

Deep Geologic Repository
Project

Projet de stockage dans des couches
géologiques profondes

Joint Review Panel
Public Hearing

Commission d'examen conjoint
Audience publique

September 15th, 2014

Le 15 septembre 2014

Royal Canadian Legion
219 Lambton Street
Kincardine, Ontario

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Joint Review Panel

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Kincardine, Ontario / Kincardine (Ontario)
--- Upon commencing on Monday, September 15, 2013
at 9:01 a.m. / L'audience débute le lundi
15 septembre 2014 à 9 h 01

OPENING REMARKS

MME MCGEE : Bonjour, Mesdames et Messieurs. Good morning and welcome to the Public Hearing of the Deep Geologic Repository for Low and Intermediate Level Radioactive Waste Joint Review Panel.

Bienvenue à l'audience publique de la Commission d'examen conjoint pour le projet de stockage de déchets radioactifs à faible et moyenne activité dans les formations géologiques profondes.

My name is Kelly McGee, I am the Co-Manager for the Joint Review Panel and I would like to address certain matters relating to today's proceedings before we begin with the scheduled presentations.

We have simultaneous translation. Des appareils de traduction sont disponibles à la réception. La version française est au poste 2.

The translation devices are available at the back of the room and the English version is on Channel 1.

Please keep the pace of your speech relatively slow so that the translators can keep up. A written transcript is being created for these proceedings and will reflect the official language used by each speaker.

Transcripts will be posted on the Canadian Environmental Assessment Agency website for the project. To make the transcripts as meaningful as possible, we would ask everyone to identify themselves before speaking.

As a courtesy to others in the room, please silence your cell phones and other electronic devices and, as a courtesy to our hosts, please make sure you place all of your beverage containers and other garbage in the available recycling bins and garbage containers at the back of the room.

These proceedings are being webcast live. The webcast can be accessed from the Canadian Nuclear Safety Commission website at www.nuclearsafety.gc.ca. A detailed agenda for all eight days was published on August 26, 2014

and is available on the website for the project. Daily agendas are also posted for each day to reflect any necessary last-minute scheduling changes.

The hearing will begin each day at 9:00 a.m. and will wrap up at approximately 5:00 p.m.

Emergency exits are located at the back of the room and to my left behind the screen and curtain. In the event of a fire, you are asked to leave the building immediately.

Washrooms are located in the lobby at the main entrance and the wheelchair access and ramp is located in the back parking lot.

If you are scheduled to make a presentation at today's session, please check in with the Member of the Panel Secretariat at the back of the room. Each member of the Secretariat staff is wearing a name tag to help you identify them.

If you are a registered intervener and want to seek the leave of the Chair to propose a question, you are also asked to speak with a Member of the Secretariat staff.

Your proposed question must be directly related to the matters discussed during today's proceedings.

If you are not scheduled to make a presentation during these hearings but would like to seek the leave of the Panel to make a brief oral statement, please speak with a member of the Secretariat staff and complete the application form. An opportunity to make a brief statement is subject to the availability of time at the end of the day and must be for the purpose of addressing one or more of the six permitted hearing subjects.

Opportunities for either a proposed question to a presenter or a brief statement at the end of the day's session may be provided, time permitting.

In accordance with the Panel's Rules of Procedure, the resumption of this public hearing is solely for the purpose of addressing one or more of the six identified hearing subjects. Neither presentations nor questions will be permitted if they do not follow the Rules of Procedure.

Anyone who wishes to take photos

or videos during today's session should speak with the Joint Review Panel's Communication Advisor, Ms Lucille Jamault. Lucille is at the back on the side of the room here and is here to help you.

Thank you very much.

Madam Chair...?

THE CHAIRPERSON: Good morning.

First of all, let me on behalf of the Joint Review Panel welcome everyone here in person or joining us through the webcast.

My name is Stella Swanson, I am the Chair of the Joint Review Panel for the Deep Geologic Repository for Low and Intermediate Level Radioactive Waste Project.

I'm going to introduce the other members of the Joint Review Panel. On my right is Dr. Gunter Muecke and on my left is Dr. Jamie Archibald.

We have already heard from Ms Kelly McGee, the Co-Manager of the Joint Review Panel, and we also have Mr. Denis Saumure, counsel to the Panel, with us on the podium today.

As noted in the published agenda,

the subject for today's session will be methodology used to determine the significance of adverse environmental effects.

I would like to note that we have a number of government departments on standby in the event that the Panel has any questions for them.

Before we proceed with this morning's presentations, the Panel has an announcement regarding the new information presented by Dr. Greening last week.

The Panel has reviewed the transcript of the new information that was presented by Dr. Greening on September 10th and will allow it as a late submission for the record.

We have several questions to direct to OPG and CNSC regarding this information. The Panel will address these issues on the afternoon of Wednesday, September the 17th and will have an expert from Natural Resources Canada available at that time should the Panel require that resource.

The Panel's questions regarding Dr. Greening's new information will focus on the

following:

the statement on page 117 of the transcript regarding RWOS 1 releasing radioactivity into the aquifer;

the statements on page 119 regarding the theoretical justification for correlations between carbon-14, chlorine-36, iodine-129, et cetera, and the cobalt-60 content of a DGR waste container;

scaling factors;

the assertions on pages 123 to 125 that there are "major problems" with OPG's chlorine-36 and iodine-129 inventories;

the statements regarding iodine-131 on page 125 of the transcript;

the statements on page 131 regarding calandria tubes and zirconium;

and, finally, the statements in the transcript regarding Dr. Greening's characterization of the WIPP incidents.

We will now proceed with presentations by Ontario Power Generation, Canadian Nuclear Safety Commission and Environment Canada pertaining to the subject of methodology used to determine the significance of

adverse environmental effects.

The Panel will hear all three presentations before proceeding with its questions.

I would like now to call on OPG to begin their presentation, which is PMD 14-P1.1D.

Ms Swami, the floor is yours.

**PRESENTATION BY / PRÉSENTATION PAR:
ONTARIO POWER GENERATION**

MS SWAMI: Good morning, Dr. Swanson and Members of the Panel. My name is Laurie Swami and I am the Senior Vice President for Decommissioning and Nuclear Waste Management at OPG.

For today's presentation Diane Barker, the Manager for Environmental Assessment, will provide an overview of the significance of determination for residual adverse effects.

When Ms. Barker completes the presentation this morning, OPG would like to address two comments and questions that were raised earlier. Ms. Barker will address EC

comments on surface water quality and Mr. Wilson will respond to a question the Joint Review Panel asked with respect to surface water quality and storm events last week.

Ms Barker...?

MS BARKER: Good morning.

For the record, I am Diane Barker, Environmental Assessment Manager with the Nuclear Waste Management Organization.

On the phone we have Mr. Danny da Silva, Principal and Acoustic Noise and Vibration Engineer, and Mr. Martin Rawlings, Senior Air Quality and Environmental Assessment Specialist, both with Golder Associates.

Today I will present information on OPG's response to Information Request EIS-12-510 relating to the significance determination for residual adverse effects of the deep geologic repository for low and intermediate level waste.

In this presentation I will provide context and a brief overview of the Information Request; I will describe the reasoned argument approach used to assess the significance of the predicted adverse effects of the DGR; for

each residual adverse effect identified in the Environmental Impact Statement, I will provide an overview of what would have been required to result in a significant environmental effect; and the results of OPG's assessment of significance.

As noted in OPG's written response to this Information Request, the use of the reasoned argument approach to significance assessment confirmed the conclusion of the Environmental Impact Statement, that the DGR is not likely to cause significant adverse environmental effects.

I will also discuss OPG's confidence in the significance assessment. In general, it is not practical to provide numerical levels of confidence in the significance. Our confidence is based on the conservative assumptions as part of the precautionary approach used in identifying adverse effects and the experience and expertise of the people conducting the assessment of significance.

OPG's Environmental Impact Statement presented a technical approach to significance assessment using decision trees. This approach assessed the significance of

potential residual adverse effects in a stepwise manner relative to the set of criteria included in the Environmental Impact Statement Guidelines issued by the Canadian Environmental Assessment Agency and the Canadian Nuclear Safety Commission.

The Information Request required OPG to present a detailed narrative to explain how the significance of each residual adverse effect on the biophysical environment and on Aboriginal interests was determined.

The narrative was to use context-based reasoning and use references, where available, to provide defensibility. Where it was necessary to rely on experience, this was to be plainly indicated. Each residual adverse effect was to be presented as a separate narrative and in sufficient detail to allow a third-party reviewer to understand how the conclusion was reached.

OPG reviewed the Information Request against published literature and recently completed environmental assessments. The reasoned argument approach to significance assessment is one of several methods described in

literature. It is consistent with the approach suggested by Dr. Dunker and it meets the requirements of the Information Request.

In developing the response to the Information Request, an early draft of one section of the reasoned argument narrative was provided to Dr. Dunker for review. Based on his comments, further enhancements to the response were made prior to submission to the Joint Review Panel.

Consistent with the reasoned argument approach, OPG first identified one or more conditions that would result in an effect being considered significant. These conditions formed the basis for hypothesis statements which were developed for each residual adverse effect on the biophysical environment and for Aboriginal interests.

In developing each hypothesis, the specialists reviewed relevant available scientific literature and other sources of technical information, including environmental assessments for other projects with similar effects.

In some cases there was little

literature information and the experience and knowledge of technical specialists contributed to the development of the hypotheses.

Significance was determined by comparing each residual adverse effect identified in the assessment against the relevant hypothesis statements. The reasoned argument assessment of significance relied on the assessment of effects, including the identification of residual adverse effects that was completed and documented in the Environmental Impact Statement submitted to the Joint Review Panel in April of 2011 and that was the subject of discussion at previous hearing days.

Having described the methodology, I will provide a summary of the narrative significance assessment for each residual adverse effect, the conclusion reached and OPG's confidence in the conclusion.

For hydrology, the residual adverse effects identified were changes to flow in existing engineered ditches on the Bruce nuclear site. There will be a decrease in flow to the North Railway Ditch, which is shown in the photo on slide 5.

This decrease in flow will not result in any adverse effects in Stream C, which is cold water habitat and to which the North Railway Ditch flows.

In the Interconnecting Road Ditch which discharges to McPherson Bay and Lake Huron, there will be an increase in flow. OPG's hypothesis of what is a significant change in flow in an engineered channel are shown on slide 5. A change in flow would be significant if it resulted in flooding or erosion of the ditch, or sedimentation that would block flow.

These hypotheses are based on standard engineering principles for the design of ditches.

The North Railway Ditch, in which a decrease of approximately 30 per cent in flow is predicted, is not considered aquatic habitat and under current conditions is often dry.

The decrease in flow in the ditch has the potential to result in an increase in deposition of sediments in the ditch, however, the change is small. Increased sedimentation will be managed to ensure that flooding is avoided. Therefore, OPG concluded that the

decrease in the flow in the North Railway Ditch is not significant.

In contrast, the average annual flow in the Interconnecting Road Ditch was predicted to double during site preparation and construction and increase by about 1.5 times during operations.

This increase has the potential to exceed the existing capacity of the design capacity of the ditch. However, OPG has committed during the engineering phase to evaluate the design capacity of the ditch. If necessary, OPG will resize the ditch to accommodate the flow and avoid flooding and provide appropriate erosion control. This effectively addresses the potential adverse effect and so OPG concluded that the increase in flow in the Interconnecting Road Ditch is not significant.

Our high degree of confidence in the significance conclusion is founded on well-established engineering design principles.

Terrestrial environment. The residual adverse effect identified for the terrestrial environment was a loss of Eastern

white cedar as a result of removal of mixed wood forest. In southern Ontario, including the regional study area, Eastern white cedar is a common and resilient species. The 8.9 hectares of mixed wood forest represents less than 1 per cent of the mixed wood forest in the local study area.

The DGR project site is in an already industrialized site that has been subject to intermittent clearing, disturbance and regeneration over the last 60 years. In determining what would be significant, OPG considered literature on forest ecosystem sustainability, professional experience with forest ecology in southern Ontario and guidelines issued by the Ontario Ministry of Natural Resources respecting natural heritage protection in land-use practices.

This information indicated that, in addition to direct loss, other factors such as ecological function and connectivity were important considerations in assessing significance.

The literature generally indicates that relatively large losses of

contiguous forests with sensitive functions may be considered significant. OPG's hypotheses statements are presented in slide 6.

Tested against these hypotheses, the loss of Eastern white cedar was assessed to be not significant. The loss will not affect the sustainability of Eastern white cedar as a tree species as it is a relatively abundant local species.

The mixed wood forest to be removed comprises three small isolated stands that have already been fragmented by other activities on site that have limited use by wildlife and are marginally connected with the core natural heritage system.

For these reasons OPG has a high degree of confidence in the conclusion that the loss of Eastern white cedar is not significant.

Aquatic environment. Two residual adverse effects are predicted on the aquatic environment. Construction of a culvert across the South Railway Ditch will alter aquatic habitat of the redbelly dace, creek chub and variable leaf pondweed, burrowing crayfish and benthic invertebrates.

Secondly, removal of habitat for burrowing crayfish shown in the photograph in other areas of the project site will result from site preparation and construction duties.

Fisheries and Oceans Canada applies the risk management framework to decision-making under the habitat protection provisions of the *Fisheries Act*. In assessing sensitivity of fish habitat, Fisheries and Oceans considers species sensitivity, dependence on habitat and habitat resiliency.

OPG developed its hypotheses of what would constitute a significant adverse effect based on these ecological principles and the judgment of our technical experts. OPG's criteria for significant effects are presented in slide 7.

The South Railway Ditch is a constructed intermittent drainage ditch though some portions are continuously wet. OPG will construct the crossing such that it will not disrupt flow in the ditch or affect watercourse continuity or migration through the study area.

The area to be affected is a small portion of similar habitat available

elsewhere in the site study area. It is considered to be marginal habitat in comparison with other habitat in the site and local study areas and has been sustained through previous manmade interferences.

The area to be affected does not contain unique species, features or ecological functions within the study areas. The VECs that would be affected are common and resilient species.

The area of burrowing crayfish habitat to be lost represents less than 1 percent of the available habitat in the project area. The habitat to be lost is in areas that had been previously disturbed by construction activities at the site. OPG has a high degree of confidence in the conclusion that the removal of a small portion of aquatic habitat within the project area is not significant.

Air quality: During the site preparation and construction phase, concentrations for nine air quality indicators are predicted to increase over existing ambient concentrations. During the operations phase eight air quality indicators are predicted to

increase over existing ambient concentrations. These were identified as residual adverse effects. Effects of decommissioning are considered to be similar to those of site preparation and construction.

OPG's hypothesis is that for a significant adverse effect to result from the DGR project, ambient air concentrations outside the site-study area would have to exceed the relevant ambient air quality criteria more than 10 percent of the time.

Ambient air quality criteria in Canada are typically set such that occasionally exceeding criteria is not likely to result in significant adverse effects. The Canada-wide standards development process included acceptable frequency for exceeding the criteria value while still achieving the standard.

The maximum ambient concentrations for suspended and fine particulate matter may exceed ambient air quality criteria periodically during the site preparation and construction and decommissioning phases of the project. While the effects may occur throughout the site preparation and construction phase they

are predicted to occur less than 0.5 percent of the time. To provide some context this is less than two days in any year.

The area where the exceedances occur is just outside the fence line of the Bruce nuclear site and while it is accessible to the public, it is not in an area used for residential purposes. At human receptors none of the indicators exceed relevant ambient air quality criteria.

During the operations phase predicted emissions do not exceed relevant ambient air quality criteria. For these reasons OPG concluded that the increase in ambient concentrations of particulate matter is not significant. Our high degree of confidence in this conclusion is founded on the use of a conservative approach to predicting effects, site-specific meteorological data and an established air dispersion model.

Noise: During the site preparation and construction and decommissioning phases a noticeable increase in noise is predicted near Baie du Doré. Published literature includes information on how changes in

noise level affects people. Based on available literature, OPG's hypothesis was that for changes in noise levels to be significant they would have to be disturbing. That is, the noise level would need to increase more than 10 decibels over the quietest existing hourly noise level.

The increase in ambient noise predicted to result from the DGR project is 5 decibels. For this reason, OPG concluded that the increase in noise resulting from the DGR project is not significant.

Although not a part of OPG's hypothesis for significance, OPG also considered the reference materials that Health Canada mentions in its sufficiency review. As part of the assessment of effects on human health, Health Canada's 2010 reference was considered. For the DGR project this threshold is not exceeded.

The noise levels associated with the DGR project will be less than the 30 dBA noise level inside buildings recommended by the World Health Organization to minimize sleep disturbance. The DGR project noise will also be less than the more recent World Health Organization's recommended night noise guideline

of 40 dBA outside dwellings at all receptors calculated over the period of a year.

For these reasons, OPG has a high degree of confidence in the conclusion that the increase in noise is not significant.

Turning now to Aboriginal interests, the DGR project is predicted to have an adverse effect on Aboriginal heritage resources. The effect is a diminished quality or value of activities undertaken at the Jiibegmegoong burial site which is located on the Bruce nuclear site more than a kilometer to the southwest of the DGR project.

There are no absolute effects thresholds in literature to use when evaluating the diminishment of quality or value of ceremonies. OPG's hypothesis was that for an effect to be significant, the activities associated with the DGR project would have to prevent or interfere with access or activities at the burial site.

OPG follows a draft protocol to ensure that access is granted when members of the Aboriginal community request access to the burial site. No changes in access to the site will

result from the DGR project.

Activities associated with site preparation and construction may result in increased noise and dust levels at the burial site and may contribute to a diminished quality or value of ceremonies undertaken there. Adverse noise and dust effects are associated only with the site preparation and construction and decommissioning phases and can be managed so that they do not result in adverse effects during ceremonies or observation of the burial site.

The visibility of structures associated with the DGR project including the waste rock pile may contribute to the diminishment of value or quality of ceremonies. However, the DGR project is not expected to change the existing industrial nature of the Bruce nuclear site and is therefore not expected to prevent or interfere with ceremonial activities.

For these reasons, OPG concluded the effects of the DGR project on the Jiiibegmegoong burial site are not significant. OPG is confident in this conclusion because the project will not change existing access

arrangements and indirect noise, dust, visual effects can be managed and mitigated if necessary.

For several components of the biophysical environment no residual adverse effects were identified and therefore an assessment of significance was not required. As part of the response to the information request, OPG developed significance hypotheses which would have been used for these components of the environment if a residual adverse effect had been identified:

- For an effect arising from radiation and radioactivity to be significant the predicted doses to humans would need to be above regulatory criteria.

- For non-human biota the effects would have to have been predicted to be above established screening criteria to be assessed as significant.

- For an effect on near-surface geology and hydrogeology to be significant, OPG hypothesized that there would have to be migration of contaminants of potential concern in excess of relevant criteria on a frequent and/or

continuous basis or alteration of the shallow groundwater flow regime to an extent that's sensitive or critical habitats would be altered on a frequent or continuous basis.

- For an effect on surface water quality to be significant, concentrations of contaminants in releases would have to exceed relevant discharge criteria or result in alteration of the surface water quality regime sufficient to result in adverse effects to sensitive or critical habitat on a long term or continuous basis.

In conclusion, OPG has now used two different methodologies, each based on accepted environmental assessment practice to assess the significance of the residual adverse effects of the DGR project. The CNSC used a third methodology. Each of these assessments reached the same conclusion, that the DGR project is not likely to cause significant adverse environmental effects.

The detailed narrative explains how the significance of each residual adverse effect was determined and provides a transparent assessment of significance. It is presented in a

manner that allows a third party reviewer to understand how the conclusion was reached. OPG has confidence that the DGR project is not likely to result in any significant adverse effects to the environment. OPG's confidence is based on the use of the precautionary approach in the assessment. In addition, a follow-up monitoring program is proposed to verify the predicted effects and the effectiveness of mitigation measures.

This completes the presentation on significance assessment.

As Ms Swami noted in her introduction, I will now address the comment in Environment Canada's submission PMD14-P1.4 on page 8. As noted by Environment Canada, OPG incorrectly attributed to Environment Canada an assessment in CNSC's response to undertaking number 47, that compliance with the proposed discharge criteria would result in compliance with section 36(3) of the *Fisheries Act* and would not be deleterious to aquatic communities in MacPherson Bay.

With respect to surface water quality, OPG reiterates that it is committed to

compliance with applicable regulatory requirements. Results of surface water quality modeling completed in 2012 indicated that with appropriate mitigation discharge from the storm water management pond could meet proposed discharge criteria without the need for additional treatment. OPG is aware that through the environmental compliance approvals process, discharge limits may be established which may differ from those proposed in the EIS. If needed to meet regulatory criteria, OPG will implement treatment.

I will now turn to Mr. Wilson.

MR. WILSON: Derek Wilson for the record.

Last week the Panel asked if OPG could comment briefly on the consequences of unplanned releases from the storm water management pond. The Panel would be particularly interested in distinguishing among the various constituents of concern that would be in a storm water management pond versus in the repository itself.

During construction there will be approximately 27 litres per second going to the

storm water management pond. Contributions to that storm water management pond from the underground development activities is greater than 80 percent. The next largest contributor is runoff from the surface facilities at 10 percent and from the waste rock management pile at approximately 6 percent, and then 2 percent from direct precipitation. During the operations phase, however, the discharge from the underground workings is limited to any water inflows from the shafts, which is conservatively estimated to be less than .5 litres per second, and 7 litres per second in total going to the storm water management pond from surface runoff conditions. This information was discussed in detail as part of the July 18th, 2012 technical information session, as well as the October 1st, 2013 hearing days.

The storm water management pond following best practices is documented in the Ministry of Environment's Storm Water Management Planning and Design Manual. It is designed to contain the six hour 25 millimetre storm event and safely pass the 100 storm year event. As discussed in 2013, the storm water management

pond is subsequently sized to be able to contain the 24 hour 10 year storm event as currently proposed.

For both the construction and operation phases, the prime constituent of concern in the overflow discharge would be total suspended solids associated with surface runoff. We have modeled other constituents that could be affected, such as un-ionized ammonia and total dissolved solids at peak concentrations from the waste rock management area. And these would be in concentrations consistent with the detailed modeling provided in 2012 as part of the Bruce County Peer Review.

Predicted concentrations are at the point of the storm water management discharge and do not take into consideration mixing with waters from other sources contributing to the drainage ditch to MacPherson Bay. It's conservative and does not take into consideration mitigating measures or reductions in concentrations from the waste rock management area over time. The storm water management pond is designed to direct the overflow to the interconnecting ditch and not back towards the

project site or the north marsh. As part of good operating practice, in the event of such a storm, discharge from the underground activities would be suspended as to not contribute to the loading of the storm water management system, as there is sufficient capacity for storage in the underground sump system.

THE CHAIRPERSON: Thank you very much. We will now continue with the presentation by the Canadian Nuclear Safety Commission, which is PMD14-P1.2D. Dr. Thompson, please proceed.

**PRESENTATION BY / PRÉSENTATION PAR:
CANADIAN NUCLEAR SAFETY COMMISSION**

DR. THOMPSON: Good morning, Madam Chair and members of the Joint Review Panel. My name is Patsy Thompson. Je suis la directrice générale de la Direction de l'évaluation et de la protection environnementale et radiologique avec la Commission canadienne de Sûreté nucléaire.

With me today are Dr. Hemendra Mulye and Mr. Graham Smith, environmental risk assessors with the CNSC's Environmental Risk

Assessment Division. In addition, other members of the CNSC staff's technical review team are available to answer questions.

CNSC staff have reviewed OPG's submission of the methodology used to determine the significance of adverse environmental effects as requested by the Joint Review Panel and information requests EIS-12-510. CNSC staff also submitted as part of last year's hearing proceedings a lengthy response to undertaking number 53 that outline CNSC's staff assessment of significance of adverse environmental effects.

Today's presentation summarizes CNSC staff's review presented in PMD14-P1.2. I will now ask Mr. Hemendra Mulye to continue with the presentation.

MR. MULYE: Thank you, Dr. Thompson. Good morning, Madam Chair, members of the Joint Review Panel. For the record my name is Dr. Hemendra Mulye. I am an environmental risk assessment specialist at the CNSC. This presentation will cover the following topic areas: CNSC staff's previous assessment of the significance of residual adverse effects on the biophysical environment in undertaking number 53;

the basis for CNSC staff's review of OPG's response to the information requests, as well as our methodology to assess significance as presented in undertaking number 53; an example of CNSC staff's analysis of the significance of adverse effects of the DGR project on the terrestrial environment; a discussion of OPG's response to information request EIS-12-512, and, finally, the impact of this assessment on previous CNSC staff conclusions and recommendations for the EIS and the licence to prepare the site and construct the proposed DGR.

In PMD13-P1.3, CNSC's staff summarized our assessment of OPG's submission on the assessment of the significance of residual adverse effects on the biophysical environment and on Aboriginal interests as provided in the 2011 Environmental Impact Assessment. Then during the 2013 hearings the Panel requested, in undertaking number 53 additional, information on CNSC staff's evaluation of significance, including the methodology and criteria used in the assessment. The environmental aspects covered in CNSC staff's response to the undertaking included hydrology and surface water,

aquatic environment, terrestrial environment, human health, and, finally, radiation dose to non-human biota.

Prior to the assessment of significance of residual adverse effects, CNSC staff reviewed the information submitted by OPG from the perspective of completeness, logical reasoning, and that the information was scientifically sound. Where information was lacking or needed further clarification, information requests were issued. OPG's responses to these information requests were reviewed by CNSC staff.

CNSC staff used a number of methods to determine significance of residual adverse effects depends on the biophysical component of the environment being assessed. Staff did not rely on OPG's methods for determining significance. Staff used criteria outlined in the EIS guidelines issued in 2009. These criteria are magnitude, geographic extent, timing, duration, frequency, reversibility, ecological and social cultural contexts, and probability of occurrence. A weight of evidence approach was then used by CNSC staff to

collectively consider the information provided for each of the significance criteria. In doing so, staff took into account uncertainties and used a precautionary approach.

Documents, standards, guidance and objectives used by CNSC staff for significance assessment are listed in the reference section of a response to Undertaking No. 53. These include relevant regulatory documents, environmental standards, guidance and objectives published by federal, provincial or international agencies to assess potential effects of hazardous substances on human health.

Toxicity reference values were used by regulatory agencies such as Health Canada, U.S. Environmental Protection Agency, World Health Organization or the Ontario Ministry of the Environment were used in the assessment.

If applicable quantitative standards for a biophysical environmental component did not exist, then significance was determined using factors derived from the scientific literature such as ecological function and the presence of unique features.

In the Environmental Impact

Statement and through information requests, OPG identified eight residual adverse effects for site preparation and construction in operations phases of the DGR project. These are found under hydrology, terrestrial environment, aquatic environment, noise and vibration, atmospheric environment and Aboriginal interests.

In the EIS, OPG assessed the significance of these residual adverse effects using a decision tree approach along with the criteria outlined in the EIS guidelines.

CNSC staff found OPG's approach to be acceptable.

I will now pass on this presentation to Mr. Graham Smith to provide a detailed example of how CNSC determine significance.

MR. SMITH: For the record, my name is Graham Smith. I'm an Environmental Risk Assessment Officer with the CNSC.

This portion of the presentation will discuss staff's determination of significance using the terrestrial environment as an example. I will first provide a brief summary of the residual adverse effect identified and

will then present CNSC staff's use of the EIS criteria for making a significance determination.

For the terrestrial environment, the EIS identified an adverse effect to eastern white cedar associated with the clearing of mixed woods forest within the DGR project area during site preparation and construction activities.

The mixed forest vegetation community was represented by the eastern white cedar as a Valued Ecosystem Component, or VEC, in the EIS because it is an abundant species in the local study area, indicating it is a good representative for local forests.

It is slow growing and plays an important role in providing habitat for wildlife, particularly in winter when it is a preferred food source of food and shelter by white-tailed deer and other wildlife. Also, as a conifer, it was considered potentially more susceptible to changes in air quality.

Mitigation measures proposed by OPG included the retention of forest where possible and constructing exclusionary fencing around the project area to prevent further loss of species from adjacent habitats. However, the

loss of 8.9 hectares of mixed wood forest could not be mitigated and, therefore, this was identified as a residual adverse effect of the project.

To assess the significance of the forest removal, staff evaluated the residual effect using the significance criteria provided in the EIS guidelines. As mentioned in a previous slide, these are magnitude, geographic extent, timing, duration, frequency, reversibility, ecological and social context and the probability of occurrence.

Firstly, the magnitude of the effect was evaluated. The importance of a given area of forest is highly site specific, requiring consideration of a number of forest attributes. For this reason, a generic quantitative benchmark that would characterize the magnitude or amount of forest removal which may be considered significant was not available.

In the absence of a quantitative benchmark regarding the magnitude of an effect, CNSC staff employed a weight of evidence approach using information provided by the proponent for each of the remaining EIS significance criteria,

which I will now outline.

Regarding the geographical extent criterion, the removal of mixed forest will be limited to within the DGR project area. As mentioned on a previous slide, an estimated 8.9 hectares will be cleared to make room for surface infrastructure.

Within the site study area, or SSA, additional forest exists to the northeast and also to the south, which is where the largest on-site woodlands are located and which are contiguous with the forests of Inverhuron Provincial Park.

Considering these additional forests, 8.9 hectares amounts to approximately 11 percent of the mixed forest in the site study area.

Also, primarily due to forests to the north of the site, including McGregor Point Provincial Park, the amount to be cleared represents less than one percent of the woodland in the local study area, or LSA.

The timing, duration and frequency are relatively straightforward for this effect. The forest clearing will commence during

site preparation activities and direct effects to eastern white cedars would be continuous throughout operations.

Regarding the probability of occurrence criterion, although OPG has indicated the vegetation removal will be avoided where possible, the removal of 8.9 hectares will be required should the project be approved.

For evaluating the reversibility criterion, CNSC staff acknowledge that the rehabilitation or site rehabilitation is planned for the DGR site during the decommissioning phase and which includes plans for mixed forest regeneration.

It is recognized, though, that it will take additional time before forests would be re-established to their current state. Therefore, for the purposes of significance determination, this effect was treated as non-reversible by CNSC staff.

As mentioned earlier, the value of a given forest or forest subset is highly dependent on site-specific attributes. These are considered primarily under the ecological context criterion.

The 8.9 hectares of forest to be cleared do not contain features such as species composition, age or habitats that would be considered unique to the local study area.

The forest exists as three smaller forest parcels comprised of common regenerating species, and their ecological function is limited by their small size, fragmentation and the high level of disturbance they are subjected to as a result of their location amongst the infrastructure of the Bruce nuclear power plant and other on-site infrastructure.

Habitat connectivity was considered under the ecological context criterion. The forest is used occasionally by wide-ranging wildlife species such as white-tailed deer and wild turkey. However, the ability of the forest in the DGR project area to function as meaningful habitat connections for bird and wildlife movement is severely limited by the presence of the existing Bruce Power facilities to the north, south and to the west.

Continuing with ecological context, the sustainability of eastern white

cedar in the local study area will not be compromised. The 8.9 hectares of forest represents a very small proportion, less than one percent, of the mixed wood forest in the local study area. Therefore, the loss of this forest area was not considered critical to the sustainability of this vegetation community in the local area.

Regarding the sustainability of bird and wildlife populations using the forests which are targeted to be cleared for the DGR project, the species which inhabit these forests are generally those that are tolerant of disturbance and fragment forest habitat.

Given the abundance of fragmented forest in the region, these are generally common species with healthy populations.

Furthermore, due to their small size, these forest fragments do not provide the interior forest habitat that is preferred by many area-sensitive species. Therefore, removal of this low quality habitat is not expected to have measurable impacts on local populations of bird and wildlife species.

Considering the information

provided by the proponent, the key points of which I have just outlined in this presentation, CNSC staff determined that the residual adverse effect on the terrestrial environment, namely the cleaning of 8.9 hectares of mixed forest for the DGR project, is not likely to result in a significant adverse effect on the terrestrial environment taking into account the implementation of mitigation measures.

