

# Assembly of First Nations Report on “Alternative Exposure Groups, Characteristics and Data for the Post- Closure Safety Assessment of a Deep Geological Repository

APM-REP-00611-0004

May 2012

**Assembly of First Nations**  
Environmental Stewardship Unit

**nwmo**

NUCLEAR WASTE  
MANAGEMENT  
ORGANIZATION

SOCIÉTÉ DE GESTION  
DES DÉCHETS  
NUCLÉAIRES

**Nuclear Waste Management Organization**  
22 St. Clair Avenue East, 6<sup>th</sup> Floor  
Toronto, Ontario  
M4T 2S3  
Canada

Tel: 416-934-9814  
Web: [www.nwmo.ca](http://www.nwmo.ca)

**Assembly of First Nations Assembly Report on “Alternative Exposure Groups, Characteristics and Data  
for the Post-Closure Safety Assessment of a Deep Geological Repository”**

**APM-REP-00611-0004**

May 2012

**Assembly of First Nations**  
Environmental Stewardship Unit

---

Disclaimer:

This report does not necessarily reflect the views or position of the Nuclear Waste Management Organization, its directors, officers, employees and agents (the "NWMO") and unless otherwise specifically stated, is made available to the public by the NWMO for information only. The contents of this report reflect the views of the author(s) who are solely responsible for the text and its conclusions as well as the accuracy of any data used in its creation. The NWMO does not make any warranty, express or implied, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information disclosed, or represent that the use of any information would not infringe privately owned rights. Any reference to a specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise, does not constitute or imply its endorsement, recommendation, or preference by NWMO.

---



***AFN report on “ALTERNATIVE EXPOSURE GROUPS,  
CHARACTERISTICS AND DATA FOR THE POST-CLOSURE  
SAFETY ASSESSMENT OF A DEEP GEOLOGICAL  
REPOSITORY”***

***Submitted to the  
Nuclear Waste Management Organization***

May 2012



## **Introduction**

This report is a review of a document titled “Alternative Exposure Groups, Characteristics and data for the post-closure safety assessment of a deep geological repository”. The objective of this report is to contribute to an enhanced understanding of the long term (up to 1 million years) risks imposed by a deep geological repository (DGR) for high level nuclear waste. In general, while application of additional data sources can be improved and would likely lead to better inputs for the model, the analysis contained in the document is generally robust.

The Assembly of First Nations (AFN) has focused its analysis on Chapters 4 and 5, Recommended Parameters for a Boreal Forest Hunter/Gatherer and Inland Tundra Hunter/Gatherer respectively. Particular emphasis is placed on parameters for the Boreal Forest Hunter/Gatherer group.


The AFN recommends that the Nuclear Waste Management Organization (NWMO) consider follow-up analysis on Plains Hunter/Gatherers, so long as there remains a chance that a DGR may be located in a Plains environment. Follow-up analysis might be as simple as validating that Plains lifestyle parameters are sufficiently similar to Boreal Hunter/Gatherer lifestyles to provide an accurate estimate for scenarios modelling. However, distinctions in culture and lifestyle between First Nations in the Boreal forest and First Nations on the Plains makes it far more likely that a separate chapter devoted to Plains lifestyle parameters will be necessary.

### **Assumptions related to climatic/environmental conditions**

The scenarios document outlines two possible climatic scenarios which may be relevant for First Nations. These scenarios appear to contemplate future environments based on past environments either observed or modelled from the past 1 million years. These are reflected in the categorizations for the Boreal Hunter/Gatherer and Inland Tundra Hunter/Gatherer.

The AFN conducted a brief literature review in order to determine whether climate assumptions might omit one or more sets of climatic conditions within the study area. Recent glaciation episodes, within the past 10,000 years, represent only a small fraction of the projected lifespan of the DGR. As a consequence, the AFN sought more information on climate conditions in central Canada over the past 1 million years.

Warmer and wetter climates might give rise to Carolinian forest conditions. This is of particular relevance to the AFN because First Nations living within Carolinian forest areas derive a much more substantial portion of their diet from agriculture. The types of crops grown and consumed by First Nations living in Canadian forests, as well as the means of agriculture, are sufficiently distinct from those of “self-sufficient” farmers.



The AFN's findings confirmed that climatic conditions across most of the study area could best be defined as inter-glacial periods of warmer climates punctuated by periods of glaciation. Using the past as the exclusive means to extrapolate future climate conditions, the assumptions within the model appear robust for those areas that currently comprise the Boreal forest. Sites located in other areas may implicate slightly distinct climatic conditions, which in turn may implicate distinct cultural patterns and exposure pathways.

