Canada's Nuclear Regulator

Proposed Comprehensive Study Report for Cameco Corporation's Proposed Redevelopment of the Port Hope Conversion Facility (Vision 2010)

MAY 2012

CEAR 06-03-22672

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire

Canada

EXECUTIVE SUMMARY

In 2006, Cameco Corporation (Cameco) notified the Canadian Nuclear Safety Commission (CNSC) of its proposed redevelopment of the Port Hope Conversion Facility (PHCF), (Vision 2010) ("the Project"). The Project includes:

- the cleanup and demolition of a number of old or underutilized buildings
- the removal of contaminated soils, building materials at the PHCF
- additions or modifications to existing buildings with associated landscaping and infrastructure

In accordance with the *Canadian Environmental Assessment Act* (CEA Act), a federal environmental assessment (EA) in the form of a comprehensive study is required for this Project.

The comprehensive study report (CSR) identifies the potential interactions between the Project activities and the existing environment during all Project phases and under likely malfunctions and accident scenarios. Based on these interactions, the resulting changes that could occur to the components of the environment were described. The EA also assessed the potential socio-economic effects resulting from potential changes to the environment, taking into account mitigation measures, and found these unlikely to be significant. Further, no significant residual effects on the Project from the environment were identified.

The common law duty to consult with Aboriginal groups applies when the Crown contemplates actions that may adversely affect potential or established Aboriginal or treaty rights. Following the whole-of-government approach to uphold the honour of the Crown, federal departments involved in the review of this Project have integrated Aboriginal consultation into the EA review process, to the extent possible, to address potential adverse impacts to potential or established Aboriginal or treaty rights.

Typically, project proponents or licence applicants of nuclear projects do not bear the Crown's legal obligation to consult Aboriginal peoples under section 35 of the *Constitution Act, 1982*. However, where appropriate Licensee engagement with Aboriginal groups can supplement CNSC consultation activities and help the CNSC make informed decisions.

This CSR concludes that the Project is not likely to result in significant adverse environmental effects taking into account the implementation of mitigation measures identified in the Proposed CSR and the Final EIS. CNSC staff have also concluded that the public consultation that has been carried out during the EA and will continue during the Canadian Environmental Assessment Agency's public consultation period on the CSR and will meet the requirements for consultation under the CEA Act. The completion of the CSR fulfills the CNSC requirements, pursuant to section 5 of the CEA Act.

The detailed design work for each Project activity will be completed and submitted by Cameco to the CNSC for its approval prior to starting any work related to the Project through the CNSC licence and compliance process. This process will ensure that Project activities undertaken are within the bounds of this EA prior to their commencement and that all mitigation measures identified during the EA are implemented. Furthermore, once work has begun, the CNSC licence and compliance process will be used to ensure the implementation of the follow-up program that will verify EA predictions and the effectiveness of mitigation measures.

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LIST OF ACRONYMS

AECOM	formerly Gartner Lee Ltd. Consulting Company
AAQC	Ambient air quality criteria
ACM	Asbestos-containing material
AECL	Atomic Energy of Canada Limited
AHF	Anhydrous Hydrogen Fluoride
ALARA	As Low as Reasonably Achievable
ANSI	Area of Natural and Scientific Interest
CCME	Canadian Council of the Ministers of Environment
CEA Agency	Canadian Environmental Assessment Agency
CEA Act	*Canadian Environmental Assessment Act*
CEAR	Canadian Environmental Assessment Registry
CFM	Cameco Fuel Manufacturing
COPC	Contaminant of Potential Concern
CSQG	Canadian Sediment Quality Guidelines
CSR	Comprehensive Study Report
CUP	Clean Up Program
CWQG	Canadian Water Quality Guidelines
DAC	Derived air concentration
DAL	Derived Administrative Level
DCE	Dichloroethylene
DNL	Day-night Level
DRL	Derived Release Limit
EA	Environmental Assessment
EIS	Environmental Impact Statement
ERP	Emergency Response Plan
ERT	Emergency Response Team
FA	Federal Authority
FARE	Families Against Radiation Exposure
GMS	Growth Management Strategy
GTA	Greater Toronto Area

HEPA	High-efficiency particulate air
LSA	Local Study Area
LLRW	Low Level Radioactive Waste
LTWMF	Long Term Waste Management Facility
MOE	Ministry of the Environment, Ontario
NBC	National Building Code
NDR	National Dose Registry
NEW	Nuclear Energy Worker
NSCA	Nuclear Safety and Control Act
ODS	Ozone Depleting Substance
ODWS	Ontario Drinking Water Standard
OTR	Ontario Typical Range
ORL	Operating Release Limit
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated biphenyl
Po	Polonium
POI	Point of impingement standards
PHAI	Port Hope Area Initiative
PHCF	Port Hope Conversion Facility
PHCHCC	Port Hope Community Health Concerns Committee
PDP	Preliminary Decommissioning Plan
PSQO	Provincial Sediment Quality Objective
PWQO	Provincial Water Quality Objectives
Ra	Radium
RA	Responsible Authority
RSA	Regional Study Area
SAP	Sampling and analysis plan
SSA	Site Study Area
SA/PGA	Spectral and Peak Ground Acceleration
SLC	Stakeholder Liaison Committee
TCE	Trichloroethylene

TERO	Transportation Emergency Response Organization (TERO)
TLD	Thermoluminescent Dosimeter
Th	Thorium
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbon
UNSCEAR	United Nations Scientific Committee on the Effect of Atomic Radiation
VEC	Valued ecosystem component
WHO	World Health Organisation

1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

The Port Hope Conversion Facility (PHCF) is located in the Municipality of Port Hope on the northern shore of Lake Ontario, approximately 45 km east of Oshawa, Ontario, and 100 km east of Toronto, Ontario. The proposed Project consists of a major site clean-up and renewal of the facility and comprises the following activities:

- clean-up and demolition of a number of old or underutilized buildings (figure 3.3-1)
- removal of contaminated soils, building materials and stored wastes
- construction of new replacement buildings at the PHCF and additions or modifications to existing building with associated landscaping and infrastructure (figure 3.3-1)

Cameco Corporation (Cameco) is the proponent of the proposed redevelopment of the PHCF (Vision 2010) ("the Project"). The Fuel Facility Operating Licence (FFOL) FFOL-3631.00/2017 [1]for the PHCF was renewed for a period of 5 years on February 29, 2012 after public Commission hearings on November 3, 2011 and January 17 and 18, 2012. The licence authorizes Cameco to operate the PHCF for the conversion of uranium trioxide (UO_3) into uranium hexafluoride (UF_6) and uranium dioxide (UO_2) as well as for the production of uranium metal.

It is the responsibility of the applicant to obtain the necessary provincial and/or municipal permits or authorizations from other regulatory agencies which exist outside of the context of the *Nuclear Safety and Control Act* (NSCA) [2] and its associated regulations. Staff of the Canadian Nuclear Safety Commission (CNSC) are committed to consulting and cooperating with other federal, provincial, and municipal departments and agencies to harmonize regulatory oversight and minimize duplicative or conflicting regulatory requirements.

Table 1.1 Project Summary

Name	Summary
Project Name	Redevelopment of the Port Hope Conversion Facility (Vision 2010), Port Hope, Ontario
Project Summary	Cameco is proposing to undertake a major site cleanup and renewal of the PHCF. The timing of the proposed Project will overlap with the timing of the Port Hope Area Initiative (PHAI) project, a joint federal-municipal government undertaking for the cleanup and long-term management of low-level radioactive and industrial waste in the Municipality of Port Hope, Ontario. The PHAI project has undergone a federal screening and is not part of the scope of the Project.
Proponent	Aldo D'Agostino Project Manager, Vision 2010 Cameco Corporation, Fuel Services Division Port Hope Conversion Facility One Eldorado Place Port Hope, ON L1A 3A1 www.cameco.com
Location	The Port Hope site Study Area includes the PHFC, the Centre Pier and 158 Dorset Street East, which are all located within Ward 1 of the Municipality of Port Hope (figure 3.2-1). Historic low-level radioactive waste and industrial wastes from the remediation Project will be placed in the long-term waste management facility located in Ward 2.
Canadian Environmental Assessment Registry	http://www.ceaa-acee.gc.ca/050/index-eng.cfm CEAR #06-03-22672

2.0 ENVIRONMENTAL ASSESSMENT

2.1 FEDERAL EA PROCESS

Cameco currently holds a Fuel Facility Operating Licence (FFOL) FFOL-3631.0/2017 [1] for the PHCF in accordance with subsection 24(2) of the *Nuclear Safety and Control Act* [2]. The CNSC determined that a federal environmental assessment (EA) was required pursuant to paragraph 5(1)(d) of the CEA Act [3] before the CNSC can consider amending this licence or issuing a new licence for the proposed Project in accordance with the CEA Act *Law List Regulations*.

The Vision 2010 Project includes the decommissioning and demolition of several buildings, three of which are or were Class 1B nuclear facilities; remediation and restoration of the licensed site; construction of new buildings and operation of those facilities; and additions to existing buildings. These activities constitute undertakings in relation to a physical work and are not found in section 7 of the CEA Act and the *Exclusion List Regulations* established under the CEA Act.

The Project is subject to a comprehensive study type EA pursuant to subsection 19(c) of the *Comprehensive Study List Regulations* because the Project was scoped as the licensed site which contains the decommissioning activities of three buildings classified as Class 1B nuclear facilities with a uranium production capacity greater than 100 t/a. The CNSC recommended to the Minister of the Environment that a comprehensive study is required. On March 24, 2009, the Minister accepted the recommendation that the Vision 2010 Project continue as a comprehensive study.

The comprehensive study EA for the Vision 2010 Project was started in 2006 prior to the amendments to the CEA Act in S.C. 2010, chapter 12. Therefore, the comprehensive study for the Project is proceeding as if the CEA Act amendments had not come into force.

The CNSC is the only Responsible Authority (RA) under CEA Act for the Project. Health Canada, Fisheries and Oceans Canada, Natural Resources Canada and Environment Canada, as Federal Authorities (FAs), provided technical expertise during the review process. The role of the federal EA coordinator was delegated by the Canadian Environmental Assessment Agency (CEA Agency) to the CNSC in July 2010.

As a comprehensive study EA, the EA decision rests with the Minister of the Environment. The CEA Agency will initiate a public comment period after the CNSC submits the Proposed CSR to the Minister of the Environment and the CEA Agency. The Minister of the Environment will consider the information in the Proposed CSR, the views of the RA and FAs and any comments filed during the public comment period and will issue an EA decision statement under section 23 of CEA Act. If the Minister decides that the Project is not likely to result in significant adverse environmental effects, taking into consideration the implementation of mitigation measures outlined in the Proposed CSR and the EIS, the CNSC may proceed to the licensing process under the NSCA [2].