We hope that by walking through the specific example provided a clearer understanding of the methodology used by CNSC staff to determine the significance of adverse effects.

I will now pass this presentation back to Dr. Hemendra Mulye.

DR. MULYE: Thank you.

Dr. Hemendra Mulye, for the record.

During the fall 2013 hearings, the Panel asked OPG how the significance of adverse environmental effects was assessed for the DGR project.

In response to the questions from the JRP during the hearings, OPG outlined the

approach used for determining the significance of adverse effects in the EIS.

Subsequently, the JRP requested as part of information request package number 12 that OPG provide a detailed explanation of how the significance of each residual adverse effect on the biophysical environment and on Aboriginal interests was determined.

The proponent's response to this information request was submitted to the JRP on March 28 of this year.

CNSC staff completed and submitted a detailed sufficiency review of OPG's submission on June 6 of this year. Our review is available on the registry as entry number 1871.

OPG's response to information request EIS-12-510 relied on a series of hypotheses or conditions for each residual effect. In order for a residual effect to be considered significant, any of -- any one of the conditions would need to be evaluated as true.

OPG applied context-based reasoning as requested by the Panel in the information request to make a determination regarding each hypothesis, and ultimately arrived

at its final significance determination.

Each effect was also characterized using the EIS significance criteria discussed earlier.

OPG's initial approach used in the 2011 EIS submission involved categorizing each effect under the various significance criteria and making a determination using a decision tree.

OPG's conclusions using the hypothesis approach outlined in their response to EIS-12-510 were consistent with the significance determination made in the EIS.

CNSC staff also reviewed OPG's approach and found the hypothesis used as well as the reasoning to be acceptable. Much of the reasoning used to assess each hypotheses was similar to that used by CNSC staff in response to undertaking 53.

CNSC staff have determined that the additional information and analysis provided by OPG in response to the information request have no impact on previous assessments presented in PMD 13-P1.3 for the environmental impact statement and PMD 13-P1.2 for the licence

application.

On the basis of our independent assessment of all the information presented to support the EIS CNSC staff continue to conclude that the DGR project is not likely to result in significant adverse effects on the environment taking into account the implementation of mitigation measures and OPG's commitments.

Staff also conclude that OPG is qualified and will make adequate provisions to protect persons and the environment as required under the *Nuclear Safety and Control Act*.

This concludes CNSC staff's presentation. We are available to answer any questions.

THE CHAIRPERSON: Thank you.

We will now continue with the presentation by Environment Canada, which is PMD 14-P1.4.

After Environment Canada's presentation we will be taking a break, and then after the break we will proceed with questions for all three.

Ms Ali, please proceed.

PRESENTATION BY / PRÉSENTATION PAR:
ENVIRONMENT CANADA

MS ALI: Good morning everyone, my name is Nardia Ali and I am the Manager of Compliance Promotion, Expert Support and Nuclear Operations at Environment Canada.

With me to day is Sandro Leonardelli, Senior Environmental Assessment Coordinator for the DGR EA review at Environment Canada.

We also have technical experts available via phone, if needed.

Environment Canada received a request from the Panel to be here today to present our review of the OPG response to EIS-12-510 on the methodology used to determine significance.

For the presentation today I will briefly describe Environment Canada's role in the environmental assessment process, Environment Canada's mandate and expertise related to the DGR project review, and the focus of our review of the project.

Then I will summarize EC's

submission to the Joint Review Panel dated July 2, 2014 related to our review of OPG's responses to information request EIS-12-510.

I will not explain EC's role in the EA process.

Environment Canada participates as a federal authority under the *Canadian Environmental Assessment Act* to provide specialist information and knowledge related to our mandate as requested by the Joint Review Panel.

Environment Canada has actively participated in the review of the environmental impact statement for the DGR. EC provided a written submission to the JRP on July 22, 2013 on the findings of our review and actively participated in the 2013 public hearings.

Following those hearings in November 2013 the JRP issued additional information request to OPG on several topics. OPG provided its response to those information requests over the subsequent months.

On June 9, 2014 the JRP requested that Environment Canada provide a written review of OPG's responses to three of the information

requests and participate in these public hearings.

Environment Canada provided a written submission to the JRP on July 2, 2014 regarding the adequacy of the OPG responses.

On August 15 the JRP again wrote to EC requesting a presentation on our submission on two of the information requests; EIS-12-510 and EIS-12-512. Today we look at EIS-12-510.

I will now describe EC's mandate, expertise, and the focus of our review.

Environment Canada's mandate and expertise in relation to the DGR project is with regard to impacts on or related to water quality, water quantity, air quality, accidents and malfunctions, migratory birds, species at risk, ecological risk assessment, and effects of the environment on the project.

Environment Canada's review was focused on potential effects of the project upon the surface environment, primarily during the construction, operations and abandonment phases.

The potential migration of contaminants out of the repository during the abandonment and long-term performance phase was

outside the scope of Environment Canada's mandate and expertise.

With respect to IR EIS-12-510 Environment Canada did not comment on OPG's assessment methodology. Instead, our review focused on whether the predictions and conclusions in OPG's response were valid and consistent with our own views and conclusions.

I will now provide the general conclusions of EC's review of EIS-12-510.

In general, Environment Canada concurs with OPG's conclusions about the significance of residual effects for: hydrology, specifically the effects on surface water levels and flows and the maximum flood hazard assessment; the terrestrial environment, specifically the effects on migratory birds and species at risk; near surface geology and hydrogeology, specifically the effects upon water levels and flows in the northeast marsh, also known as wetland 4, and water quality in the northeast marsh.

Environment Canada also concurs with OPG's conclusions about the significance of

residual effects for air quality, radiation and radioactivity, surface water quality.

I would like to note that Environment Canada's assessment approach for review of the original EIS was similar to the context-based reasoned argument methodology described by Dr. Duinker in his 2013 report to the JRP.

It is worth noting that OPG's response to EIS-12-510 did not contain any new information as compared to the original EIS. OPG only used a different methodology to evaluate that information.

OPG's revised methodology and assessment does not alter Environment Canada's independent conclusions about the significance of these residual effects.

I will now go into more detail on specific aspects of our review of this IR response.

So first of all, the Environment Canada conclusions regarding hydrology. So hydrology regarding effects and water levels and flows. Environment Canada's sufficiency review was in relation to changes to flows in the North

Railway Ditch and its downstream impact to flows in Stream C.

The net flow reduction within the North Railway Ditch predicted to be a 31 per cent loss of flow means that stream flows are less likely to cause erosion and therefore less likely to carry elevated levels of total suspended solids to Stream C.

Furthermore, OPG has committed to installing silk curtains so that sediment from site preparation activities will not enter the North Railway Ditch and therefore will not affect Stream C.

Environment Canada does not deem the 0.8 per cent flow reduction to Stream C to be significant. In fact, it would be difficult to detect considering the normal range of variability and flows both seasonally and from year to year.

Overall, Environment Canada concurs with OPG's conclusions, that this is not a significant residual effect.

The information presented in the OPG response does not alter any of the conclusions or recommendations outlined in

Environment Canada's departmental submission or in our testimony during the 2013 public hearings.

Hydrology regarding the maximum flood hazard assessment. OPG's IR response includes an assessment of the project's effect on flows and the drainage ditch at Interconnecting Road.

Environment Canada concurs with OPG's conclusions about the significance of effects. Any potential effects of increased flow within the drainage ditch at Interconnecting Road can be mitigated through redesign of the ditch.

The information presented in the OPG response does not alter any of the conclusions or recommendations outlined in Environment Canada's departmental submission or in our testimony during the 2013 public hearings.

Environment Canada's recommendation 3.13 in our original written submission recognized that OPG would need to submit a final detailed engineering design of the DGR surface facilities and infrastructure, and that a revised flood hazard assessment should be conducted based on that design.

Climate change is expected to

increase the frequency and intensity of storm events. Environment Canada's recommendation 3.13 made note of the importance of incorporating the potential effect of climate change on the size of the probable maximum precipitation event, particularly since the PMP event and the resulting flooding have implications for loss of human life at the DGR site.

Next, I will summarize the EC conclusions regarding the terrestrial environment.

Regarding impacts to the terrestrial environment, in our original review of the EIS Environment Canada evaluated potential effects to migratory birds and species at risk arising from forest habitat loss, noise and disturbance, loss or changes to nearby wetlands, and wildlife mortality during land-clearing activities.

Environment Canada concurs with OPG that the 8.9 hectare habitat loss would not result in significant adverse effect. Although the OPG response does not directly address the other factors noted above, they were previously addressed to Environment Canada's satisfaction

and we concluded that they would not cause a significant adverse effect.

Therefore, the information presented in the OPG response does not alter any of the conclusions or recommendations outlined in Environment Canada's original departmental submission or in our testimony during the 2013 public hearings.

Environment Canada's departmental submission provided the rationale for our conclusion that the 8.9 hectare habitat loss would not result in a significant adverse effect.

The context-based reasoning that led to this conclusion is as follows. The largest remaining forest within the site study area exists to the south approximately one to two kilometres from the DGR site. These are the least fragmented forests in the site study area on are contiguous with forest and Inverhuron Provincial Park.

Forests to the east of the site study area, approximately 300 metres to two kilometres from the DGR are much more fragmented and are not as contiguous with adjacent forested areas.

At the DGR site a total of 8.9 hectares of mixed forest spread across tree forest fragments will be lost as a result of the project. The 8.9 hectares is comprised mostly of Eastern white cedar, which is common and abundant within and surrounding the site study area.

These three small remnant forest patches on the southern half of the DGR site do not represent pristine habitat and are too small and isolated to support viable populations of area-sensitive breeding bird species. Area-sensitive breeding bird species have a preference for larger woodlots and in southern Ontario are typically absent or found in low numbers in forests that are less than 30 hectares in size.

The tree forest on the DGR site, which amounts to 11 percent of the mixed forest within the site study area, are only 2.9 percent of all forest within the site study area and are not connected to the larger forests such as those in nearby Inverhuron Provincial Park.

Based on the above information, Environment Canada concludes that migratory bird species of conservation concern are unlikely to

be found in significant numbers in the DGR site and those habitats closest to the existing industrial development.

EC believes that the remaining small fragmented blocks of natural habitat, which are surrounded by existing infrastructure, including buildings and roads, cannot support the breeding requirements of notable populations of breeding bird species of high conservation concern, example species at risk on Bird Conservation Region 13 priority species.

Furthermore, many of the migratory bird species that utilize fragmented forests are tolerant of disturbed habitats and often occur in high abundance because there is an ample supply of these habitats in southern Ontario.

The 8.9 hectare loss of this habitat type at the DGR site does not pose any serious concerns. Area-sensitive breeding bird species do occupy fragmented habitats, but at a much lower abundance and diversity than in similar large habitats.

EC therefore believes that the loss of a small quantity of low-quality forest

habitat will not have a significant adverse environmental effect on provincial or even regional breeding bird populations.

Noise levels at the DGR site are unlikely to have an adverse effect on breeding bird populations, except at a very local scale, given the fragmented condition of the forest within the site study area.

Furthermore, many of the breeding bird species that currently utilize these fragmented habitats are already adapted to disturbance, such as the activities and noise associated with the existing facilities; for example, the Western Waste Management Facility.

Noise effects from the DGR site preparation and construction, such as from heavy machinery and blasting, are temporary effects that are intermittent and staged over approximately six years. Noise from ongoing DGR operations from ventilation fans for the two shafts in the air compressor plant will be constant and more similar to noise from the existing facilities.

So although the project may result in adverse noise impacts on migratory

birds, the site study area is already heavily impacted by industrial disturbance; example, habitat fragmentation, noise, lighting, traffic and buildings.

The habitats closest to the DGR will experience a notable increase in noise impacts, but this will not affect significant numbers of breeding birds that have been identified as high priority species within Bird Conservation Region No. 13.

Local bird populations already seem acclimated to a high degree of human disturbance.

I will next describe the EC conclusions regarding air quality.

With respect to air quality, Environment Canada evaluated potential effects to air quality during the various phases of the project. Based on the original review, Environment Canada had concluded that OPG's modelling approach and emission estimates were appropriate and that the air quality predictions were credible and suitably conservative.

Environment Canada concurs with OPG's conclusions about the significance of

effects. The predicted frequency of exceedances of air quality criteria as a result of the project is less than one percent and we would conclude that this would not be a significant effect, particularly when considering the conservativeness of the modelling, which likely overestimates the effects, the duration of effects, exceedances during the Stage 1 construction phase only when concurrent activities of site preparation, surface facility construction and shaft excavation are occurring.

The magnitude of effects exceedances are for some of the one-hour and 24-hour criteria only with only a small increase reflected in our newer levels, which remain well below the annual criteria and the geographic extent of the exceedances primarily occur on site and just beyond the OPG property fence line, with no exceedances predicted at human receptor locations.

One of Environment Canada's recommendations on our original written submission was that a follow-up monitoring program for air emissions be implemented to ensure the facts are consistent with predictions.

In summary, the information presented in the OPG response does not alter any of the conclusions or recommendations outlined in Environment Canada's original departmental submission or in our testimony during the 2013 public hearings.

I will now move on to the EC conclusions regarding radiation and radioactivity.

With respect to radiation and radioactivity, the scope of Environment Canada's review was limited to impacts on migratory birds and federal species at risk and was primarily focused on ensuring that the general risk assessment methodologies were appropriate and that valued ecosystem components were appropriately assessed since they act as surrogates for all species found on site.

Environment Canada does not have any outstanding concerns since the predicted dose increases to wildlife are small and well below established dose criteria.

The information presented in the OPG response does not alter any of the conclusions or recommendations outlined in

Environment Canada's original written submission or in our testimony during the 2013 public hearings.

I will now provide the EC conclusions regarding near surface geology and hydrogeology.

With respect to near surface geology and hydrogeology, Environment Canada's review of the DGR EIS addressed the following: the effect on surface water levels and flows, most importantly the Northeast marsh and Stream C and the effect on surface water quality in the Northeast marsh.

Based on the original review, Environment Canada had concurred with OPG's determination that water levels in the marsh will not likely be affected due to the very low permeability of the glacial tills that underlie the marsh and the remainder of the DGR site.

Environment Canada's recommendation 3.12 from our written submission seeks verification that the overburden permeability is in fact low, consistent with OPG's descriptions and assumptions.

In our original written

submissions, EC had not specifically discussed the potential for groundwater contamination to enter the Northeast marsh. Environment Canada did not consider this to be a concern in light of the low permeability overburden at the DGR site, the ditching system that surrounds the waste tract management area and the lower elevation of the stormwater management pond in relation to the marsh, which would prevent groundwater flow towards the marsh.

In the conduct of our sufficiency review, Environment Canada evaluated OPG's response in relation to these same issues. With regard to evaluating the significance of effects, OPG's overall response is sufficient.

Environment Canada concurs with OPG's conclusions about the significance of effects. The information presented in the OPG response does not alter any of the conclusions or recommendations outlined in Environment Canada's original written submission or in our testimony during the 2013 public hearings.

Next I will provide the Environment Canada conclusions regarding surface water quality.

Regarding surface water quality, Environment Canada's original review of the DGR EIS addressed the following: the potential effect of the effluent discharged from the stormwater management pond on downstream surface water quality and aquatic biota and the potential effects of spills.

Environment Canada's original written submission included an extensive discussion and evaluation of the effluent discharged from the stormwater management pond.

Environment Canada's main conclusion was that treatment will be required for effluents from the DGR facility in order for it to be in compliance with subsection 36.3 of the *Fisheries Act*.

A number of related recommendations were made. In the conduct of our sufficiency review of OPG's response to IR EIS-12-510, Environment Canada's evaluation was in relation to the same issues previously mentioned.

With regard to evaluating the significance of effects, OPG's overall response is sufficient.

Environment Canada concurs with OPG's conclusions about the significance of effects. The information presented in OPG's response does not alter any of the conclusions or recommendations outlined in the EC's original written submissions or in our testimony during the 2013 public hearings.

Environment Canada's 2013 written submission provided an extensive analysis of the stormwater management pond, the issues that may affect the final effluent quality and potential downstream effects.

It is Environment Canada's expectation that OPG will design and operate the stormwater management pond and associated treatment system in accordance with the conclusions and recommendations outlined in our written submission.

Environment Canada also stated at the public hearings, specifically on October 30th, 2013, that it is our expectation that the stormwater management pond will be designed to minimize discharge of untreated effluent and pond sediment in the case of a severe storm event.

In our Sufficiency Review

Submission, Environment Canada did make several comments regarding the OPG response wherein we disagreed with some of the statements and characterizations made by OPG. These comments do not alter the fact that we agree with OPG's conclusion about the significance of effects on this aspect of the project.

Finally, I will give a summary of Environment Canada's position. In summary, Environment Canada is of the view that OPG's response to EIS-12-510 was sufficient within the context of our review.

For all of the potentially adverse effects reviewed by Environment Canada, the information contained in the OPG response does not alter any of the conclusions or recommendations previously outlined in our written submission dated July 23rd, 2013 and during our oral testimony and any undertakings over the course of the public hearings held in 2013.

Thank you for your attention and we will be pleased to address your questions.

THE CHAIRPERSON: Thank you very much, Ms Ali.

We are now going to take a 15-minute break. We will return at 10:45.

--- Upon recessing at 10:27 a.m. / Suspension à 1027

--- Upon resuming at 10:46 a.m. / Reprise à 1046

MS MCGEE: Good morning. If I could ask everyone to take their seats we will resume.

Before the Panel begins their questions, I would ask everyone to take this opportunity to once again check your cell phones and other electronic devices and ensure that they are on silent mode.

Thank you very much.

THE CHAIRPERSON: The Panel will now proceed with its questions based on the previous three presentations and I would like to start with Dr. Muecke, please.

MEMBER MUECKE: Thank you.

The Panel's first questions go to CNSC. Could you outline for the Panel and the public the main features of the weight of evidence approach to determine significant residual adverse effects versus the narrative reasoned argument approach taken by OPG?

As much as possible, could you please put it into accessible language?

--- Pause

DR. THOMPSON: Patsy Thompson, for the record.

Perhaps first I will briefly describe the reasoned argument approach that the CNSC has used as well on certain occasions.

So the reasoned approach argument implies that you set a hypothesis and set a priori what would be considered significant. Our experience is that this works reasonably well when you can put numerical values or look at, for example, loss of function in a valued ecosystem component.

For example, the CNSC has done it for some environmental assessments where we looked at, for example, the discharge of treated effluent with concentrations of metals and radionuclides that may accumulate in sediment and we looked at predictions of impairment and sediment quality and from that made assumptions on what we would consider significant in terms of impairment of benthic invertebrate communities, for example, a decrease in 50 percent of the

density number of organisms or loss of 30 percent of species, that type of hypothesis, and then we would look at predictions and when we do monitoring programs we verify our predictions.

In terms of the weight of evidence approach, what is typically done is to take all of the information that has been collected. For example, we went through the various factors looking at significance in terms of geographic extent, magnitude, reversibility and all of those factors together, and so the important thing with the weight of evidence is you take into consideration all of the factors to have a more comprehensive picture of what the impact may be and using all of that information come to a conclusion. So it's weighting the different factors or different lines of evidence that have been brought forward, using professional judgment and scientific literature, to make an overall conclusion.

THE CHAIRPERSON: Dr. Thompson, thank you. The Panel has some follow-up, therefore, on how you have distinguished between a narrative and a weight of evidence approach.

How specifically does the CNSC

weight of evidence approach differ from OPG's narrative approach, and for this the Panel did rely on your response to Undertaking No. 53.

The Panel notes that in Undertaking 53 the CNSC essentially uses the same list of significance criteria as was used in OPG's narrative, only you have placed it in the context of a weight of evidence. However, the Panel would like more clarity with respect to how the CNSC's weight of evidence analysis of those same criteria for significance differed in any material way from the narrative provided by OPG.

We do know that the one time in the Undertaking 53 where it was clear that it differed was the CNSC's use of risk quotients for water quality parameters, but the Panel were unable to identify any other examples of material difference between the CNSC's analysis, which it calls a weight of evidence, and the OPG's analysis which is a narrative.

DR. THOMPSON: Patsy Thompson, for the record.

You are right, in terms of material differences for this assessment there isn't substantive differences between the two

approaches and, as we mentioned in our presentation and in the submissions to the Panel, the conclusions using the approaches are basically the same. We also noted that the information used by both approaches is essentially the same.

So it's more in the way that the information is assessed and evaluated and presented that there is a difference. But in terms of the amount of information used, the data that is in the EIS that we have used, it is essentially the same information and the same criteria.

THE CHAIRPERSON: Given how you have just explained how CNSC approached the task of reviewing the significance of adverse effects, how does the CNSC justify its statement earlier to this Panel that the same information was evaluated two or three different ways because, as the Panel had noted earlier, really in Undertaking 53 response from CNSC the only material difference that is evident is for the risk quotients approach used in water quality?

DR. THOMPSON: Patsy Thompson, for the record.

You are right in this case, the different approaches were materially similar. We tend to refer to our method as the weight of evidence approach because we have used guidance from the U.S. EPA and other organizations where the line for complex assessments, where the different lines of evidence are weighted in terms of quality of the information, the uncertainty and other parameters, and so in this case where the assessments for many of the parameters that we presented this morning wasn't very complex, then the difference between the approaches isn't that evident.

THE CHAIRPERSON: So, therefore, finally, Dr. Thompson, the Panel would appreciate some further clarifications regarding the description of the CNSC approach.

The Panel's understanding from what you have just told us is that in fact the CNSC did not apply different weights to the various lines of evidence according to some of the criteria you have just mentioned to us from the EPA guidance, such as quality or quantity of information, therefore, would CNSC please comment on the appropriateness of the use of the

description of your approach as a true weight of evidence approach?

--- Pause

DR. THOMPSON: Patsy Thompson, for the record.

Probably the only example where we weighted the quality of the information and assessed -- used the information in a different way is for reversibility for the terrestrial environment, otherwise the approaches are quite similar.

THE CHAIRPERSON: Dr. Thompson, is that different method for evaluating reversibility, remind the Panel, is it contained within the Undertaking No. 53 or shall we have to rely on the transcript and your most recent written submission for that explanation?

--- Pause

DR. THOMPSON: Patsy Thompson, for the record.

My understanding is it is documented in Undertaking 53.

THE CHAIRPERSON: Thank you.

Dr. Muecke...?

MEMBER MUECKE: If I may continue

along similar lines, what confidence does CNSC have that a rigorous application of the weight of evidence approach would not reach the same conclusions as you have reached using the approach that you did use?

DR. THOMPSON: Patsy Thompson, for the record.

I would not say that we did not use a rigorous approach, I would say that we used the approach to the extent that it was necessary given the information we had and the complexity of the assessment, particularly when we speak for the assessment for the site preparation, construction and operations where the types of impacts, especially during the normal operations and some of the accidents and malfunctions considered are the type of impacts that we have seen in many other projects and the science and the information site characteristics for example, the types of releases that can happen for those types of activities are pretty well understood.

THE CHAIRPERSON: Dr. Archibald...?

MEMBER ARCHIBALD: This is a question to OPG and specifically concerns a

response in section 2.1 of your EIS item 510.

It stated there that:

"For changes in flow to be considered adverse, the change would need to be sufficiently large to be accurately detected using standard stream flow measurement techniques and a change of plus or minus 15 percent in stream flow was sufficient to be accurately measured." (As read)

Could you explain to me whether accepted methodology for accuracy prediction applies over all flow ranges or whether the detection actually varies with flow?

MS BARKER: Diane Barker, for the record.

The flow detection accuracy does vary with flow, you are correct.

MEMBER ARCHIBALD: And would this have any bearing on your significance predictions for the low or very high -- obviously not the high flow ranges, but the low flow ranges?

MS BARKER: Diane Barker, for the record.

The flow on the North Railway Ditch, which is one of the ditches that is affected is an intermittent flow, so it's

difficult to accurately assess flows in an intermittent ditch with any degree of accuracy.

The Interconnecting Road Ditch, the other engineered ditch that was affected, at the time of the assessment was also an intermittent -- intermittently flowing ditch, so again it's difficult to get accurate flow measurements.

MEMBER ARCHIBALD: Well, let me go further on then. Several of the CNSC recommendations were submitted in their PMD 13-P1.3 last year in which OPG was asked to collect additional baseline information on sediment quality data in the unnamed ditch at McPherson Bay.

Can OPG provide information to the Panel at this time concerning the status of baseline sediment and quality data collection efforts that have been completed since the time of the last hearings?

And sorry, and additional, if no additional baseline sediment quality data has been collected in the interval, when do you plan to start?

--- Pause

MS SWAMI: Laurie Swami, for the record.

The baseline sampling has been continuing. If it's helpful, we would have to ask someone to pull the data.

MEMBER ARCHIBALD: No, we don't need the data, we just need the timing and the progression.

MS SWAMI: Laurie Swami.

The sampling has been taking place on approximately a monthly basis for the last eight months to a year, if you would.

Is that sufficient?

MEMBER ARCHIBALD: On a similar side, from this same CNSC submission information is requested for conduction of proper assessment of the migration of the tritium plume, which we had a lot of discussion about last year, in order to design an adequate groundwater monitoring well network and provide early detection of the potential migration.

Can OPG provide information to the Panel concerning the status of the tritium plume monitoring network design efforts that have been completed since the end of the last

hearings?

MR. WILSON: Derek Wilson, for the record.

I will take an initial response and then I will ask perhaps Lise Morton to speak with respect to activities at the Western Waste Management Facility.

In 2012 we did establish the shallow groundwater monitoring network, a series of wells at the site. We have been monitoring those wells now on a quarterly basis since the fourth quarter of 2012 and are collecting a database of that information. At this time we are not seeing any changes in the tritium concentrations within that well network. So at this time we don't have any specific need for additional monitoring based on the results that we are seeing right now.

Perhaps Lise Morton has more to offer with respect to Western's tritium monitoring.

MS MORTON: Lise Morton, for the record.

So in addition to what Mr. Wilson has said, in preparation for becoming compliant

with N288.4, there have also been additional groundwater monitoring wells being installed this summer around the Western Waste Management Facility, and I apologize, the exact number of wells escapes my mind right at this moment, but it's upwards of 15 additional wells are being installed, pretty much around a perimeter around the facility to aid with respect to the tritium monitoring that we are speaking of.

MEMBER ARCHIBALD: Therefore, at this time it's not necessary to ask any information about the detail of the monitoring results, but I do have a question.

Have any contingency plans been assessed in any way that might be considered for reduction of plume advance towards the DGR shafts should the proposed project go ahead if either the modelled or measured Plenum advances can potentially exceed the expected migration limits, or migration limits or values expected?

--- Pause

MS SWAMI: Laurie Swami, for the record.

We haven't developed any contingency plans at this time given what the

information is showing us.

MEMBER ARCHIBALD: Thank you, then.

I would like to address a question to CNSC. In your addendum response to EIS-12-510 you state that:

"Given the longevity of the DGR project, CNSC staff do not agree with the proponent that the forest removal should be considered as a reversible project." (As read)

My question in this element is, the key factors for sustainability that have been expressed by OPG in its assessment focused largely on the scale or area of effect rather than on time or duration.

Could CNSC provide an explanation of its assessment, basically that they do not agree with the proponent that the forest removal should be considered as a reversible project, on timescale effects or for impact reversibility, looking at both the short term versus the long term, that would be pre-closure versus post-closure?

--- Pause

MR. SMITH: Graham Smith, for the

record.

I actually alluded to that in the presentation, that CNSC staff valued the reversibility of the forest removal to be not reversible, acknowledging that OPG does have plans, a re-vegetation plan during decommissioning. But there is essentially two components to that assessment for the terrestrial environment; one is the impact, specifically the direct impacts to Eastern white cedar, and then also the additional considerations regarding effects to species and wildlife.

So although it is reasonable to expect that re-vegetation occurring after -- during decommissioning could lead to the regeneration of the forest, but with time to their existing state, therefore, sorry, with respect to Eastern white cedar specifically and the mixed woods forest, that could be considered reversible.

However, when we are considering species we thought it would be sort of taking a precautionary approach to that would be not to assume that after 40 or 50 years or what have you, that it would be safer not to assume that

those species and the ecosystem would automatically sort of regenerate to the current state.

So we did make note of that in our assessment, but we also noted that it didn't have an impact on our overall conclusions and that is sort of in line with the weight of evidence approach and in this context for the removal of Eastern white cedar it was -- ecological context had a very large weighting, so to speak, and since we weren't identifying significant risk sort of looking at the severity, the magnitude and ecological context, the reversibility had less of a role in that particular significance determination.

THE CHAIRPERSON: Dr. Muecke, did you have a follow-up?

MEMBER MUECKE: Yes, thank you.

This goes to OPG. We were just talking about the loss of the Eastern white cedar removal, 8.9 hectares, and this is said to be reversible with time upon closure.

Now, taking into account the possible expansion of the DGR, we are talking many decades now in terms of closure, why has OPG

not considered or committed to planting an equivalent area of forest near the site shortly after the site preparation?

MS SWAMI: Laurie Swami, for the record.

OPG has a biodiversity program which would enable us to do tree plantings, et cetera. It is a normal part of our doing our business within any of our sites, and so I think it's not that we didn't commit to it, it was just something that we do as a company on a regular and routine basis.

MEMBER MUECKE: Would you consider making such a commitment at this time?

MS SWAMI: Laurie Swami, for the record.

Those types of investments we typically look for an appropriate site to do that. That would take some effort to look at what that site would actually be and it would certainly be part of our biodiversity program to do that.

A specific commitment on that without those specific details is very difficult to just do on-the-fly, if you will.

But yes, it would be part of our biodiversity program.

THE CHAIRPERSON: Dr. Archibald...?

MEMBER ARCHIBALD: I just have one last question and this is for EC, Environment Canada.

In your response you note that in OPG's response to this portion of the IR, that being hydrology, that:

"Changes in climate are expected to be gradual and this provides time to modify the engineered draining features and to include OPG's evaluation of the significance of effects is sufficient."

(As read)

In stating that EC's recommendation is not altered, does EC still disagree with OPG's statement that time-based, phased or adaptive management modifications should be permitted for the engineered draining system? Or would you like a robust, firm series of drainage features built prior to any activity?

MR. LEONARDELLI: Sandro Leonardelli, for the record.

So in our July 2nd, 2014

sufficiency review we highlighted the fact about climate change. The reason we highlighted that is because we wanted to point out that it was our expectation that this would be something that would be done up front, so that they should be factoring climate change into the design. So we did point that out.

Overall in terms of the sufficiency review, it doesn't change our conclusions, but in terms of a recommendation that we would make, our departmental submission made recommendations on the sizing of the stormwater management pond in regards to climate change, that it should be done with climate change factored into the design.

MEMBER ARCHIBALD: Thank you, then.

THE CHAIRPERSON: Dr. Muecke...?

MEMBER MUECKE: Again to OPG, could you remind the Panel whether the air modeling software, AERMOD, used by OPG is designed to deal with shoreline atmospheric phenomena?

And, secondly, is this software -- does this software specifically

address the presence or the possible presence of thermal internal boundary layers?

I might as well go onto the third part. Does OPG have data on the frequency and duration of this phenomena at the Bruce site?

MS SWAMI: Laurie Swami, for the record.

I'd like to ask one of the experts on our phone to assist with this answer. Mr. Rawlings would be able to answer that for you.

THE CHAIRPERSON: Mr. Rawlings, are you there?

MR. RAWLINGS: Yes, Martin Rawlings for the record.

THE CHAIRPERSON: Please go ahead and if you need Dr. Muecke to repeat any of the question just let me know.

MR. RAWLINGS: Thank you. And, again, Martin Rawlings, for the record.

The AERMOD dispersion model is not specifically designed to deal with the thermal internal boundary layer phenomena. The thermal internal boundary layer phenomena was discussed in the Atmospheric Environment TSD,

specifically in Appendix C, section C8.3.