The NWMO should consider evaluating climate change scenarios to estimate regional scale impacts of climate change over the short, medium and long term. Anthropogenic climate change may result in lasting impacts over the short term (100-1000 years) and may also result in a significant long term changes to regional climate conditions. This issue, the potential impact of climate change to the regional environment over the life of the project, deserves analysis.

In a similar vein, the identification of a Boreal category and an independent farmer category omits the possibility of a First Nation Plains culture. These cultures are less dependent on trees and more dependent upon grasses and smaller plants. In addition, Plains environments tend to have scarcity of fresh water resources, increasing the reliance of First Nations peoples on particular sources of water (for example, cisterns, wells and rivers).

### **Cultural eating patterns**

#### *Food Preparation*

The method of food preparation may also have an impact on the type and amount of contaminants in the food. For example, searing foods may lead to the introduction of combustion by-products on the food, such as dioxins. Such considerations would not impact radioactive dose, but would contribute to cumulative impacts of chemical or radiological exposure.

However, one possible source of exposure does arise in the combustion process. Radionuclides which may be sequestered in wood fuel may be released during combustion. This represents an as-yet undefined exposure pathway.

For example, the model notes exposure factors for energy fires and indoor smoke. It does not provide any information related to smoking meats. Smoking presents a potential pathway for contaminants sequestered in wood to be introduced to the food chain. This practice may be contrasted to the Arctic practice of sun drying fish, for example. A better understanding of different types of food preparation and the relative frequency with which each is used will provide a fuller picture of the contaminant burden expected from consuming country foods.

### *Seasonal cycles*

First Nations eating patterns shift with seasonal cycles. While averaging potential exposure pathways over one's lifetime may provide an adequate assessment of overall exposure, it may over or under estimate exposure, if releases of contaminants are more likely into certain media during certain times of the year. For example, if one potential pathway for exposure is contact between ambient groundwater and the DGR, one should expect substantial release of contaminants during spring melting episodes.

### *Related to consumption*

Cultural eating patterns related to consumption may increase or mitigate the potential for exposure. Some First Nations demonstrate preference for consuming certain body parts and organs and avoid others. Contaminants, including radionuclides, are known to accumulate in certain organs and/or body parts. This suggests that preferring or avoiding those organs and/or body parts may have an impact on the likelihood and degree of exposure.

## **Additional Plant Pathways**

### *Distribution of Food Components for the Hunter/Gatherer*

The report provides a methodical information base for food components of a typical Inland Tundra Hunter/Gatherer and a Boreal Hunter/Gatherer. There are several values in the model which are supported by very few (in some cases only one) data points.

The proposed diets are very heavy in meat and fish. The model should also consider additional plant pathways; in addition to berries, which are considered in the model. For example, traditional peoples in both the Boreal and the tundra are known to consume tea. In addition, a number of plants are used or consumed with meats or are used as medicines. One common example is smudging with sweetgrass, tobacco and/or sage, which may present an exposure pathway unique to First Nations, depending upon several factors, including contaminant loading in the plants, the frequency of smudging and the amount of smoke ingested during smudging.

The focus on caloric intake provides a powerful technique to quantify the relative magnitude of potential exposure pathways. However, a focus on caloric intake may skew analysis towards major food items being consumed and away from minor dietary staples which may produce profound nutritional benefits or exposure pathways.

A prime example of this is the importance of teas made from pine or other trees. Such teas contain relatively few calories when compared to other dietary staples, such as meats. Such teas are rich in vitamin C, conferring substantial nutritional benefits. The NWMO should consider altering the scenarios model to reflect potential exposure pathways from low-calorie dietary staples.



## Normalized Values tables

Very little of the data cited in this report appears to have been collected by First Nations, much collected by consultants/industry in relation to development projects. This is important because in many cases, consultants collect data for very limited purposes. For example, in environmental assessments, data is collected in order to assess quality of Valued Ecosystem Components (VECs), usually defined by the proponent or a consultant, rather than impacted aboriginal communities. As a result, the data collected in such studies may be robust, but may also be incomplete.


The AFN recommends an examination of a broader set of data sources to include community-based studies. The purpose of this examination would be to verify, and if necessary, expand on the information in the normalized values tables.

There have been several examples of environmental contaminant studies by First Nations communities which may provide helpful data on contemporary consumption of traditional foods. The focus of some of these studies was not on food consumption, but on contaminant uptake; however, the amount of food consumed is a critical factor in assessing the amount of uptake.