2.2 PUBLIC PARTICIPATION

The CNSC, as the RA, ensured that public participation, which is required for comprehensive studies, had been conducted, in accordance with the CEA Act. Opportunities for public participation during the comprehensive study process under the CEA Act include:

- providing comments on the Project and the conduct of the comprehensive study
- participating in the comprehensive study
- commenting on the conclusions and recommendations of the CSR

The CNSC undertook a number of public participation activities, including a 30-day public review of the EA Guidelines [4] (appendix A), a public site tour in September 2009, an open house to discuss the EA in September 2011, and a 30-day public comment period on the Draft CSR in September 2011.

The purpose of Cameco's public consultation program was to inform the public of the Project and consult with the public on the results of the technical studies. The CNSC was responsible for consulting with the public on the interpretation, recommendations and conclusions of the technical studies and on the Draft version of the CSR. The CEA Agency is responsible for making the final CSR available for public comment.

A more detailed review of the public consultation process for this Project can be found in section 6.0 of this report.

2.3 ABORIGINAL CONSULTATION

The common law duty to consult with Aboriginal groups applies when the Crown contemplates actions that may adversely affect potential or established Aboriginal or treaty rights. Following the whole-of-government approach to uphold the honour of the Crown, federal departments involved in the review of this Project have integrated Aboriginal consultation into the EA review process to the extent possible to address potential adverse impacts to potential or established Aboriginal or treaty rights.

Typically, project proponents or licence applicants of nuclear projects do not bear the Crown's legal obligation to consult Aboriginal peoples under section 35 of the *Constitution Act, 1982*. However, where appropriate Licensee engagement with Aboriginal groups can supplement CNSC consultation activities and help the CNSC make informed decisions. Further details on Aboriginal Consultation activities for the Vision 2010 Project are summarized in section 6.0 of the CSR**.**

3.0 PROJECT DESCRIPTION

3.1 NEED AND PURPOSE OF THE PROJECT

In a letter dated June 22, 2006, Cameco submitted a proposal for the Vision 2010 Project along with a Project description [5]. The Project consists of removing a number of old or underutilized buildings; removing contaminated soils, building materials and stored historic wastes; transporting those soils and wastes to storage and disposal sites; and constructing new replacement buildings at the PHCF with necessary landscaping.

The PHCF site is polluted with contamination from historical and ongoing industrial and nuclear operations. The Project is needed to facilitate remediation of the PHCF site, improve the operation efficiency and environmental performance of the PHCF and enhance site safety and site security through site design. The Project also presents an opportunity for Cameco to make the PHCF more visually appealing and to improve public access to the waterfront. The Vision 2010 Project is proposed to be carried out with the Port Hope Area Initiative (PHAI) project, a joint federal-municipal government undertaking for the clean-up and long-term management of low-level radioactive and industrial waste in the Port Hope, Ontario area.

3.2 LOCATION

The PHCF main site (1 Eldorado Place), the Centre Pier and the Dorset Street Site (158 Dorset Street East) are located in Ward 1 of the Municipality of Port Hope (figure 3.2-1).

The PHCF main site occupies an area of approximately 10 hectares (ha). The Centre Pier portion of the site occupies approximately 3.8 ha and the Dorset Street Site occupies an area of approximately 2 ha.

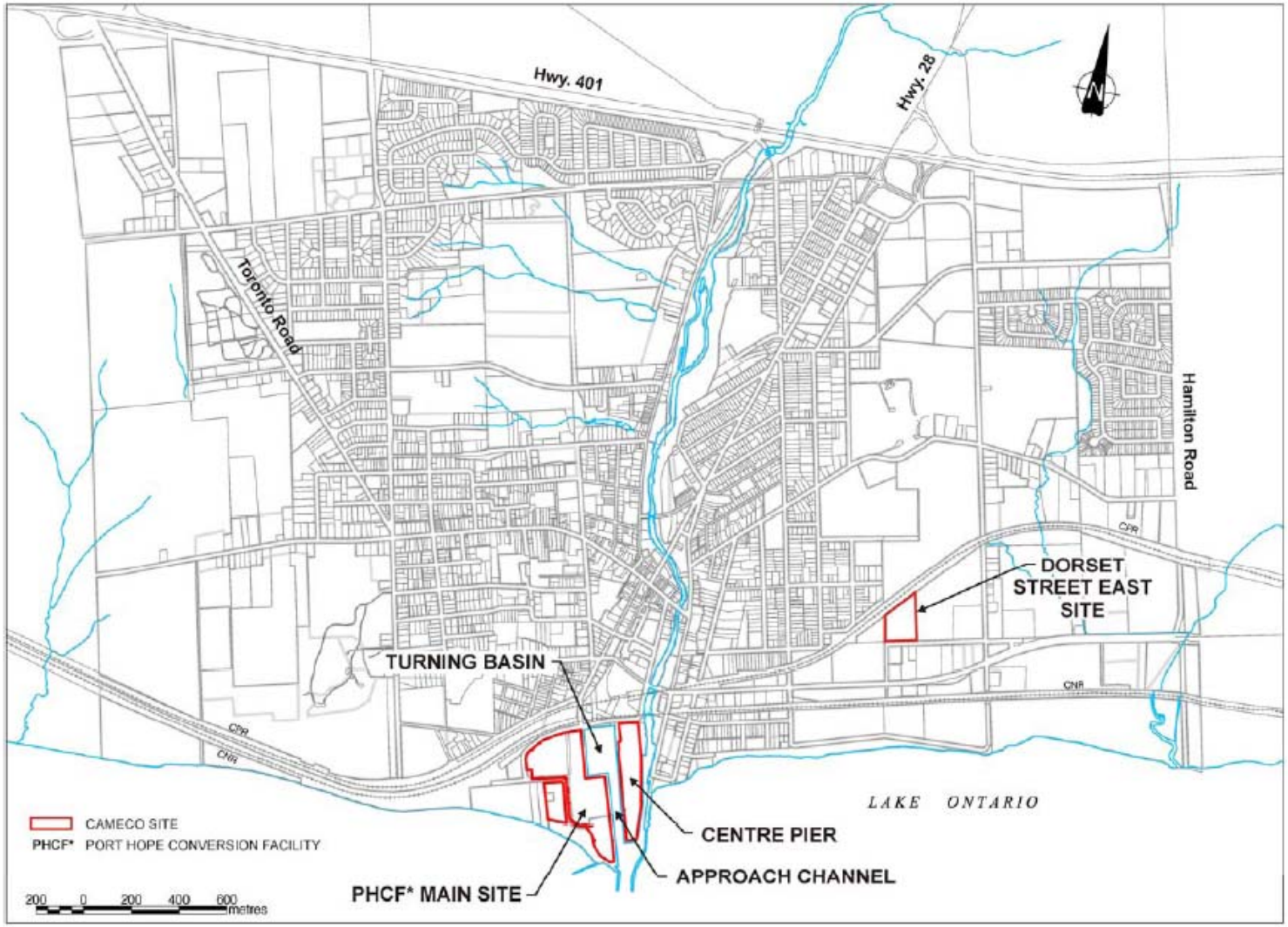

Figure 3.2-1 Location of Cameco Within the Municipality of Port Hope

3.3 PROJECT COMPONENTS AND ACTIVITIES

The proposed Vision 2010 Project includes the following project components:

- cleanup and demolition of old or under-utilized buildings
- removal of contaminated soils, building materials and stored wastes
- construction of new replacement buildings at the PHCF and additions or modifications to existing buildings with associated landscaping and infrastructure

3.3.1 Project Activities

Specific activities that will be carried out in relation to the Project components include:

- general project activities
- demolition
- site excavation
- construction
- transportation of wastes
- landscaping and site restoration
- ongoing site management and operation

The main proposed project works are site remediation, demolition and construction. These activities will overlap temporally and will need to be coordinated with the PHAI. For example, waste from Vision 2010 activities will need to be coordinated with receiving operations at the Long Term Waste Management Facility (LTWMF). The activities have been planned to allow normal operations of the PHCF during project implementation.

3.3.2 General Project Activities

On-site Traffic

In order to facilitate site redevelopment and normal operations, site access and transportation will not be compromised during project activities. The following may impact on-site roads:

- the presence of heavy machinery
- the presence of demolition debris
- excavation work related to underground services
- the presence of contaminated dust

If a road must be excavated, one side will be excavated at a time. An alternate route will be developed if the entire road must be excavated. In areas of building demolition, on site traffic may have to be controlled.

Construction Equipment Fuelling

Applicable standards such as the *Liquid Fuel Handling Code 2007 (Technical Standards and Safety Authority)* Canadian Centre for Occupational Health and Safety [6] and the provincial *Environmental Protection Act* will be used to manage on-site fuel and refuelling.

Transportation of Equipment and Materials

Approximately 15,800 tonnes of concrete and over 1,000 tonnes of steel as well as roofing, wall and miscellaneous materials will be transported as part of Vision 2010 construction activities. An estimated 9,000 truckloads of material will enter and leave the site.

3.3.3 Demolition Activities

Demolition activities of the Vision 2010 Project include:

- the removal of materials and equipment from buildings
- the removal of above and below ground building services
- the dismantlement of buildings
- the processing and management of all demolition waste
-

Twenty-three buildings (23) will be demolished on the PHCF main site. Buildings on the main site are being demolished because: some buildings are unused or under-utilized, some are situated on contaminated soils and some contain operations that are better located elsewhere (Environmental Impact Statement (EIS) figure 3-11[7]). Cameco's current lease agreement with the Harbour Commission requires that Centre Pier Buildings (Buildings 40, 41, 42 and 43) be demolished prior to the termination of the lease, unless directed otherwise (see figure 3.3-1).

If buildings are demolished, they will be stripped of equipment, material and services prior to demolition. Further, buildings will be cleaned to minimized exposure to demolition workers and prevent releases of radioactive material and designated substances (e.g., asbestos-containing, PCB-containing and ozone-depleting material) to the environment. If they are to remain, they will be cleaned in compliance with approved procedures and applicable regulations, standards and licence conditions.