The thermal internal boundary layer is a phenomena that forms where shore and water meet. The shoreline area warms up on a sunny day. You get a vent over boundary layer that can, where you have a tall stack such as you usually get at, say, a coal-fired power plant, present at the shoreline. Under those conditions plumes from the tall stack can be fumigated down to the ground when it intersects with that thermal internal boundary layer.

But understanding that at the DGR project all of the emission sources are close to the ground, fundamentally area sources associated with construction activity, the need for a model that specifically was designed to deal with a thermal internal boundary layer was not considered a necessary parameter. The choice of the AERMOD dispersion model was selected, as we discussed in Technical Information Session 2, based upon its use in the United States and recommended use in Canada for modelling situations such the DGR project, its extensive verification studies and the fact that the model has been shown to be conservative for situations

such as this.

With respect to the second component where I think Dr. Muecke and perhaps, Dr. Muecke, you may clarify if I've got it wrong, you talked about shoreline phenomena and something referred to as lake or sea breezes.

MEMBER MUECKE: Yes, I was referring to that.

MR. RAWLINGS: Thank you. Martin Rawlings, for the record.

In the case of sea breeze or shoreline phenomena, again it's described in section C8.3 of the Atmospheric Environment TSD. In those situations where a thermal internal boundary layer may form, the warming air over the land tends to draw water in off of the water and the air in over from the lake landward. That would transport release emissions towards receptors located, if you want, further away from the shoreline.

That phenomena, that shore breeze phenomena is most accurately captured if the meteorological data used in the model comes from a site located at effectively where the project is, in relatively close proximity to the

shoreline.

You'll recall again from Technical Information Session 2 and also from the presentation I gave at the hearings last September, the meteorological data used in the AERMOD dispersion model comes from a tall meteorological tower located physically adjacent to the DGR project site. Any situations during the five years of data used in the model where a shore breeze or shoreline effects were occurring would be evident in that meteorological dataset and, thus, they would be included and the modelling completed for the DGR project.

MEMBER MUECKE: One final component here. Since we are going to then discuss the expanded DGR tomorrow onto atmospheric effects at this time, in the modelling that was done how would -- would it be affected by the increased height of the waste rock management area?

MR. RAWLINGS: Martin Rawlings, for the record.

The transport of winds that affect the emissions from the DGR site and how they are transported downwind, in the event that

you had a large structure such as the waste rock pile, what tends to happen is winds flow up, over and down and around the pile. At even a short distance downwind from that waste rock pile the effect of the physical disruption of the waste rock pile on the wind patterns would not be noticed.

The type of disruption you would get from the existence of a waste rock pile such as the one proposed either for the DGR project or potentially a taller pile in the event of an expansion would be similar to the presence of trees or perhaps even large structures such as those already present on the Bruce nuclear site.

MEMBER MUECKE: Thank you.

One more question for OPG.
Again, it impinges on tomorrow's deliberations.

OPG believes that no liners will be required for the stormwater management pond or the waste rock management area and relies on the properties of the till cover to protect the near-surface groundwater. The functionality of both these structures may now have to extend through the expansion phase and so we are talking many decades. What are the fallback strategies

of OPG if the till cover turns out to be more permeable than predicted and given the spatial constraints of the site if expansion should occur?

--- Pause

MR. WILSON: Derek Wilson, for the record.

As we discussed last year with respect to the waste rock management pile and as you've commented, Dr. Muecke, the design of the waste rock management pile, as you say, assumes that there is the integrity of the existing natural till on the site to act as that barrier to the groundwater. In the event that we identify areas where that is not sufficient then we have made a commitment to install appropriate liners in order to be able to again protect the groundwater flow.

In the case of an expanded waste rock management area and, again, if you look at the expansion where it has the two hectares impact on the overall footprint, that same -- that same philosophy would be maintained for that portion of the waste rock management pile that would be expanded.

We also have the monitoring program, as we've discussed, to be able to ensure that the waste rock management area is performing in the means that we expect it to and then again as we go through we've also been very conservative in the way that we've modelled these to assume that we don't have a dissipation of concentrations of contaminants of concern over time.

MEMBER MUECKE: Could you explain how you install a liner once the waste rock pile has grown to reasonably big proportions?

MR. WILSON: Derek Wilson, for the record.

The expectation is that we would not be going in and installing a liner after the waste rock management area has been constructed because, again, we're going to verify through our construction monitoring the effectiveness of the natural tills.

And again, if we feel that that is not sufficient we will go ahead and install a liner. So it's not the expectation that we would be going in after the fact to install such a liner.

In the expansion we'll have the evidence of the existing waste rock management pile and, again, as we expand the area to consider additional waste rock we would then follow the same process but either validate the natural tills or install the liner for those additional portions as appropriate.

MEMBER MUECKE: It didn't quite cover the concern I expressed here, and that is a concern that the till cover proves to be insufficient after the fact. In other words, during the operation -- during the construction -- well into the construction phase. --- Pause

MS SWAMI: Laurie Swami, for the record.

I think we would like to take a little bit more time to consult on this and we'll come back after lunch and provide a response if that's acceptable.

THE CHAIRPERSON: That is acceptable, Ms Swami.

MEMBER MUECKE: Could you do the same conservation with respect to the stormwater management pond?

MS SWAMI: Yes, we will.

MEMBER MUECKE: Could OPG explain the absence of any mention of the possible impact on turtle habitat at the margins of the site in the Analysis of Significant Adverse Environmental Effects?

MS BARKER: Diane Barker, for the record.

In the environmental assessment there were no adverse effects on habitat for turtles identified and as there was no residual adverse effect there was no significant assessment or a need for a significant assessment.

The effects to the aquatic habitat that were identified were identified for other species such as the redbelly dace, pond marsh and burrowing -- chimney building crawfish. So those were the valued ecosystem components whose aquatic habitat was -- the project resulted in a residual adverse effect on.

THE CHAIRPERSON: If I could ask a follow up of Environment Canada just in terms of a reminder to the Panel, the Panel recalls last fall there was some discussion regarding

mitigation of effects on specifically turtles and also snakes, as I recall. And the OPG, as the Panel recalls, are committing to fencing and there was some discussion of the effectiveness of said fencing to protect these species.

So if Environment Canada would please remind the Panel regarding your evaluation of the effectiveness of the proposed mitigation via fencing for both the turtles and the snakes?

MR. LEONARDELLI: Sandro Leonardelli with Environment Canada.

Yes, I recall the testimony on it and we had also gotten back to the Panel afterwards. I believe we did an undertaking on that. So that was on the record.

I do have Madeline Austen of the Canadian Wildlife Service from our department available on the line if you wish. But let me just introduce her for a moment so that you have an understanding of her duties.

So Madeline Austen is with Environment Canada's Canadian Wildlife Service in Ontario and she has been the head of the Species at Risk Recovery Unit for the past 11 years and has been working on wildlife and species at risk

issues since 1989.

So I'll turn it over to Madeline.

THE CHAIRPERSON: Specifically, Ms Austen, the Panel would be interested in your comments regarding fencing as an appropriate and effective mitigation measure and whether you've had experience with this measure in other recovery plans for snakes or turtles?

MS AUSTEN: For the record, Madeline Austen.

So to respond to your question, first of all, our recommendation was that to help mitigate for effects to three species; the snapping turtle, milk snake and eastern ribbon snake, which were the three species we identified as potentially having adverse effects to them on the DGR site, EC recommended and it is Recommendation number 5.8 that mitigation be in place to prevent turtles and snakes from entering the DGR site prior to and during site preparation and construction.

We specifically recommended that exclusion fencing be in place along the southern edge of the DGR site, north of the adjacent abandoned rail bed, from the southeast corner of

the DGR site to a point 50 metres east of the waste package haul road rail bed crossing as well as along the whole length of the eastern edge of the Deep Geological Repository site.

And the reason for this was to prevent turtles from entering the Deep Geological Repository site and, in particular, Wetland 3, prior to and during site preparation and construction.

In regards to the second part of your question about whether we have any experience with the efficacy of the exclusion fencing, we did provide a response to Undertaking No. 37 on September 30th, 2013 and there we outlined some of the information we had about the effectiveness of the recommended fencing as a mitigation measure for turtles and snakes.

Our response then was that exclusion fencing has been shown to be very effective for turtles and snakes in Ontario and the United States provided that the fencing is installed correctly, constructed out of a higher quality silt fencing or galvanized mesh and maintained regularly. To come up with this conclusion we relied on information from the

Ministry of Natural Resources where they have done specific conservation projects in Ontario under their *Ontario Endangered Species Act* and provided permits for various work on turtles and snakes and exposures to mitigate effects to these species.

THE CHAIRPERSON: Thank you, Ms Austen.

MS AUSTEN: You're welcome.

THE CHAIRPERSON: Dr. Muecke?

MEMBER MUECKE: One last point, and going to OPG, regarding Aboriginal interests, clarification basically on -- a bit on the wording.

In the case of the burial site if noise and dust do prove to interfere with the ceremonies, you state:

"OPG could adjust construction activities during ceremonies."

Could that be translated into a commitment that if noise and dust do interfere OPG would adjust construction activities?

MS SWAMI: Laurie Swami, for the record.

That seems like a reasonable

rewording of the commitment.

MEMBER MUECKE: Thank you.

THE CHAIRPERSON: I now have a series of questions for OPG, and then I'll turn back to CNSC. Occasionally, I'll ask both of you the same questions.

My first question is for both the terrestrial and aquatic environments one of OPG's hypotheses associated with the significance of adverse effects was that ecological function would be affected.

In the case of the eastern white cedar the functions had to be, quote "unique" unquote in the local study area. And in the case of effects on aquatic valued ecosystem components there had to be changes to the ecological function of the aquatic community or habitat in the site study area.

For eastern white cedar which, quote/unquote, "unique" ecological functions were considered is the Panel correct in assuming that the listed attributes in the final paragraph of page 17 as well as on page 18 of the IR response is the list of unique features you were assessing, for example, edge area ratio, stand

size, role in habitat, connectivity, et cetera.

MS BARKER: Diane Barker, for the record.

The list that you mention on pages 17 and 18 of OPG's response is a partial list of the things that were considered in relation to ecological function. We also considered such things as the ability of, for example, the terrestrial habitat to sustain, for example, sensitive or at risk species.

THE CHAIRPERSON: Thank you.

For the aquatic valued ecosystem components what specific changes in ecological function were considered in the site study area, specifically the ditches?

MS BARKER: Diane Barker, for the record.

The changes that were considered were disruption of flow, disruption of movement; for example, of the aquatic species using the ditch to move through the aquatic system, the watershed.

THE CHAIRPERSON: Is the Panel correct in assuming therefore that the functions that OPG focused on for your significance

determination were largely those associated with habitat and not with other ecological functions such as productivity?

MS BARKER: Diane Barker, for the record.

Those were the functions that we're primarily focused on, recognizing that the habitat is not prime habitat by any stretch of the imagination.

THE CHAIRPERSON: Thank you.

I now have a question to CNSC regarding those same two hypotheses. And the question the Panel has of the CNSC is did the CNSC agree with the differences in the spatial context for the hypotheses for Eastern white cedar, which were the local area, versus the smaller spatial context for the aquatic community or habitat, which was the site study area? And if so, please provide your rationale for agreement with the different spatial contexts.

--- Pause

DR. THOMPSON: Patsy Thompson, for the record. Graham Smith will explain the why for the terrestrial environment, the appropriate scale with the local study area, and

then I'll speak to the aquatic and do some of the comparisons.

MR. SMITH: Graham Smith, CNSC environmental risk assessment officer for the record.

For the terrestrial environments, the local study area was considered the appropriate spatial scale for considering effects, specifically for the effect that we're discussing with the terrestrial environment. When we want to look at the sustainability of the cedar community within the larger -- from a sustainability context, it's important to consider more than just the site study area and also for wildlife species where we're interested in sort of population level responses. So, it was essentially -- it was required to look beyond the site study area, which is essentially, you know, limited to the Bruce Nuclear site. So to look at, as we mentioned, things like habitat connectivity and the sustainability of populations and movement corridors and such, it's required to pull back a little bit and look at the larger local study area.

Patsy.

DR. THOMPSON: Patsy Thompson for the record. In terms of the aquatic assessment, when we looked at the impacts that were predicted from the project in terms of the on-site ditches and then potential impacts to MacPherson Bay and Lake Huron, and more broadly in Lake Huron, because of the nature of the impacts, the potential impacts in MacPherson Bay were so low as to not be an effect that would require a detailed assessment of significance and most of the impacts were on the site study area in terms of the potential ditches that -- for example, we just talked about crayfish but also some of the streams that are cold water habitat for fish reproduction, we believe it was appropriate to focus the aquatic assessment on the site study area relative to more broadly in Lake Huron.

THE CHAIRPERSON: Thank you.

I am now going to ask OPG a question back to air quality. Would OPG please remind the Panel by how much the maximum 24 hour ambient concentrations of PM2.5, PM10 and SPM were predicted to exceed relevant criteria during the 0.5 percent of the time that they did in fact exceed criteria? The Panel notes that Tables 5-2

and 5-3 in your IR response on pages 35 to 36 refer to increases over existing concentrations in a local study area but not increases over criteria.

MS SWAMI: Laurie Swami, for the record. Again I'll ask Mr. Rawlings to respond.

THE CHAIRPERSON: Mr. Rawlings.

MR. RAWLINGS: Martin Rawlings, for the record.

The predicted concentrations during the site preparation and construction phase are presented in Chapter 8 of the Atmospheric TSD. The -- specifically Table 8.2.3-6 on page 13 of the Atmospheric TSD.

THE CHAIRPERSON: So, Mr. Rawlings, if you could simply, for the benefit of the Panel, remind us of by how much on that table did the maximum 24 hour ambience for the particulate matter measurements exceed the relevant criteria.

MR. RAWLINGS: Certainly. The only criteria that exceeded, as pointed out -- Martin Rawlings, for the record. The only three that exceeded were 24 hour SPM. The maximum predicted concentration including background was

276.9. The relevant criteria is 120. For the 24 hour PM10, the maximum predicted value including background was 75.3. The criteria was 50. And in the case of the 24 hour PM2.5, the maximum predicted value, the maximum predicted value was 45.7, and the relevant criteria was 30.

THE CHAIRPERSON: Thank you, Mr. Rawlings.

On the same theme then regarding ambient air quality criteria, would you please remind the Panel, Mr. Rawlings, about the degree of conservative in air quality criteria for particulate matter, i.e. how many layers of safety are built into these criteria?

MR. RAWLINGS: Martin Rawlings, for the record. It is usual when establishing criteria for use in protecting ambient air quality that the effects levels are identified and then the criteria established at some level well below that effects threshold. Often it's a factor of two, many of times it's a factor of four. For some parameters, such as SPM, there really isn't an affects threshold used to establish that criteria. That criteria of 120 is a criteria established to avoid nuisance or

aesthetic effects.

THE CHAIRPERSON: Thank you, Mr. Rawlings.

I am now going to turn back to OPG but now with respect to the near surface groundwater, and this is turning to the theme that Dr. Muecke originally raised but with a little bit of a different twist to it. Would OPG explain to the Panel why the hypothesis associated with significance of effects on near surface groundwater included the statement that migration of contaminants of potential concern had to occur on a frequent and/or continual basis? Would one or more severe pulses also have the potential to cause significant adverse effects even if these might be rare?

--- Pause

MS BARKER: Diane Barker, for the record. The hypotheses that were developed for the response to information request EIS-12-510 were developed for normal operating situations. They were not developed, for example, for malfunction and accident events which might result in shock loads. If there is -- the monitoring results would provide an early

indication that there was trending increases in concentrations of contaminants in groundwater and thus there would be an opportunity to mitigate in advance of effects occurring.

THE CHAIRPERSON: CNSC, was it your understanding that the -- OPG's hypothesis associated with significance on near surface groundwater was appropriate for normal operating procedures and that you were -- you concurred with the fact that any sudden pulse would only be under an accident or a malfunction scenario rather than, for example, the simple extension of the waste rock pile over an unexpected lens of material that had a much higher hydraulic conductivity?

--- Pause

DR. THOMPSON: Dr. Swanson, we would need some time over lunch, if we could, to come back with a proper answer.

THE CHAIRPERSON: Thank you.

I will now turn my attention to surface hydrology and this question is to OPG. On page 7 of your IR response you state, quote, "While future climate conditions may result in storm events that exceed the current design

capacities, such changes in climate are expected to be gradual. This provides time to modify the engineered drainage features such that they will continue to serve their design purpose," unquote. Would OPG provide the Panel with justification for the statement that climate changes will be gradual? Are there new engineering design principles and guidelines being developed in light of climate change effects on frequency and severity of extreme weather events, notwithstanding the fact that the total drainage area would remain the same?

--- Pause

MS SWAMI: Laurie Swami, for the record. I think we can answer one part of your question quite easily, which is in engineering practice there has been not -- there has not been changes to take into consideration climate change yet. I would imagine that that will take place over time. The models that we use generally predict a gradual change in climate. However, we'd like to go back and just look at that over the break, if that's acceptable, just to confirm that, but it's my understanding those models at this time predict a gradual change in climate.

With respect to the -- one of the comments in Environment Canada's document on page 5, the -- Environment Canada states that OPG's initial design engineering, particularly since the maximum rain event could result in flooding that would have implications of loss of human life at the DGR site, I'd just like for the record to state that we don't have any design -- or any event prediction that we would end up with a loss of life as a result of a storm event at the DGR site. There -- we have put in a collar design to prevent flooding underground that we think is sufficient given what the predicted rain event would be with design margin at this point in time.

THE CHAIRPERSON: Thank you.

And, yes, we'll look forward to expanding on your response after lunch. It's an obvious segue to Environment Canada. We have, number one, the Panel would like Environment Canada to inform us whether or not you have or are developing guidance for assessing climate change implications for designs of mitigation measures such as drainage ditch designs and other mitigation measures that obviously rely upon

confident assessment of hydrology. So, that's a, and b. would Environment Canada please comment on the basis for your prediction that there may actually be loss of life given a severe flooding event.

MR. LEONARDELLI: Sandro Leonardelli for the record. So, I am going to address the second one first, since it's fresh in my mind.

So, under the original maximum flood hazard assessment, when they ran the model they had assumed a certain collar -- shaft collar height; okay? And on the basis of the hydrological modeling of that flooding event under a PMP scenario, it was found that the maximum flooding height could exceed the height of that shaft collar. Now, that's the shaft collar as it was -- the height of the shaft collar as it was in the model. Now, I think my understanding was that OPG afterwards said that they would adjust the height of the collar in response to that and in light of that modeling, and they can confirm that. In terms of loss of life, the reason we say loss of life is because potential flooding into the repository, if you

have workers in the repository at the time, could potentially be dangerous, so... And the PMP scenarios are run in situations where there is a potential risk of loss of life and that's why the PMP design event is chosen in those scenarios.

THE CHAIRPERSON: So, OPG, can you provide assurance that you have committed to increasing the collar height according to updated analysis of the PMP?

MS SWAMI: Laurie Swami, for the record. I am going to let Mr. Wilson answer that design question. But before moving off the loss of life, I think that we would take -- I know we would take appropriate steps to protect workers underground should there be a risk of flooding underground. That would be something that we would do immediately. We wouldn't wait for the flooding event to take place. I just want to be clear about that.

MR. WILSON: Derek Wilson, for the record. Just a couple of points of clarification, I think. I will speak directly to the issue of the collar height.

The PMP, which is the hazard assessment, which is the maximum permissible

precipitation event that we could look at, which is, you know, close to a 1 in 10,000 year storm event is what was used for the flood hazard assessment, and it had an elevation of about 186.5 metres above sea level, which would be the point at which that maximum flood would occur. Our collar height right now is set at 188 metres above sea level, so we have another metre and a half or 5 feet or freeboard above that maximum level for various reasons, including site grading and so on. One of the commitments that we did take was to -- once we finalized the site grading for 188 metre elevation, that we'd re-run the flood hazard assessment just to confirm that the collar heights are indeed well above the maximum height.

The other issue is the PMP event that keeps being referred to in terms of the stormwater management design basis. And it's not realistic to assume that such a storm event, a 1 in a 10,000 year storm event, would be used as your design basis for your Stormwater Management Pond. And we did take a commitment from the 2013 sessions after the October 1st sessions to go back and look at what the design based storm

event would be for the Stormwater Management Pond in consultation with the CNSC, which would also take into account the issues of climate change. So, that would then become -- now, whether it be a 1 in 50 year storm or whatever the return period is that's agreed upon, which is more practical for the site and the activities that we expect to have, that is completely different than the PMP event. And I think it's very important that we recognize that we cannot design a Stormwater Management Pond to that PMP event.

THE CHAIRPERSON: Thank you, Mr. Wilson.

So, therefore, back to Environment Canada, are you in the process of or have you already developed some guidance for proponents with respect to Environment Canada's expectation for design to climate change parameters?

MR. LEONARDELLI: Sandro Leonardelli, for the record. So, the guidance we provide right now as we did for this process is -- it's a general guidance. It's to reflect the fact that climate change studies are showing an expected increase in the duration and

intensity of storm events -- or sorry, the frequency and duration of -- sorry, the frequency and intensity of storm events. So in recognition of that and the science behind it, we -- in situations where we feel that it might be an important consideration, we make that as a recommendation and it's reflected in our departmental submission.

In terms of a broader exercise of developing guidance on mitigation measures as some sort of technical design specification, I think that's what you're getting at -- yes -- I'd have to look -- I'd have to ask internally to see if there's anything like that that's going on. But I do know that typically these types of technical guidance scenarios or guidance that's given is something that the -- for example, the National Building Code would address. So, I don't know what the status of that is internally within the government. I'd have to make inquiries.

THE CHAIRPERSON: Mr.

Leonardelli, if you could make some quick calls and perhaps get back to us either today or tomorrow with respect to confirmation of whether

any such guidance is in preparation specifically within your department, that would be most appreciated.

As a follow-up, though, in terms of this specific proposed project during site preparation and construction, has Environment Canada spent any time yet assessing the return period that might be appropriate for this specific stormwater management pond design given the receiving environment?

MR. LEONARDELLI: Sandro Leonardelli, for the record.

So if my memory serves me correctly, I did talk a little bit about this at last year's hearings. And there was a discussion that was going on between yourselves, OPG and CNSC as to whether a PMP event should be the commitment for the stormwater management pond. Let's be clear, we're talking about the stormwater management pond here and not the shaft collars.

The -- as I recall, it was put out -- it was suggested by somebody that perhaps a PMP event would be appropriate.

From what I recall, I said that

we would agree to that, but that's not necessarily something that we would have asked for because, again, a PMP event is typically something that is modeled in situations where there's a potential risk to human life.

And so what would be the appropriate size of the stormwater pond?

If you do the hydrological modelling based on the proposed final design and you have a good sense of what the state of contaminated water would be in the stormwater management pond, you'd -- you'd have to take a look -- one of the factors you would take a look at is the extent to which the storm event would actually end up achieving the water quality criteria of the discharge.

So in the analysis that OPG had done last year, their first take on the water quality modelling, and that's on the CEAA registry. It's document number 936.

If you take a look at the tables in there, they have different scenarios of water quality with and without mitigation for the size of the -- under different storm event scenarios.

And so if you look at the table,

you can see that with the increasing size of the storm event, you have lower and lower levels of contaminants concentrations in the effluent.

So as an initial thing, I had -- I had suggested that that might be one of the ways of looking at is to see just how big an event do you need to design for to ensure that you're not having effluent that's released at a -- in exceedance.

So I mean, this would need to be looked at in greater detail. I think we need to update the modelling, and I would suggest that if you wanted a definitive answer, I guess there would need to be a collective undertaking on doing that type of modelling and looking at the results.

THE CHAIRPERSON: Mr. Leonardelli, I don't think the Panel will be requiring an undertaking at this time.

I think our question was really more focusing on whether or not your department had any particular return period in mind at this time.

The Panel understands your response to mean no and that it would depend on

further analyses.

Are we correct in assuming those further analyses might be in support of the licensing phase should we get into that phase?

MR. LEONARDELLI: I can say, first of all, yes, you're correct in your summary.

As to whether that would be during a licensing phase or not, I -- just offhand, I'd have to think that through.

I could get back to you after lunch.

THE CHAIRPERSON: Thank you.

Dr. Thompson.

DR. THOMPSON: Patsy Thompson, for the record.

Last year, we had a recommendation to the Panel in terms of an updated PMP for the analysis for stormwater management.

We did take into consideration Environment Canada's recommendation to consider the effects of climate change on PMP, and our experts have indicated that the use of PMP is already a very conservative approach.

Effects of climate change on PMP are not well understood at this time, and there's sufficient safety margins in the design of the surface facilities to cover the PMP and other unforeseen uncertainties.

So on that basis, from a licensing point of view, we believe that an adaptive management approach to this situation with changes in climate is more appropriate.

THE CHAIRPERSON: Dr. Thompson, the -- thank you.

The Panel is actually quite clear on the positions of the agencies with respect -- both Environment Canada and CNSC with respect to the PMP, but we are now on the topic of when you don't use the PMP for the design of the stormwater management pond. And we've just heard Mr. Wilson say it is not practical to size the stormwater management pond to a PMP event.

And I'm assuming that CNSC will have a chance to think about that and get back to the Panel regarding that -- first of all, (a) that statement, and (b) the Panel would be interested in hearing from CNSC as we have just questioned Environment Canada if not the PMP for

the stormwater management pond, then what in terms of the return period for a storm event given (a) climate change and (b) the consequences to the receiving environment.

Mr. Leonardelli also already alluded to the consequences by referring to some of the modelling results in one of OPG's documents, but the Panel would appreciate CNSC's response to that as well.

DR. THOMPSON: Patsy Thompson, for the record.

We'll go back to some of the information we had prepared for last fall and we have our expert at the CNSC in Ottawa which we'll be working with to provide a response.

THE CHAIRPERSON: OPG, if you could please confirm for the Panel that we just accurately paraphrased you with respect to the use of the PMP and the design of the stormwater management pond?

And perhaps expand in terms -- if we were correct -- why it is impractical to use PMP as your design basis for the stormwater management pond.

MR. WILSON: Derek Wilson, for

the record.

Yes, Dr. Swanson, you have actually correctly paraphrased the concerns.

The current design basis for the stormwater management pond is actually a six-hour 25 millimetre storm event which would be retained and maintained without discharge.

The upper bound of the stormwater management pond design is that it would safely pass the one in 100 year storm without damage to the structure and keeping the flows to the -- to the preferred channel, which is interconnecting road down to MacPherson Bay, and not coming back in and affecting the marsh and so on.

So those are the current criteria.

The -- again, the PMP event which is in a one-hour period is almost 400 millimetres of rainfall, in order to be able to set that as the criteria for no discharge and be able to ensure that, you know, the discharge meets criteria would require a significant -- I think we did size it at one point, but it would be a significant holding capacity which then, in turn, becomes a very difficult stormwater management

design to actually implement for practical use because you wouldn't be discharging anything under a normal condition.

So it's a balance of how we can -- how we can actually have a functioning stormwater management pond to be able to deal with our effluent as we go through the various phases and still have it functioning in a way that doesn't just become a holding area on the site for water.

THE CHAIRPERSON: Thank you.

And as all of you are pondering this over lunch, the Panel would appreciate if you would remind the Panel regarding the existing design basis for the stormwater management pond and the safe passage of water in to that specific storm event what the predicted total suspended solids were flowing down the ditch and decanting into MacPherson Bay because the Panel understands that that may be the primary constituent of potential concern.

And this would go against Mr. Leonardelli, the trend in some of the other potential contaminants of concern whereby you would have a lower concentration simply because

of the increased volume.

Is the Panel's expectation clear?
CNSC, Environment Canada, OPG?

Good.

Back to OPG, and we're still on climate change. Now we're going to switch back, though, to trees.

Would you provide the specific reasons why future environmental effects by climate change will not influence the conclusions of the assessment with respect to eastern white cedar as stated on page 18 of your IR response?

And this is -- the Panel would be interested in your specific comments with respect to average precipitation and temperature regimes within the usual tolerance range for eastern white cedar.

MS BARKER: Diane Barker, for the record.

I think we're going to have to refer back to our discussion on climate change a few moments ago where the atmospheric TSD predicted that changes in precipitation associated with climate change would be moderate and, therefore, there wouldn't be significant

effects on the eastern white cedar.

THE CHAIRPERSON: Ms Barker, could you help us out, though, in terms of defining "moderate" again, please, and also in terms of whether "moderate" fits comfortably within the eastern white cedar's growing requirements?

MS BARKER: Diane Barker, for the record.

I'm referring now to the atmospheric environment technical support document, Appendix D, page 32, so it's page D-32.

The tables in the appendix provide historic and future temperature trends and precipitation trends for each decade from the time period from 2011 till 2100, and the changes per decade for temperature trends typically range from averages in the range of .36 up to highs of about .7. I'm just picking representative numbers off the table.

The future precipitation trends again by decade range -- averages from about, in some cases, a predicted decrease of about one and a half percent; in other cases, increases up to, it appears to be, about four percent per decade.

In relation to that, we have said previously that eastern white cedar is a hardy and resilient species, and we would anticipate that it would acclimate as these conditions change gradually.

THE CHAIRPERSON: Thank you.

Again to OPG, why didn't OPG provide more narrative detail in support of its determination of the significance of adverse effects using your sustainability criterion as provided to the Panel in your response to EIS 03-44?

MS BARKER: Diane Barker, for the record.

For a number of the hypotheses statements, we did use sustainability principles in developing the hypotheses statements, and although we didn't do a direct tieback to sustainability, there are links between them. You can see that -- if you went back, you could see that preservation of aquatic habitat, for example, and sustainability are incorporated to some extent in the hypothesis statements.

THE CHAIRPERSON: And Ms Barker, you are confirming for the Panel that there were

no explicit linkages made back and forth between your new narrative and your tables provided to the Panel in your response 03-44 where, at least for some of your significance criteria, you did apply some sustainability narrative or definition. So that would be, in essence, then, up to the Panel to kind of toggle back and forth between the narrative and your response to 03-44?

MS BARKER: Diane Barker, for the record.

You're correct; we didn't do an explicit link back. Some of the narrative, as you say, does make the connection, but it's not a direct tie to the IR response.

THE CHAIRPERSON: Thank you.

So CNSC, when you did your analysis or evaluation of the significance assessment, did you attempt to assess the sustainability criteria narrative against the original sustainability criteria that OPG incorporated into its response to EIS 03-44? And if not, why not?

--- Pause

DR. THOMPSON: Patsy Thompson, for the record.

My indication is that we have not considered specifically the sustainability criteria that OPG put forward in their information request number 44.

THE CHAIRPERSON: Environment Canada, did you have a chance to review and provide any -- or could you provide any feedback to the Panel with respect to those sustainability criteria originally appearing in 03-44?

MR. LEONARDELLI: Sandro Leonardelli, for the record.

I don't have the -- that IR in front of me, so without that, it would be difficult for me to comment on it.

THE CHAIRPERSON: Can the Panel ask that you refer to that response over the lunch hour and -- or tomorrow would be fine as well because the Panel is interested in the extent to which this requirement within the terms of reference to use sustainability has actually been followed and reviewed by the appropriate regulatory agencies?

MR. LEONARDELLI: It would be -- Sandro Leonardelli, for the record.

It would be more appropriate for

tomorrow. We're going to have to look at that.

THE CHAIRPERSON: Thank you very much, Mr. Leonardelli.

The next question is for CNSC as well.

Did the CNSC determine that all of the adverse effects that -- all of the adverse effects would have to occur frequently or continuously in order to be significant for all of the categories in the environmental assessment, i.e. by categories, I mean the various overall headings such as air quality, surface water, terrestrial environment, et cetera?

To paraphrase or reword this a bit, the Panel would like to know whether, in CNSC's opinion, in order to be significant the frequency and duration need to be high or continuous.

