaluation of the current uncertainty analysis of the postclosure assessment, with emphasis on how assumptions used in the assessment regarding the issue of shaft sealing build confidence in the assessment.	The time required for saturation of the bentonite/sand materials may be considerable, dependent upon the degree of groundwater inflow from the sides of the shaft and then the migration up and down within the bentonite/sand column from the point of groundwater inflow. Therefore, the time required for a “tight seal” with the shaft wall may also be considerable. This has implications for the postclosure safety assessment; in particular, the uncertainty analysis for that assessment, the “confidence-building” assumptions used in the assessment (as per Table 3.5) and the degree to which the precautionary (conservative) approach was balanced with realistic assumptions.

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		Confidence Building Measures and Attributes, page 23.		
EIS 04-154	▪ Section12, Accidents, Malfunctions and Malevolent Acts	▪ *Preliminary Safety Report*: Section 7.5.1.2, Step 2: Initiating Events, page 419-420.	Provide information relating to design or operating provisions that would be implemented in the event that major ventilation stoppages occur. Describe design provisions that would be made in case of failure of a main fan site (such as in the ventilation shaft). These provisions would maintain a minimum critical airflow until repairs, replacement or maintenance of mechanical elements of the ventilation system are complete.	"The ventilation system could fail due to fan or damper electrical or mechanical problems." A fan network consisting of pull-type fans in the ventilation shaft, push-type fans on surface at the main shaft and various booster fans in the access drifts are designed to keep airflow circulating.
EIS 04-155	▪ Section 8.2, Decommissioning	▪ *EIS:* Section 4.11.4.2, Construction of Shaft Sea ▪ Figure 4.11.4-2, Arrangement of Shaft Seal Components	Figure 4.11.4-2 shows the arrangement of shaft seal components. Provide revised illustrations that include the geologic horizons (formations), their permeabilities, and the shaft seal components. In particular, show detailed diagrams of the concrete shaft seal zones and their stratigraphic placement. Indicate the location of the anticipated highly-damaged zones.	The long-term integrity of the shaft seals is critical to the permanent closure of the DGR. The materials used at various depths should match the physical and chemical conditions encountered.
EIS 04-156	▪ Section 13.1, Demonstrating the Long term Safety of the DGR	▪ *Preliminary Safety Report:* Section 4.5.4.2, Shaft Seal Analysis, page 235.	Provide verification that the assumed increase in horizontal stress due to glacial loading on the shaft walls and seals will approximate 2 MPa, and that this is a conservative estimate.	In Section 4.5.4.2 (p.235) where a summary of shaft seal analysis effects of glacial loading, it is stated that: "… each seal will be subjected to glacial loading with a maximum vertical pressure of about 30 MPa … An assumed horizontal stress increase of 2 MPa due to bending of the strata was also imposed in the simulation …" Inasmuch as the maximum principal pre-existing in situ stress is directed horizontally, the determination of additional horizontal stress action is an important design feature for the analysis of shaft wall damage and seal performance.

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EIS 04-157	▪ Section 10.1.3, Groundwater	▪ *EIS:* Section 6.2.7, Hydrogeology	Describe the Westbay MP55 casing system and explain why it was chosen. Compare its advantages and limitations to other state-of-the art techniques and equipment available for the measurement of ground water pressure, composition, and hydraulic conductivity in low permeability environments.	The measurement of ground water pressure, compositions, and hydraulic conductivity in low-permeability ('tight') rock formations presents considerable challenges. Therefore the measuring technique is important.