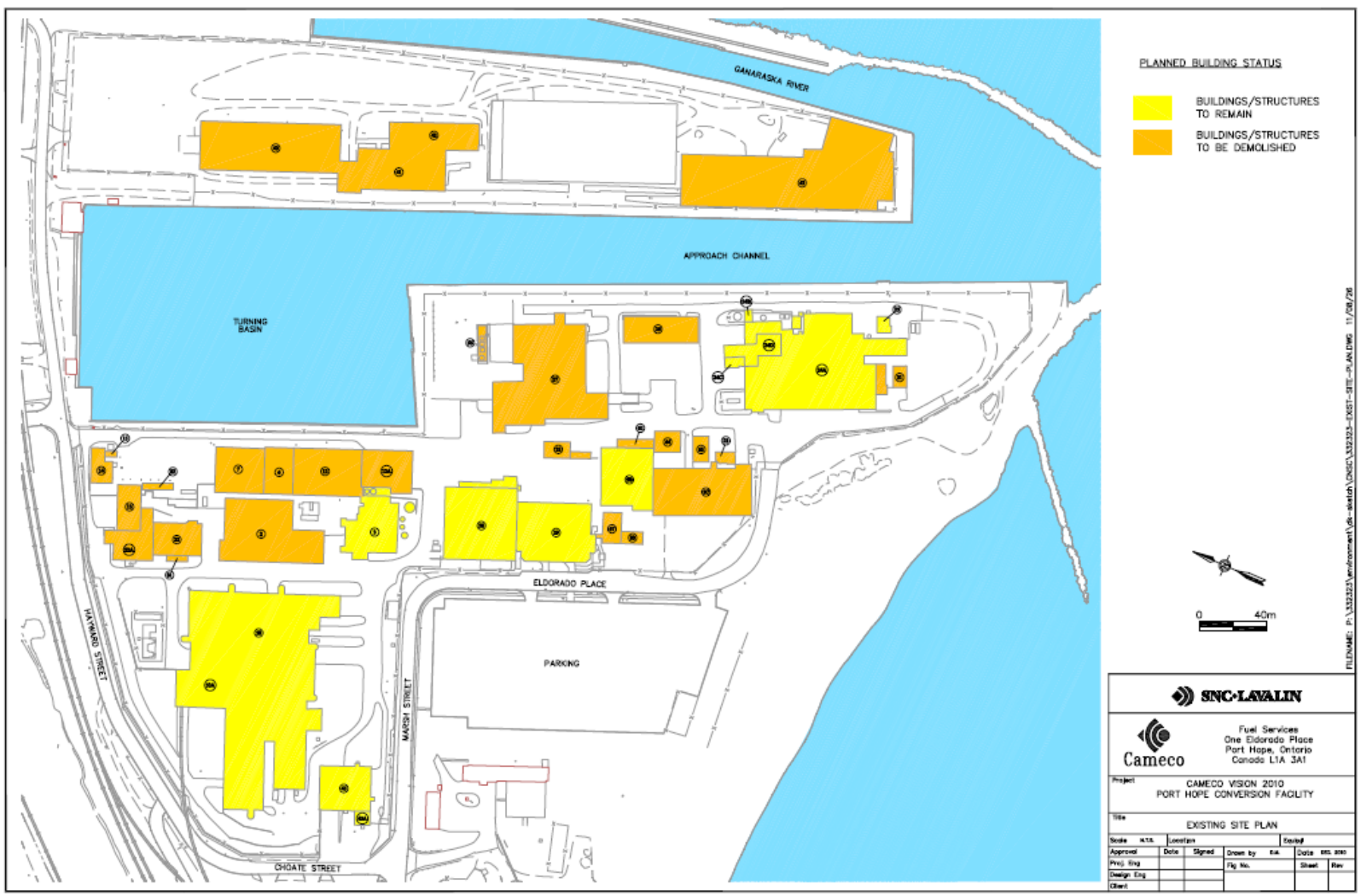

Figure 3.3-1 Map of Buildings to Remain or to be Demolished

Table 3.3-1 Building Legend for Figure 3.3-1

Building Legend	
Building Number	**Building**
2	Waste Recovery
3	Power Plant
5B	Scrap Processing
5C	Metals Plant
6	Warehouse
6	Warehouse
12	Warehouse
12A	Warehouse
13	Innovation & Technology Development – Research Centre
14	Metallurgical Products
15	North Cooling Water Pumphouse
20	Maintenance Stores and Engineering
22	Analytical Lab
22A	Analytical Lab
23	Radiography
24A	UO_2 Plant
24B	D.A. Room
24C	Tote Bin Area
24D	UO_2 Plant
25	Cooling Water Pumphouse
26	Depleted Uranium Metal Storage and Stores
27	East UF6
29	Administration
31	Incinerator
32	Truck Wash
40	Centre Pier Storage (North)
41	Centre Pier Storage (Central)
42	Centre Pier Storage (Central)
43	Centre Pier Storage (South)
44	Mobile Equipment Repair
45	Receiving & Stores Warehouse
45A	Gas Bottle Storage
50	UF_6 Plant
50A	Hydrogen fluoride (HF) Storage
62	Emergency Response Vehicle Storage
63	Waste Management
66	Liquid Hydrogen Storage
67	Project Offices
80	Project Offices
81	Engineering Offices
82	Innovation & Technology Development – Research Centre Offices

3.3.3.1 Removal of Hazardous Materials and Drummed Wastes from Interiors

The buildings to be demolished have varying degrees of radiological and chemical contamination because of past and/or current operations. The contamination could be both surficial and volumetric because of the wide range of materials used in building and equipment construction. Building interiors will be cleaned successively during demolition to reduce the potential for release of contaminants.

Potential Asbestos-Containing Materials

Asbestos-containing material (ACM) has been found in a variety of materials in some buildings according to an asbestos survey undertaken at PHCF [8]. ACM may also be present in inaccessible spaces and in the drywall jointing compounds of buildings. Since, this assessment, some asbestos removal has occurred. The remaining ACM will be removed as part of demolition activities in accordance with occupational health and safety procedures.

Asbestos contaminated with radionuclides will be removed during demolition and will be sent to the LTWMF for disposal based on waste acceptance criteria and protocols developed for the LTWMF (e.g. *Ontario Environmental Protection Act* [9] and *Packaging and Transport of Nuclear Substance Regulations* [10]). ACM that meets the criteria for unrestricted release will be disposed of at a provincially-regulated facility certified to receive this type of waste.

Materials Containing PCB

Polychlorinated biphenyls (PCBs) may be present in the ballasts of older fluorescent light fixtures. All known PCB-containing capacitors and transformers have been taken out of service and removed from the PHCF. Any PCB-containing items that are found will be directed to Cameco's Waste Management Group. PCB-containing equipment will be cleaned to remove radioactive contamination and will be stored in the on-site designated area until arrangements for disposal can be made. Cameco will arrange to dispose of PCB-containing equipment and materials at a facility approved for the handling and disposal of PCBs. In accordance with approved procedures and applicable regulations, Environment Canada will be informed of changes to the on-site inventory. In the event that PCB waste meets the unrestricted-release criteria, it will be handled in accordance with the appropriate regulations [11].

In the unlikely event of a release of PCB to the environment, clean-up and remediation activities will take place in accordance with applicable regulations.

Ozone-depleting Substances

Cameco's Ozone Depleting Substances (ODS) plan contains an inventory of every piece of equipment at the PHCF that contains ODS. The refrigeration equipment in Building 50 (see figure 3.3-1), which will not be removed as part of Vision 2010, has the largest quantity of ODS at the PHCF site. Small amounts of ODS are present in various air conditioning equipment in the remaining buildings.

Where possible, ODS will be recovered while the affected equipment is still in place. If this is not possible, the equipment will be removed intact to prevent the release of ODS to the

environment and stored in a secure location on the PHCF site. Equipment that meets the unrestricted-release criteria will be recycled, while equipment that does not meet these criteria will be sent to the LTWMF for disposal.

The appropriate authorities will be notified, in the unlikely event that ODS is released to the environment during demolition, ODS recovery and storage or while moving ODS-containing equipment on site.

Lead-based Paint and pipes

A field investigation revealed that the presence of lead in paint is not widespread [12]. Analysis will be conducted as needed during site remediation activities to provide instantaneous determination of the presence of lead in paint on demolition materials. Lead pipes and fittings are expected to be uncommon.

Paint will be removed during decontamination using grit blasting equipment. Lead pipes will be removed at the same time that services and equipment are being removed during building demolition.

Workers using oxyacetylene or plasma arc torches to cut metal will be required to wear air purifying respirators. Respirators protect against workplace inhalation of uranium and lead.

If lead pipes are encountered during demolitions they will be disposed of, or recycled as per the *Environmental Protection Act R.R.O 1990 Regulation 347: General Waste Management* [13].

Animal Detritus and Mould

Animal detritus, including bird droppings and dead birds, is present in building areas (Buildings 2, 7, 14 and 227) that are not actively used. No visible mould has been observed.

3.3.3.2 Removal of Equipment and Building Services

Before the final cleaning is complete, equipment services will be removed.

Equipment

Prior to the start of dismantlement, all remaining equipment and material will be removed from buildings. Wherever possible, process residues will be removed first. If this is not practical, the equipment will be sealed to prevent the release of residues before transport to the cleaning area.

Once process residues are removed, the equipment will be fully disassembled, cleaned and recycled. Metal components will be recovered to the extent practicable. Equipment or parts thereof that cannot be cleaned to meet release criteria will be sent to the LTWMF. Equipment will be drained of all liquids. Some equipment will be disassembled and/or cut into smaller pieces to meet the PHAI-mandated size requirements. The LTWMF will be notified if equipment cannot be disassembled and/or cut into pieces so that specific handling requirements can be developed and implemented.

Process and Services Piping

Removal of remaining process and services piping inside buildings will occur prior to dismantlement of the structure. Removed piping will be decontaminated and released for recycling or disposal, where practical. If this is not practical, the piping will be sent to the LTWMF.

Electrical Cable

An electrician will cut individual cables, disconnect power to a building or isolate a portion of a building before cables are removed. The removal of remaining electrical cables inside buildings will occur before the dismantlement of a building structure. Where practical, the removed cable will be decontaminated and released for recycling otherwise the cable will be prepared and sent to the LTWMF.

Above- and Below-Ground Services

All services will be traced and shutdown when no longer needed during the demolition process. In order to facilitate access of equipment, removal of above-ground services to a building will be done before building dismantlement. Below-ground services will be blocked and removed after the associated building has been dismantled.

Overhead piperacks vary in design, elevation and the contents they carry. Piperacks are used to carry compressed air, process cooling water, pressurized steam, various gases (e.g., hydrogen, nitrogen, natural gas), electrical power distribution and cabling (e.g., cameras, public announcement system). The major piperacks start at the power plant and distribute above-ground services to most buildings.

Once all services have been discontinued, overhead piperacks will either be removed, remain in place, or will be demolished. Some new racks will be constructed. Similarly, some of the below-ground services will be retained while others will be relocated.

3.3.3.3 Cleaning of Building Interiors

Buildings slated for demolition exhibit varying degrees of radiological contamination due to past and current operations, despite periodic cleaning and other measures. A number of factors, alone and in combination, have contributed to the contamination in the old process buildings. The contamination can be both surficial and volumetric due to the wide range of materials used in building and equipment construction. Radiological contamination is also found to varying degrees in buildings that were not used for production purposes.

Surface Contamination

A variety of methods are available for the reduction of surface contamination:

Vacuuming – the use of vacuums with high-efficiency particulate air (HEPA) filters to remove loose materials, when contaminants are present as damp or dry dust

Pressure Washing – the use of portable pressure water systems to remove accumulated dust and debris from surfaces

Wet Brushing – simple brushing or mopping is effective for small spills

Short-term Fixatives – short-term fixatives (e.g., aerosol capture coatings, strippable coatings and polymeric barrier systems) could temporarily prevent dust generation during demolition

Scarification/Scabbling – the use of mechanical methods known as scabbling or scarification to remove concrete layers that have been impregnated by uranium solutions

Workers will be required to wear respiratory protection during the use of all of the above technologies.