DR. THOMPSON: So Dr. Swanson, your question is, would an assessment of significant be conditional an adverse effect happening only frequently or continuously.

THE CHAIRPERSON: Not quite. I think what we're asking is not that it be

conditional because, obviously, it is -- you have to consider all of the criteria for significance. But for the duration and frequency criteria to fall in to a category of -- qualitative category of high, for example, is it the CNSC's practice to require that it be very frequent and/or continuous under all circumstances for all of those environmental categories or are there specific aspects of the receiving environment for which you would be more rigorous than even that?

DR. THOMPSON: Patsy Thompson, for the record.

I would say it's -- I wouldn't say rigorous. I would say that it depends on the type of valued ecosystem component or a combination of VEC and stressor that we're looking at.

There are some stressors, for example, that would result in higher adverse effects if they're intermittent than if they're continuous, so we would look at it on a -- as per the situation that we have in front of us.

THE CHAIRPERSON: Do you recall if any of the stressors in consideration for this proposed project were, indeed, of concern

regarding higher effects due to intermittent exposure rather than continuous?

DR. THOMPSON: Patsy Thompson, for the record.

One of the -- one example where we would have considered an intermittent exposure as being something of -- that needed further analysis would be, for example, if the total dissolved solids would have been, you know, high enough to cause osmotic effects on biota, for example.

In this case, the discharges from the stormwater management pond were not at that level.

THE CHAIRPERSON: Dr. Thompson, would you remind the Panel whether or not you also would consider intermittent total suspended solids exposure vis à vis critical life stages?

DR. THOMPSON: Patsy Thompson, for the record.

Yes, we would.

THE CHAIRPERSON: Environment Canada, can you also confirm whether or not your analysis included intermittent exposure specifically with emphasis on total suspended

solids as well as salinity on critical life stages of aquatic biota?

MS ALI: Yes, when we look at that in the context of the *Federal Fisheries Act* requirements, we expect it to be met at all times because the *Act* does not allow deviation, like it is absolute. So I mean, that would be how we looked at it.

THE CHAIRPERSON: So it really almost becomes moot in terms of the frequency or duration? You just can't expose critical life stages, period, to any exposure? Is that how you interpret the *Act*?

MS ALI: Well, that is how the *Act* has to be interpreted, like if you look at it black and white. But when we look at it from a risk -- we are looking at it from point of risk. I mean, we would look to see I mean how often it would get to a level where the solidity would, you know, affect the most sensitive life stage that is in the receiving environment.

THE CHAIRPERSON: So, Ms Ali, I think what the Panel just heard is notwithstanding perhaps the more absolute interpretation of the *Fisheries Act*, Environment

Canada also applies a risk-faced interpretation of the *Fisheries Act*. Is that correct?

MS ALI: When we did the initial review with *Fisheries Act* we applied the absolute. When we went through undertaking 47 we talked about the levels of treatment that would be required, that is when we looked at the element of risk.

THE CHAIRPERSON: Thank you for that clarification.

Mr. Leonardelli?

MR. LEONARDELLI: Perhaps, I can give an example that might provide some clarity.

So when we take a look at the total suspended solids criteria that were originally being proposed for the project our concern was that it was an annual limit. So an annual limit, you can have wide variation; you can have a storm event with really really high levels, but the average over the year, when conditions are generally calm overall, will give you a much lower value.

So when we establish suitably protective criteria, we wouldn't want to establish just an annual limit, we might suggest

a weekly limit and a daily limit. And that would be with the intention of preventing those shorter-term pulse events as you have been referring.

THE CHAIRPERSON: Thank you.

This question is to Environment Canada.

What is your department's recommended best practice with respect to protection of groundwater resources at mine sites, specifically with respect to waste rock management areas and stormwater management areas?

MS ALI: Nardia Ali, Environment Canada, for the record.

I would like to actually discuss with our Minerals and Processing Division and get back to you on that question.

THE CHAIRPERSON: Thank you, we appreciate that.

And I have a final question, and I think this one will be going back and forth again a bit between OPG and the regulators.

But the Panel would very much appreciate absolute clarity with respect to OPG's commitments to water treatment.

Would OPG please confirm the Panel's understanding of your commitments to water treatment to, at present, include oil-water separators as well as treatment for removal of total suspended solids? And do we recall also that you had some commitment for treatment of salinity? Those three. So let's get that confirmation first.

MS SWAMI: Laurie Swami, for the record.

So to try and be as clear as possible, the oil-water separators is part of the design for the underground. That is a clear commitment.

For the total suspended solids and salinity, those would be on an as-required basis. And I think we had a lot of discussion last year about the ability to measure and quickly implement clean-up systems, if you will, for water treatment should we find that there is a need that arises as a result of the design and operation of the facility.

At this point we don't see that need, but we would be monitoring and, if needed, we would implement the appropriate design change.

THE CHAIRPERSON: And one last clarification. We assume that statement reflects the fact that there would be some "treatment for total suspended solids" vis-à-vis settling in the stormwater management pond. So it would be over and above that that you would reserve judgment in terms of the requirement for treatment?

MS SWAMI: Laurie Swami, for the record.

That is correct.

THE CHAIRPERSON: Thank you.

Okay. Given that understanding, CNSC, do you have any further suggested recommendations to make to the Panel with respect to the potential need or requirement for further water treatment for other constituents of potential concern such as ammonia, for example, or other forms of nitrogen such as nitrates and/or any other sources of whole water toxicity that may arise that we have not as yet anticipated?

DR. THOMPSON: Patsy Thompson, for the record.

You will recall in undertaking 47 that we had done quite a detailed assessment

based on compliance with some discharge limits, discharge criteria.

So the regulatory expectation is that those discharge limits or criteria would be a regulatory requirement and that the normal procedure for CNSC licensees is that with discharge limits comes action levels and administrative limits, that the licensee is expected to take action so that you're not taking action as a realization that discharge limits are being exceeded.

So there is a structured process for managing treated water in licences and in licensing documents. We had also identified, and I believe OPG had made a commitment, to do some toxicity testing for a period of time to verify compliance with the *Fisheries Act*.

THE CHAIRPERSON: Thank you, Dr. Thompson.

Yes, the Panel is very clear on the discharge criteria as a regulatory instrument and we are not asking that question.

We are asking whether, as a regulator, you are comfortable a priori that OPG is saying they will not, at this time, commit to

water treatment over and above you have just heard them say, and that in fact it would be an adaptive management measure pending additional information?

DR. THOMPSON: Patsy Thompson, for the record.

The information that is available to date indicates that the mitigation measures that have been identified would be sufficient. And the regulatory process is in place to make sure that, should it not be, that waters would not be discharged and appropriate treatment put in place.

THE CHAIRPERSON: Environment Canada, what is your position on the lack, so far, of a definite commitment by OPG to treatment beyond what you have just heard them describe?

MR. LEONARDELLI: Sandro Leonardelli, for the record.

I can understand the Panel's confusion on some of this. But I will go back to our departmental submission, which it does a very clear analysis of what we saw to be the potential problems associated with the effluent quality. And so we would stand on our original position.

But just to point out a couple things that touch upon these issues. In terms of other parameters, you mentioned ammonia, et cetera. We had made a recommendation that a broad spectrum of parameters; for example, other metals, phosphate, total petroleum hydrocarbons, et cetera, be monitored during the site preparation and construction phase and later during the operations phase to ensure that there are no other additional parameters of concern.

So you are actually collecting data as the operation's construction phase are going on and seeing what the stormwater pond quality is prior to discharge.

So that would inform whether you need any additional treatment or not.

We also had recommendations regarding the waste rock -- sorry, that a full-strength leachate monitoring program be undertaken. Again, that might be a very important source of contaminants that would affect the stormwater pond quality, water quality.

And so having an understanding of what might be coming as leachate would help

inform your need for treatment.

So these are just a couple of examples. And we did point out that there was a need for follow-up monitoring programs that were associated with both the water quality predictions from the various contaminated sources, water quality at various points within the stormwater management pond system; so whether the water is being pumped up from underground or from -- or the leachate quality, and then ultimately the effluent discharge quality and downstream effects, follow-up monitoring program.

So we comprehensively looked at all those issues and I think we would stand on our recommendations in there.

THE CHAIRPERSON: Forgive me, Mr. Leonardelli, but standing on your original recommendation, the Panel's recollection of that is that Environment Canada recommended treatment. What treatment?

Over and above what we have heard in terms of oil-water separation and potential settling out of total suspended solids in the stormwater management pond, that is our question right now.

MS ALI: Nardia Ali, Environment Canada, for the record.

I will try to take a stab at this because I think I know the answer that you are looking for.

When we reviewed it and we realized that there was a possibility that this could be more than stormwater treatment or typical stormwater effluent, we asked for treatment. When it came up and we worked with the CNSC on undertaking 47, our big concern is that OPG does monitoring of the effluent and the stormwater treatment before anything that is discharged to the lake.

So I mean our position is that that effluent characterization be done, acute toxicity testing, sub-lethal toxicity testing, all the things we said was our expectation from undertaking 47, we would like that to be done, and then OPG do adequate treatment of that before any discharge goes into the lake.

THE CHAIRPERSON: Thank you, that helped.

All right, Dr. Muecke, Dr. Archibald, did you have any further questions?

Dr. Archibald?

MEMBER ARCHIBALD: One last question just to clear this up. Environment Canada made statements of objection to OPG's reference to effluent criteria attributed to -- EC, this is on page 8 of your submission, where criteria were discussed by EC in 2013, were thought to have been agreed upon through discussion with OPG, but do not appear in any way, shape or form in OPG's current response.

Would OPG confirm that water quality criteria for salinity and total suspended solids, as listed by EC in their response, will be established as potential contaminant guidelines for the proposed project?

MS SWAMI: Laurie Swami, for the record.

Just for clarity, I am looking at page 9 of Environment Canada's submission which talks to the TSS criteria of 40 ppm, and that there will be a limit established at a later date. "Salinity and TSS are the only effluent criteria that Environment Canada..."

Is that the section that we are discussing?

MEMBER ARCHIBALD: I believe it was on page 8, that is the notation I have in mine.

MS SWAMI: Laurie Swami, for the record.

So we have already discussed the commitment on the total suspended solids, and that we recognize that there will be other potential limits established as part of the ongoing regulatory program.

MEMBER ARCHIBALD: And this was just confirmation of salinity and TSS then? It was a specific reference made by EC and I guess it was in combination through a discussion made last year?

MS SWAMI: Laurie Swami, for the record.

That is correct.

THE CHAIRPERSON: That brings the questions to a close for now. We will take a lunch break and reconvene at 2:00 in the afternoon, when we will proceed with the first presentation for the afternoon by I believe it is Ms Martin.

--- Upon recessing at 12:40 p.m./

Suspension à 12 h 40

--- Upon resuming at 1:59 p.m. /

Reprise à 13 h 59

THE CHAIRPERSON: Good afternoon everyone. Thank you for your attention.

If everyone could please take your seats we will continue with the agenda. Next on our schedule today are four 30-minute oral interventions.

As previously explained, the Panel will direct its questions to each presenter following each presentation. The Panel will consider, time permitting, questions submitted by registered participants at the end of the day.

I would ask each of the individuals and groups making oral presentations this afternoon to remain available until the end of today's session, if possible, in the event that we have time available to consider questions from registered participants.

The first 30-minute presentation is by Joanne Martin, which is PMD 14-P1.21.

Ms Martin, the floor is yours.

PRESENTATION BY / PRÉSENTATION PAR:**JOANNE MARTIN**

MS MARTIN: Thank you and good afternoon, Dr. Swanson, Dr. Muecke and Dr. Archibald. I am Joanne Martin, a homeowner and third-generation resident in Inverhuron, completely opposed to constructing a DGR on the shore of Lake Huron or anywhere in the Great Lakes basin on either side of the border.

Troy Patterson wrote that: "The proposed DGR is only one of the most scientifically complicated projects ever conceived in the history of humanity...it is complicated beyond belief..."

One of the most noteworthy complications with the February, 2014 failure of New Mexico's WIPP is that nowhere in the world is there an example of a successful DGR, certainly not one as large, deep or as expensive as OPG's proposed DGR, nor blasted into fracture prone limestone, nor with such an expanded level and amount of radioactive waste to be stored, nor one where it is virtually impossible and

prohibitively expensive to retrieve the deadly waste in case of an accident, nor one that is supposed to last and safely store the nuclear waste for 100,000 years, and certainly not one crowded cheek-to-jowl beside 21 percent of the entire world supply of fresh water which millions of people rely on every day.

The Japanese PM wrote, Japanese:
"Government officials have been blinded by a false belief in the country's technology infallibility and were too steeped in a safety myth!"

What if we changed government officials in this quote to read OPG and CNSC seem to have been blinded by a false belief in OPG's technology and fallibility and are too steeped in OPG's safety myth?

Read their explanation of why WIPP failed and how this could not happen at the proposed DGR. Are they 100 percent certain? Are they 95 percent certain? How can they rule out human error or equipment malfunction completely?

Apparently here in Bruce County we are going to show everyone that we are smarter than nuclear scientists anywhere in the entire

world, no matter the consequences. WIPP's failure after only 15 years should be a big red flag to us in Canada that warns us to choose another site to bury nuclear waste. WIPP no longer supports OPG's safety case.

OPG showed an unprecedented lack of due diligence when siting the proposed DGR on their land for their own convenience beside Lake Huron without investigating other sites. Those issues, in a nutshell, are the two most important reasons for a lack of trust for this proposed project on the part of millions of people.

One, no other sites were carefully considered, investigated or sought and the most cogent fact, the proposed site is too close to our precious Great Lakes.

The Canadian Rockies and the Great Lakes are at the core of our Canadian pride and identity, our Maple leaf psyche, they are sacrosanct and cannot be risked for any reason no matter how many scientific safety claims are made.

The JRP's subsequent direction to the IEG vis-à-vis the relative risk analysis of alternative means of carrying out the proposed

project in order to properly expand and conscientiously explore the siting exercise seem vital to the integrity and safety of the 2014 process. Unfortunately, given the limited time available and incomplete choice of variables to be researched, we are not further ahead. It was impossible for the IEG team to have thoroughly explored other venues in granite rock, but, most surprisingly, they chose to consider a conceptual granite site as if it were beside a Great Lake.

To be consistent, they then should have considered the distance of transport to the granite site to have been the same as to the Cobourg site.

The aboveground storage options also needed to be considered with the additional variable of being moved further away from the Great Lakes rather than only at the WWMF in order to elicit more complete and valuable information.

The IEG report may have been expedient for the exercise, but given the far-reaching and disastrous consequences of choosing the wrong site for the wrong reasons, we did not move towards a 100 per cent guarantee that the site and method chosen provides the

highest level of safety of any option.

A DGR beside Lake Huron adds an unprecedented consequence to the risk of failure already inherent in this project. It would be interesting to computer model the risk factor as at the onset the proposed DGR only has a 50:50 chance of success at best.

Consider that there is no empirical evidence, only opinions of the proponents to support the hundred-thousand-year timeline, because WIPP failed after only 15 years.

Couple this with incomplete knowledge of the strata that will be encountered in blasting and digging, how much fracturing will occur, how long it will take for water to seep into the cavern, the effects that events such as earthquakes, tsunamis, climate, malevolent acts, et cetera, will have and what damage human error or incompetence will cause and the uncertainty of success for 15 years or beyond becomes significantly less, maybe five or 10 per cent, if we were lucky.

As we are a nation with broad mind experience, we should attempt this

experiment in the Precambrian granite of the Canadian Shield. At least with this location huge populations and the drinking water for 40 million Canadians and Americans would not be put at irreparable risk.

The methodology used to determine the significance of adverse environmental effects is largely based on computer modelling, simulations and assumptions and, therefore, any conclusions have a variable and unconfirmed degree of accuracy that cannot be relied on.

OPG and CNSC do recognize this, which is evident in the way they couch their opinions, with no quantifiable guarantees. How have these unlikely environmental effects, mitigation measures and uncertainties in the safety case been a 100 per cent resolved with clarity and transparency within the context for predicated changes in terms of magnitude, geographic extent, timing and duration, frequency and reversibility and with defensibility of each significant determination?

As the initial OPG EIS and subsequent revisions are largely based on modelling, the most important issue is the

validity of these models. A model makes accurate predictions when its assumptions are valid and does not make accurate predictions when its assumptions do not hold. A model is evaluated first and foremost by its consistency to empirical data. However, a fit to empirical data alone is not sufficient for a model or models to be accepted as valid.

Do we want to rely on methodologies that only appear sound? How does anyone really know?

As for sign-offs by government departments and agencies, we are really relying on the best guesses of people writing reports in their Ottawa and Toronto offices. They are not actually there to test calculations, but still signed off on the EIS in 2013 by saying that the methodology appears sound. How does anyone or any regulatory body really know that the models employed, the calculations and the assumptions made are valid, that the data has been entered correctly or that simulations have been properly carried out?

Consider the due diligence concept. What if 12 or 24 boreholes were tested

instead of only six? What additional intelligence would have been gleaned with twice or four times the resulting data? Why are so few boreholes investigated?

Again, that seems like too little for such an expanded project. Engineer friends that I have consulted are astounded. In this case one would expect that more is better.

Why didn't OPG and CNSC and other partners voluntarily recognize and act on what millions of people are saying. The proposed DG repository site is too close to our freshwater supply and given no definite assurance of success without risk, the site must be moved. We must set ourselves up for success. Imagine the public acceptance and trust such an announcement would have engendered.

Also, what about the human factor and fallibility? Dr. Greening, a former long-time OPG scientist has made us all aware of serious miscalculations published by OPG and NWMO concerning refurbishment waste calculations as well as other serious incidents at the Bruce site of which the public was not made aware.

OPG actually agreed with Dr.

Greening's comments. He was an insider and, therefore, has specific and vital knowledge. We do not. This leads us to legitimately ask what other mistakes, miscalculations, errors in theory, testing, geographic hypotheses, radiation effects, plant, fish, animals, snake and human contamination have gone unnoticed, unreported, discounted or actually hidden from us?

So although the methodology seems to determine the significance of adverse environmental effects may be sound, there is not definitive empirical evidence to support this assumption, nor any historical data.

In EIS-12-510, OPG has been asked to avoid the "may not be significant" determination and to instead explain their level of confidence in each of the significant conclusions. These should be quantified with a percentage by OPG and also CNSC in order to improve understanding and evaluation, which is what this hearing is all about.

How can the reader have confidence in the significant conclusions that OPG brings forward because the answers are based on unproven hypothesis, assumptions and OPG's

judgment.

Where is the definitive proof? What is CNSC's percentage of confidence in their estimations and processes? Can this be quantified as 70 per cent or 80 per cent and what per cent is actually acceptable?

Let's talk about a case in point. One example is in number six concerning noise. No noise receptor was placed on the shore at Inverhuron on Lake Street. Taxpayers in homes along the bay from Bruce Power and the proposed site complained that they heard sound from the plant like they were at the large end of a megaphone. The sound waves carry across the water and are amplified significantly.

If you build windrows you will see that Inverhuron is more affected by prevailing winds than tiny Baie du Doré.

The effects of 24-hour construction during site preparation, construction and decommissioning phases cannot be accurately assessed until those phases actually happen with real, not modelled, noise levels echoing across the bay.

With 24-hour construction noise,

a relatively peaceful tourist and recreation retreat will be turned into a battle zone with blasting for years. House values will plummet and OPG will not be obliged to compensate those homeowners for their dire financial losses because it seems that the Kincardine Municipal Council was too unaware to properly protect homeowner interests and OPG perhaps took advantage of the council's lack of business acumen and sophistication.

So why or how did Port Hope get a better protection agreement? Inverhuron homeowners were not asked to have input on the property protection agreement, yet we would be most affected. That agreement should be revisited.

And then we have the, what I'd call maybe sneaky and slanted willing host community survey, which also should be re-addressed by a referendum.

Here is an interesting fact that impacted on the willing host community survey. The Western Waste Management Facility was formerly called the Radioactive Waste Operating Site 2, RWOS 2. Now, RWOS 1 was beside

Inverhuron Park and leaked radioactivity into the groundwater and wetlands there, also poisoning wells in the immediate vicinity, i.e. Mary McKenzie's well. The waste was transferred to RWOS 2 and then problems started to show up there.

Then the name of this facility was changed to the very innocuous Western Waste Management Facility with no mention of radioactive waste or deep geological burial so close to Lake Huron.

It's also interesting that Kincardine refers to their landfill dumps such as Armow as waste management centres, so is Armow the northern, southern or eastern waste management centre?

No wonder people were confused and not concerned when they answered a phone question in winter of 2005 that asked: Do you support the establishment of a facility for long-term management of low level and intermediate level waste in the Western Waste Management facility? Oh, they thought another garbage dump, no problem, maybe it's closer.

What if the question had said:

Establishment of a facility deep underground beside your drinking water in the radioactive waste operating site?

The willing host agreement is not based on a representative survey especially given the small number of people who got to answer and the almost 2,000 seasonal and permanent taxpayers and millions of stakeholders who did not. It is not based on informed consent, but on council's promise of economic benefits and council's firm recommendation. The term "willing" should mean with a free will, not bought for a million dollars a year or because the respondents were afraid to lose their jobs or pensions.

Further, the term "informed" means having all the pertinent facts before coming to a decision, not a quick and dirty winter phone survey. The willing and informed house designation for this project is not robust, but actually flawed.

OPG's noise pollution submissions were based on a 2006 paper "Night Noise Guidelines for Europe" and actually looked at how wide people were able to open their windows in order not to be bothered by destructive noise

levels.

Health Canada has not actually concluded noise health studies, however, they feel that the noise that would be generated from the proposed DGR phases would not cause health issues. So this supposition is not based on any empirical evidence or exhaustive health studies because none have ever been done.

Health Canada failed to study medical data that shows an established link between high blood pressure, heart disease, depression and psychiatric illness. Health Canada and OPG did not research the literature adequately because they buy into OPG's misconception that adverse effects from construction noise are not significant.

One cannot turn off construction noise like one can turn off a radio. Imagine the stress and health implications inherent in 24-hour construction over many years, untenable. Most people would move rather than put up with that constant annoyance.

WHO says the evidence on low frequency noise is sufficiently strong to warrant immediate concern. There should obviously be an

ongoing debate and impact study about the level of construction related C-weighted or infrasound noise because OPG still does not recognize the validity and harmful potential of this issue.

An extremely important issue is that in all the years we have lived in Inverhuron, we have never been provided with iodine pills. What about the increased possibility of radiation poisoning and contamination should the project be approved?

So if Bruce Power is thinking to finally issue nearby homeowners iodine pills, what will they be issued or actually not issued if Bruce Power and the DGR are beside each other?

Is this actually covered in the safety case? How is it acceptable or believable for OPG to say that we shouldn't worry if the proposed DGR leaks because there is enough water in Lake Huron to diffuse the radiation effect, yet the United States, across the ocean from Fukushima, reports contaminated fish being caught close to American shores?

International Physicians for the Prevention of Nuclear War, IPPNW, have just issued a scathing critique of the UN report on

Fukushima that says:

"No discernible changes in future cancer rates and hereditary diseases are expected due to exposure to radiation as a result of the Fukushima nuclear accident."

Really? The UN report, the physicians complain, draws mainly on data from the nuclear industry's publications rather than from independent sources and omits or misinterprets crucial aspects of radiation exposure and does not reveal the true extent of the consequences of the disaster, which I understand is ongoing and getting worse.

Dozens of independent experts report that radiation attributable health effects are highly likely, another problem with a trust issue and risk perception.

The UN group also professionally rejects the use of a threshold for radiation effects, which -- this is interesting, they reject the use of a threshold for radiation effects of 100 mSv used by the International Atomic Energy Agency in the past.

Like most health physicists, both

groups agree that there is no radiation dose so small that it can't cause negative health effects. There are exposures allowed by governments, but none of them are safe. Please take note, Health Canada, et al.

Further, we live next to a nuclear power plant and our Medical Officer of Health has not established baseline cancer and hereditary disease studies among the Bruce Power employees, their families and the rest of the population within the radiation nucleus. Why?

My cousin Jim has worked on contract part time at Bruce Power for four or five years. He had to be all suited up and give urine samples daily, or routinely. He went to the Bruce Power doctor last January and in the Kincardine Hospital complained of a sore throat. He was treated for a cold.

His London doctor diagnosed him with inoperable stage IV cancer of the throat this June and he is taking chemo and radiation therapy. He has lost 30 pounds and the next step is a feeding tube. He is only 63 and was in good health.

An increase in childhood

leukaemia cases near Germany's operational nuclear reactors was proven in 1997. Chernobyl and now Japan and not just near Fukushima are showing alarming reports of cancer and confirmation of contaminated food and water.

So it seems that really the Saugeen Ojibway Nations should be worried about the consequences of this forever project.

The proposed DGR project is only one kilometre or less than two thirds of a mile from the Lake Huron shoreline. This is the most compelling negative irresponsible and disturbing fact in the whole project, the one that millions of people worldwide, and particularly on both sides of the border in the Great Lakes basin, cannot understand or condone.

This is a tipping point. This experiment with a 50:50 chance or less of succeeding safely for 100,000 years is being planned within dangerous and arrogant proximity to 21 percent of the world's available freshwater supply. That fact alone is the showstopper and it should be.

In 2004 when Kincardine signed on to host the project, we know that they actually

agreed to half the size of the underground nuclear dump, a smaller percentage of intermediate level to low level waste, no decommissioning waste, less emplaced volume and half the containers compared to the current list.

Many interveners have described the OPG project "creep", but I am more concerned with project "gallop". The current size of the proposed DGR is twice the original size with future plans to have a DGR four times the original size.

Talking about the Independent Expert Group, I was disappointed in their submission and the lack of variables, particularly concerning the aboveground options that could have been meaningful and actually providing alternate means and guidance.

The IEG outlines their difficulties with the process in notes four and five and reveals that there is significant uncertainty about the correct icon locations in both the likelihood and the consequent dimensions. Therefore, it would seem that many of the icons were placed based on assumptions.

Now, one of the most concerning

was siting the conceptual granite DGR in the Canadian Shield beside a Great Lake. This completely skewed the validity of the results.

The discussion about public tolerance was very limited and incomplete, using subpar studies that completely ignored Inverhuron, the second largest and closest community to the proposed site.

There does not seem to be a proper distinction also made between the two issues, acceptance of nuclear power and a nuclear power plant versus acceptance or non-acceptance of the concept of burying nuclear waste beside Lake Huron. Those are very different.

The taxpayers and homeowners in Inverhuron have zero tolerance for risk, noise pollution, endangered health and property values that have not been protected and it seems that we are consistently overlooked, particularly by OPG, who seem determined to do what they please despite the risk. They seem much more concerned with Baie du Doré, which has four houses, instead of Inverhuron which has four to 500 homes and about 2,000 people. So four homes versus four or 500.

In contrast, in the limestone and granite DGRs, the IEG seems to think that both rock formations would work. The granite DGR site would be expected to have a higher overall fluid transmission potential than the dense low porosity and low permeability sedentary rocks at the Bruce DGR site. This low porosity and permeability question concerning the Cobourg limestone has been vigorously disputed by many geologists, engineers and scientists at the previous JRP hearing.

The available research, largely based on six boreholes, does not give a definitive answer concerning the geology, despite OPG's claims, therefore, both sites being relatively equal, the clear disadvantage of the Bruce site compared to the conceptual Canadian Shield site is its potentially dangerous and risky proximity to Lake Huron and the freshwater source of 40 million people.

The distance transportation issue is actually a non-issue as a longer distance to travel to the Canadian Shield should hold the same relative to absolute risk ratio as the Cobourg site given the much higher population

along that route.

I agree with many Bruce Power workers and with the U.S. Nuclear Regulatory Commission that is now saying that because of the difficulty of constructing underground waste storage facilities that waste cannot be stored aboveground in dry concrete -- that waste can now be stored aboveground in dry concrete casks indefinitely.

Therefore, I would strongly recommend enhanced surface storage. My preference would be to remove the aboveground storage away from Bruce Power and Lake Huron for the time being.

Further, I strongly suggest that OPG should be directed to make a concerted effort to find a real deep repository site in granite bedrock in the Precambrian geology of the Canadian Shield and to abandon the proposed site near Kincardine.

Another trust issue. Ontario Power Generation has finally upped the ante and come clean about its intentions concerning the expanded proposed DGR. OPG plans to expand the repository to contain decommissioning waste, an

additional 2,000 cubic metre of radioactive waste.

This was not on the table in the 2013 hearing or when Kincardine signed on in 2004. This was not made clear to the 4,057 people who agreed to be a willing host community.

Apparently this is for another hearing, or not, depending on the whims of government and whether nuclear waste is a provincial or a federal responsibility.

If OPG can blatantly change parameters and double or quadruple the size and content of the repository, all the stakeholders need a chance to approve or disapprove of the entire project. A referendum is required because the project is no longer the same.

As well, the pathetically weak, one-sided and useless home value protection plan should also be revisited and rewritten.

Preliminary analysis of WIPP events by CNSC and OPG point to lax inventory control, cost-cutting measures, measures by government departments, failure to uphold, institute or follow best practices in safety measures and procedures, employee error and

perhaps lack of training and oversight.

CNSC and OPG attempts to protest the Canadian standards are much more strict and comprehensive, especially mining regulations, safety training, et cetera, and therefore the precipitating factors, human error and consequence could and would not happen at the Bruce site.

It is once arrogant and foolhardy to suggest that the proposed OPG project would never experience accidents, malfunctions and other malevolent acts. No one can guarantee that. Where there are employees there will be incidents, that is life, and there is no way that WIPP wasn't an accident waiting to happen. We are not infallible, our science is not infallible, our modelling is not infallible and the whole process is so complex that unknown errors, some big/some small, will be present throughout the process.

WIPP's failure is a timely reminder of the serious and unbelievably difficult task of trying to keep radioactive waste safely contained and controlled.

There are no successful examples

of non-leaking, intact and safe DGRs anywhere in the world, despite the very best brainpower and science available. We must not disregard such a clear warning as the WIPP failure by attempting to convince ourselves that we are better, smarter and more careful than anyone else. We're really not.

OPG's initial lack of due diligence and ongoing insistence on siting this proposed DGR right beside 21 percent of the world's available freshwater supply proves that point.

We can spend millions of hours and dollars modelling results, testing variables, writing opinions and revising the EIS, but our chance of success is still 50:50 or less.

In closing, our distinct obligation to Canada, the United States and the world is to take that incredible risk out of the equation and put trust back in by choosing a site many hundreds of kilometres removed from Lake Huron and the Great Lakes basin, or by continuing to monitor the waste aboveground, but again, removed from Lake Huron.

Thank you, merci beaucoup.

--- Applause / Applaudissements

THE CHAIRPERSON: Thank you,
Ms Martin.

Panel Members, did we have
questions?

Dr. Muecke...?

MEMBER MUECKE: Ms Martin, you
make a statement: Along with many Bruce Power
employees I would strongly recommend enhanced
service storage.

What evidence can you provide to
the Panel that many Bruce Power employees would
support such a statement?

MS MARTIN: Thank you, Dr.
Muecke.

If you live in a small town like
Kincardine, in the area, and many people are with
the company as it were and people talk, you hear
more and more when we talk to people in
Kincardine to say, what about this DGR and they
say, you know what, let's -- we have had no
problems, let's just leave it where it is or, you
know, in containers aboveground, let's not do
anything that would be a disaster if the thing
leaked.

So I can't tell you that I have talked to every last single employee but, you know, when people talk and they start saying to you, well, you know, why don't we leave it where it is -- and some of the gals I play tennis with say to me, "Well, you know, our husbands think the DGR could work, but on the other hand, we have looked after it safely for 40 years and if we have better storage and maybe we moved away from the site, then we will be fine."

So I think as this goes on and more people are aware of the risks that siting a DGR beside Lake Huron can pose, they are becoming more and more convinced that they have been doing something right already.