For example, the Effects on Aboriginals from the Great Lakes Environment (EAGLE) study was a coordinated study of contaminant uptake led by First Nations communities in the Great Lakes basin. A summary of the EAGLE final report is referenced in an Appendix to the report, but there are a number of EAGLE community, regional and technical reports which may contain relevant data values on consumption of traditional foods and contaminant exposure.

In addition, there have been several community based projects under the National First Nations Environmental Contaminants Program (NFNECP), which implicate consumption of country foods in southern (south of 60) First Nations communities. These reports can be obtained from the First Nations and Inuit Health Branch at Health Canada.

The First Nations Regional Longitudinal Health Survey (RHS) commenced with development of a questionnaire in 1997. Phase I of the RHS occurred in 2002/03 and phase II occurred in 2007/08. The RHS provides a valuable source of information to validate the data in the tables, particularly those related to consumption of traditional foods as a share of the total food consumed. More information on the RHS can be obtained from the First Nations Information Governance Center at [www.fnigc.ca](http://www.fnigc.ca).



There is also current research which might enrich the data sources mentioned in this report. For example, the First Nations Food, Nutrition and Environment Study (FNFNES) is a community driven nation wide assessment of First Nations contaminant exposure. The FNFNES uses a detailed questionnaire to assess the amount and type of traditional foods consumed by individual communities. The construction of the questionnaires (included as Appendix A), suggests that the identification of exposure pathways from plants may be underestimated because the FNFNES questionnaires include questions regarding a wide range of plants consumed by First Nations.


The RHS and the FNFNES both operate on the principles of Ownership, Control, Access and Possession (OCAP) of information. This means First Nations communities exert ownership over the research data and control over how that data is applied, particularly for community level data. However, both the RHS and the FNFNES have published regional and national roll up reports. The FNFNES is an ongoing project. A regional report has been published for British Columbia and a publication of a regional report for Manitoba is imminent. The FNFNES is currently collecting data in Ontario. More information on the FNFNES project can be obtained from the Environmental Stewardship Unit at the AFN.

The AFN also notes the voluminous research which has been completed on fish consumption, through the EAGLE project, some NFNECP projects and through the FNFNES. NWMO should do a great deal of work to diversify this category to include species specific information, either by trophic level (fish which consume primary producers versus fish which consume other fish) or by benthic versus non-benthic fish.

Finally, the chapter on Inland Tundra places on overreliance on coastal resources, as evidenced by references to seal, ptarmigan and beluga consumption. It would be more helpful to focus on diets based mainly on consumption of musk ox and caribou, as the DGR will not likely be located in a coastal zone, although there is a moderate to high likelihood that the DGR may be sited in a region which may experience tundra-like conditions over the next million years.

### **Lifestyle Parameters**

With very minor exceptions, the lifestyle parameters identified are comprehensive. However, some of the assumptions may merit further investigation. For example, a number of parameters are identified for one category (Boreal forest Hunter/Gatherer) as assumed to be the same as another (self-sufficient farmer).



The AFN believes further research on traditional lifestyles may provide additional information on of pre-contact or early contact diets and lifestyles. The AFN has conducted an initial review of anthropological and archaeological literature to extrapolate or confirm dietary components with little relevant results. This suggests a more intensive scan may be desirable, or, more likely, that NWMO may consider undertaking some primary research to determine potential exposure pathways likely to be encountered by First Nations citizens living on the land.

## **Conclusion**

In general, the AFN finds the document “Alternative Exposure Groups, Characteristics and data for the Post-Closure Safety Assessment of a Deep Geological Repository” to be robust. The limited amount of data sources for some parameters is an issue of some concern which can and should be addressed through further research. The AFN makes the following recommendations:

- Consider development of a chapter on Plains lifestyle parameters.
- Conduct additional food and nutrition related research through an environmental scan comprised of the following research projects:
  - EAGLE;
  - FNECP;
  - RHS; and,
  - FNFNES.
- Conduct further anthropological, archaeological or direct research on traditional lifestyles, with particular emphasis on pre-contact or early contact diets and lifestyles.
- Conduct an assessment of potential short term and long term regional impacts of anthropogenic climate change.
- In the chapter on Inland Tundra, consider a focus on diets based mainly on consumption of musk ox and caribou.
- Reconsider focus on caloric intake and consider alternative means of modeling foods which provide little caloric value, but may represent non-trivial pathways for contaminants.