Volumetric Contamination

Volumetric contamination is expected for materials such as concrete and brick in production areas. The surfaces will be cleaned prior to dismantlement to control dust generation. These materials will not be recycled and will be deposited in the LTWMF.

3.3.3.4 Building Dismantlement

The buildings will be dismantled after all the materials have been removed and a final cleaning has been done. Maintenance principles will be followed including:

- maintaining worker safety
- minimizing the release of dust
- minimizing the possible spread of contaminants
- maximizing the amount of material that can be removed for unrestricted disposal (landfill, recycle, re-use)
- reducing the impact on the operation of the PHCF

Dismantlement will be conducted to allow for the removal of salvageable material and the preservation of the stability of the building structures. The resulting debris will be classified as recoverable and non-recoverable based on its potential for decontamination and off-site disposal, recycling or reuse. Debris sent to the LTWMF must meet the criteria for the facility and adhere to transport regulations and procedures of the LTWMF.

Outside contractors will dismantle buildings and provide the necessary equipment. Contractors will be required to develop procedures to ensure the stability of the structure while controlling dust and handling debris.

Systematic dismantlement, which involves taking down a structure in the reverse order to which it was constructed, will be used. Hand dismantling will also be part of the systematic process. The remaining structure will be left in a stable state at the end of each work day. No heavy equipment will be moved to upper floors of buildings. Debris will not be allowed to accumulate or remain in areas that may result in the collapse of those areas.

3.3.3.5 Management of Demolition Waste

Waste Management

Various kinds of waste materials are anticipated from demolition activities:

- contaminated combustible solid wastes including wood, cardboard and paper as well as some articles of personal protective equipment

- contaminated non-combustible waste such as fibreglass and ceramic insulation, glass, fibreglass reinforced plastic, built-up roofing material, masonry and refractory
- hazardous waste-containing materials including switches, fluorescent light bulbs, batteries, cleaners and paints
- structural steel and scrap metals
- process piping
- process equipment
- concrete and masonry
- asphalt from roadways
- wood from non-process buildings
- PVC and other plastics

Those materials that meet unrestricted-release criteria will be recycled through the PHCF Waste Management Group to approved outlets. Materials that fail to meet unrestricted-release criteria will be sent to the LTWMF in accordance with Transport Canada's *Transportation of Dangerous Good Regulations* [14] and the CNSC's *Packaging and Transport of Nuclear Substances Regulations* [10]. Contaminated combustible solid wastes will be sent to Cameco's Blind River refinery for incineration. Other materials including hazardous waste-containing materials, concrete, masonry and wood will be directed to Cameco Waste Management Group.

3.3.4 Excavation Activities

Vision 2010 excavation activities include the excavation of soils at the site and shipment of contaminated soils to the LTWMF in coordination with the PHAI.

3.3.4.1 Excavation of Soil

Location and Volume of Contaminated Soil

The Project includes the excavation of soils at various locations of the facility both above and below the water table. Past assessments conservatively estimate that the total volume of soil requiring excavation is 100,200 m^3, of which approximately 87,500 m^3 is contaminated material that will be sent to the LTWMF. The anticipated amount of soil to be excavated will be approximately the same for all options.

Remediation Criteria

The PHAI soil clean-up criteria (table 3.3-2) were adopted as remediation criteria under the Vision 2010 Project. These criteria were based on known contaminants of potential concern (COPC) associated with legacy wastes in Port Hope. The PHAI soil clean-up criteria reflected provincial generic soil remedial criteria [15] available at the time of their development. However, no federal or provincial soil remediation criteria had been published for uranium and therefore a site-specific soil clean-up criterion of 35 µg/g for properties without development constraints was adopted. The CNSC is currently reassessing the PHAI soil clean-up criteria in light of recent updates to the MOE standards for several constituents including the adoption of a uranium soil criterion lower than the adopted PHAI soil clean-up

criterion. This could result in the adoption of more stringent soil clean-up criteria at the time of CNSC licensing for the Vision 2010 Project.

Table 3.3-2 PHAI Cleanup Criteria for Soil [16]

	Criteria
Primary COPCs	
Ra^{226} (Bq/g)	0.24
Th^{230} (Bq/g)	1.11
Th^{232} (Bq/g)	0.103
Arsenic (ppm)	20
Antimony (ppm)	13
Cobalt (ppm)	40
Copper (ppm)	225 (150)
Nickel (ppm)	150
Uranium (ppm)	35
Lead (ppm)	200
Fluoride (ppm)	N/A
Secondary COPCs	
Barium (ppm)	750
Beryllium (ppm)	-
Boron (ppm)	1.5
Cadmium (ppm)	12 (3)
Mercury (ppm)	10
Molybdenum (ppm)	40 (5)
Selenium (ppm)	10 (2)
Silver (ppm)	20
Vanadium (ppm)	200
Zinc (ppm)	600

Scheduling and Sequencing of Excavation

During remedial work, PHCF will continue normal operations. Excavation activities will be scheduled to minimize disruption of operations and sequenced to integrate with demolition and relocation activities.

Temporary Storage of Excavated Soil

Waste from project activities will be coordinated with receiving operations at the LTWMF and other designated waste management facilities, where appropriate. Soil that does not require remediation will be stockpiled at designated onsite areas to be used later as backfill.

General Excavation Procedures

The excavation method used depends on subsurface soil and groundwater conditions, the depth of excavation and the proximity to facilities. Shallow, intermediate and deep excavation methods will be used. Excavated soil that meets cleanup criteria will be stockpiled and used as backfill.

Shallow excavation will be carried out "in-the-dry" to the top of the water table. Conventional excavation using a hydraulic excavator that loads trucks directly will be used.

Excavation to depths 1 m below the water table will be carried out mainly in dry conditions with intermediate depth excavation. Pumps may be used to keep excavations relatively dry. No major lateral support requirements are expected.

Deep excavations are generally carried out 1 to 3 m below the water table. Lateral supports are required to secure the structure and stability of local foundations and services. The "in-the-wet" and coffer dam approaches are being considered for deep excavations.

Short-term, isolated circumstances may arise that require the groundwater table to be lowered. If these occur, procedures will be put in place to provide adequate safety to on-site workers. Once the contaminated soil has been removed, the cleaned-up excavation will be backfilled with granular material that would provide similar hydraulic conductivity to that of the material that was removed. There will be no building structures below the existing water table. The existing hydrology below the site is not predicted to be adversely affected. The selection and placement of backfill material will be conducted to prevent the occurrence of sink holes. The existing groundwater pump-and-treat system is currently part of an environmental management program, which will continue to be maintained in the long-term.

3.3.4.3 Excavation near Harbour Wall

Near the harbour wall, Vision 2010 excavation activities will be coordinated with the PHAI. The integrity of the harbour wall will be maintained during Project works and activities. Further, proposed excavations will comply and/or integrate with PHAI measures. Any soil that meets cleanup criteria will be stockpiled and reused as backfill.

3.3.5 Water Management

Precipitation

Efforts will be made to prevent runoff of sediment-laden surface water from excavation areas during precipitation events. The following precautionary measures may be used:

- construction of diversion dykes to channel runoff around the excavation area
- covering stockpiles and excavated soil with secured tarps or plastic sheeting
- placement of sand bags, water-filled bags or equivalent to prevent surface water escape
- allowing surface water inside disturbed work areas to drain to the open excavations to be collected for treatment, as required
- protection of catch basin inlets using filter fences, geotextiles or an excavated sediment trap
- implementation of velocity controls and temporary water holding areas

Water Infiltration

Water infiltration is not required if the "in-the-wet" approach is used for deep excavations. However, if the coffer dam approach is used, water will infiltrate the excavations from the following sources:

- via joints in the sheet piling
- through the excavation floor

- from the saturated unexcavated soil within the sheet pile enclosure

Water will be pumped out and sent for treatment as it accumulates in the excavation areas.

Wastewater Treatment

The calculation of the amount of wastewater that would be generated from Project activities considered the following sources: a) material cleaning and vehicle washing; b) de-watering of soil volumes prior to excavation; c) control of infiltration during excavation; and d) precipitation captured within building footprints during demolition.

The estimated amount of wastewater that could be generated by the Vision 2010 Project is 48,000 m^3; with approximately 18,500 m^3 from equipment and vehicle washing, 22,500 m^3 from groundwater and excavation water and 7,000 m^3 from precipitation collected within building footprints during and after demolition. A 20% contingency is included in these numbers.

It is expected that a combination of reverse osmosis and evaporation would be used to treat wastewater collected during excavation work and from precipitation events. Wastewater from the washing of equipment or vehicles would either be sent directly for evaporation at either Building 2, Building 50, or a new wastewater treatment facility.

Dewatering wells and sumps would be used to collect groundwater and excavation water. The water would be transported to a water treatment facility; however some pre-treatment may be necessary for water with high suspended soils prior to treatment with reverse osmosis and evaporation.

3.3.6 Construction Activities

Construction activities for the Project include the demolition of existing structures, the relocation of some existing facilities to other existing or new buildings, and the construction of new facilities. Remediation activities will also require the relocation of existing site services.

- a new Cameco Research Centre and Technical Services Building will be constructed to house the Innovation and Technology Development Research Centre and the Technical Services Department
- a new drum storage building will provide storage, shipping and receiving facilities for UO2 drums
- a new waste management building for processing and temporary storage of waste materials

New construction and renovations will incorporate energy, environment and sustainable design features which will contribute to Cameco's environmental goals. Section 3.6.2 of Cameco's EIS summarizes the Vision 2010 Project construction activities, additions and modifications to existing buildings.

3.3.6.1 Site Services

Many piperacks carrying above-ground services at the PHCF will be disconnected, re-routed or replaced, as required, due to building demolition. Similarly, some below-ground services

will also be disconnected, re-routed or replaced. Site services that will undergo changes include:

- domestic / potable water and fire water
- sewers
- natural gas
- above and below ground electrical supply
- cooling water

3.3.6.2 Roads, Parking and Paved Areas

Parts of Marsh Street, Eldorado Place, the existing parking lot and the former waterworks property will be incorporated within the PHCF as part of the Project. A new parking lot will be constructed in place of the existing parking lot and the former waterworks. New roadways and manoeuvring areas will be constructed within the PHCF for vehicle traffic.

3.3.6.3 Fencing and Lighting

New fencing and lighting at the PHCF perimeter will be required due to changes at the PHCF perimeter and remediation of areas near the existing fenceline. Alternative fencing styles that provide an aesthetic improvement to chain link and barbed wire yet comply with CNSC security requirements will be considered.