MEMBER MUECKE: Perhaps, could you comment on the apparent absence of Bruce Power employees voicing this opinion to the Panel?

UNIDENTIFIED SPEAKER: They are afraid for their jobs.

--- Laughter / Rires

MS MARTIN: No. Excuse me.

THE CHAIRPERSON: I would ask that audience members not interrupt the

proceedings and I will ask Ms Martin to answer that question, please.

MS MARTIN: Thank you.

I have to say that when I first got involved in this, a couple of years ago when we found out what was happening with the DGR, I can remember going to various places to get services, like for instance getting printing done, and I said to the gal who owns the printing shop just over here, "So what do you think about the DGR?" And she said "I can't comment. If I am against anything to do with the Bruce Power, I will not have any more business."

And she is not the only one. We have heard over and over again. My son works for Bruce Power, you know, it's just the fear that they could lose their jobs or they won't get their pension or -- really people in their family will be against them because, you know, you could have -- just like the Civil War, you could have a divided family, somebody who does work for Bruce Power, who doesn't work for Bruce Power. It's just a fear.

For instance, we were told that before this survey in 2005 that all the employees

of Bruce Power -- and Laurie can correct me if I'm wrong, but we have been told that everybody got a letter from the head of Bruce Power saying it would be very nice if you would say yes and support us in this survey.

Again, you know, there was the incidence of sending messages to the fundraisers and the not-for-profits that Bruce Power was supporting and asking them to stand up and speak for them. So there is an influence.

Maybe it's not overt, but there is certainly a thought that if I go against Bruce Power it won't be good for me in this town.

MEMBER MUECKE: Would OPG care to comment on that?

MS SWAMI: Laurie Swami, for the record.

I think that it's important to recognize that Bruce Power and Ontario Power Generation are separate companies. We don't send letters to Bruce Power employees asking them to support us. How they deal within their internal company I can't comment specifically, but I can say within the nuclear industry -- and we had a lot of discussion about safety culture earlier

during this set of hearing days -- that through safety culture we encourage our staff to raise issues.

Bruce Power would have the same traits of a healthy nuclear safety culture where they would encourage their staff to raise safety concerns or safety issues.

I would anticipate that Bruce Power employees that felt strongly about the DGR one way or the other would certainly feel free to come forward and raise those issues, whether in this forum or through their line organizations or directly to Ontario Power Generation.

I'm not familiar with any letters that were sent directly to employees, as Ms Martin suggested, I am just not familiar with that.

MEMBER MUECKE: Thank you,
Ms Martin and Ms Swami.

THE CHAIRPERSON: Dr.
Archibald...?

MEMBER ARCHIBALD: Ms Martin, you give an example on slide 13 of your presentation of noises and adverse environmental effects and state that sound waves carry across the water and

are amplified significantly.

I would like to address the question to both Environment Canada and OPG. Would you please comment upon the effects of sound transmission over water and enhanced adverse impact effects on nearby residents?

OPG first, please.

MS SWAMI: Laurie Swami, for the record.

I would like to ask one of our experts on the phone to respond to that. Mr. da Silva I believe is with us.

THE CHAIRPERSON: Mr. da Silva, did you hear the question?

MR. da SILVA: Yes, I did.

For the record, Danny da Silva. Propagation of sound over water is enhanced, it isn't necessarily amplified. There is an input of energy from an external source.

Under calm atmospheric conditions where the water surface is still, the propagation of sound over the surface will be enhanced due to the reflection of the sound waves back into the propagating wave.

So we have accounted for that in our modelling by including a parameter on the water which basically makes it acoustically hard. So that reflection is present all the time in our predictions. So we have in the modelling accounted for reflection of sound over water to enhance the propagation of sound in any direction.

MEMBER ARCHIBALD: And would there be any comments from Environment Canada?

THE CHAIRPERSON: Perhaps we could have Environment Canada representatives come to the third table, just because we are going to be returning to our questions from before lunch in a couple of minutes anyway.

--- Pause

THE CHAIRPERSON: So, Mr. Leonardelli, I believe Dr. Archibald simply wants Environment Canada's comments, if any, on the relevance of the topic of sound propagation across water.

In this case, of course, in your jurisdiction it would be with respect to any effects on the wildlife, for example birds, and whether that would have affected in any way your

evaluation?

MR. LEONARDELLI: Sandro Leonardelli, for the record.

So first of all, let me be clear that if any of the questions have to do with impacts on human receptors, we don't have the mandate or the expertise for that, nor do we have the expertise to evaluate the acoustic modelling that you are speaking of.

In terms of migratory birds, we did do an analysis of that and the largest -- sorry, the loudest sounds would be experienced in and around the DGR site itself. So that's what our review focused on, is potential sound effects on migratory birds in and around the DGR site.

We would not have looked further afield across the water, for example.

THE CHAIRPERSON: Thank you.

I have a couple of questions that arise out of Ms Martin's presentation directed to the Medical Officer of Health.

Dr. Lynn, are you on the phone?

DR. LYNN: I am.

THE CHAIRPERSON: Thank you.

So my first question to you, Dr.

Lynn, is how would you describe what a baseline health study should look like in order to encompass concerns regarding radiation-related cancer and hereditary disease?

DR. LYNN: I guess if you want a cancer report then you would need to do the levels of cancer and follow them over years, which we do. Every five years we put out a new one for Grey and Bruce. We do have it separated into counties as well.

THE CHAIRPERSON: Then how about hereditary disease?

DR. LYNN: What do you mean by "disease"? I mean, we do know some of the oncogenic genes which are passed from one family to another, we can get them measured in London. It's not something that is done frequently, it's when there's clusters within families.

THE CHAIRPERSON: My question arises directly out of Ms Martin's presentation where she refers to hereditary disease. So with the indulgence of Ms Martin I will try and add a little bit more to the interpretation.

I believe Ms Martin is expressing a concern regarding any role played by radiation

in increasing the incidence of hereditary genetic change.

DR. LYNN: I think you would need to talk to a geneticist. Again, the only cells that go from the parents to the children are the reproductive cells and if it is a genetic fault then you have a one in two chance, each of you, passing those on.

I don't know if that's what she wants to talk about.

THE CHAIRPERSON: I believe I will leave it for now. Perhaps CNSC can help us a little bit with the types of studies that might be specific to radiation-related inherited disease as per the definition of what a sufficient and appropriate baseline might be.

So I will leave that for a minute and I will move on to the next question for you, Dr. Lynn, which is, would you remind the Panel -- and I know you did refer to this last fall, but just remind us again, what specific baseline information does exist for the Grey Bruce Health Region?

DR. LYNN: We have anything that Health Canada collects, Cancer Care Ontario

collects. So we have heart attack rates, we have hypertension rates, we have all sorts of health behaviours.

Is that the kind of information you are looking for? We have it from every -- we do cancer here every five years because we don't have enough to be able to publish the data because you can't -- if you have only a few numbers in each cell you can't publish it. So about every five years we redo it.

THE CHAIRPERSON: Dr. Lynn, with respect to the baseline data that are gathered every five years, does the Grey Bruce Region have any plans to ask for the resources to, for example, increase either the frequency of baseline data collection or increase the sample size?

DR. LYNN: Well, this is Cancer Care Ontario stuff, so every cancer is reported through that.

THE CHAIRPERSON: Okay.

DR. LYNN: So I can't increase it any because we get them all already.

THE CHAIRPERSON: Okay. Thank you.

DR. LYNN: But there is just -- I mean, we don't have a huge population here.

THE CHAIRPERSON: So by that, again remind the Panel, the inference is because of the low population the data simply will not support a reliable analysis, or at least a cause/effect analysis between radiation exposure and incidence of any of the radiation-related diseases; is that correct?

DR. LYNN: Yes. We do actually monitor pretty carefully in comparison to other areas, particularly rural areas which are similar to ours in diet and so on, so that's the ones we sort of match up to and I guess we are basically under or at the same rates as our comparators.

THE CHAIRPERSON: Thank you for that reminder, Dr. Lynn.

CNSC, did you have any further information to add?

DR. THOMPSON: Patsy Thompson, for the record.

When we talk about -- it's a hard word to say for a Francophone, inheritable disease, normally the type of baseline work that is done is, for example, looking for Down's

Syndrome, congenital malformations and miscarriages. That is the type of baseline information that is collected in other regions, for example, around Durham where the Pickering and Darlington plants are.

The ICRP has identified risk factors that when we calculate the potential for health risk in relation to a radiation dose, we do take into consideration incidence of lethal and non-lethal cancer and there is a risk factor for inheritable diseases even if they have never been observed in humans. It is based on animal studies and to be conservative and prudent, the risk factor for humans is used.

THE CHAIRPERSON: Thank you.

I believe that answers the questions we had based on Ms Martin's presentation.

Before we proceed to the next presentation, the Panel understands that both Environment Canada and CNSC require clarification on a question. So let's deal with that now.

Returning to some of the questions from this morning, and apparently we do have some answers ready, the Panel will hear

those answers after the break this afternoon.

So if Environment Canada could start, you required a clarification did you?

MS ALI: Nardia Ali, Environment Canada, for the record.

And it wasn't a clarification of a question. It was your other clarification on a phrase that was in our presentation this morning.

So EC would like to clarify the statement in the July 2nd '14 submission to the JRP which was also included in our presentation this morning related to implications of flooding from a probable maximum precipitation event in which we used the phrase, and I quote:

"...and the resulting flooding have implications for loss of human life at the DGR site."

Unquote. The use of this term by Environment Canada was only meant to emphasize the importance of ensuring the DGR facility is appropriately designed to the highest standard to eliminate the risk of flooding into the facility. We did not intend to imply in any way that the DGR facility would be a safety risk to humans who work in the facility and we expect -- we fully expect that OPG would follow appropriate measures

to ensure safety of their workers in the facility.

Thank you.

THE CHAIRPERSON: Thank you, Ms Ali.

CNSC...?

DR. THOMPSON: Patsy Thompson.

I do have a clarification. So this morning when you rephrased the question you asked, "Is that clear?" And I went like this. And so my neck went like this and my brain must have done like this because -- and my hand didn't write it.

But the question was in relation to total suspended solids and the risk in relation to if there is an overtopping, I guess, of the stormwater management. Was that your question?

THE CHAIRPERSON: I think the context for it was that scenario that the Panel were considering was, yes, in a storm event beyond the current design, even though the ditch might safely carry the flow the potential for increased suspended solids in that flow to, in turn, have adverse effects in MacPherson Bay.

DR. THOMPSON: Thank you. So, we'll be prepared to come back tomorrow with an answer.

Thank you.

THE CHAIRPERSON: The next presentation is by Siskinds LLP and Eugene Bourgeois which are based on PMDs 14-P1.27 and 27A and 14-P1.48.

Mr. Bourgeois and Ms Lombardi, please proceed.

**PRESENTATION BY / PRÉSENTATION PAR
EUGENE BOURGEOIS AND PAULA LOMBARDI**

MR. BOURGEOIS: Thank you, Madam Chair, Members of the Panel, First Nations and members of the public.

Attachment A of EIS 12-512 discusses air quality effects when it asserts that CO, SO₂, NO₂ will not exceed regulations more than 10 percent of the time beyond the site boundaries. In addition, it asserts that hourly averages for PM_{2.5}, PM₁₀ and SPM will not exceed relevant guidelines more than 0.5 percent of the time and then only just beyond the site study

area that is immediately adjacent.

Pages 32 and following describes these effects. Unfortunately, much of what it describes has little to do with the environment and conditions found in Inverhuron, rendering its analysis about effects, and particularly the potential for health impacts on residents, suspect. On page 32, it states:

"OPG's hypothesis was that, to have a significant effect on the air quality VEC, the DGR Project would need to result in ambient air concentrations beyond the Site Study Area that exceed relevant established ambient air quality criteria more than 10% of the time."

It adds:

"The detailed assessment of the potential effects presented in the Atmospheric Environment TSD (Golder 2011) identified residual adverse effects of the DGR Project on air quality during the site preparation and construction phase, the operations phase, and the decommissioning phase. None of those effects were assessed to be significant."

Thus, both the response and OPG's statement in the TSD are relevant determinants in

assessing the human health impacts from airborne emissions.

The TSD uses five-year average meteorological data, ending in 2009. Table C3-1 shows that our summer maximum temperature is 31.8C and that there were only two days during the year with temperatures above 30C. Times have changed and it appears as well that our climate has changed with it. Already this year, we have had more than five days of above 30C weather in June alone. However, there is no description in the responses as to how these average temperatures might affect the models OPG uses to track pollution from the nuclear site to the nearby community and overnight campers.

The air quality section of EIS 12-512 makes the following statement:
"When establishing ambient air quality criteria in Canada, thresholds are set at levels that inherently provide a level of protection. Criteria are usually set below 'no-effects' or 'lowest-observed-adverse effects' levels."

In the absence of a detailed cumulative effects analysis, considering all the variables on-site, what might be a no effects

threshold for one chemical alone can become a significant effects threshold when it combines with other freely available chemicals and/or particulate matter.

In addition to these concerns, there are other problems represented by the data in the TSD. Our farm and property is identified in Appendix J as a Human Health receptor, HH1, and JA1-1 gives the air quality data for our property. Unfortunately, OPG never came to our home here to install NO₂ or SO₂ monitors. It is, therefore, unclear how it has acquired this data or what precisely this data represents. It does earlier, in Table J1.1.1-1, provide predictions for NO₂, SO₂ and SPM, giving averages of 499.5 micrograms per cubic meter for NO₂, 133.9 for SO₂ and 182.5 for SPM.

Unfortunately, these data also come with the caveat that they do not include any predictions for the Waste Rock Management Area. Since this is one of the issues of grave concern for area residents, and particularly for its potential to impact on our health, this oversight is both critical and significant.

The problem is even more acute

because of the dynamic weather and meteorological patterns that develop along shorelines and particularly those below an escarpment. It is well known that a thermal internal boundary layer (TIBL) will develop under many spring to fall weather conditions. Measurements taken by Ontario Hydro in 1984 confirmed that the TIBL was present between the months of April and October, in some cases with a maximum height that more or less matches the height of the escarpment.

This circumstance isolates the lower shoreline community from the atmosphere above the TIBL where pollutants emitted by industrial processes can achieve significant mixing, dilution and uninterrupted transport downwind.

A TIBL begins to grow where there is a change in surface roughness from the smooth lake to the rougher land at the shoreline. Thus, any industrial facilities at the shoreline, such as a nuclear power plant, will emit pollution above the boundary layer and these can become entrained by the TIBL as it grows inland, instead of being mixed in the stably stratified layer above it.

At the location of the Waste Rock Management Area, the TIBL will on average have a height of approximately 50 metres, almost the same height as the rock pile is projected to be. The rock pile itself will act as a new hill making the TIBL grow faster closer to the shore.

The TIBL will grow inland above the rock pile but there is no indication in the air quality assessment as to just how great this growth in height will be. Depending on the temperature gradient between land and lake, the TIBL will grow more or less rapidly, yielding widely variable growth patterns and changing the possible locations for fumigation of entrained pollutants within it.

Below the TIBL, depending on cloud cover and ground moisture, thermals can develop that will, in turn, capture pollutants emitted at sources on the surface (such as the rock pile or the incinerator) and move these about in a looping pattern driven by thermals caused by the sun heating the surface.

The paved surfaces at the Western Waste Management Area beside the projected Waste Rock Management Area will be an ideal source for

the development of thermals caused by the surface heating. There is no discussion of how these interactions might occur and no predictions of the nature and values of pollutants such thermals may contain, nor how these might mix with the surrounding biosphere.

There is no description as to how or in what manner these looping thermals will develop. Nor is there a description of the extent of their reach in the shoreline community of Inverhuron. These pollutants vary broadly and would include incinerator gasses, ventilation gasses, construction and vehicular wastes, particulate matter and more. The Waste Rock Management Area will grow to cover some 55 acres in area and rise to a height of some 35 metres or about 115 feet. This mountain of tailings will contain Cobourg limestone from cavern extractions -- excavations. These tailings will have been blasted, drilled, crushed and mixed up with one another before being brought to the surface to be deposited as tailings here. We know from the EIS that this waste rock is exceedingly dry and that this is one of the compelling characteristics that recommends this

site as a suitable one for a DGR.

When the rock is moved to the surface, it will range in size from very fine particulate matter to large rocks. The EIS does not describe the characteristics of the rock itself. The atmospheric moisture will be absorbed by this clay-based bedrock, causing it to swell and fracture further, creating more very fine particles over time. The mass of rock itself coupled with the additional moisture will make this rock pile conducive to being heated on sunny days and this will help to create the unstable atmospheric conditions above -- over the rock pile. These updrafts occurring from the waste rock pile will carry pollutants until a downdraft brings them back to the surface where it will impact on any sensitive receptors.

The air quality cumulative effects analysis is silent about any of these possibilities, including a description of the local meteorological conditions and the role these will play in distributing toxic materials from the nuclear site to the surrounding biosphere, including locations in the hamlet of Inverhuron.

OPG, in this response, addresses each studied chemical as though it alone and as a singular element will be available for distribution to the surrounding biosphere. It fails in its entirety even to mention the role that the TIBL will play in distributing this material unmixed to the community-at-large. Without considering the impacts of combinations of these materials or the role of the TIBL and other meteorological conditions, OPG nonetheless states:

"The emissions used in the modelling included the mitigation incorporated into the design of the project;

therefore, all predicted adverse effects were also classified as residual adverse effects."

In addition, it states:

"Although predicted ambient acrolein concentrations at the off-site human receptor locations were less than ambient Ontario criteria, the resulting inhalation of acrolein by local residents during the site preparation and construction phase was identified as a residual adverse effect to human health because the predicted concentrations were

above health screening criteria. However, based on the results of a human health risk assessment, the resulting health risks to local residents were considered low."

By some mysterious logic, this allows OPG to conclude:

"Therefore, no significant adverse effects were predicted on human health as a result of changes in air quality."

It continues by stating:

"Existing air quality conditions in the Local Study Area were predicted using a combination of dispersion modelling of the existing local sources and background air quality derived from air quality monitoring stations in the Regional Study Area. Existing conditions were predicted in a conservative manner."

It makes this statement without identifying the methodologies it uses to consider the validity of these air dispersion models. It fails to include an analysis of our local meteorological conditions and the role these will play in distributing site-available toxins to the surrounding environment and community through

shoreline fumigation scenarios.

During the Hearings last year, the JRP will recall that I asked Ian Parrott of the MOE whether model predictions could be back-dated to test their assumptions against known events. When he confirmed this, the JRP will also recall that I requested both from the CNSC and OPG whether either would consider doing so. Each declined.

The EIS identified a significant anomaly in the radionuclide concentrations of our leafy garden vegetables in 2009 when it recorded 1137 Becquerels per litre of tritium, approximately 50 times greater than the next highest reading at an offsite property right next to Bruce A, the source of the tritium. Dr. Thompson undertook to consider why this existed and observed that CNSC now knows why this event occurred but failed to identify meteorological models that would have predicted this occurrence nor whether this was caused by a single spike or was the result of continuous exposure.

Dr. Swanson asked me to put in writing and submit to Mr. Parrott modelling conditions which I believe would better describe

the existing conditions and more accurately represent what happens here in Inverhuron. These responses never happened. Instead, the Panel Secretariat emailed me that the status is closed: "Any additional information that the Panel requires will be related to the prediction of future emissions and to the consideration of requirements for the DGR Environmental Compliance Certificate." (As read)

I now reinstate this request.

The JRP cannot know the basis on which OPG has come to its conclusions about air quality, other than the use of its self-serving professional judgment when instead valid and robust models could be used to make such determinations. Moreover, the JRP has learned during the first phase of these Hearings that neither OPG nor the Grey Bruce Public Health Unit has adequate health data to determine whether existing operations have caused any health impacts whatsoever in the community-at-large, in spite of compelling data that suggests this to be so.

The Grey Bruce unit data used in this EIS shows that prostate cancer rates are

higher here than the Ontario average and in the past it has targeted prostate cancer, ovarian cancer, colorectal cancer, childhood leukemia, progeria, diabetes and heart disease, among other morbidity as being higher than the Ontario average, possibly significantly so. Neither the Grey Bruce unit nor OPG can comment on the epidemiological significance of this data because there are no baseline data with which to compare it. I will return to this theme later in my presentation.

Instead, OPG relies on the professional judgment of a Golder employee to make these determinations on its behalf, as the JRP heard during Phase 1. It also makes the claim that:

"The emissions were conservatively based on the maximum permitted emissions from all of the facilities at the Bruce nuclear site, as well as the emissions for actual vehicle traffic activity levels for the sources that do not require permits. The resulting predictions are conservative because actual emission levels at the Bruce site are considerably lower than the permitted maximum values. The resulting maximum

predicted concentrations were combined with background concentrations derived from the air quality measurements taken in the Regional Study Area. The existing conditions modelled in this manner are shown in the second column on Tables 5-2 and 5-3."

It's an empty claim. There are no such monitoring stations in Inverhuron, the location where the TIBL will play a major role. Above the escarpment, normal meteorological mixing will take place while below the escarpment the biosphere is prevented by the TIBL from mixing with existing conditions in the stably stratified layer above it. Thus, any measurements taken in Tiverton will often yield quite different results from ones taken below the escarpment, and especially so when we are subjected to periods of inversion brought on by the TIBL.

As this Panel heard during my presentation, these concerns have been a long-standing and unresolved issue. OPG prefers professional judgment and models that fail to reflect actual circumstances to actual collection of data.

If you, the JRP, approve the DGR without requiring that OPG adopt meteorological models at least as rigorous as the ones I described previously and without requiring OPG to conduct a community health survey that will provide baseline data for future epidemiological analysis concerning the impacts on human health, there will be no basis on which you will be able to state that this project will be safe for Inverhuron residents, flora and fauna. Many of us are elderly and with significant health challenges. We rely on you to fulfill the mandate you have been given and to ensure that OPG meets the claims it makes in its EIS when it states that there will be no significant adverse effects.

These are important factors relating to human health. As a result of Bruce Power's fire training activity in 2008 when our property was fumigated twice from a ground level source, first in May and then in June, my wife Ann has developed viral asthma. There are no genetic predispositions that would predict asthma for Ann. Nor are there lifestyle conditions that would cause it. As a result, only environmental

conditions remain as a potential cause. This is true as well in respect of her multiple cancers of ovarian and breast. She has neither genetic conditions nor lifestyle ones that would have predisposed her to these cancers.

Even OPG admits that its results are entirely arbitrary when it states:

"For an effect to be considered significant, the frequency of exceeding the relevant ambient air quality criteria was selected as 10%. This frequency is based on professional judgment and past environmental assessments, and is an incremental contribution comparable to the current situation observed in the region."

Clearly, from OPG's perspective, our communal good health is not considered to be either relevant or important:

"The conservative nature of the assessment in combination with the short duration of the periods during which the criteria could be exceeded, and the point of impingement being limited to the area immediately adjacent to, but beyond the fence line of the Bruce nuclear [power] site, is the basis for concluding that the residual adverse effects during site

preparation and construction are not significant."

Instead, OPG relies on unsupported and self-serving conclusions rather than rigorous analysis. OPG considers only single toxic substances on a standalone basis when, as Dr. Duinker observed, toxic pollutants can have very different effects in combination with one another than alone, especially when dumped willy-nilly on an unsuspecting neighbourhood of senior citizens and children.

CNSC has recently given OPG permission, and Bruce Power is in the process of requesting the same, to operate Pickering and Darlington beyond the 210,000 hours of operations before pressure tubes needed to be replaced. This will have the effect both of increasing the radioactivity of the intermediate level wastes from re-tubing these reactors as well as add to the low and intermediate level wastes from operations beyond those described for the DGR by OPG.

The addition of these wastes could mean that the caverns will need to be even larger than the descriptions given to date,

including those added through information requests by the JRP after the hearing is closed. It entails that the rock pile might be even higher than the 115 feet and/or cover a base larger than the 55 acres identified.

With this extra construction schedule as described, there will be more than 15 years of intermittent construction at this site merely to excavate the caverns and manage the tailing wastes. Since it is unknown at this time how many reactors will seek to extend their operating life, we cannot yet know how much more construction and excavation will be required. In my presentation before the JRP I asked whether it would be prudent to wait until we know fully and decisively what wastes and what quantities of wastes are being planned for the DGR.

It is inconceivable that this extension was not a reasonably foreseeable event. CEAA guidelines require OPG to have considered this as part of the EIS. Nonetheless, the Panel has to date allowed OPG to modify, extend and increase the size of this cavern, along with the nature of the wastes, without requiring OPG to modify its environmental assessment with respect

to the additional impacts on either human health or the socioeconomic values to our community.

Each addition adds to the health risks we in the host community must face and will face, by its own admission in this information request. OPG summarizes its opinion about air quality in this way:

"OPG has a high degree of confidence in the conclusion that the changes in air quality resulting from the proposed activities associated with the DGR...are not significant."

This opinion appears to be founded on professional judgment since it has assiduously avoided collecting relevant data that would lend support to such a conclusion in the same vein that it has refused to test the models it uses in a meaningful way. It almost appears that OPG would rather invent models that bore scant relation to our stakeholder community in the past and will unfold to bring us a whole new collection of radioactivity, chemical toxins and particles ranging in size from the subatomic to the micrometer.

The information request that led to the above analysis stated this:

"In Dr. Duinker's hearing submission he expresses concerns about the lack of transparency of the decision trees and the apparent arbitrariness in professional judgment used to determine significance. The determination of significance of adverse impacts is fundamental to the environmental assessment. Therefore, the rationale for the determination of significance must be credible, defensible, clear, reliable, and appropriate."

OPG has not given clear and complete responses about its air quality assessment and continues to rely on professional judgment. This in turn results in an inadequate analysis of the key concerns this Inverhuron community has expressed over the past 30 years about the conditions leading to wide-spread fumigation from site activities.

It continues to avoid discussion about the TIBL along with shoreline fumigation scenarios and fails deliberately to include the role this will play, as it has in the past, in distributing pollutants from the site to the surrounding community. These pollutants have arrived virtually unmixed.

There is no discussion about how the various chemicals might combine with one another or how they might, in conjunction with one another, affect human health and quality of life in the stakeholder community. The section entirely lacks this type of thorough cumulative effects analysis. It fails to describe all the constituent elements such as radium that will be present in the waste rock that will be piled in this area.

OPG recognizes that there will be radium in the Cobourg limestone it brings to the surface. As it degrades into radon and other radioactive and toxic daughter isotopes, these will be available from the waste rock pile itself to the local environment, descending on plants, soil, vegetables and people.

Furthermore, radon from the cavern that vents to the surface will become immediately available to the biosphere. I have nonetheless been unable to find a thorough description of the quantities of radon that will be released from these sources. There is no account of how much radium the waste rock pile will contain, nor how much radon it will release,

nor how it will be distributed throughout the waste rock pile itself. Nor do we know how much radium will be on the surface of the dust particles that wind currents will pick up to distribute invisibly throughout the shoreline community.

Anna Tilman talked about these issues during her presentation last year. These very fine clay-based dust particles of Cobourg limestone that will be available to atmosphere on the surface will contain radium and/or its daughter elements. Radium will be trapped in larger pieces of rock as well. As atmospheric moisture and rain is absorbed by the limestone, it will lead to fracturing that, in turn, will release these elements to the atmosphere. As this list of 'daughters' demonstrates, these are very nasty radioactive subatomic particles that will be carried windward below the TIBL and deposited helter-skelter throughout our local community. Since this rock pile will remain permanently in this location, it is certain that the Inverhuron committee and shoreline will be fumigated for the very long term with these toxic particles.

EIS-12-512 discusses possible DGR expansion plans. OPG appears to say that this expansion could be used either for decommissioning waste or for further operational and re-tubing waste, perhaps anticipating its recent permission to operate its current reactor fleet beyond the 210,000 operating hours recommended by the manufacturer of the pressure tubes. On page 1 it states:

"The DGR project has also assessed the feasibility of an expansion of the GR from the current planned waste volume capacity of 200,000 [cubic metres] to a capacity of 400,000 [cubic metres]. This additional capacity could account for the potential of future [low and intermediate level] waste volumes arising from either new operational and refurbishment activities or decommissioning activities."

On page 2, OPG refers to its underground construction as mining activities:

"The equipment and general approach to mining during repository expansion is assumed to be similar to that used during initial construction of an underground repository."

If best practices were observed,

as OPG claims that it does in the introduction of the EIS, the regulatory processes in respect of building a mine that will produce limestone dust tailings in the midst of a residential and recreational shoreline community would be followed. In addition, inversion is present over much of Inverhuron in the summer, a time when residents are most likely to be outside. Shoreline fumigation models exist that describe these conditions and one would think that the JRP overseeing this project would demand that rigorous standards be applied that will safeguard us here in Inverhuron. We continue to hope that you will act responsibly and support our right to a safe and healthy biosphere as we will be forced to live with the unaddressed consequences of these mining tailings and operations.

Others have highlighted the deficiencies in OPG's inventory of radioactivity and radioactive materials that will be present in the DGR, independent of its expansion. I wish to acknowledge these concerns and particularly the potential for these to impact on the quality of human health in the stakeholder community.

The EIS adopts the World Health

Organization's standard of good health and says so on page 6-269.

The JRP understands that the value of our property can be a significant determinant in the perception of good health by community residents and have heard extensively about our fears of stigma associated with the DGR. I have taken advantage of your offer to interveners to comment on Dr. Leiss' analysis and did submit a critical analysis of his presentation, one which demonstrates the likelihood that a stigma is present now. As a result of this submission, which remains unchallenged, it must be stated that our community currently suffers from the shadow of a stigma whose damages are yet to be determined.

But our community suffers from physical morbidity as well that could be caused by our proximity to the nuclear power plant. The Grey Bruce Unit has identified in the past issues in which regional morbidity differs, sometimes significantly, from provincial averages. Neither it nor OPG have been able to pinpoint the source of this morbidity because, as each stated during the hearings, appropriate baseline data is

nonexistent.

Anna Tilman and I have proposed, in respect of Bruce Power's re-licensing application, to create a protocol for just such a community health service -- community health survey that would assist in providing this baseline data. Because we have heard OPG's concern that this data does not exist, we have asked OPG to provide some of the funding required to produce this plan and have included our correspondence as part of the record of these hearings. The secretariat has published the correspondence to date.

The authors of the RADICON study have commented on the need for such a survey. In a response to the journal: *Chronic Diseases and Injuries in Canada*, they state:

It could be that public concern may only be eased with comprehensive, individual-level tritium dose measurements and 20 years of meticulous follow-up of a well-defined cohort. However, considering both the enormity of such an endeavor as well as the weight of existing evidence regarding hazards from normally operating nuclear power plants, public health

researchers must suggest feasible and practical means to address community concerns.

Scott Berry, speaking on behalf of OPG about our proposed health survey, has time and again declined OPG's participation, without even asking what a community health survey is about or why it should be relevant to this process. The proposal that Anna Tilman and I are developing is both a "feasible and practical means to address community concerns" and the JRP must be concerned that no such health survey has been conducted in this community. It is an essential feature of an environmental assessment because without one no assessment can be made about the impact of site operations on human health. Such a survey provides the baseline data against which future health impacts will be measurable. We urge the JRP to become directly involved in this matter and insist that OPG provide the funding needed to complete this plan. Once a community health survey plan exists, the costs of bringing it to fruition will be readily determinable.

Our site-specific meteorology prevents toxic pollutants from escaping our

atmosphere for large parts of the year. These are precisely the times of the year when most retirees and children are outdoors. The site will add:

- Construction noise, dust and inconvenience for a minimum of seven years and up to 18 years if all the decommissioning, additional operations and additional re-tubing wastes are added;

- A mountain of rock composed of radioactive radium, small particulate matter, and very fine clay particles;

- A topological feature that will generate the formation of thermals;

- The possibility that radioactivity and chemicals from the incinerator site could be drawn to the thermals at the rock pile;

- The possibility that radiation from vents could be brought to the rock pile;

- The likelihood that these same particles will be distributed throughout the local community according to existing meteorological conditions at the time;

- The uncertainty about the

inventory and concentrations of radioactive particles that will be present at the site that might be distributed here;

- And these impacts on human health.

This is not an exhaustive list, but each item will add significant risk to human health and well-being of our members of our community. We need to have baseline data now, before this project begins, in order to determine what health impacts we will have suffered as a result of it.

Most of all, OPG needs to begin to talk to our community in an open, trustworthy and transparent manner.

Thank you for the opportunity of hearing our views and I now turn this over to Paula for some of her comments. Thank you.

MS LOMBARDI: The EIS and EIS-12-513 includes an analysis of the alternative means conducted by OPG and the Independent Expert Group of two surface storage options: (1) the Status Quo and an Enhanced and Hardened Surface Storage, and (2) two deep geological repository options: The Bruce Site

and a Hypothetical Canadian Shield DGR.

The proposed DGR project is the only alternative that was assessed in terms of its impacts on the biophysical environment. OPG has failed to assess and compare the environmental effects of all four of the proposed alternative means. OPG's analysis lacks the detail required for the JRP to make a determination on their preferred alternative means to the project. The alternative means analysis is incomplete and, as a result, you have no alternative to conclude but the EIS and the information responses are deficient.

The EIS and OPG's responses to the information request fails to identify mitigation measures with any specifics, neglects to make a determination of significance, and fails to consider any follow-up. The cumulative effects analysis presented by OPG fails to meet the requirements of CEAA, the Operational Policy Statement and, as a result, they are deficient.

And those are our submissions.

THE CHAIRPERSON: Thank you. We are going to take a break before the Panel has questions based on the most recent presentation,

and we will reconvene at about 20 minutes to 4:00. Thank you.

--- Upon recessing at 3:21 p.m. /

Suspension à 15 h 21

--- Upon resuming at 3:41 p.m. /

Reprise à 15 h 41

MS MCGEE: Good afternoon. If I could ask everyone to please take their seats, the hearing will resume. Thank you.

--- Pause

THE CHAIRPERSON: The Panel has no questions based on the previous presentation, so we are now going to go directly to OPG's responses to the questions carried over from this morning.

--- Pause

MS SWAMI: Laurie Swami, for the record. OPG was -- suggested there were three questions to be answered after the morning session today. One of the questions which we could answer to some extent is on the predicted total suspended solids during an overrun event, and we propose that we hold that until the CNSC

and Environment Canada have had an opportunity also prepare their response so we could discuss it in totality, if that's acceptable.

THE CHAIRPERSON: That's acceptable.

MS SWAMI: Thank you.

The two other questions, I'll start with the discussion that we had with Dr. Muecke with respect to the Surface Water [sic] Management Pond and the waste rock management area should we find that there was leakage, if you will, to groundwater, and I think it covers both of those components of the facility. And if I get that wrong, please correct me, Dr. Muecke.

However, to start, we don't predict any of -- any effects on groundwater as a result of the waste rock pile or the Stormwater Management Pond. However, if we should find something through our monitoring program that would indicate there was an impact on groundwater, we would use adaptive management techniques to address the concerns that may arise.

So, I'll speak first to the

Surface Wa-- I'm sorry, Stormwater Management Pond. If we were to find a leak from that component of the design, we would remediate it. And I say this with confidence because we have remediated a pond on one of our facilities already. And during that execution of the work, we closed part of the pond, remediated appropriately -- addressed the concerns with the leakage, and returned it to surface. We did that in two stages, where we closed part, remediated, put that part back in service and then moved to the next part of the pond. So that worked very well, so we believe that that's easily achievable for this particular situation.

For the waste rock management area, again, we don't predict that there is going to be an effect. But if we did measure contamination through the monitoring program, we would again put in place some sort of mitigation. And as an example, what we would suggest could happen - I can't say precisely but could happen is we would put in a system to collect the groundwater, remediate that groundwater, and return it either to ground or to surface. And we believe that that's a possible alternative as

well. That's just one example. There may be others that would be available as time moves on.

I believe you also asked what would happen if we were to expand the facility. In expansion, what we would do is we would have to, of course, go through a licensing, likely an environmental assessment process, and we would go through a re-characterization of the site at that time, as we do today when we do an environmental assessment. We would look at the experience that we had with the operational DGR, what had occurred, and we would obviously factor that in to any proposal for that expansion program should we proceed with that. And we would, again, put in appropriate measures if we needed to, whatever that may be at the time.

THE CHAIRPERSON: Thank you.

MEMBER MUECKE: Thank you.

MS SWAMI: The second question that we had was to provide justification for the gradual climate change effects that we were looking at, and I'll ask Ms Barker to speak to that.

MS BARKER: Diane Barker, for the record. As described in Appendix D of the

Atmospheric Environment Technical Support Document, we reviewed historic climatic trends and considered future climate models. For the DGR project assessment we used results from the Canadian Climate Centre CGM3 model, which is one of seven highly regarded models by the Intergovernmental Panel on Climate Change. It was chosen for this assessment as it is designed to model changing climate in the mid to upper latitudes and in particular North America.

Three forecast periods were considered: 2011 to 2040; 2041 to 2070, and 2071 to 2100. As noted earlier, high and low ranges of the outputs of these scenarios are presented in Appendix D, Table D3-1 of the Atmospheric Environment Technical Support Document. The range of increases are in the order of 0.15 to approximately 1 degree per decade, and 0.3 percent to 3.6 percent increase in millimetres per year of precipitation per decade. This rate of change is gradual enough such that OPG would be able to adapt to their mitigation strategies, for example, for the Stormwater Management Pond, accordingly.

THE CHAIRPERSON: OPG, I would

appreciate, the Panel would appreciate a little bit more information on that particular model you cited with respect to whether it is capable not only of predicting temperature changes and precipitation changes with time or in those three time periods but also whether it is at all able to assist in the re-evaluation and return periods of severe weather events, which was really the main context for the Panel's questions specifically around design changes for surface drainage facilities.

MS SWAMI: Laurie Swami, for the record. We'll ask Mr. Rawlings to respond to that. Hopefully he heard the question.

THE CHAIRPERSON: Mr. Rawlings, did you hear the question?

MR. RAWLINGS: Martin Rawlings, for the record. Yes, I did.

THE CHAIRPERSON: Please go ahead.

MR. RAWLINGS: Certainly. In Appendix D, specifically section D2.3.4.4 on page D-30, there is a discussion about extreme weather events and the ability to forecast extreme weather. There is quite a bit of evidence

suggesting that in the future there will be changes to severe weather events both in the frequency of those events and in the intensity. However, to date the models available for forecasting future climate, such as the CGCM3 model developed by Environment Canada, are not reliable tools for predicting what those changes are and, therefore, it's not really to date practical to look at future return periods based upon model forecasts.

THE CHAIRPERSON: Thank you, Mr. Rawlings. So I understand that that is the completion of the questions for OPG for today. So, I am now going to turn to CNSC. Apparently you have responses for three questions.

DR. THOMPSON: Patsy Thompson, for the record. I think it's three, but the first one is on near-surface geology and hydrology. Your question had been in terms of whether we agree or not with the hypothesis that OPG has put forward in terms of migration of contaminants of potential concern in excess of established criteria and/or guidelines relevant to human or ecological health under frequent and/or continuous basis and whether that would

capture, for example, pulses. And so, I would say that in general we agree with this hypothesis for significance. What we would have added is the requirement for consideration as well that the expected groundwater quality on an industrial site is different from the requirements for groundwater quality off site. And so, we would also have looked to add a -- essentially a statement to say that any activities on site that results in groundwater contamination should not rely unduly on dilution to meet, for example, drinking water standards off site. And so, we would add that provision. And if a situation would arise where you require extensive dilution from groundwater to essentially meet drinking water standards off site, we would expect additional mitigation measures.

The other point as well is that you spoke about whether we would consider pulse events. And so, in the modeling that was done, because we looked at -- the assessment included, for example, severe precipitation events that would result potentially in, you know, large infiltration rates that could result in a positive contaminant to groundwater, the

expectation of this would be captured - it was captured through the modeling but also through a monitoring network if the project goes ahead.

The other one was on the question of PMP and sizing of the Stormwater Management Pond and ditches. I was reminded that on October 29 last year we essentially indicated to the Panel that we wanted to change or revise recommendation 20 and essentially this is captured in the registry as well. The revised recommendation would state "that OPG shall confirm the size of the Stormwater Management Pond based on an updated 24 hour probable maximum precipitation event before construction begins." OPG should consider an alternate design that would minimize while maintaining the structural integrity of the pond, the potential for the release of untreated water and pond sediment during large storm events. So, we had moved away from the recommendation of using a PMP to this revised recommendation. And essentially this -- that was recommendation 13.

We have, as was just mentioned by OPG consultant, also looked at what is being done internationally in terms of climate change

science, with the ability to predict return periods for storm events and that was the basis for not moving forward with a recommendation that climate change be considered right now at the design stage but rather through adaptive management.

The last one was a question on sustainability and how it was considered by CNSC staff. And so, Mr. Graham this morning spoke of how CNSC assessed sustainability in relation to the cedar -- white cedar forest. We also looked at more generally the concept of sustainable development in -- overall in the project proposed by OPG in terms of management of the waste, such as the waste should be managed in this generation rather than waiting -- delaying to future generations, which would be implied by continuing to manage the waste on surface.

We also looked at, for example, the surface footprint would change continued employment in the region and things like that. We also looked at consumption of energy resources, impacts on ecosystems, production or waste, and impact on economy. Those are the types of factors that we looked for in the

submissions from OPG.

THE CHAIRPERSON: Thank you.

We will now proceed with the next 30 minute presentation, which is by the Bluewater Coalition and Ruth MacLean, which are PMDs 14-P1.54 and 14-P1.67.

Ms. Dailey and Reverend MacLean, please proceed.

**PRESENTATION BY / PRÉSENTATION PAR:
BLUEWATER COALITION, ELLEN DAILEY AND
RUTH MACLEAN**

MS DAILEY: Good afternoon, Madam Chair and fellow panel members. Thank you for allowing us to present our views at these hearings. My name is Dr. Ellen Dailey and with me is Reverend Ruth MacLean. We are here today on behalf of the Bluewater Coalition and will speak from our respective backgrounds.

The creation myths of diverse cultures and religions invariably include the fundamental element of water. They remind us water is inseparable from our physical and spiritual identity. We humans are a

personification of creation in part because of our water content. Water ties us to the very origins of the universe.

Astonishingly, the importance of water to the public is not adequately addressed in OPG's methodology used to determine the significance of adverse environmental effects as well as the relative risk analysis of alternative means of carrying out the project. In addition, we believe OPG's response to the applicability of recent incidents at WIPP to the safety case for the proposed DGR does not reflect a culture of safety.

We believe in the primacy of water. Water is both structure and function for all atomic and molecular activity of life. As we evolved, we internalized primordial oceans in the architecture of our cells and later our organs and bodies. Because of its electrically bipolar nature, water is an ideal medium in which to dissolve a large variety of substances, such as salts, proteins and amino acids. With these elements water becomes the matrix for the chemical reactions on which life depends. It is the medium for growth and communication of our

cells. Even reproduction, with the motility of the sperm and egg, is based in a fluid medium. The fetus grows in the internal ocean contained in the amniotic sac. Virtually every chemical reaction in our bodies depends in some way on the presence of water.

Dr. Neil Shubin writes in his recent book, *The Universe Within*, quote:

"... The spiritual dimension of water can be appreciated when we realize our ties to water are not limited to our present existence. ... Our history has been shaped by water, our existence made possible by it, and our future likely defined by our relationship to it. Events far and wide have conspired to define our watery existence and with it, the fundamental structure of our bodies."

Not only has water shaped our physical being, it has shaped civilization through its impact on human settlement and innovation, which in turn have impacted water resources.

"The Great Lakes are a global environmental and economic wonder,"

-- containing 20 percent of the

world's freshwater supply. Spanning two provinces and eight states, the Great Lakes Basin/St. Lawrence region is one of the world's most remarkable and diverse ecosystems, and part of North America's physical and cultural heritage. The Basin is home to 40 million people, who rely on the lakes as their source of drinking water. Millions of jobs are dependent on Great Lakes Basin fisheries, forests, farmlands, industry and recreation.

"The glacial history of the Great Lakes basin and the tremendous influence of the lakes themselves create unique conditions that support a wealth of biological diversity, including many species and communities of global significance. ... 131 elements [of which] are critically imperiled, ... or rare."

This great ecosystem is interrelated and interdependent. The open lakes are connected to the more inland portions of the watershed by the movement of surface water, groundwater and living organisms. Rivers and streams supply lakes with water and nutrients, and provide spawning and nursery areas for fish. The tributaries, in turn, depend on upland

vegetation to regulate the nutrients and solids entering the waterways and for input of energy and materials such as the autumn leaf fall.

Concern for the future of water is based on growing awareness that the world's fresh water reservoir, only 2.5 percent of the earth's total water, is already under threat, while the anticipated consumption is growing.

The United Nations has warned that by the year 2025, two-thirds of the water population could be subject to water stress.

Is there any doubt why water is of such profound significance to mankind and particularly to those of us living in the Great Lakes basin?

The State of the Great Lakes 2011 Highlights Report prepared jointly by Environment Canada and the United States Environmental Protection Agency rates the Great Lakes ecosystem overall as "fair".

The specific indicators state that water quality is in fair condition, but deteriorating. Aquatic dependent life is in fair condition, but deteriorating. And physical integrity, the landscape, is in fair condition

and improving.

Fair means that the indicators are exhibiting minimally acceptable conditions, but not meeting established Great Lakes Water Quality Agreement goals or other ecosystem objectives.

According to the International Joint Commission's 1994 report, the most recent comprehensive report available, hundreds of chemicals have been identified in the Great Lakes ecosystem. Many have been linked to toxic effects on various life processes.

Some of these have been labelled critical and priority contaminants based on factors such as ambient concentration, degree of toxicity, persistence in the environment, bio availability and the potential to bio concentrate and bio accumulate.

Several papers authored by the Nuclear Task Force have reported on radionuclides within the Great Lakes ecosystem. These reports look at system-wide and not simply the point source emissions reported by the power plants that do not take into account the effects of bio accumulation and the long retention times

associated with the lakes ranging from 191 years for Lake Superior to 22 years for Lake Huron, and 2.6 years for Lake Erie.

The Nuclear Task Force noted that the bio accumulation, bio magnification and transfer factors used to describe the cycling of radionuclides and their transfer along exposure pathways to biota, including humans, came from the long history of work done in oceans, estuarian and river environments.

Comparable studies for the Great Lakes fresh water were virtually nonexistent then, and still have not been completed.

A new category of pollutants, called emerging contaminants of concern, has been reported. These include such products as pharmaceuticals, personal care products, nano materials, pesticides and herbicides, among others.

Large knowledge gaps exist in understanding bio accumulation, specific exposures, sub-lethal effects and outcomes and information regarding impacts of these emerging pollutants on a variety of organisms.

New evidence suggests that even

if a single chemical has not been shown to cause significant human or environmental health impact, its effect as part of a mixture may, indeed, be significant.

According to Peterson and Tollefson:

"This may apply particularly to chemicals that act on similar biochemical pathways in an organism because multiple low dose exposures may collectively cause an alteration, even while individual exposures do not. This has been found to extend to chemicals with different mechanisms of action, but the same target."

All categories of contaminants found in the Great Lakes have been associated with health problems. These include reproductive toxicity, neurologic toxicity, immunologic effects, hormonal and endocrine disruption, cancer, respiratory problems and bacterial and viral infections.

The potential health effects of exposure to radionuclides has been outlined in a prior submission to this Panel.

We have recently seen for ourselves the problems associated with Great

Lakes contaminants. For the first time in our memories, Saugeen Shores beaches were closed for swimming this past August because of high bacterial counts and *e coli* in the lake.

Over the recent Canadian civic holiday weekend, Toledo, Ohio residents were without potable water due to contamination of the lake water from an algal bloom.

And Ontario regularly issues advisories for fish consumption from the Great Lakes due to contamination of the fish with such chemicals as mercury and other heavy metals, PCBs, pesticides and dioxins. Local favourites such as whitefish, salmon and trout are on the watch list.

As we have demonstrated, the ecosystem of the Great Lakes is already under tremendous pressure. Therefore, the horribly dated, philosophically shallow and ecologically unsound assertion espoused by OPG's IEG that dilution is a solution to pollution is too open-ended and permissive a strategy to earn credibility from citizens who only recently and reluctantly have acknowledged the limits of natural resources and have adopted sustainability

strategies.

Furthermore, it overlooks the phenomena of yet unknown bio amplification impacts, bio concentration, the unpredictable amounts of water in the future and the unpredictable synergistic effects of known and yet unknown natural and industrial contaminants, including emergent contaminants of concern.

An inadequate safety culture has been cited as the reason for the Three Mile Island, Chernobyl and Fukushima disasters in addition to design and engineering flaws.

An inadequate safety culture has also been proposed as one of the significant reasons for the WIPP event.

In its response to the JRP, OPG gives assurances that a WIPP disaster would not happen in its DGR because of its safety culture. In OPG's words:

"OPG is confident that the measures and processes we have established will prevent or mitigate a similar event at the proposed OPG DGR."

Detailed case studies of specific high reliability organizations have identified several salient features associated with

excellent safety records. These include a preoccupation with failure, a commitment to resilience and compensatory action and respect for the input of all workers and management.

None of these studies of HROs have listed previous excellent safety performance as a prerequisite for establishing or maintaining a culture of safety.

In its response to the JRP's request of the relevance of the recent WIPP incidents to workers and public health and safety at the proposed DGR under normal and accident condition, OPG repeatedly cites its past safety record.

However, OPG does not have a flawless safety record.

In our view of reported events, the S-99s, over the past five years from the Pickering and Darlington nuclear power generating stations, there are repeated patterns of fire safety events and other safety incidents reported that suggest the safety culture is flawed.

Events ranging from seemingly minor to serious breaches such as malfunctioning fire doors and inappropriate propane tank storage

with other combustibles have repeatedly occurred.

These reports only list events that are not shielded by confidentiality and security concerns, so we don't really know the full extent of the problem. Even more troubling the regulator, CNSC, does not see these repeated safety violations as a problem because it continues to give these power plants passing grades.

In addition to doubting OPG's safety culture, one could question the scope and depth of its social and spiritual vision.

OPG has never questioned itself about the relevance of its explanation and justifications to the public. Some of the most relevant aspects of real or perceived hazards are not quantifiable.

For example, what are the conditions under which risk is taken? Is it without consent, unquantifiable, an infringement of civil liberties, or does it involve the rights of those not party to the current debate?

Risk aversion can occur for other reasons in addition to erroneous perception of probabilities. For example, did it occur to OPG

to ask the public if its primary resistance was because of where the waste would be permanently stored?

How does OPG's methodology for assessing the public's risk perception account for deeply held personal values such as the reverence for water?

We believe the water of the Great Lakes basin that has defined our world sustains us and is the most tangible connection we have with all things seen and unseen, is risked by the proponent's proposal because of potential leakage of the DGR and the adverse environmental impact it may cause by its construction and maintenance.

The ramifications of this type of decision for all peoples have not been addressed. There is no evidence the public would be willing to wager the safety of our water for OPG's proposal, even if it assured the DGR is leak-proof.

The public may not understand the risk, but they do understand the importance of water, and it is not willing to risk this in the face of uncertainty.

Human activities, both historic

and current, have altered and will continue to impact the Great Lakes ecosystem and the biological diversity it sustains. We believe the casual dismissal of a few hectares here, a common species there for the sake of this project betrays an anthropocentric posture that has already threatened the globe in general and the Great Lakes basin in particular.

This fragmented and reductionist view overlooks the aggregate impact of multiple seemingly unrelated small things.

We believe OPG's prevailing world view is much too narrow to address an issue that touches upon questions for future generations, cultural values and spiritual significance.

We should take time to allow innovation in nuclear waste management to occur, to learn from existing DGR technology and to provide an opportunity for what has so notably been lacking in the proponent's efforts to date, informed, collective introspection about the bigger picture.

REV. MacLEAN: Members of the Joint Review Panel, I am Revered Ruth MacLean from Kincardine, and I appreciate this

opportunity to speak today.

I comment as someone who holds reverence for the sacredness of life and our common responsibility to care for plants, animals, earth and water and future generations.

I would like to share these words of Dr. David Hawkins:

"All things radiate forth an intense aliveness. The luminous quality of the radiance is overwhelmingly divine in nature. It completely includes everything in its total oneness so that all things are interconnected and in communication and harmony by means of awareness and by sharing the basic quality of existence itself. The holiness of all creation is the reverence held by everything for everything else. Every leaf knows how it is being experienced by everything else and shares in the joy of the divine presence."

Obstetricians like Dr. Daley tell us that life begins in the watery womb of a woman designed as a safe environment for a wondrous creation, a baby. Yet even this sacred space is being increasingly violated by toxins. Pregnant women and fetuses are most vulnerable to

radionuclides, resulting not in a perfect miracle, but in a deformed human being.

Water is the substance of all life, and the water of Lake Huron is vital for our planet.

Since 2004, our community has been bombarded with information about the DGR, which has been deceptive.

From the original proposition, it has doubled in size, become a mining excavation of 25 years with increased radionuclide inventory, increased gas generation and increased risk of radiological release when malfunctions occur.

Dr. Greening's report also brought to our attention that levels of radioactivity had been vastly understated in OPG's initial submission. There seems to be a lack of truth-telling by OPG.

OPG acknowledges that, with time, canisters containing the waste will corrode. According to the IEG report, radioactivity could leak out into Lake Huron, though the quantifies are deemed insignificant because the immense waters of Lake Huron would dilute it.

I share these words of a health practitioner:

"It is truly important to note that one drop of poison or radioactive waste leakage in the water can never become fully and completely diluted without harmful effects that trickle throughout the entire ecosystem of Lake Huron and all her inhabitants. Once a vibration source has been added to a body of water, the added vibration forever changes the original frequency of the water, thus changing the molecular structure indefinitely. This power of entrainment can forever alter a body of water, whether that water be a human body or a Great Lake."

Gina Tome.

Dr. Theo Colborn focused on the prenatal origins of cancer through endocrine disruption. Her 1988 research on the state of the environment in the Great Lakes revealed that persistent man-made chemicals transferred from predator females, fish and birds, to their offspring undermined the construction and programming of their youngers' organs before they were born.

Do we need to add more damage

through radioactive leakage from a DGR?

Radioactive effluent is intentionally released from Sellafield into the Irish Sea. Fukushima continues to contaminate the Pacific. Children in Japan and children in Cumbria are sick with cancers.

Around Sellafield, beaches, seaweed, fish, dolphins and seals are contaminated with plutonium and other radionuclides. Instead of decreasing with dilution, radioactivity spreads outward.

When I lived on the island of Islay on the west coast of Scotland, people wondered if their cancers were caused by Sellafield carried on the ocean currents.

Dilution into Lake Huron or anywhere is not morally responsible.

The incident at WIPP comes as a wake-up call and warning to us, for only after 15 years, the unspeakable happened. According to a report by William Boardman, radiation releases into the aboveground environment spiked again in June, as detected by New Mexico environmental department monitors.

Computer modelling cannot

guarantee the safety case for a DGR. There are too many unknown, unpredictable and uncontrollable factors before which we need greater humility.

It is appalling that OPG intends to close the DGR in 100 years or less and walk away, washing their hands of any responsibility such that:

"There will be no requirement for the maintenance of a well-trained technical and professional cadre to oversee the facility in post-closure phase."

The nature of risk will certainly be changed, for when malfunctions occur, there will be no expertise available.

As nuclear power plants are shut down over the next few decades, there will be a shortage of nuclear professionals. If, in future, the DGR needs to be dug up, who will help?

This community must live with the reality of this risk long after Bruce Power and OPG are gone.

As you have heard many times, all waste should be stored aboveground far away from

Lake Huron and monitored until better solutions are found. And I am confident that they will be.

If the DGR happens, a decision has been made to do something potentially something devastating to the environment.

Twenty (20) or 200 years from now, we will have to deal with the consequences of this decision.

OPG might walk away from Kincardine satisfied with their success, but the DGR is about everyone's children.

Artist Jane Evershed states:
"We must name the problems in order to find the solutions. We start by questioning and seeing the truth, and not denying it. We start by knowing what we would like to see here on the planet, on the earth and for the children."

The DGR would be an irreversible mistake.

We request that the Panel deny OPG a licence to construct a DGR beside Lake Huron.

Thank you.

THE CHAIRPERSON: Thank you very much.

Panel Members, did we have any questions?

Thank you so much for your presentation.

We are now going to proceed with the final 30-minute presentation, which will be by the Canadian Environmental Law Association, which is PMD 14-P1.16 and 16A.

Ms McClenaghan?

**PRESENTATION BY / PRÉSENTATION PAR:
CANADIAN ENVIRONMENTAL LAW ASSOCIATION,
THERESA MCCLENAGHAN**

MS MCCLENAGHAN: Thank you, Dr. Swanson, and thank you for hearing from us today with respect to our submissions to the Joint Review Panel.

Most of the presentation is going to be delivered by Ms Tanya Markvart, our expert witness in this matter.

I don't think I need to belabour the slide about our organization. You heard from us last year.

So we did retain Ms Markvart

again to review the new information, and she'll outline the scope of her review and the information she has for you here today.

MS MARKVART: Thank you, Theresa.

Good afternoon, Madam Chair and Members of the Panel. I am pleased to be here today and happy to have the opportunity to give this presentation and to answer any questions that you and the public might have.

CELA's focus in this presentation is on the report commissioned by CELA with the assistance of the intervenor funding program.

The objective of the commissioned report was to assess OPG's response to information request EIS-12-513.

In this request, the JRP asked OPG to undertake an alternative means risk analysis, or AMRA.

Specifically, the commissioned report analyzes the manner in which OPG and the AMRA addresses, one, contribution to sustainability, two, conceptual consideration of alternative sites, and three, the precautionary principle and its AMRA analysis.

The summary of the report goes as

follows. There are three key points.

Number one, serious questions remain about the approach and methods used in the risk analysis as they relate to and fulfil the contribution to sustainability requirement.

Number two, the conceptual consideration of a DGR in granite bedrock does not meet international standards or reflect international EA experience. By not requiring an investigation of alternative sites the JRP has not addressed the OPG's insufficient level of attention to the location issue.

This risks giving the public the impression that the Panel considers OPG's previous investments in the Bruce location a valid basis for its selection.

Number 3, OPG must describe how the three criteria; risk avoidance, adaptive measurement capacity, and preparation for surprise were applied and the public must have a clear understanding of how each alternative would perform in relation to these three criteria.

Now I will go through each point in more detail.

With respect to contribution to

sustainability, information request EIS 12-513 asked OPG to consider contribution to sustainability in the risk-to-safety case section of OPG's AMRA.

In a previous submission and presentation to the JRP in 2013 CELA on a commissioned report by Gaudreau et al that explained the steps that OPG should have undertaken to fulfill the contribution to sustainability requirement.

I won't go over that here. But basically, the steps that OPG should have undertaken include setting out a comprehensive set of sustainability-based evaluation criteria, identifying the potentially reasonable options, including alternatives to and alternative means, showing how the criteria have been applied in the comparative evaluation of the options, and showing with clear justification in light of the criteria how the proposed project was selected as the preferred alternative.

Throughout the EIS, however, the OPG did not incorporate a comparative evaluation of the relative contributions to sustainability of the alternative means. And I won't go over

our points about the EIS, because we are focusing on the AMRA today.

In the JRP's requested AMRA the OPG had an opportunity to fulfill the EIS requirement for sustainability considerations in a transparent systemic and comprehensive way. But unfortunately, the OPG analysis reduced sustainability considerations to a simple table; table 1 in OPG's response to information request EIS 06-273.

Table 1 does not address critical matters related to, for example, boom and bust effects, human health and safety, short and long-term economic costs and cumulative environmental impacts.

Table 1 also fails to illustrate how OPG's sustainability criteria were applied throughout the AMRA.

Sustainability should have been conceived as an overarching concept from the outset of the AMRA and OPG should have demonstrated how it used sustainability criteria in a systematic way throughout the evaluations to compare the options.

So what we would have liked to

have seen ideally in other words is a risk assessment that was lead by generic sustainability criteria and then the pathways of harm that were created would then be framed as the context-specific concerns that surround the selection among options of best management of nuclear waste.

And so then those generic criteria with the specified pathways of harm would have provided the evaluative framework. And then using the probability in consequences approach that was applied, the results that come out of that would have been related back to sustainability criteria.

At the very least, we would like to see some discussion of how the sustainability matters that were present in the table could be discussed in terms of the results of the analysis.

With respect to OPG's AMRA, serious questions still remain about how the approach used in the relative risk analysis relate to and fulfill the contribution to sustainability requirement, how sustainability criteria were incorporated into the risk

analysis, how sustainability considerations influence the risk analysis findings, and how the results of the risk analysis bear on the extent to which each option would contribute to sustainability.

So in conclusion, as it stands, we feel that the public has really no clear understanding of how OPG's consideration of sustainability influence the AMRA and design of the project, but we feel that critical uncertainties remain with respect to how a preferred site is selected as the best option in terms of net social, economic and ecological benefits to society over a millennia.

With respect to point 2, conceptual consideration of alternatives sites. CELA previously emphasized that siting is fundamental in the geological disposal of long-lived radioactive waste. A critical issue in OPG's consideration of alternative means was that a systematic comparative evaluation of alternative sites was not undertaken.

In its request the JRP stipulated the AMRA should include a conceptual DGR in granite bedrock and OPG should use the extensive

data and analysis available within the EA performed by Atomic Energy of Canada Ltd. for the Seaborn Panel.

A conceptual consideration of a DGR and granite bedrock however is inadequate. Authorities hold that the most important issue in siting is the long-term safety of the site in relation to the geosphere.

Moreover, international standards recommend sites should be selected after the investigation of a large region, the rejection of unsuitable sites and the screening and comparison of the remaining sites. A selection should be made from several sites identified at the start of the siting process on the basis of the geological setting and other factors.

A conceptual consideration of the DGR in granite bedrock therefore does not meet international standards.

To overcome this issue the JRP asked OPG to use available ACL data and analyses. However, the AMRA does not really clearly indicate which ACL data was used as well as where and how it was used, thus it remains unclear how these sources influenced the comparative risk

assessment.

Regardless of how the data were used, failure to request an actual investigation of alternative sites in our opinion represents an unsupportable accommodation of OPG's initial conceptual consideration of alternative locations. And it disregards OPG's unjustifiable rationale for focusing its original alternative means investigation on sites within the Bruce location only.

OPG's rationale for not evaluating other sites rests primarily on the willing host criterion.

In conclusion then, by not requiring an investigation of alternative sites the JRP has not addressed OPG's insufficient level of attention to the location issue in the EIS process.

This risks giving the public the impression that it considers OPG's previous investments in the Bruce location a valid basis for the selection of the Bruce site for the DGR.

Point 3 relates to the precautionary principle. In our opinion, OPG's AMRA is replete with scientific uncertainties.

The report, in general, describes and compares the hypothetical granite DGR to the DRG in the sedimentary rock of the Bruce site without presenting sufficient data or sources of information.

It admits that the details of a DGR in granite rock are difficult to specify because there has been little characterization of a specific site in Canadian Shield in Ontario. In an attempt to address this issue, the analysis rests on assumptions that skew the results towards favouring the Bruce location.

And here I am specifically talking about assumptions related to fractures in granite versus fractures in sedimentary rock.

The EIS guidelines reiterate the importance of precaution as one of the guiding principles for the assessment. The guidelines provide minimum expectations in how OPG establishes it apply the precautionary principle in the design of the DGR project.