3.3.7 Transportation of Waste

The maximum limit of decommissioning wastes from the Project that can be sent to the PHAI LTWMF is 150,000 m^3. Moreover, only historic waste attributable to Eldorado operations in the town of Port Hope – pre 1988 (i.e., pre Cameco), or waste that has co-mingled with this historic waste – is eligible to be sent to the PHAI LTWMF. A specified time period has been allocated to Cameco during the time that the LTWMF is receiving wastes. The decommissioning waste to be sent to the LTWMF will include stored waste, excavated soil from remediation activities and various materials from demolition activities.

3.3.7.1 Preparation of Stored Waste for LTWMF

A variety of materials with different characteristics are currently stored in drums in various warehouse buildings including:

- magnesium fluoride slag (~14,000 drums)
- contaminated non-combustibles (~13,000 drums)
- depleted uranium trioxide (~3,000 drums)
- used refractory (~400 drums)
- cell sludge (~30 drums)

Different approaches will be used for the preparation of the different stored waste materials. Further, in accordance with CNSC requirements, Cameco will maintain and update its inventory on all stored wastes as materials are repackaged, bulked and sent to LTWMF or other receiving sites.

3.3.7.2 Waste Acceptance Criteria for the LTWMF

Waste materials will be prepared to meet the requirements of the LTWMF. The requirements of the disposal facility relate to the physical properties of the waste that is being received. Waste acceptance criteria for different waste categories for the LTWMF are listed below:

- solid and solid-like bulk waste:
  - no free liquids should be associated with the waste
  - the maximum particle size is 100 mm
  - waste will be divided into two categories based on the level of radioactive contamination present: >0.925 Bq/g and <0.925 Bq/g
- non soil-like bulk waste:
  - wastes that can be excavated/handled as bulk but do not have the physical characteristic of soil
  - no free liquids should be associated with the waste
- decommissioning and demolition waste:
  - structural steel is to be handled as individual pieces or bundled in 1m (width) by 0.5 m (height) by 3 m (length)
  - process piping and equipment will be handled in individual pieces or bundled into similar dimensions as those for structural steel
  - concrete slabs must be cut and handled as individual pieces
  - asphalt and masonry will be crushed to a maximum particle size of 100 mm
  - miscellaneous materials are to be sized to a maximum of 1 m (width) by 0.5 m (height) by 3 m (length)
- drummed waste and other packaged waste:
- no void space within waste drums or over-packs
- no free liquids within waste drums or over-packs
- maximum size of packaged materials is to be 1.2 m in any dimension
- miscellaneous waste:
- acceptance criteria will be developed using waste-specific criteria

3.3.7.3 Transportation and Disposal of Contaminated Materials

Vision 2010 site remediation activities include the transportation of waste to the LTWMF. As a result, transportation will be conducted safely, efficiently and with sensitivity to the community. Waste delivered to the LTWMF will be packaged and labelled in accordance with applicable regulations, including the *Transport of Dangerous Goods Regulations* [14] and the *Packaging and Transport of Nuclear Substances Regulations* [10].

The vehicles selected to transport waste to the LTWMF will accommodate the type of material to be transported. All equipment will be routinely maintained to ensure that they are

in optimum working condition and will be decontaminated prior to being used for handling clean soil.

Drivers will be trained on properties and hazards of radioactive materials and to respond to emergency situations that may arise during transport.

Leaving the PHCF

In order to track the flow of material to the LTWMF, a trip ticket system will be developed. Final details of the system will be finalized in consultation with the PHAI during the engineering design phase.

Vehicles will be inspected to ensure safe transport of materials as well as worker and public safety. Vehicles will be inspected before leaving the site to ensure that exterior surfaces meet Cameco's radioactive contamination release criteria for vehicles.

Transportation Route

Preferred routes to move contaminated wastes to the LTWMF were discussed and identified with the Municipality.

Arrival and Receiving Site and Disposition of Loads

Procedures developed by the LTWMF will be used for handling and deposition of waste at the facility. Advanced notification may be required for the arrival of a shipment of waste. Such notification will be provided before shipments leave the PHCF.

If waste arrives at the LTWMF which does not meet the waste acceptance criteria, the materials may be returned to the PHCF for further processing. The appropriate paperwork must be completed for transfer back to the PHCF. Trucks may have to be cleaned before leaving the site, due to the nature of the materials being deposited.

3.3.7.4 Transportation and Disposal of Non-Contaminated Materials

Different types of non-contaminated materials will be handled in different ways:

- scrap metal that meets the unrestricted release criteria will be sold to a local scrap metal dealer
- uncontaminated non-combustible waste that meets the unrestricted waste criteria will either be sent for recovery or taken away for disposal at a landfill site. The current sites are County of Northumberland facilities located either in Seymour Township or near Brighton
- waste paper and cardboard will be collected separately and sent off-site for recycling
- hazardous solid and liquid waste materials are to be released to waste disposal companies based on unrestricted waste criteria
- waste organic liquids will have their uranium concentration assessed in order to determine how the material will be managed
- other special wastes will be managed as appropriate

3.3.8 Landscaping and Site Restoration

Site restoration will occur at the main site. Landscaping will occur in appropriate areas including the waterfront, in particular, the area around the west side of the inner basin.

A barrier approximately 1.2 m high will be a key landscaping feature. The barrier will run along the east side of the site from the north end of the turning basin to the south end of the approach channel and will provide an additional level of flood protection. This additional level of flood protection will exceed the Ganaraska River Conservation Authority (GRCA) flood protection requirements. The barrier will also shield the site perimeter from gamma radiation originating from cylinder storage areas.

3.3.9 Ongoing Site Management and Operation

Changes at the PHCF due to project activities will result in changes to the management of the UO_3 totes, UO_2 drum storage and UF_6 cylinder storage and wastewater treatment.

UO_3 Tote Storage

The UO_3 storage area will store full and empty totes. Full totes will remain in the storage area for several weeks before they are unloaded at the UF_6 or UO_2 plant and subsequently returned to Cameco's Blind River facility for filling.

UO_2 Drum Storage

Better access and improved shielding will result from changes in UO_2 drum storage and management. A new Drum Storage Building has been proposed to limit traffic on plant roadways, provide storage space closer to the point of production and increase operational efficiencies. The storage area will be able to accommodate 10,800 drums, with 75% of the storage consisting of drummed UO_2. Other materials to be stored could include empty drums, uranium scrap material, fluoride products and other dry materials such as drummed U_3O_8. Separate areas will be provided for cleaning the exteriors of the drums.

UF_6 Cylinder Storage

New gravel areas will provide outdoor storage for at least 1,600 UF_6 cylinders and 60 UO_3 tote bins. The storage areas will store full, heeled and empty cylinders. Cylinders typically remain in storage areas for extended periods (months and possibly years).

Wastewater Treatment

Building 50 will accommodate a wastewater treatment facility, replacing the capacity of Building 2.

Operation of New Buildings

New buildings will be operated in a manner similar to existing facilities and will be operated in alignment with Cameco's commitment to safety, health and the environment.

3.3.10 Summary of Vision 2010 Project Activities

Table 3.3-3 provides a summary of the project works and activities that are a part of the Vision 2010 Project.

Table 3.3-3 Vision 2010 Activities Summary Table

Project Activity	Activity Description
General Project Activities	
On-site Traffic	There will be general construction vehicle movement on-site and practices such as cleaning vehicles prior to leaving a work area and/or the facility.
Construction Equipment Fuelling	Fuelling of heaving equipment, trucks, vehicles and other equipment will occur. Fuel storage will be necessary and there will be bulk deliveries and direct fuelling from tanker trucks.
Transportation of Equipment and Materials	The transportation of equipment and materials to and from the site will take place.
Demolition Activities	
Removal of Hazardous Materials and Drummed Wastes from Interiors	Friable asbestos-containing material and animal detritus will be removed from buildings in accordance with required procedures. Drummed wastes will be removed and managed on site or sent for disposal at the LTWMF.
Removal of Equipment, Material and Building Services	The remaining loose material and fixed equipment in the buildings will be removed. Services to the buildings will be disconnected. Piping, electrical components and cables will be taken out.
Cleaning of Building Interiors	Successive cleaning of the equipment and building interiors will occur as items are removed. A variety of methods will be used to reduce surface contamination.
Building Dismantlement	This task involves the dismantlement of roof, walls, floor slabs and structural steel.
Management of Removed Demolition Waste	This task involves the management of waste removed during demolition activities. Contaminated demolition debris will be prepared for acceptance at the LTWMF. Waste arising from demolition of non-process buildings will be assessed to determine if they can be released directly for reuse or disposal.
Excavation Activities	
Excavation of Soil	This task includes the excavation of contaminated and non-contaminated soils including the foundations of the buildings. The excavations will be backfilled with clean fill. The contaminated soils will be disposed at the LTWMF. Temporary storage of non-contaminated excavated soil until verification analyses are complete will be necessary.
Water Management	The task includes the dewatering of saturated contaminated soils and the treatment of the contaminated wastewater and groundwater collected during excavation. Stormwater management will also be part of this

Project Activity	Activity Description
	activity.
Construction Activities	
Construction of New Buildings and Additions or Modifications to Existing Buildings	The construction of new buildings and the modification of, additions to, existing buildings, including excavations and piles for foundation structures, the construction of building shells and fit-out of building interiors.
Site Infrastructure	Many of the piperacks that carry above-ground services on the PHCF site will require replacement. Many below ground services will require replacement. These will be discontinued, re-routed or replaced with new racks as required.
Transportation of Waste	
Transportation and Disposal of Contaminated and Non-Contaminated Materials	Materials to be disposed of at the LTWMF will included drummed wastes, soils, demolition debris, asbestos-containing materials, etc. Appropriate vehicles will transport the materials in accordance with applicable regulations and the trip ticket system. Waste handling and disposal at the LTWMF will be undertaken in accordance with procedures developed by the PHAI.
Landscaping and Site Restoration	
Landscaping and Site Restoration	Landscaping includes planting and the construction of walking paths, retaining walls, barrier and fencing.
Ongoing Site Management and Operation	
UO_3, UO_2 and UF_6 Management	Handling, storage and on-site transport of drums of UO_2 and cylinders of UF_6 will be required.
Wastewater Treatment	Replacement wastewater treatment facilities will be established.
Operation of New Buildings	Day-to-day operations of the new buildings once the buildings are commissioned.

3.3.11 Preliminary Decommissioning Plan

Nuclear activities are regulated by the CNSC through a multi-stage licensing process which includes application for site preparation, construction, operating, decommissioning and abandonment licences. A Preliminary Decommissioning Plan (PDP) must be prepared and submitted to the CNSC as early as possible in accordance with CNSC's Regulatory Guide G-219, *Decommissioning Planning for Licensed Activities* [17]. The decommissioning of soils under buildings that are not part of the Vision 2010 Project will be dealt with as part of decommissioning of the PHCF.