The guidelines oblige OPG to evaluate and compare the alternative means of carrying out the project in light of three generic criteria; risk avoidance, adaptive

management capacity, and preparation for surprise.

In requesting the AMRA OPG was provided an opportunity to appropriately consider these criteria. Again, however, OPG reduced its consideration to Table 1 in OPG's response to IR EIS-06-278. It appears that the information was added to the table after the risk assessment was completed.

There is no explanation of the information in the table and it overlooks important concerns related to risk avoidance, adaptive management capacity, and preparation for surprise.

We feel that, at a minimum, OPG must describe how the three criteria were applied as a framework for evaluating and comparing the alternative means considering a range of plausible scenarios, how each alternative performs in relation to the three criteria.

Finally, any conclusion about the most suitable option that emerges from the AMRA must explain why it was selected as the preferred option giving explicit attention to risk avoidance, adaptive management capacity, and

preparation for surprise.

Finally, because probability of risks and the consequences of these risks relate to how certain we are about potential impacts and consequences, or uncertain we are, as well as the knowledge that we have about our options, we would ideally like to see an explicit discussion of the uncertainties surrounding the four options respectively and how these uncertainties then relate to the pathways of harm and the risk analysis.

So this would strengthen our ability to better determine the best option, especially then steer away from the option that poses the greatest risks and uncertainties.

Thank you.

THE CHAIRPERSON: Thank you, Ms Markvart.

Panel Members, do we have questions?

I had a couple of questions for you, Ms Markvart. In your analysis you criticize the explicit lack of considering sustainability criteria, as you explained, sort of as an overall framework within which the IEG would have then

analyzed the individual pathways of harm.

Would you help the Panel understand a little more how the links would be made between specific sustainability principles or benchmarks and those pathways of harm?

MS MARKVART: I have given this some thought. It is not completely clear to me either, but the basics of a sustainability-based analysis or analysis lead by sustainability criteria are that you begin with a generic set of criteria such as the ones set out in table 1.

Then you take the next step to specify the criteria, and that specification represents all of the different issues, impacts, benefits associated with the task involved in choosing the best option for nuclear waste management.

So it is still kind of general, but it is more specific than the generic sustainability criteria. And because this has to be applied to the risk analysis, what I was thinking is that the pathways of harm would become those context-specific considerations underneath the sustainability criteria.

So, for example, how would the

pathways of harm relate to the generic criteria of ecological integrity or, more importantly, organizational or administrative capacity to manage the DGR over a long term or to manage all of the options over the long term?

And then using the probability and consequences approach that has already been set out in the risk assessment the evaluation could proceed from there and then the results then could automatically be related back to the sustainability criteria.

THE CHAIRPERSON: Ms Markvart, in your experience, is there actually sufficient experience in the literature and in practice to be able to do what you have just described?

And you refer to international practice. The Panel would be interested in whether or not there actually exists such a model in practice.

MS MARKVART: That is a good question. Applied to nuclear waste management options, not to my knowledge. But the process that I have just described is well-known in the academic and practitioner literature. It is a basic of sustainability-based decision making to

move from generic criteria to specification and then analysis of options.

When I was referring to international standards, that was in relation to siting, so it was a different...

THE CHAIRPERSON: So to OPG, given what we have just heard from Ms Markvart, to what extent did OPG go from the general corporate sustainability policy as well as OPG's sustainability measures down to the specifics of the OPG assessment within the EIS, even if it isn't within the AMRA, even within the EIS?

And for that, I refer specifically to your response to information request 0-344 where you do provide some explicit sustainability-based criteria for the various measures of significance.

In other words I would like, OPG, if you can, to try and connect the dots a little bit more explicitly between your corporate sustainability commitments and measures and what the Panel saw in your response regarding significance of adverse effects.

MS SWAMI: Laurie Swami, for the record.

During the lunch break we had some discussion of this concept. And while I understand we are limiting the number of undertakings during this, or you are, we would suggest it might be helpful for us to take that as an undertaking and provide you a written response, given we think that might be a difficult thing to do quickly, if that is acceptable.

THE CHAIRPERSON: I am waiting for Mr. Haddon to give me a number, because I think this will have to be the exception. I appreciate your point, Ms Swami, and yes, I think you are right, we will need a bit more information than can be provided orally.

Mr. Haddon?

MR. HADDON: Yes. So continuing on from the last hearing, the next undertaking number would be No. 72.

THE CHAIRPERSON: So this will become Undertaking No. 72, Ms Swami.

MS SWAMI: Thank you. We would propose to complete that by Thursday of this week.

THE CHAIRPERSON: That would be

greatly appreciated. Thank you so much.

My final question -- or, sorry, Ms Markvart, you had a supplementary?

MS MARKVART: No, I had a comment related to your question put to me about this approach that I have described from going to generic to specified criteria.

I can provide to you examples from other joint review panels that have applied the contribution to sustainability test.

If you would be interested, I could write something up and submit that as well.

THE CHAIRPERSON: I would actually be interested in that.

MS MARKVART: Okay.

THE CHAIRPERSON: So we are into 73, undertaking 73. When could you provide that to us, Ms Markvart?

MS MARKVART: By end of week, Friday.

THE CHAIRPERSON: That would be good. Thank you so much.

Finally, Ms Markvart, on slide 15 you state that a conceptual consideration of a DGR in granite bedrock does not meet

international standards.

Which particular international standards are referred to there?

MS MARKVART: That is a good question. This is not specifically my area of specialization. However, in doing research into this question I came across some references from the Organization for Economic Cooperation and Development and the International Atomic Energy Agency. I have some quotes here that I could provide if you are interested.

They basically just speak to the importance of siting with respect to building the safety case and the International Atomic Energy Agency sets out the different steps that should be taken to siting.

So they describe a step-wise approach where you begin with a conceptual and planning stage and then you move to an area survey stage, which is to identify regions, and then progressively target areas that may contain suitable sites after the relevant siting factors identified in the previous stage have been considered.

And then from there, moving down

to a more specific site investigation stage that involves the detailed study of one or several of the potential sites identified in the area survey stage.

And then finally the fourth stage is the detailed site characterization leading to site confirmation.

THE CHAIRPERSON: Thank you, Ms Markvart.

So to CNSC, to your knowledge does that IAEA guideline actually explicitly require all of those steps for alternative sites or is...? Just for clarification here, because our understanding from the slide is that there is an international guideline that would ask for a more detailed than conceptual characterization of alternatives. And the Panel requires clarity in this matter.

DR. THOMPSON: Patsy Thompson, for the record.

I believe the IAEA document that the intervener refers to is one or the other of the documents that CNSC staff included in our presentations on the IAEA requirements for conducting work in relation to siting of a

repository for spent fuel.

The steps are generally in relation to national programs where sites are -- you know, there is a process to find willing host communities, there is an inventory, characteristics of potential sites, down to a smaller number of sites similar to what is being done by the NWMO for the APM program.

In the case of the specific guidance, once a site has been chosen to conduct the site characterization, build a safety case, the safety assessment, the work that was done by OPG meets both the NEA and IAEA guidance.

But if you wish, Dr. Son Nguyen will be back here tomorrow and he could probably address this issue better than I can.

But perhaps what would be useful as well is to have Kiza Francis, which I should have told her a couple of seconds ago, that the alternatives assessment is done in consideration with the requirements of the *Canadian Environmental Assessment Act*, which are a bit different from what the intervener has been speaking to.

THE CHAIRPERSON: Ms Francis?

MS FRANCIS: Kiza Francis, for the record.

So during CNSC staff's review of OPG's submission on alternative means we do use the operational policy statement from the Canadian Environmental Assessment Agency, which is addressing the purpose of and alternative means under the *Canadian Environmental Assessment Act*.

And the policy statement includes four steps when you are doing your alternatives. And what is important to note I guess is step 3 talks about selecting your approach for your analysis of alternative means.

And it provides two cases; one where you identify your preferred means, and one where you bring forward multiple alternative means.

So in this case OPG had identified a preferred means before going on to step 4, which is where you assess the environmental effects at a higher level for all of the alternatives, but you do a detailed assessment of the environmental effects for the preferred means.

So therefore, when we did our assessment on the alternative means we concluded that they had followed the operational policy from the CEA agency.

THE CHAIRPERSON: Thank you, Ms Francis.

I believe that is all the questions we have.

Ms Markvart?

MS MARKVART: Thank you.

I would just like to reply that my understanding is the reference, the IAEA reference that I gave relates to long-lived radioactive waste generally, not just spent fuel.

Secondly, our insistence on an empirical investigation of alternative sites also rests on the precautionary principle in the sense that in the context of environmental assessment one of the key aims of the precautionary principle is that it compels us to steer away from options that entrain the greatest amount of uncertainty or the least amount of knowledge and experience, and so if we are talking about where to locate at DGR and there are high uncertainties surrounding it, we need to have more than one

site to compare it to in order to be certain that we are choosing the best option or the one that has the least amount of uncertainties associated with it.

THE CHAIRPERSON: Noted. Thank you, Ms Markvart.

Returning to your undertaking, actually I have been reminded that we will need the results of that undertaking by Thursday as it is our last scheduled day, so if you could please provide it to us by then. Thank you.

We are now going to be proceeding with three 10-minute oral presentations. The Panel will direct its questions to each presenter following each presentation.

The first 10-minute presentation is by the Lawyers' Committee on Nuclear Policy, which is PMD 14-P1.42.

Ms Dwyer, please proceed.

**PRESENTATION BY / PRÉSENTATION PAR:
LAWYERS' COMMITTEE ON NUCLEAR POLICY,
ANABEL DWYER**

MS DWYER: Good afternoon. My

name is Anabel Dwyer, I am a Member of the Board of Directors of the Lawyers' Committee on Nuclear Policy and also a Member of the International Law Section of the Michigan Bar.

I come here to thank you for continuing these hearings and also bring some perspective of the problems of nuclear waste in the context of the entire nuclear fuel and weapons cycle.

The Lawyers' Committee on Nuclear Policy is concerned mainly with nuclear disarmament and fulfilling the obligation for nuclear disarmament in all its aspects.

So it seems to me that obviously nuclear waste is one of the great issues of the day, but it must be thought about not just in terms of low and medium level waste in this context, but in broader context.

So I would like to ask you to reject the OPG's deep geological repository proposal because the methodology used to determine the significance of environmental effects of radiation and radioactivity is dangerously narrow in three areas. And you have heard a lot of this before, but I would like to

reiterate, in terms of space, the area of concern in terms of quantity, the amount of presumed safe human and biota exposure, and three, the time, the length of the danger of lethality.

Your minimum concern must take into consideration at least the geological and hydrological interconnections of the Great Lakes watershed as a whole. As your methodology is very narrowly confined to this particular area of the Great Lakes, and you have heard this discussed before, but I would like to say that once again, as I said last year before you, that we would like to request that you and the Canadian government -- aske the Canadian government and the United States government to pursue the assessment of the human and environmental effects of nuclear sites identified by the Nuclear Task Force of the International Joint Commission on Great Lakes Water Quality in its inventory of radionuclides for the Great Lakes of December 1997 and the Report of Bioaccumulation of Elements to accompany the inventory of radionuclides in the Great Lakes basin.

This requires, of course,

continuing this very good effort that you have begun. And I don't mean to demean the details of what you are doing and the way in which you are going about it because I think it's most important and it's a real model for those of us in the United States, but we are considering a whole ecosystem and we are considering a whole nuclear system.

So the second point I would like to make is that the quantity, the amount of presumed safe and human biota exposure is obviously a controversial subject. You have heard a lot about it today, but we need to take the cumulative effects very seriously.

I think you have heard already the International Institute of Concern for Public Health, you have heard already this afternoon all sorts of people within your purview who have a lot of expertise in this, but I also would like to reiterate what I said last year as well, which is that you have an example very close to here from the Serpent River Watershed where there were 12 uranium mines from the 1950s to the 1990s.

The nuclear waste in various forms there was also simply abandoned in the

mines. So this was an example of not so deep geological repository. These wastes were dumped right here, not far from here, and in lakes which were called natural basins under licences by the Atomic Energy Control Board.

And the results at the front end of the nuclear power and weapons waste problems we documented in a book called, "This Is My Homeland: Stories of the Effects of Nuclear Industries" by people of Serpent River First Nation and the North Shore of Lake Huron.

I would like you to also consider the effects that we know about and pursue the way in which monitoring has gone on and mining procedures have taken place in the past so that you can look at what OPG and Bruce Power -- OPG is proposing in the context of what has already happened.

The kind of trust that you have to have in this procedure doesn't have a great history in the nuclear system, and by this I don't mean just Canada by any means of course, because those uranium mines up in the Serpent River Watershed were initially for the U.S. weapons program.

So obviously this is not a Canadian problem and I'm not trying to malign you and your procedure in any way, but, you know, the processes by which people stored waste, for example that we documented in that book, when thorium for example was being moved from a storage site at the old Nordic Mines site to a storage site in a waste management area up here, that was stored in oil drums and the Atomic Energy Control Board came to town to supervise the move and the barrels were thrown into the waste management area, these were, as I said, lakes, and they wouldn't sink.

So one of the members of the United Steelworkers Association said that the AECSB, the Atomic Energy Control Board worker shot the barrels with a gun so that they would absorb the water and eventually sink. This was joked about as AECSB's nuclear -- new modern waste technology.

So basically you have heard my third point is the time and length and nature of the lethality of these radionuclides. You have heard about a lot, you know something about obviously, you have heard also a recommendation

that rolling stewardship of nuclear wastes, yes, aboveground is a good way to go until we have some real understanding of what the situation actually is.

We have worked to give you support for recommendations not approving this site in Michigan by getting various Michigan -- the Michigan Legislature, as well as various county commissions, including our own in Cheboygan, right across again the water from here.

These resolutions opposing the development of underground nuclear waste facilities here could give you support to pursue these studies through the International Joint Commission.

So what I would just like to say in conclusion is that you are dealing, as you well know of course, with not very well understood grim realities and we trust you will find the strength to reject the OPG proposal and not be swayed too much by short-term political or corporate pressure for a too narrowly conceived solution to the long-lived nuclear waste problem.

And I ask you one thing further,

that you recommend that production of these wastes from any source must be halted because both nuclear weapons and nuclear power are unnecessary, unneeded and plainly unwise for either our common security or for energy.

Thank you.

-- Applause / Applaudissements

THE CHAIRPERSON: Thank you, Ms Dwyer.

MS DWYER: I assume you don't have any questions.

THE CHAIRPERSON: Panel Members, did we have any questions?

No, okay. Thank you very much.

The next 10-minute presentation is by Algonquin Eco Watch, which is PMD 14-P1.52 and 52A.

--- Pause

THE CHAIRPERSON: Mr. Wilton, please proceed.

PRESENTATION BY / PRÉSENTATION PAR:

ALGONQUIN ECO WATCH, MIKE WILTON

MR. WILTON: Thank you for this

opportunity.

My name is Mike Wilton, and I am with an environmental protection group known as Algonquin Eco Watch.

(off microphone) the individuals see what the slides say. Slide No. 1: All living matter requires water for survival. All water comes to us from the atmosphere. Clean, pure, surface water percolates into the Earth's surface to become clean, pure groundwater.

Any impurities, whether or not they are chemical, physical or nuclear will remain in the groundwater for immeasurable time. Because groundwater follows the nap of the Earth, it has the ability to flow aboveground as freshwater springs that support unique ecosystems.

The addition or removal of groundwater from any point will create a positive or negative pressure respectively, causing the water to flow toward or away from the changing pressure since water will always seek to find its own level.

The creation of a dry in-ground chamber will create a negative groundwater

pressure within that chamber, causing the outside groundwater to seek access to the chamber.

Anyone who has ever had a leaky basement realizes that leaks cannot be repaired from the inside.

If the groundwater achieves access through structural compromise, the resulting equalized groundwater flow could lead to the egress of groundwater containing radioactivity. If this groundwater is collected and pumped to the surface, then that water must be decontaminated or contained indefinitely, creating a whole new problem.

The Bruce deep ground repository will be situated in sedimentary rock, such as this limestone, which will allow increased groundwater flow through time as calcareous sediment dissolves with the passage of groundwater through enlarging cracks and seams.

Alternatively, owing to its volcanic nature, the cracks and seams in granitic rock, such as illustrated in this slide, are less likely to enlarge allowing increased groundwater flow since granitic rock is far less soluble than sedimentary rock.

While the term "solid rock" is used somewhat loosely and may refer to large chunks of solid rock, the occurrence of large unfractured rock layers is most unlikely. Groundwater will flow through and among fractures in an effort to stabilize the water table.

As its sphere expands, cracks and fissures will appear in its surface due to stretching. The Earth's surface is expanding. As a result of glacial melting thousands of years ago, the Earth's crust is rising in response to all that weight of ice being removed. This phenomenon is known as post-glacial rebound, crustal movement or crustal tilting. As is illustrated in this slide, this location is on Highway 6 travelling north between the Manitoulin Island and Espanola.

It is estimated that the Bruce nuclear site is rising by as much as nine centimetres per century. This is from a paper by Mainville and Craymer in 2005. I can supply you that reference. Extrapolating this estimate over the next 1,000 years indicates a rise of 90 centimetres, or approximately three feet or 30 feet over the next 10,000 years.

While it is unrealistic to assume that this will continue unabated, the consequences of such subterranean activity are not only difficult to visualize, but impossible to predict. They do, however, include an apparent equal and opposite drop in the Lake Huron water level in relation to the shorelines.

I would like to submit a hypothesis to the Panel that supports this line of thought. I think it is quite important.

The OPG Deep Geologic Repository Report implies that groundwater flow in the local vicinity is extremely low at 650 metres depth. I feel that with the ongoing and possibly increasing change within the Earth's crust, it is difficult, if not impossible, to state categorically that the DGR is safe from breaching, but is more likely through time to be accompanied by the opening of new and growing seams in the adjacent substrate, with resulting ingress and subsequent egress of radioactive groundwater.

While I did not find reference to it, I expect that the 2010 Ottawa earthquake would have been recorded by devices located at

Bruce nuclear. It would be very interesting to learn what readings on the Richter scale were recorded at that time, especially since that event was felt as far west from Ottawa as Chicago. While this earthquake only registered 5.0 on the Richter scale, seismologists felt that it was experienced over such a large area because of its extreme depth of occurrence.

Hydraulic fracturing or fracking involves the liberating of petroleum-based hydrocarbon fuels from sedimentary rock formations such as this through the introduction of high-pressure chemical compounds. Aside from the irreparable damage that the introduction of toxic chemicals will cause to deep underground -- to deep groundwater sources, fracking forces sand particles between the rock layers utilizing extreme hydraulic pressure, thus permanently altering the interstitial spaces between rock layers at depths well below the DGR.

Even though the OPG report appears to dismiss the likelihood of fracking in the Bruce nuclear area, no one can accurately predict how desperate humankind will be to reclaim petroleum products 10,000 or even 1,000

years from now.

Averages are derived from extremes and, as such, tend to dampen reality. The estimated groundwater flow of between 10 to the minus 11 and 10 to the minus 15 metres per second at the 650 metre depth OPG report neglects to take into account the fact that sedimentary rock is soluble through time, which will lead to enlarging flow paths with consequent higher flows, which will in turn give rise to enlarged flow paths, and so on.

Further, to predict 10,000 or even 1,000 years ahead in view of crustal uplift, earthquakes and fracking smacks of human arrogance. As long as these cumulative factors remain in play stability cannot be assured.

I, therefore, respectfully submit that the containment facility should be built aboveground so that it can be properly monitored and maintained for the next 10,000 years. Our groundwater is far too precious to risk accidents.

I have three additional notes I would like to add here.

Counting will not begin when the

facility opens. The counting will not begin until the facility is closed and permanently sealed. I have "sealed" in red quotes there because, frankly, I don't believe that it can be sealed.

Note No. 2: The proximity to Lake Huron will always be worrisome.

Note No. 3: This is a precedent setter. If this project proceeds the way will be made easier for others to follow.

Thank you.

--- Applause / Applaudissements

THE CHAIRPERSON: Thank you, Mr. Wilton.

I understand Dr. Muecke has a question.

MEMBER MUECKE: Yes. It's a question to OPG.

Has OPG evaluated how future fracking activity in the vicinity of the proposed DGR may affect long-term safety considerations?

MS SWAMI: Laurie Swami, for the record.

I will ask Dr. Gierszewski to come forward. He may need assistance from Mr.

Jensen as well.

--- Pause

DR. GIERSZEWSKI: Paul Gierszewski, for the record.

So has been discussed at previous days in these hearings, there are no hydrocarbon resources at the site that would support fracking at the site, and because of the nature of the impermeability of the rock at far distances where it might occur, it would not have an impact at the site itself.

MEMBER MUECKE: We had a similar discussion or questions several days ago and one of the questions arose as to the evaluation of NRCan and the Department of Natural Resources regarding the potential for hydrocarbons in the vicinity of the proposed DGR.

I don't think we quite have resolved that.

MR. JENSEN: Mark Jensen, for the record.

Based on that discussion on Friday I took a look at the transcripts and the presentations and the written submissions from those groups on September the 18th.

I believe my interpretation of that is that they would have agreed that at the site the hydrocarbon potential is low, which is consistent with all the site characterization work that we have done.

THE CHAIRPERSON: Dr. Archibald...?

Thank you, Mr. Wilton.

MR. WILTON: Madam Chair, if I could just -- I'm not sure if I'm still on there or not. Now I am, thank you.

If you could go back to that final slide. As you can see from the illustration there, when drilling for fracking it doesn't go vertical as much as it goes horizontal. Even though there may not be fracking potential at site, if it's possible to drill and force liquids horizontally, is there not a danger that fracking not on site but at a nearby site where the potential hydrocarbons are available, could that not affect this site as well, being accessible through horizontal pressures?

THE CHAIRPERSON: Thank you, Mr. Wilton.

I will redirect that question back to OPG, please. And we will keep the slide up.

MR. JENSEN: Mark Jensen, for the record.

Our assessment of shale gas and shale oil suggests that conditions necessary for those would not exist within many tens of kilometres within the site.

If fracking operations were conducted at distances of tens of kilometres from the site, they would not affect the proposal.

THE CHAIRPERSON: Thank you.

Thank you, Mr. Wilton.

The next 10-minute presentation is by the Toronto Conference of the United Church of Canada, which is PMD 14-P1.56.

Dr. Obedkoff, please proceed.

PRESENTATION BY / PRÉSENTATION PAR:
TORONTO CONFERENCE, UNITED CHURCH OF CANADA,
MARY LOU HARLEY

MS HARLEY: For the record, I'm Mary Lou Harley, we partnered in the

presentation.

I am presenting on behalf of Maritime Conference and Toronto Conference of the United Church of Canada and we thank this Panel for this opportunity.

The United Church has been active in education advocacy on nuclear issues for four decades. My Ph.D. is in chemistry and since 1993 I have been involved in nuclear issues on behalf of the United church, including presentation to the Seaborn Panel hearings participating in the study of nuclear fuel waste management options by the Nuclear Waste Management Organization and taking a study tour in the radioactive contaminated area of Northeast Japan and presenting the United Church policy on nuclear issues on a conference there on the triple disaster.

In this brief presentation a few points will be highlighted with some clarification. They are taken from the written submission by myself and Dr. Reverend Victoria Obedkoff.

Specific to the topic of the significance of adverse effects, the narrative

form of the response by OPG to 12-510 does not change the shortcomings in the determination of the significance of adverse impacts.

A defence is given for each significant determination, however many determinations are not reliable because of high levels of uncertainty, inadequate data, arbitrary judgments and other considerations.

The methodology has judgment of likelihood layered over determination for both the impact and the potential for its mitigation. When an adverse impact is indicated in the assessments, mitigation options are applied to give the residual adverse effect. Judgment of the effectiveness of proposed mitigation is susceptible to bias toward safety influenced by overconfidence in existing mitigation tools or optimism in future capability.

Thereafter, the estimated probability of occurrence of the effect is the decisive criterion as to whether or not the residual adverse effect is significant.

This is a cycle which could remove adverse effects from assessment and it is not appropriate in a conservative and

precautionary methodology.

The safety case must not lose sight of estimated low probability scenarios that could have substantial adverse effects. For the long-term scenarios involving radionuclides, the adverse effect is judged for a significance determination using a formula provided in the IAEA safety standard SSR-5. This formula is intended to express the probability of fatal cancers and severe genetic damage for a healthy male adult expressed in a form such as 1:1,000, 1:10,000, et cetera.

Since adverse effects could be dismissed by applying a low probability factor, the formula is only to be used when the probability of occurrence figure is reasonably known, which cannot be assessed from the OPG narrative and is questionable for the long-term scenarios.

Additionally, a conservative methodology in the scenario assessment should include fatal and serious non-fatal biological harm. And rather than the healthy male adult, the method should recognize that harm per dose is greater in other portions of the population,

particularly the fetus and the child, by using data for impacts on the most vulnerable portion of the population.

Depending on the mode of contamination, the body experiences the effects of external ionizing radiation, internal ionizing radiation from inhalation, breaks in the skin and ingestion and also chemical toxicity from many of the radionuclides. There is no indication that chemical toxicity, as well as radiological toxicity of the radionuclides are included in determining the significance of adverse environmental effects from the radionuclide releases.

Many radionuclides are dropped from post-closure assessment because of their shorter half-lives, however, it is not apparent whether the chemistry and biological impact of their end products were or should be considered in the assessments.

For non-human biota, OPG acknowledges that for certain scenarios some radionuclides could exceed the screening criteria, however, the risked non-human biota is rated as low because the exceedances are local,

the screening criteria are considered conservative and the scenarios are judged to be very unlikely.

This cyclical justification of downgrading or dismissing significance of adverse effects is common in OPG methodology and the logic is flawed, especially for a method so dependent on judgment.

Screening criteria are set to be conservative and the range of scenarios are selected to include the low probability situations. These preset factors cannot then be used to dismiss the results, otherwise what is the point of doing the work?

If when the result is not insignificant it would be dismissed anyway based on the preset conservatism and probability judgments.

Overall, the methodology used to determine the significance of adverse environmental effects for radiological impacts does not adequately address the context of timing and duration, frequency or irreversibility.

In some scenarios radiation and radioactivity is not clear what the predicted

dose is in the primary affected area and what dose is averaged over a larger area, larger volume, or larger population. It is not clear whether the dose is a severe spike averaged throughout a timeframe or it is a continuous exposure.

Averaging out significant doses through space and time would not properly represent the biological harm experienced by those in the zone of primary exposure.

Application of improved methods and methodology would be useless until the unknowns and uncertainties in the inputs are addressed.

The waste inventory characterization is central to determining adverse effects. The revision to the reference waste inventory addressed in the response to IR 13-514 is indicative of ongoing revisions that will be needed perhaps until the waste is no longer being generated.

Fundamental inputs to the determination of significant adverse impacts and the safety case for the DGR will remain unacceptably uncertain until at least

statistically valid data is available. The waste inventory verification plan is not anticipated to have statistically valid data before 2021.

The geo-science and geo-technology is uncertain and some is unknowable. The geo-scientific verification program outlined in the response to IR 12-511 and associated study of gas-generating processes signal the exceptionally experimental nature of this DGR proposal.

There is significant reliance on the process for granting an operating licence as a means to assure safety should OPG proceed to apply. Implicit in this is an optimistic anticipation of solutions to as yet unsolved fundamental issues.

Altogether an excessive amount is left for the EA follow-up program and the ongoing environmental monitoring programs.

Further, the capacity of adaptive engineering may be stretched beyond reasonable limits. Of course, there needs to be an EA follow-up program monitoring things, but at what point is it acknowledged that too much is being assumed, too much left unknown that critical

issues of inherent hazards are not addressed and statements of safety are unsupported by a demonstrated safety in the EIS?

The potential expansion for decommissioning wastes adds more uncertainty to the quantity of waste and the waste characteristics of the inventory and more inherent hazard.

The response to IR 12-512 shows little evidence of additional conservatism in response to the higher inherent hazard of the waste stream into the expansion area.

In conclusion, for a reliable, defensible determination an assessment of significant adverse impacts and the establishment of the safety case for the original proposal or the expansion, too many of the necessary inputs are not known or are not available with adequate certainty.

Consistent with the United Church submissions in other forums, we highlight the necessity not to move from on-site storage to another form of waste management until the safety of that option is well-established.

Thank you.

--- Applause / Applaudissements

THE CHAIRPERSON: Thank you,
Ms Harley.

Panel Members, did we have any
questions? Thank you very much.

We now have time for a few
questions from registered participants. I
understand from Secretariat staff that we have
eight people who have asked for leave to present
a proposed question.

I will now call upon Mr. Mann.

MR. MANN: Thank you, Dr.
Swanson.

I'm asking leave to OPG, CNSC and
Environment Canada regarding their DGR adverse
effects analysis this morning.

What is the significance of the
WIPP radiation leak disaster to the DGR adverse
effects analysis and why does OPG not have a
contingency plan to protect our community when a
WIPP disaster occurs in Kincardine?

THE CHAIRPERSON: OPG, I believe
the Panel would appreciate some comment on the
applicability of the WIPP incident, if any, to
the significant adverse effects assessment; and,

(b), perhaps just very briefly remind the Panel regarding the already presented information around emergency response.

MS SWAMI: Laurie Swami, for the record.

I'm going to ask Ms Barker and Mr. Wilson to address those two components, Ms Barker on significance.

But before I do that, I would like to just state that while the WIPP event is an unfortunate event, it's not something that we would accept as good practice obviously. I find that characterization of a disaster is perhaps overstating what the result was.

I think that both OPG and CNSC have described what the result of that event was and continue to monitor that, but disaster seems too strong a description of that particular event.

With that, I will ask Ms Barker first to describe the significance assessment.

MS BARKER: Diane Barker, for the record.

I would like to point out first that the WIPP incident occurred well into the

timeframe when we were preparing our response for EIS-12-510. However, the significance assessment that was completed in that response was prepared under the requirements of the *Canadian Environmental Assessment Act*, and so the *Canadian Environmental Assessment Act* asks that we identify residual adverse effects for the project and assess the significance of those effects on the project.

The *Canadian Environmental Assessment Act* does not require the assessment of effects of malfunctions and accidents and the incident at WIPP would be considered a malfunction and accident scenario.

Nonetheless, OPG did consider malfunctions and accidents and the consequences of malfunctions and accidents in its assessment, but didn't undertake a significance assessment.

THE CHAIRPERSON: Thank you.

Mr. Wilson...?

MR. WILSON: Derek Wilson, for the record.

And again to be quite brief in this area, we have had several discussions around the emergency response preparedness that is being

planned for the DGR, so in the event that even if there were workers underground at the time of such a release, the planning and the preparedness to be able to get those isolated into controlled areas and to be able to model the predicted impact of a surface release, let's say of a similar magnitude, has been assessed, the criterion has been set such that it is moving away from predominant areas of workers and the on-site second emergency protocols would be established and people would be removed from harm's way until such a time as they were deemed suitable to release again.

THE CHAIRPERSON: CNSC, the Panel simply requires that you confirm Ms Barker's statement just now that under *CEAA* 2012 the significance of effects under malfunctions and accidents and malevolent acts is not required to be assessed?

DR. THOMPSON: Patsy Thompson, for the record.

The *Canadian Environmental Assessment Act* requires an assessment of a proposed project under normal operating conditions and then requires an assessment of

accidents and malfunctions.

The expectation is that the consequences of accidents and malfunctions can be mitigated such that the project doesn't have unacceptable consequences, taking into consideration both the actual consequence of the event and its likelihood once mitigation measures and other factors are taken into account.

So I would say yes and no, but we do look at the severity of the consequence of an accident and malfunction in relation to its likelihood.

THE CHAIRPERSON: And, Environment Canada, have you had a chance to evaluate the implications for non-human biota from an incident such as that as occurred at WIPP?

MR. LEONARDELLI: Sandro Leonardelli, for the record.

So we don't have any data from the WIPP incident itself to be able to say we understand what the dose implications for biota would be. I would defer to the CNSC as to what information on that might exist at the moment.

THE CHAIRPERSON: Thank you.

Mr. Mann...?

MR. MANN: I guess I would like to know what OPG did with regard to the WIPP incident, though, insofar as the adverse effects. What did they look at with regard to the WIPP incident?

THE CHAIRPERSON: I think we already heard from Ms Barker that they were well into preparation of the response to the IR regarding significant adverse impacts and that, notwithstanding that, the WIPP incident actually fits within accidents, malfunctions and malevolent acts and the Panel has already received information on the first day of this hearing last week regarding fitting it into that perspective, Mr. Mann. So I believe the Panel has heard all it needs to on that matter.

MR. MANN: Thank you.

This is for Joanne Martin, by leave through you, Dr. Swanson.

Ms Martin noted that there were only six boreholes done to prove safe geology and why not 12 or 24.

With regard to NWMO's finding that there is unsafe geology in Saugeen Shores

and here in Elderslie for a DGR, I wonder if Ms Martin could comment upon the lateral predictability and the effect that six boreholes doesn't seem to be sufficient for her to find safe geology in Kincardine.

THE CHAIRPERSON: Mr. Mann, commenting on a matter such as that, which is a technical matter, I would suggest would be directed towards OPG and/or CNSC and, in fact, we have addressed those questions that you raised the other day sufficiently for the Panel and we don't require any more information.

Thank you.

MR. MANN: I just have one more.

THE CHAIRMAN: Just one more?

MR. MANN: One more question for Eugene Bourgeois.

Last year Mr. Bourgeois gave a presentation, Dr. Swanson, about his ordeal throughout the process and I just wondered if Mr. Bourgeois could comment upon OPG's response since the hearings adjourned last October, what response OPG has given him, because they committed to him that they would work with him with regard to this.

THE CHAIRPERSON: Mr. Mann, the Panel is aware of the correspondence and has noted Mr. Bourgeois' presentation this afternoon and really that is all the information we need at this time.

Dr. Greer...?

--- Pause

THE CHAIRPERSON: Dr. Thompson, did you have something you wanted to add?

DR. THOMPSON: Yes. Patsy Thompson, for the record.

I wanted to correct -- I may have given wrong information. So under the *Canadian Environmental Assessment Act* there is a requirement to assess the significance of the effects, it says referred to in paragraph (a), and that is the environmental effects of the designated project, including the environmental effects of malfunctions and accidents that may occur in connection with the designated project and cumulative effects.

As I mentioned, we do assess in terms of the consequence of the accident and the likelihood of occurrence with mitigation measures.

THE CHAIRPERSON: Dr. Greer...?

DR. GREER: Thank you, Madam
Chair.

Dr. Sandy Greer, for the record.
I have two questions.

The first is, in browsing through as much of the bibliography of OPG's submissions as possible, I didn't see anything per se in regard to the ICRP publications and I would just like to give OPG the opportunity, if I was mistaken, whether it informed itself about the international standards by the ICRP in regard to protection of the environment, given that the reference animals and plants, information and studies, as a substantial amount of studies had been done and published by the year 2008 and, if you did not refer to those; why not?

THE CHAIRPERSON: Dr. Greer, are you referring to their specific IR response of issue today?

DR. GREER: Yes, I'm sorry. I'm referring to the IR EIS-12-510.

THE CHAIRPERSON: Thank you.

OPG, I understand from Dr. Greer she is asking whether or not you would have also

considered the ICRP information related to non-human biota effects in your answer to the Information Request.

I believe, Dr. Greer, you are specifically referencing the statements by OPG regarding the significance of, for example, radiation effects on non-human biota which you referred to very briefly in your presentation; is that correct, Dr. Greer?

DR. GREER: Dr. Greer, for the record.

Yes, that is correct.

MS BARKER: Diane Barker, for the record.

In the original assessment the identification of adverse effects and assessment of the effects that is presented in the environmental impact statement, we did consider ICRP reference material. ICRP reference material is not included in the IR response 12-510.

As noted in OPG's response, there were no adverse effects associated with radiation or radioactivity on either humans or non-human biota, so there was no significance assessment completed.

THE CHAIRPERSON: So to be clear, Ms Barker, the entire reference list in support of not carrying forward adverse effects on non-human biota from radionuclides would appear in the main body of the EIS plus the technical supporting document?

MS BARKER: Diane Barker.

That's correct.

THE CHAIRPERSON: Thank you.

Dr. Greer...?

DR. GREER: Yes, I have a related question.

Referring again to IR -- EIS 12-510 on page 53, I just want to read one sentence here:

"The existing ionizing radiation and radioactivity conditions were established through a compilation and review of existing information for existing doses to humans and the results of modelling for existing doses to non-human biota."

However, now in contrast, the most recent publication from the ICRP 124, which was published this year on page 38 it states: "Unfortunately, there are very few data that relate directly to the chronic low level

irradiation conditions of relevance for animals and plants in the wild, i.e. exposures at dose rates over the lifespan of the organisms." (As read)

And it states elsewhere, with an honesty I truly respect, that:

"There needs to be more scientific information..."

That's on page 45, and that:

"...even the bands or the DCRLs that the ICRP has identified as dose rate bands, these are not to be considered or used as limits because still the material that they have collected to date..."

And as I mentioned last week:

"...in regard to ecosystem principles it is not scientifically defensible." (As read)

Therefore, if the international standards of the ICRP are declaring that the state of the art in terms of identifying consequences from radiation poisoning are still a work in progress and are not scientifically defensible, how can this DGR project go forward at this time? What is the rationale?

THE CHAIRPERSON: Dr. Greer, the Panel actually asked a very similar question of

OPG during the Technical Information Session around the modelling of doses to non-human biota and the effects resulting from those doses and we explicitly raised the question about uncertainty around benchmarks for effects due to chronic exposure of the population level and OPG answered in quite a bit of detail regarding how they addressed that issue.

And I would direct you to the Technical Information Session of the fall of 2012 for a lot of information about that which came directly from OPG's team that performed that exercise. I really don't -- the Panel really does not require any further information in that regard.

DR. GREER: Okay, well, thank you very much.

THE CHAIRPERSON: Ms Lloyd...?

MS LLOYD: Thank you, Dr. Swanson.

My question is around the inventory used for Significant Effect No. 8, the radiation and radioactivity. I'm taking from both the OPG, the summary response, and from their references in their narrative section of

their report that they relied on the 2010 reference inventory. And I wonder if they could confirm that and I may have a supplementary based on their response.

THE CHAIRPERSON: OPG...?

MS BARKER: Diane Barker.

Yes, we relied on the 2010 inventory.

THE CHAIRPERSON: Ms Lloyd...?

MS LLOYD: Yes, thank you, Dr. Swanson.

I guess my question is about the reasonableness of doing that. We have now the reference inventory from 2010, the revised inventory, revised based on the recalculations related to the pressure tubes and we have an expanded inventory from the decommissioning waste. And I wonder if OPG considered or how they thought it -- you know, what their sort of reasoning was for using an inventory that we know now to be not only uncertain as we knew it last year, but to be incomplete and inaccurate.

I appreciate that the chronology was it was, you know IR 5-10 versus IR 13-514, I think it was, but they could have done a redo.

THE CHAIRPERSON: OPG...?

MS SWAMI: Laurie Swami, for the record.

I'm going to ask Dr. Gierszewski to respond to the details of the inventory. However, I would point out that Ms Lloyd has referenced the decommissioning waste. The decommissioning waste is not part of our request for approval in this particular case and that is going to be, as we've described a lot, subject to a separate licence and environmental assessment process.

But Dr. Gierszewski can respond to the remaining questions.

THE CHAIRPERSON: Ms Swami, before I ask for Dr. Gierszewski to comment, I would however, suggest that we could also discuss the implications to the Cumulative Effects Assessment for Decommissioning Waste tomorrow, Ms Lloyd, if we wanted to return to some of the details.

Dr. Gierszewski...?

DR. GIERSZEWSKI: Paul Gierszewski, for the record.

So as was discussed last week on

the waste inventory, we did look at the implications of the revised inventory which is within the scope of the current licence application. And the nature of the changes to the radionuclides had very little effect on the safety case conclusions. And so -- well, that's the point that we looked at the effect and it had no effect.

THE CHAIRPERSON: Dr.

Gierszewski, does that apply to both human and non-human receptors in your safety case?

DR. GIERSZEWSKI: I just would want to go back and just check the calculations just to make sure before I responded to that.

THE CHAIRPERSON: Thank you.

Ms Lloyd...?

MS LLOYD: Thank you.

THE CHAIRPERSON: Mr. Hazell...?

MR. HAZELL: Thank you. Thank you, Madam Chair.

Two questions. The first has to do with terminology. I would like to have some clarification regarding the functional criteria that were used in order to decide on the use of the term "stormwater management pond". And I

mention this because there are many types of ponds that are used in -- artificial ponds that are used in mining and general site planning purposes and they have very specific criteria with regards to maintenance, function, et cetera.

The stormwater management pond has been chosen in this case and I'd like to know how that decision was made and whether there was any consideration of, for example, settlement pond or tailings pond.

Thank you. That's the first question.

THE CHAIRPERSON: OPG, and specifically the Panel would appreciate absolute clarity with respect to differentiating stormwater management pond and tailings pond.

MR. WILSON: Derek Wilson, for the record.

As I mentioned this morning at the end of Ms Barker's presentation, the stormwater management pond as we referenced as part of the design in the proposed DGR is a stormwater management pond. So it has to deal with the collection of both processed water and surface runoff from the DGR project. And again,

it's being designed according to the Ministry of Environment's Stormwater Management, Planning and Design Manual. So again that has very -- it's specific to do with stormwater and the collection of water and then the ability to have that, some treatment whether it be sedimentation, dropout and so on before discharge.

Tailings ponds are typical of the mining industry and are typically an end-product of the processing of a facility and are significantly different than a stormwater management pond as being proposed for the DGR.

THE CHAIRPERSON: Thank you.

Mr. Hazell...?

MR. HAZELL: I do have a supplementary to that, if I may.

THE CHAIRPERSON: Yes.

MR. HAZELL: Stormwater management ponds are designed to contain water from those events and from hard surface conditions and they were also designed to allow for overflow. Was it the intention of the OPG, I suppose in this case, to allow for overflow conditions to exist? Was that an advantage?

THE CHAIRPERSON: Mr. Hazell, the

Panel is pretty clear on the intent of the stormwater management pond which includes a discharge according to water quality criteria. So the Panel is a bit puzzled by the context for your question.

MR. HAZELL: Madam Chair, the stormwater management pond has been discussed in terms of its capacity to handle stormwater events.

The site has been identified as being difficult, let's say, to accommodate some of the capacity issues that have been discussed earlier today. The assumption is that when capacity is reached that the edges will be breached and the water will flow freely onto the site and surrounding area. That is a concern.

THE CHAIRPERSON: I will ask OPG to clarify the scenario where we would have the safe flow out of the stormwater management pond and then in the event of a severe weather event.

MR. WILSON: Derek Wilson, for the record.

Again, there is a component of the stormwater management pond for retention in storm events. As we discussed again, the 10-year

storm event could be maintained within the stormwater management pond without discharge to or over-boarding of the facility.

The design with respect to large storm events or beyond design basis events is such that the stormwater management pond design is structurally able to be able to withstand the overflow condition of that and direct that overflow through the established discharge point into an interconnecting ditch and then through to MacPherson Bay as opposed to overtop of the edges and retreating back into the site and so on.

So it's a design, an engineered design for an overflow and, again, the discussion around what the retention capacity of the stormwater management pond should be or will ultimately be is still to be decided.

THE CHAIRPERSON: Thank you, Mr. Wilson.

Mr. Hazell?

MR. HAZELL: Yes.

My second question has to do with the discussion surrounding the white cedar and decisions as to whether it can be removed in the area of those three or four isolated forest

conditions.

There was discussion in -- when the discussion took place it had to do with the context of a forest environment. The forest environment referred to was to the south, the national park, MacGregor Park as well. Cedar, white cedar -- very important white cedar conditions are a part of just to the north in the Douglas Point Swamp. The Douglas Point Swamp has been referred to in a study as being one of the most significant conditions in the local area and it is identified as important because of its extraordinary biodiversity with some of the highest ratings. It's also identified as being important because it's next to the Bruce Nuclear Power Plant site and it an important complex biodiversity study area and worthy of research and support.

The white cedar is identified in that report as having special significance because of its mixed relationship with other species. The report goes on to discuss that in a bit of detail.

Given the significance of the surrounding context which supports that unique

and important environment next to the Bruce nuclear site, would there be some recommendations or would those commenting on the significance of removal of supporting environments around that condition, would they reconsider some of the significance of factors that led to agreeing that that could be removed with no effect on the surrounding area?

In other words, I would like consideration of this, the area at Baie du Doré and this unique swamp condition to be included in the assessment rather than an assessment simply to be associated with better stands of cedar in national parks, in parks nearby.

THE CHAIRPERSON: OPG...?

MS BARKER: Diane Barker, for the record.

The eastern white cedar was selected as a VEC because of its local significance and importance to the community and the plants and animal communities. The three stands that are -- that would be removed should the project proceed are isolated stands. They are located within the Bruce nuclear site. They are not contiguous with the cedar swamps that Mr.

Hazell is mentioning. So that removal of these three isolated swamps would not have any impact on any plants or animals that were using the forested areas and the surrounding outside of the site study area.

I'd also like to point out that the Environmental Assessment considered potential effects, for example, atmospheric deposition on trees and identified that there were no effects.

THE CHAIRPERSON: Thank you.

Mr. Hazell...?

MR. HAZELL: Just a small supplementary. So just in terms of the report, if it could include this area as opposed to not having any comment on it regarding the decision that there was no effect from removing of those three isolated forest areas.

THE CHAIRPERSON: Noted, Mr. Hazell.

Ms Taylor...?

MS TAYLOR: Thank you, Madam Chair.

I have a couple of questions, the first to do with the waste rock management area. I understand from reading the OPG reports that

there are two areas within the waste rock management area, one for temporary and one for permanent storage.

I'd like to ask the question, what goes into the temporary waste management area and where will it go after it leaves the site and would there be barriers placed under this temporary waste area?

THE CHAIRPERSON: OPG...?

MR. WILSON: Derek Wilson, for the record.

There are two key areas for the waste rock management through the construction phase, that being of temporary which would be primarily housing the stone removed from the excavation of the shafts. This is the dolostones, the shales and so on.

As discussed in previous hearing days, the intent of those will either be to go directly into the segregating plant as we have a deficiency or an imbalance initially in terms of segregating materials, and they would also go into the formation of the berms, the acoustical berms and visual berms around the project site.

So again, we've taken from a

conservative perspective, we've assumed that those remain in their -- available for our concentration analysis specifically with respect to total dissolved solids. So we've assumed them to be there but we don't anticipate it because we intend to essentially place them in their final resting place right from excavation.

THE CHAIRPERSON: Thank you.

Ms Taylor...?

MS TAYLOR: I actually had another impression from reading the material that that temporary storage area might contain materials such as the material that's coming from below the Cobourg Formation or above it in the oil rich areas above the Cobourg. I was wondering where that material was going to be.

THE CHAIRPERSON: OPG...?

MR. WILSON: Derek Wilson, for the record.

As was discussed already this afternoon, there are no oil rich or carbon rich areas within that.

We also had a discussion last year around carbon and the presence of carbon in the layers of the shaft. We went through an

analysis to determine what sort of carbon loading would be from those areas and found that they were well within expected limits, but they also contributed to the assessment of concentrations for those. And again, taking into account that they would be available to enter into the stormwater management pond as part of our assessment.

THE CHAIRPERSON: And just for completeness, Mr. Wilson, can you answer Ms Taylor's question regarding any rock that would come from below the Cobourg?

MR. WILSON: Derek Wilson, for the record.

There will be rock coming from below the Cobourg. The shafts actually extend below the Cobourg Formation as well as the ramp access from the Cobourg Formation or the repository level at nominally 680 metres down to a depth of 725 for the main shaft and 745 for ventilation shafts. So there will be excavation blow into the curve field.

THE CHAIRPERSON: Thank you.

Ms Taylor...?

MS TAYLOR: I think my question

was where is it going?

THE CHAIRPERSON: Mr. Wilson.

MR. WILSON: Derek Wilson, for the record.

The excavation of the materials from the Cobourg and below will go into the waste rock management area because they are very consistent with the materials of the Cobourg Formation themselves.

THE CHAIRPERSON: Thank you.

Ms Taylor...?

MS TAYLOR: Thank you.

I have a question about the stormwater management pond. I was under the impression from reading the material that perhaps more than one pond would be required to accommodate the water and its solids from rainwater water -- isolating it from rainwater water, from the runoff -- rainwater, sorry, precipitation as well as the runoff from the waste rock management area, the process water and the sump pump water from the shaft and ramp as well as from the emplacement panels.

I think I had that impression because it was not going to be economical to

store all that material in the same place in the stormwater management area because you'd have to treat it. And what's the use of treating rainwater?

THE CHAIRPERSON: OPG...?

MR. WILSON: Derek Wilson, for the record.

The stormwater management pond as proposed is a continuous pond. It's one entity on its own. There is a forebay and a main bay.

What we did discuss in previous sessions was should there be a need to mitigate, should there be a need if we had a situation where we couldn't put an inflow treatment system in for, say, total suspended solids there would be the option and available space if we had perhaps an intermediary pond in the short term to be able to address that issue. But it's not a planned activity. It's a mitigative strategy so maybe that's where the confusion is.

THE CHAIRPERSON: Ms Taylor...?

MS TAYLOR: Thank you very much. I'm just wondering where that would occur on the site plan.

THE CHAIRPERSON: Mr. Wilson...?

MR. WILSON: Derek Wilson, for the record.

There's significant space available to us; first, once the temporary waste rock management area is done in that area. But there is still existing if they were to be existing and staying there for some time, between that location towards the existing or the proposed stormwater management pond. There is more than enough real estate and proper grading to be able to establish a system in that area.

THE CHAIRPERSON: Thank you.

MS TAYLOR: Thank you.

THE CHAIRPERSON: Dr. Storck...?

MR. STORCK: Thank you, Madam Chair. Peter Storck, for the record.

I have a question, another one about the storm management pond. I don't ever recall hearing a discussion about whether solids going into the pond and settling out would be dredged and if they are going to be dredged where are the dredgings going to be placed?

THE CHAIRPERSON: OPG...?

MR. WILSON: Derek Wilson, for the record.

We actually did discuss that at the 2013 hearing days with respect to pond maintenance and the ability to remove the fines from the pond and where those fines would up. And as we discussed then, as part of any stormwater management maintenance program, those would be monitored and should there be a need to remove them, then they would be analyzed to see whether or not they are available to just be released within the project site itself or if they would need to be moved to an offsite location based on the analysis of that.

Our preliminary expectation is that we would be able to just remove them from the site and maintain them on the project site either within the berm structure or something similar.

THE CHAIRPERSON: Thank you.

Dr. Storck.

MR. STORCK: So I gather the sludge would be moved to another location and just left?

THE CHAIRPERSON: The Panel understands that it would be removed to another bermed location on the site, the DGR project

site, yes --

MR. STORCK: Thank you.

THE CHAIRPERSON: -- and managed.

Did you have another question,

Dr. Storck?

MR. STORCK: I did, one other question. I think this is a question that may come up, I hope it will come up during the discussion of expansion and might relate to a geotechnical trigger for terminating the project during construction, and that is a question what is the upward capacity of the sump reservoir and the ability of the pumps to remove water? I heard a figure and I see a figure of 7 U.S. gallons per minute. I'm not sure whether that's correct. And I'm asking just about what is the maximum in capacity, the holding capacity of the sump reservoir and the ability to remove water from the facility before there might be a danger?

THE CHAIRPERSON: OPG.

MR. WILSON: Derek Wilson, for the record. I am struggling to understand exactly what pumping capacity is being referenced here. The Stormwater Management Pond doesn't rely on pumping, it's a passive system. And

perhaps this -- is this from the repository level itself in terms of the pumping capacity of the repository?

THE CHAIRPERSON: I believe so, yes. So, the -- it's the underground water removal through the sump, is that correct, Dr. Storck?

MR. STORCK: Yes, that's right. Derek Wilson himself earlier this afternoon or was it this morning mentioned a pump reservoir, which was the first time I've had any knowledge of that. And it is in Panel 1, it is in the main shaft, I think, main shaft area.

MR. WILSON: Derek Wilson, for the record. Yes, there is underground sumps at the repository level which are used as part of the mitigation strategy of water treatment of the facility through the construction phase. And that is currently anticipated to be I believe it's about 22 litres a second is the expected loading from the construction phase activities. And again, perhaps this is a better place for the expansion, but that is conservatively sized based on the amount of processed water being required for the construction activities.

Other than that, that has -- we've had significant discussion on that pumping capacity, redundancy of those systems and so on to be able to keep the underground dewatered. Perhaps I did mention that in the event that we had a storm event on surface, that we could stop that pumping so that we wouldn't contribute additional loading to the Stormwater Management Pond in a large storm event, which would be a typical best practice not to add into that in the event of a storm on surface.

THE CHAIRPERSON: Thank you.

Ms Tilman.

--- Pause

MS TILMAN: Yes, good afternoon, good evening. I have a question that is hypothetical. I had submitted it through CEAA to the Panel. It was a question to Environment Canada, and was told to ask them directly here, so that's my first question. In light of the fact that there will be -- if this project is approved there will be waste rock produced, will OPG be required to report the constituents of waste rock to Canada's National Pollutant Release Inventory, as all mining operations in Canada

have to do?

THE CHAIRPERSON: Environment
Canada.

MR. LEONARDELLI: Sandro
Leonardelli, for the record. We'd have to
consider that against the reporting criteria of
the NPRI. I used to work on the NPRI, but it's
been a number of years since I have, so we would
have to take a look at that, but it's going to
depend on the specific loadings and that kind of
thing. I would imagine that that would be part
of the evaluation because you have to meet a
certain threshold for substances in order to
trigger the reporting. So, we'd have to
determine what the substances are and what the
amounts would be to see if they trigger.

Also, it depends on the type of
activities. Not all activities at an industrial
facility are necessarily reportable. So, we'd
have to check against those specific criteria to
determine its reportability under the NPRI.

MS TILMAN: And, Mr. Leonardelli,
would that also be contingent upon the results of
OPG complying with one of Environment Canada's
recommendations around leachate testing for the

waste rock? The Panel would appreciate some clarification on that.

MR. LEONARDELLI: Okay. I -- again, I'd have to see what the most current NPRI reporting requirements or criteria are. However, we did make a recommendation that the leachate should be monitored because we need to understand its contribution to contaminate loadings to the Stormwater Management Pond, which then informs the need for treatment. So ... And also in terms of tracking its geochemical behaviour over time, right?

THE CHAIRPERSON: Ms Tilman.

MS TILMAN: I'll just respond quickly. Because I'm a member of the working group of the National Pollutant Release Inventory, so I'm very aware of the current situation. My question really, I understand there's values that have to be considered, whether there are reports, whether what chemicals get reported or not. That's not the issue. The issue to me is OPG -- is OPG going to be considered as a mining company because it is producing waste rock? That's ... And that's a question I did want to ask prior to this and was

told to come and ask it now.

THE CHAIRPERSON:

Mr. Leonardelli.

MR. LEONARDELLI: Sandor

Leonardelli for the record. The NPRI doesn't just apply to mining facilities, so it applies to a wide range of industrial activities. So, the categorization of whether it's a mine or not is not really pertinent. It's a question of whether the manufacturing, processing, or otherwise use activities of various substances would trigger the reporting under the existing framework of the NPRI. So, that's the question. I -- and quite frankly, I would have to get an interpretation from the NPRI people as to the applicability of this type of a facility for reporting under the NPRI. It's a question that would have to be posed. I couldn't give you an answer right now.

THE CHAIRPERSON: Thank you.

Ms Tilman.

MS TILMAN: Yes, that's what I was expecting and hopefully get an answer.

Now, my other question concerns radon. And Environment Canada did have a recommendation 4.3 that radon be included for

monitoring to verify, I'm quoting, "The low levels of radon that have been predicted." Have there been any levels of radon that have been estimated more than just predicted? And this assumes that the -- the statement assumes that these are low levels. I don't know what "low" means in this case, so I'm looking for clarification.

THE CHAIRPERSON: Ms Tilman, what source of radon are you referring to?

MS TILMAN: I'm referring to, I would imagine this is radon that would be emitted to the atmosphere for the ventilation exhaust system, if I read this recommendation correctly from Environment Canada, recommendation 4.3. And maybe I need clarification on that.

THE CHAIRPERSON: So are you asking whether there have been measurements to --

MS TILMAN: Yeah. I mean, to -- this is to verify values that have been predicted. So, have there been any values? And this is verify low levels of radon that have been predicted, so ...

THE CHAIRPERSON: Got it. Thank you.

OPG.

MS SWAMI: Laurie Swami, for the record. I believe Dr. Gierszewski can answer this question, but while he's answering this question we do have an answer now on the consideration of non-human biota in our assessment. So, I think he could answer both of those questions.

DR. GIERSZEWSKI: Paul Gierszewski, for the record. The question on radon: So, we did an assessment of radon and there was a report produced on that as part of the submissions. So, a number of estimates in there as to the nature of the radon levels and that's a basis for the statement that they would be expecting low levels. At this point, however, we haven't excavated underground, so we haven't had the opportunity to go down and verify whether those measurements are correct. What we do know is that at the core of those measurements is the amount of uranium that's present in the limestone. That's the largest -- that's where the repository is and what the largest amount of the waste rock pile is, and that level of uranium is based on actual measurements of core samples.

With respect to the other point on the non-human biota, the question was whether we had, in our response to EIS-12-514 with the revised inventory, whether we had also looked at the effect of the revised inventories on non-human biota. And the answer is, yes, we had. It does not change -- the revised inventory does not change the conclusions. And again, as I was presenting last week, it comes down to in part understanding what are the critical radionucleotides, as explained then, and it's true for non-human biota, carbon 14, niobium 94 were identified as important and they were not affected by the revisions.

THE CHAIRPERSON: Ms Tilman.

MS TILMAN: Yes. Will there be, again hypothetically, monitoring of radon from the rock pile?

THE CHAIRPERSON: OPG.

MR. WILSON: Derek Wilson, for the record. We've actually considered several different types of radon measurements as part of our monitoring program as we go through the various phases. Primary concern is at the rock face or at the development phase for -- where the

initial radon releases would occur, so we would sample there. We will have sampling to verify within the ventilation stream itself, and then we'll be doing surface sampling as well.

THE CHAIRPERSON: Thank you.

Ms Tilman.

MS TILMAN: A final question, not on radon, concerns air quality and the Canada -- and PM, particulate matter, 2.5 microns. The Canada-wide standard is 30 micrograms per cubic meter. That standard is acknowledged as no-- as being not fully protective of human health. PM2.5 is also declared toxic under CEPA 99. So, I am concerned about references in air quality. I'm going to -- for speed, I'm going to page 6 on Environment Canada's section 5 on air quality and the arbitrary 10 percent frequency threshold, that if they're above that or within the 10 percent, OPG considered that that was not significant. And please correct me if I am wrong. And I think Environment Canada was considering that that was a professional judgment and a less than 1 percent exceedance would be all right.

The problem is regardless of what

percent you pick, it's acknowledged that that level is not fully protective of human health in the environment, that it is toxic under CEPA 99. Therefore, having values that are considered above that mean that there will be harm. And I just think that this section was not clearly written, especially for the public, who are maybe not aware of the different levels of PM. There's terminology that's used that's been quite confusing, like SPM versus TPM, and then there is inhalable less than .1 micrograms. All these are very confusing for the public to understand. But why one would consider allowing thresholds above a value that's not protective is just a comment that I think is not good judgment.

THE CHAIRPERSON: Ms Tilman, I am struggling to find a question in there.

MS TILMAN: I don't think I have one. I think it's too late for me to formulate one, I apologize.

THE CHAIRPERSON: Well, notwithstanding that, since you have raised an issue that was discussed earlier today but received a somewhat different response from OPG regarding the layers of safety associated with

the PM2.5 Canada-wide standard, I would appreciate a comment, first of all, from OPG regarding Ms Tilman's assertion that that specific standard does not incorporate -- or is not fully protective, and I would also direct the same question to CNSC, if you are equipped to address that question, please.

--- Pause

THE CHAIRPERSON: And while OPG and CNSC are conferring, Environment Canada, did you have your specialists here that would be able to comment on the level of protection of PM2.5?

MS ALI: He actually just sent me an e-mail saying he's headed home, so tomorrow?

THE CHAIRPERSON: That would be very helpful, thank you, Ms Ali.

--- Pause

MS SWAMI: Laurie Swami, for the record. I'm going to ask Mr. Rawlings to respond to this, but I just want for clarity to make sure we're answering the right question. This morning when we had conversation, and I am referring to page 33 of OPG's response to the information request, where there is a table of the various components, PM2.5, PM10, and there is a

discussion of some of the criteria that are there, and I believe Mr. Rawlings was referring to that when he was speaking this morning, but I would like to have him answer that question.

THE CHAIRPERSON: Actually, Ms Swami, it was -- the Panel noted that that table actually didn't give the relative exceedence over criteria. Those tables are actually exceedences over existing conditions. So, the actual question for Mr. Rawlings is with respect to whether or not the standard for PM2.5 is indeed protective and to what extent it is his understanding that there are some layers of safety incorporated into that standard.

MR. RAWLINGS: Martin Rawlings, for the record. In effect the Canada-wide standards process looked at the available data and determined that a Canada-wide standard of 30 micrograms per cubic meter provided an adequate level of protection for the public. There was a caveat with respect to that and it's based upon a Canada-wide standard of 30 micrograms per cubic meter were compliance with the standard is based upon the 98 percentile, not the absolute maximum. In establishing the Canada-wide [indiscernible]

THE CHAIRPERSON: Excuse me, Mr. Rawlings, sorry to interrupt, but you're cutting in and out, so we are not hearing you very clearly. I'm not sure if you're on a speaker phone or what you're on, but can you maybe see what you can do to make sure you're coming through very clearly, please? And I'll ask the sound staff over here to try as well.

So, I'm very sorry, but can you sort of start from the beginning? Because you --

MR. RAWLINGS: [indiscernible]

THE CHAIRPERSON: -- you started making statements around the Canada-wide standard providing, there was an adjective, level of protection, but I didn't get the adjective.

MR. RAWLINGS: Martin Rawlings, for the record. I am trying it with the handset and I am still getting an echo.

THE CHAIRPERSON: Yes, but with the handset you're now much clearer.

MR. RAWLINGS: All right. I will try and proceed. Martin Rawlings, for the record.

In the Canada-wide standards setting process consideration was given to

available scientific literature and the level of 30 micrograms per cubic meter was determined to provide an adequate level of protection for the public. The caveat that went with that was that achievement of the Canada-wide standard was based upon the 98th percentile of the data. Meaning the Canada-wide standard is set at 30 micrograms per cubic meter, with a recognition that going above that criteria as much as 2 percent of the time would not exceed what was considered adequate protection. And again as we heard in the question, the predictions were less than 1 percent of the time that we were going to exceed the PM2.5 Canada-wide standard value of 30, and those exceedences would only occur on a small isolated area immediately adjacent to the fence line.

THE CHAIRPERSON: Thank you, Mr. Rawlings. I think that's adequate in terms of the Panel's understanding.

So, I think that brings us to the end of questions from registered participants. Thank you to everyone to participated today either by being here in person or watching the webcast. We will resume tomorrow at 9:00 a.m.

The subject of tomorrow's session will be expansion plans for the DGR project.

Good evening.

--- Whereupon the hearing adjourned at 6:21 p.m.,
to resume on Tuesday, September 16, 2014
at 9:00 a.m. / L'audience est ajournée
à 18 h 21 pour reprendre le mardi
16 septembre 2014 à 9 h 00