Cameco has put in place financial guarantees for the decommissioning for the main site, Centre Pier and Dorset Street properties, in accordance with CNSC Regulatory Guide G-206, *Financial Guarantees for the Decommissioning of Licensed Activities* [18].

The objective of the decommissioning plan is to return the site, to the extent possible, to conditions that existed prior to the processing and storage of radioactive materials. Clean-up and material release criteria will be defined and agreed upon.

Decommissioning is classified into nine types of work:

- plant shutdown
- demolition
- contamination clean-up
- disposal of clean recyclable material
- disposal of contaminated rubble at a Low Level Radioactive Waste (LLRW) Facility
- disposal of contaminated soil at a LLRW Facility
- disposal of contaminated drums of waste at a LLRW Facility
- disposal at public landfill
- landscaping and improvements

3.3.11.1 Decommissioning Stages

The Preliminary Decommissioning Plan consists of two stages:

- Stage I (Near-Term Decommissioning Plan): Vision 2010 activities
- Stage II (Long-Term Decommissioning Plan): Buildings not planned for demolition under the Vision 2010 program and some soil excavation

Stage II activities require approval from the CNSC and will be subject to requirements under the NSCA. A determination regarding the application of the CEA Act will be made at the time of application.

It should be noted that there is a window of time in which the 150,000 m^3 of Vision 2010 waste can be sent to the PHAI LTMWF. In close consultation with Cameco's Vision 2010 Project team, the PHAI Management Office will endeavour to ensure that all the Vision 2010 wastes are delivered and placed within the LTMWF during the approximate 5-year window for receipt of off-site wastes. Following the placement of all other (non-Vision 2010) waste,

any remaining Vision 2010 decommissioning waste will be disposed in alternative approved disposal/storage facility that Cameco may need to find.

Once Vision 2010 and the PHAI remediation are complete, the LTWMF will be closed and no longer available to receive contaminated material. At the PHCF site, all of the contaminated soil and most buildings contaminated from historical practices will have been decommissioned. Residual contamination at the remaining buildings will require decommissioning; however the quantity of contaminated material generated from these structures is expected to be small. The remaining buildings requiring demolition as part of Stage II activities include:

- operating UF_6 plant (Building 50)
- operating UO_2 plant (Building 24)
- operating power plant (Building 3)
- administration (Building 29)
- maintenance & engineering (Building 20)
- new buildings that are part of Vision 2010

3.3.11.2 Decommissioning of New Buildings

The new buildings that will be constructed as part of Vision 2010 will be included in the Stage II decommissioning process. The same demolition process as Vision 2010 will be used for these buildings.

3.3.11.3 Health and Safety Considerations

Conventional radiological and occupational safety methods used during operations are expected to be used during decommissioning. The existing radiation protection program will be reviewed and modified where necessary to deal with decommissioning. Protocols for environmental emissions and effluents will also be developed before decommissioning.

3.3.11.4 Monitoring

The nature, frequency and reporting protocols for the environment, radiation protection and conventional health safety aspects of the work will be identified and documented, including quality assurance and quality control (QA/QC) verifications. The level of environmental monitoring that will take place during the remedial program will be finalized in consultation with stakeholders (e.g., regulators, Atomic Energy of Canada Limited (AECL)) prior to starting work.

3.3.11.5 Final Acceptance

A final survey of the main site and the Dorset Street site for both radiological and non-radiological contaminants will be released once the decommissioning process has been completed. The last step of decommissioning is the landscaping and re-vegetation of the site.

The necessary documents that demonstrate that the site has been decommissioned will be compiled in accordance with the approved plan. Prior to de-licensing the site, acceptance from the appropriate regulatory agencies will be obtained and documented.

Cameco's existing lease agreement with the Harbour Commission requires that the four Centre Pier buildings (Buildings 40, 41, 42 and 43) be demolished prior to termination of the lease unless otherwise directed. Therefore, work on the Centre Pier is limited to demolition or clean up of the Centre Pier buildings.

Final Acceptance states that following demolition or clean up of the Centre Pier buildings, Cameco will turn over the decommissioned site to the Harbour Commission and that the sub-surface will be remediated by AECL. It should be noted that the Centre Pier comprises both surficial LLRW that is the responsibility of Cameco (as part of the 150,000 m^3) and underlying industrial waste that is part of the industrial waste category that is the PHAI's responsibility to clean up. There are a total of five industrial sites within Port Hope and the limit on total volume of industrial waste that PHAI will clean up has been established in the amended Legal Agreement as 51,250 m^3. It is the Municipality's responsibility to decide how best to use their 51,250 m^3 limit and the PHAI will remediate those industrial sites as directed by the municipality.

3.3.12 Implementation Sequence and Project Schedule

3.3.12.1 Implementation Sequence

Remediation and construction activities will occur concurrently throughout the implementation schedule. The implementation schedule is based on the requirements for project activities while minimizing impacts to the ongoing operation of the PHCF. Before existing facilities required for operation can be demolished, new replacement buildings would be constructed and commissioned.

3.3.12.2 Project Schedule

The proposed Vision 2010 Project schedule is as follows:

- 2013-2018: transfer of stored wastes, site excavation and demolition activities
- 2013-2019: construction activities
- 2020-2050: ongoing operations to point of decommissioning
- 2051-2055: decommissioning

Various aspects of the Vision 2010 Project must be scheduled and coordinated to meet the acceptance criteria set out by the PHAI. Coordination with AECL is important because there is limited space at the PHCF to stockpile materials. The PHAI project schedule is summarized below:

- 2012-2020: construction and development phase
- 2020 – onwards: monitoring and maintenance phase

4.0 SCOPE OF THE ASSESSMENT

4.1 SCOPE OF THE PROJECT

In establishing the scope of a project for a comprehensive study EA under the CEA Act, the physical works that are involved in the proposal and any specific undertaking that would be carried out in relation to those physical works must be determined.

Cameco's Vision 2010 Project is comprised of the following concurrent major activities:

- decommissioning and demolition of buildings currently on the site (see table 3.3-1)
- site remediation and restoration
- construction of new buildings, additions to existing buildings, and related infrastructure

The principal Project, as proposed, is the decommissioning of buildings designated as Class 1B Nuclear Facilities under the NSCA. These buildings were used for refining or converting uranium. Other undertakings in relation to these physical works considered in the EIS include the demolition of several existing buildings and the construction and operation of proposed new buildings and infrastructure (see figure 3.3-1). Figure 3.3-1 illustrates the existing site and the location of the buildings that are proposed for decommissioning and demolition as part of the Vision 2010 Project.

Associated activities considered within the scope of the Project include remediation and restoration of the site; management of contaminated process equipment and contaminated soils, hazardous and conventional waste; transportation of waste to the LTWMF or to a conventional landfill site; and transportation of equipment and materials to and from the Project site. The associated activities also include the construction, operation and decommissioning of the new buildings.

The interaction matrix (table 8.1-1), provides greater detail concerning the Project activities that were considered in this EA and the possible interactions of project activities with environmental components and subcomponents.

A preliminary decommissioning plan for the proposed new buildings was required and included in the cumulative effects assessment for the Project proposal.

The Project is proposed to be carried out in conjunction (i.e., similar timing) with the PHAI project, a joint federal-municipal government undertaking for the cleanup and long-term management of low-level radioactive and industrial waste in the Municipality of Port Hope, Ontario. The PHAI project has undergone a federal screening EA and is not a part of the scope of this Project.

4.2 FACTORS CONSIDERED

The scope of a comprehensive study under the CEA Act must include all the factors identified in paragraphs 16(1)(a) to (d) and 16(2)(a) to (d) of the CEA Act, and, as provided for under paragraph 16(1)(e), any other matter that the CNSC or the Minister of the Environment requires to be considered. The factors to be considered and assessed include:

- the purpose of the project
- alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means
- the environmental effects of the project, including the environmental effects of malfunctions and accidents that may occur in connection with the project, and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out
- the significance of the effects identified above
- comments from the public that are received in accordance with the CEA Act and its regulations
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project
- the need for, and the requirements of, a follow-up program in respect of the project
- the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future

For the purpose of an EA, the CEA Act defines the "environment" as meaning the components of the Earth, and includes:

(1) land, water and air, including all layers of the atmosphere
(2) all organic and inorganic matter and living organisms
(3) the interacting natural systems that include components referred to in paragraphs (1) and (2) above

An "environmental effect" from a project is defined by the CEA Act as:

(a) Any change that the project may cause in the "environment", including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act*
(b) Any effect of any "environmental effect" on:
  (i) health and socio-economic conditions
  (ii) physical and cultural heritage
  (iii) the current use of lands and resources for traditional purposes by Aboriginal persons, or
  (iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance
(c) any change to the project that may be caused by the environment

whether any such change or effect occurs within or outside Canada

With the discretion allowed for in subsections 16(2) and 16.1 of the CEA Act, the CNSC also requires consideration of:

- the need for the project and alternatives to the project
- consideration of traditional and local knowledge, where relevant

Subsection 16(3) of the CEA Act requires that the RA establish the scope of the factors to be assessed pursuant to paragraphs 1(a), (b) and (d) and paragraphs 2(b), (c) and (d). This involves establishing temporal and spatial boundaries of the factors to be assessed and is typically carried out by defining the study areas and time frames for the factors to be assessed in the comprehensive study. These boundaries are described in subsection 4.3.2 of this report.

4.3 SCOPE OF THE FACTORS

4.3.1 Identification of Valued Ecosystem Components (VECs)

A valued ecosystem component (VEC) is an element of the environment that has scientific, economic, social, aesthetic or cultural value and is selected because of its potential vulnerability to effects of the Project. Those VECs that may be affected by a project's activities are included in environmental assessments.

The selection of VECs for each environmental component was based on the potential Project-environmental interactions and a consideration of the existing environment. A list of candidate VECs was compiled based on previous and ongoing work taking place at the PHCF and other EAs in the vicinity of Port Hope. The initial list was modified by the CNSC and included in the EA Guidelines [4].

The following was considered in the VEC selection:

- abundance in the site study area (SSA), local study area (LSA) and regional study area (RSA)
- ecological importance
- availability of baseline data
- native species
- exposure of the VECs to stressors produced by project works and activities
- sensitivity of the VECs to stressors produced by project works and activities
- potential to affect the growth and sustainability of biota or to affect human health
- socio-economic importance
- conservation status
- traditional and current importance to Aboriginal people
- cultural and heritage importance to society

Information on the existing environment, identification of the Project-environmental interactions and the professional opinion of technical specialists on the Project team were used to compile the preliminary list of VECs. The preliminary list was refined to provide the final list of VECs which was used in the assessment of the effects of the Project. In May 2008, a VEC workshop was held in Port Hope. The Open House provided a forum for

raising public awareness about the Project and for refining the VECs for the Vision 2010 Project. The final list of VECs considered the public's comments from the VEC Open House as well as revisions to the grouping of project works and activities to more accurately reflect their interaction with the environment (table 4.3-1).

Table 4.3-1 Valued Ecosystem Components for Vision 2010

Environmental Components	Sub-components	Relevant VECs	Rationale
Atmospheric Environment	Air Quality (includes dust)	Nearest residential or recreational land user	Receptor could be affected by increased dust levels or airborne chemicals due to demolition and site remediation activities. Protection of human health.
	Noise	Nearest residential or recreational land user	Receptor could be affected by increased noise levels due to demolition, site remediation and construction activities. Protection of human health.
Radiation and Radioactivity	Members of the Public	Nearest residential or recreational receptor	Members of the public that could be potentially exposed to low doses of radiation produced by the Vision 2010 Project works and activities including transportation. Protection of human health.
	Radiation Doses to Non-Human Biota	Non-human biota as identified by terrestrial and aquatic environment	Non-human biota that could be potentially exposed to low doses of radiation produced by the Vision 2010 Project works and activities. Protection of ecological health.
Worker Health and Safety	Radiation Doses to Workers	Vision 2010 and PHCF employees and contractors	Workers expected to receive radiation doses from Vision 2010 Project works and activities while performing their tasks. Protection of human health.
	Conventional Health and Safety	Vision 2010 and PHCF employees and contractors	Workers may be exposed to conventional (i.e., non-radiological) contaminants and from risk associated with Vision 2010 Project works and activities while performing some their tasks. Protection of human health.
Geology and Hydrogeology	Geology	Bedrock geology and stratigraphy	Pathway to VECs.
	Hydrogeology	Groundwater quality	Pathway to VECs. Receiving water is Lake Ontario; changes to groundwater could affect members of the public or aquatic wildlife.
	Soil	Local soil quality	Pathway to VECs.

Environmental Components	Sub-components	Relevant VECs	Rationale
Hydrology and Surface Water	Hydrology	Nearest resident or recreational user	The Municipality uses the waterfront, river and lake for a variety of recreational uses. Protection of human health.
Hydrology and Surface Water	Surface Water Quality and Quantity	Nearest resident or recreational user	Humans that could be potentially exposed to stressors produced by the Vision 2010 Project works and activities during the demolition, site remediation and construction phase. In addition, the Municipality obtains drinking water from Lake Ontario. Protection of human health.
	Sediment Quality	Virile Crayfish	Widespread and abundant crayfish in Ontario found in the vicinity of the Vision 2010 Project site.
Aquatic Environment	Aquatic Habitat and Species	Smallmouth bass	Aquatic species that could be potentially exposed to stressors produced by the Vision 2010 works and activities. Protection of ecological health during various project phases.
		White Sucker	
		Spottail Shiner	
		Floating-leaf Pondweed	
Terrestrial Environment	Vegetation Communities and Species	Wormwood gravel beach community	Protection of ecological health.
	Wildlife Communities and Species	Earthworm	Terrestrial species that could be potentially exposed to stressors produced by the Vision 2010 Project works and activities.
		Northern Leopard Frog	
		American Robin	
		Double crested Cormorant	
		Lesser Scaup	
		Meadow vole	
		Eastern Cottontail	
		Red fox	

Environmental Components	Sub-components	Relevant VECs	Rationale
Land Use and Transportation	Landscape and Visual Setting	Visual appearance of Cameco PHCF	Vision 2010 may affect the quality of the landscape and visual setting of the waterfront.
	Transportation	Traffic	Vision 2010 Project works and activities may change traffic volumes and patterns.
Physical and Cultural Resources[1]	Archaeological Sites	Prehistoric heritage resources	Potential to affect physical and cultural resources during Vision 2010 Project works and activities.
	Heritage Resources	Heritage resources	A proposed Project option is to permanently remove physical and non-designated cultural heritage resources on the Centre Pier.
	Cultural Landscape Resources	Cultural resources	A proposed Project option is to permanently remove physical and non-designated cultural heritage resources on the Centre Pier.
Socio-economic Conditions[1]	Population and Economic Base	Business activity	Vision 2010 works and activities may affect various aspects of the local economic community.
		Community-wide population levels	
		Direct, indirect and induced employment	
		Tourism levels	Tourist activities, businesses and events may be susceptible to the nuisance effects of Vision 2010 related traffic and changes in public attitudes.
		Property levels	Changes in property values may affect existing and prospective property owners as a result of Vision 2010.
	Community Infrastructure	Use of landfill and recycling facilities	Appropriate materials may be sent to a local landfill or recycling facility.
		Use of storm sewers and sanitary sewers	Potential to contribute additional volumes and / or contaminants to the storm and / or sanitary sewers and additional loading at the Sewage Treatment Plant; management of stormwater from the PHCF.
		Water supply system	Ensure the isolation of the Cameco operations from the Municipal water distribution system. Potential to disrupt the operations of the water distribution services with the relocation of the facility.
	Community Services	Recreation and community features/resource use	Recreational features and activities conducted by residents and visitors may be affected by Vision 2010 related nuisance effects and changes in public attitudes. Vision 2010 may also affect the attractiveness of existing features or directly/indirectly to the creation of new features or opportunities.

Environmental Components	Sub-components	Relevant VECs	Rationale
	Residents and Communities	Use and enjoyment of property	People's use and enjoyment of their property may be susceptible to the temporary nuisance effects arising from Vision 2010 works and activities and changes in public attitudes.
		Community/Neighbourhood Character	The distinctive or unique qualities of the community give a community or neighbourhood its character.
Aboriginal Interests	Aboriginal Communities	Employment and business interests	Potential for construction jobs and business opportunities for Aboriginal workers/businesses.
	Traditional Land and Resource Use	Aboriginal and treaty rights	Potential to affect archaeological resources during the remediation and construction phases of the Vision 2010 Project.

1 These effects were assessed in terms of "indirect effects" in accordance with CEA Act section 2(1)(b)(i and ii).

4.3.2 Spatial and Temporal Boundaries

4.3.2.1 Temporal boundaries

The temporal boundaries define the time periods for which likely environmental effects were considered in the assessment. The temporal boundaries for Vision 2010 were determined to be as follows:

- 2013-2018: transfer of stored wastes, site excavation and demolition activities
- 2013-2019: construction activities
- 2020-2050: ongoing operations to point of decommissioning
- 2051-2055: decommissioning

4.3.2.2 Spatial Boundaries

The geographical extent(s) within which potential direct environmental effects will be considered were defined by the spatial boundaries of the EA study and are described in the following subsections.

4.3.2.2.1 Regional Study Area

The regional study area (RSA) has been defined as the area within which there is the potential for cumulative and socio-economic effects [19]. Specifically, it has been defined as Northumberland County and extends to the west to include the Municipality of Port Hope. Northumberland County includes the Municipality of Port Hope, Hamilton Township, Town of Cobourg, Alnwick/Haldimand Township, Cramahe Township, Municipality of Trent Hills and Municipality of Brighton.

4.3.2.2.2 Local Study Area

The local study area (LSA) is defined as the area outside the site study area boundary where there is reasonable potential for direct effects due to either Vision 2010 Project activities or possible abnormal operating conditions [19]. Lands within Ward 1 and a southern part of Ward 2 of the Municipality of Port Hope as well as the portion of Lake Ontario abutting the PHCF are included in the LSA. The area encompassed by the transport route to Highway 401 and the LTWMF are also included in the LSA.

4.3.2.2.3 Site Study Area

The site study area (SSA) includes the licensed area of the PHCF (the main site, Centre Pier and Dorset Street warehouses).

5.0 PROJECT ALTERNATIVES

A comprehensive study must include alternatives means to carrying out the project, as per section 16 of the CEA Act. Under the CEA Act, the consideration of these alternatives requires an environmental effects assessment of alternative means. The selection criteria used to identify a preferred alternative must include environmental factors and may include economic, technical and social factors. Cameco considers that the potential alternative means of carrying out the redevelopment of the PHCF site that are technically and economically feasible are broadly limited to the four Master Plan options that were identified through the master plan development process carried out in 2005.

The Commission strongly recommended at the August 2009 hearing that Cameco include the Centre Pier buildings within the scope of the EA for Vision 2010. On January 20, 2010, Cameco announced the inclusion of the Centre Pier building to the list of buildings to be included in the Vision 2010 Project.

5.1 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

The four Master Plan options were developed by Cameco using an iterative design process based on a series of user-group meetings and site inspections. The community was consulted on the four Master Plan options (table 5.1-1). The four Master Plan options represent a variety of unique approaches for carrying out the Project and encompass a wide range of redevelopment. Since the initial master plan process was completed, Cameco worked further to refine the preferred option in response to internal and external influences and events (section 5.1.3).

5.1.1 Description of Alternative Means of Carrying out the Project

The proposed location of the Research Centre and Technical Services building, storage facilities, receiving and parking areas vary for each option. Various other aspects of the Project such as location of new buildings, external and public roads, and proposed green space, have also been identified.

All four options have the facilities for scrap metal cleaning, potassium hydroxide unloading, and wastewater treatment. In addition, expanded maintenance areas would be moved to new facilities adjacent to Building 50. Table 5.1-1 summarizes the main highlights of each option considered.

5.1.2 Selection of a Preferred Alternative Means

The Master Plan options were subject to an issue-by-issue comparative evaluation to select a preferred alternative for the Vision 2010 Project. The following criteria, which were based on the goals and objectives of site redevelopment, were considered in the evaluation process.

Site plan arrangements and adjacencies

The options were compared both from the perspective of improving on-site adjacencies and interactions at the PHCF, as well as the enhancements to the facilities aesthetics.

Operational considerations

Each option was evaluated from the perspective of potential impacts to specific on-site operations at the PHCF. Key issues, such as cylinder storage, drum storage, gamma shine implications and site services were identified to assess the various options.

Environmental considerations

A number of environmental issues associated with the PHCF were identified for the assessment.

On-site traffic flows and management

This criterion involved a consideration of potential improvements to on-site traffic flow, routes and movements in order to increase safety and security for staff, contractors and the public.

Site remediation considerations

The rebuilding of certain operational facilities at the PHCF, possible implications to site remediation requirements were considered.

Implementation sequencing

This criterion involved a consideration of the ease of sequencing the works and activities associated with the Vision 2010 Project.

Table 5.1-1 provides an overall comparative analysis of options based on the criteria listed above. The bolded options represent the preferred option for a particular criterion. Option A was the preferred Master Plan option because it was considered to provide the most benefits and least shortcomings, relative to other options.

Table 5.1-1 Overall Comparative Analysis of Master Plan Design Concepts

Key Component	Components considered	Option A	Option B	Option C	Option D
Site Plan Arrangements and Adjacencies	Land transfer and increase in publicly available land	**Land transfer offers most public areas along waterfront.**	Land transfer but only somewhat increased access along the waterfront.	No land transfer and no improvement to public access to western side of turning basin and approach channel.	No land transfer and no improvement to public access to western side of turning basin and approach channel.
	New road for public use	**Yes.**	**Yes.**	**Yes.**	**Yes.**
	Research Centre and Technical Services	Centrally located with indoor access from the administration building and the UF_6 plant.	Centrally located with indoor access from the administration building and the UF_6.	Centrally located with indoor access from the UF_6 plant.	Centrally located with indoor access from the UF_6 plant.
	UF_6 cylinder storage	**Stacked storage in designated building, freeing up lands for landscaping and public use around west side of inner basin; increased efficiency for Cameco.**	Outdoors, requires considerably more land than Option A; thus, less land available for public / landscaping.	Outdoors, requires considerably more land than Option A; thus, less land available for public / landscaping.	Outdoors, requires considerably more land than Option A; thus, less land available for public / landscaping. Storage area separated from rest of facility by public roads.
	Drum storage	New building proposed, located near UO_2 plant for indoor storage. Common to all options			
	Receiving and Stores	**New building to the south of the facility with improved staging for vehicles waiting to enter the site.**	New building at north end of site.	Now new building expansion of existing Building 45.	New building at north end of site.

Key Component	Components considered	Option A	Option B	Option C	Option D
Operational Considerations	Cylinder storage	**Allocation of specific space near the entrance to the filling area (Building 50). New storage building provides indoor handling.**	Allocation of specific space near the entrance to the filling area (Building 50). Outdoor gravel area for cylinder storage.	Outdoor gravel area for cylinder storage.	Allocation of specific space, separated from the rest of the facility by public roadways. Handling vehicles would require special snow clearing provisions.
	Drum storage	Allocation of space for drum storage in close proximity to the UO_2 plant (the principal use) is common for all Options.			
	Worker radiation exposure	**Provision of an enclosed building for cylinder storage will reduce casual radiation exposures to workers.**	Cylinder storage remains outdoors.	Cylinder storage remains outdoors	Cylinder storage remains outdoors
	Public Radiation exposure	**Provision of an enclosed building for cylinder storage will benefit gamma radiation exposure.**	Cylinder storage remains outdoors.	Cylinder storage remains outdoors.	Cylinder storage remains outdoors.
	Site services	Most involved			**Least complicated.**
	Snow disposal	**More flexibility with respect to stockpiling.**	**More flexibility with respect to stockpiling.**	Some additional areas for stockpiling.	Some additional areas for stockpiling.
	Pedestrian traffic	**Greatest use of overhead walkway provides an improvement to existing conditions.**	Parking lot pedestrian safety is improved. Some use of overhead walkways.	Limited use of overhead walkways. Public roads remain between employee parking lot and main site.	Parking lot pedestrian safety is improved. Some use of overhead walkways. Public road between cylinder storage are and main site.

Key Component	Components considered	Option A	Option B	Option C	Option D
Environmental Considerations	Air quality management	The source of dust is roughly equivalent for all Options			
	Noise control	**Cylinder storage and noise-generating lift truck operation is moved indoors thereby reducing noise.**	Cylinder storage and handling remains outdoors; no reduction in noise generation.	Cylinder storage and handling remains outdoors; no reduction in noise generation	Cylinder storage and handling remains outdoors; no reduction in noise generation
	Minimization of public radiation exposure	**Provision of indoor storage of cylinders will reduce the potential for public radiation exposure.**	No indoor cylinder storage.	No indoor cylinder storage.	No indoor cylinder storage.
	Stormwater management	Similar approach to stormwater for all options.			
On-Site Traffic Flows and Management		**Least complex. Single truck access point. Best staging area for vehicles arriving at facility**.	Limited staging area for arriving trucks, but least use of access road to the beach area.	Access points similar to existing arrangement. Somewhat more complex on-site traffic management.	Difficult on-site traffic management. More traffic on public roadway. Most access points required.
Site Remediation Considerations		Equal. All of the options have similar amounts of proposed remediation work.			
Implementation Sequencing		Land ownership transfer with Port Hope may ease logistical requirements during construction and demolition.	Land ownership transfer with Port Hope may ease logistical requirements during construction and demolition	**Building 45 will not be demolished reducing complexity. Liquid hydrogen tanks are not moved**.	No land ownership transfer with Port Hope and significant relocation of cylinder storage are may significantly complicate implementation.
Overall ranking		**Most preferred.**			

5.1.3 Refinement of the Preferred Option

As a result of a number of events and the economic downturn in 2009, the preferred option from the Master Plan process had to be revised. Option A of the Master Plan process was no longer economically viable. A new scenario, the base case, was developed based on a refinement of Option A. Table 5.1-2 compares Option A from the Master Plan process and the Refined Option. The Refined Option for Vision 2010 was carried forward and was evaluated in this EIS.

Table 5.1-2 Comparison of Option A with the Refined Option

Criterion	Option A	Refined Option
Site Plan Arrangements and Adjacencies	Land transfer resulting in improved public areas long waterfront.	Not included.
	Centrally located Research Centre and Technical Services building with indoor access to the administration building and Building 50.	Centrally located Research Centre and Technical Service Building with close proximity to the administration building.
	New building to the south of the facility with improved staging for vehicles waiting to enter the site.	Not included.
	Inclusion of a Visitor Centre.	Visitor Centre not included.
Operational Considerations	New building for UF_6 cylinder storage.	Outdoor UF_6 cylinder storage.
	Site layout will provide more flexibility for snow stockpiling and the greatest use of overhead walkways.	Open space for stockpiling and staging activities.
		Overhead walkways not included.
Environmental Considerations	Provision of a new building for UF_6 cylinder storage should result in reduced noise and minimization of public radiation exposure.	Barriers provided to further control public radiation exposure as a result of outdoor UF_6 cylinder storage.
	Improved stormwater network.	Improvements to stormwater management similar to Option A.
On-site Traffic Flows and Management	Single truck access point, from main gate location towards the southern portion of the site.	
Site Remediation Considerations	Extensive remediation of historical contamination found on the PHCF site including contaminated soil and buildings. Disposal of approximately 150,000 m^3 of waste materials at the LTWMF.	
Implementation Sequencing	Land acquisition/easement with Municipality will optimize implementation sequencing	

6.0 CONSULTATION

In accordance with CEA Act, the CNSC has ensured that public participation as required for comprehensive studies was conducted.

The Crown also has a duty to consult, and where appropriate accommodate, when it has knowledge that its proposed conduct might adversely impact a potential or established Aboriginal or treaty right.

Cameco and CNSC consulted with the public and First Nation and Métis groups to provide information on the Vision 2010 Project. The following sections describe the consultation activities undertaken with the public, First Nation and Métis groups led by Cameco and the CNSC.

6.1 CAMECO LED PUBLIC PARTICIPATION

6.1.1 Cameco led Public Participation Activities

The public consultation program for Vision 2010 was initiated in the fall of 2005, approximately two and half years before the start of the EA for the Project. *Cameco Vision 2010: Connecting with Port Hope's Future* was a consultation and communication program initiated by Cameco and designed and conducted by AECOM. Between September 2005 and March 2006, AECOM implemented a series of community engagement and communication activities. AECOM further assisted Cameco in carrying out public participation activities for the EA study between 2007 and 2010. Objectives of the public consultation program included:

- encouraging wide public participation by providing multiple avenues and opportunities for input
- communicating the Project's objectives, EA process, and consultation feedback to stakeholders
- keeping key stakeholders such as regulators, local elected officials/staff, First Nation groups, community and business leaders, and local environmental groups informed about project developments

Public consultation activities included traditional open houses, web content, a 1-800 information line, newspaper/radio notifications, newsletters, public opinion polls and a committee comprising stakeholders, called the Stakeholder Liaison Committee (SLC). The SLC acted in an advisory role throughout the EA process. Cameco designed the public consultation program to be as accessible as possible for interested parties in local governments, First Nations and Métis communities, neighbours and the general public, the business community, non-governmental organizations, media groups and other stakeholders.

6.1.2 Stakeholder Comments and Issues

Very few written comments were received by Cameco during the Vision 2010 EA. However, verbal input was received from stakeholders through three community Open Houses and SLC meetings. The recurring topic raised by stakeholders during SLC and Open Houses was Port Hope's waterfront and how the Vision 2010 Project fits with the PHAI and

the Municipality's Waterfront Master Plan. The redevelopment of Port Hope's waterfront is beyond the scope of the Vision 2010 Project. Other comments and suggestions were included in Cameco's plans:

- adding more green space
- incorporating naturalized features around the site
- increasing the attractiveness of buildings
- using sustainable design features in new buildings

6.2 CNSC-LED PUBLIC PARTICIPATION

6.2.1 Public Participation under the *Canadian Environmental Assessment Act*

A public registry for the environmental assessment has been established including identification of the Project assessment on the CEAR. The CEAR can be accessed on the CEA Agency website (*ceaa.gc.ca*) using the CEAR reference number for the Project: 06-03-22672. The CNSC also maintains a webpage (*nuclearsafety.ca*) detailing the status of the Vision 2010 EA process.

The CNSC is responsible for determining the need for and level of public participation for the Project, in accordance with section 21of the CEA Act. The following public participation activities were identified as appropriate for the Project:

- posting notice of commencement of the EA on both the CNSC website and the CEAR
- posting notice of availability of Project-Specific Guidelines, for public comment
- holding a public hearing on scope and track of environmental assessment on November 6, 2008
- posting notice of availability of Draft EIS and allowing minimum 30-day comment period

6.2.2 Public Participation in the Comprehensive Study

The federal Participant Funding Program (PFP) is designed to promote public participation in the evaluation and review process of projects that are subject to an EA. This program is administered by the CEA Agency and funding opportunities were offered to assist in the participation in the review of the EIS or the CSR.

On March 27, 2009, the CEA Agency awarded $34,000 in participant funding to 3 applicants – Families Against Radiation Exposure (FARE), Lake Ontario Waterkeepers (LOW) and the Port Hope Community Health Concerns Committee (PHCHCC). The funding was awarded to support the applicant's participation in the EA process for Cameco's Vision 2010 Project. An additional $10,000 in participant funding through the CEA Agency was announced on November 3, 2010. The additional funding was awarded to The Pier Group and the LOW on February 10, 2010.

A 37-day public comment period (March 5 – April 11, 2008) on the Draft Guideline-Scoping Document was organized by the CNSC and the CEA Agency. Concurrently, an invitation for public comments was posted on the CEAR website, and advertisements were placed in the following newspapers:

- Windspeaker – Canada's National Aboriginal News Source
- Northumberland News – Community Newspaper (Port Hope and Cobourg)
- The Peterborough Examiner
- Port Hope Evening Guide
- Cobourg Daily Star
- Le Métropolitain (Toronto)

The notices requested that the public provide comments on the EA Guidelines document to the CNSC by April 11, 2008. The notices also provided details concerning how to access the document, and how to provide feedback (e.g., by e-mail, by regular mail, by phone, and by fax).

The EA Guidelines document was made available at two libraries in Port Hope, a library in Cobourg, and online on the CEAR. It was also mailed directly to 13 stakeholder groups and/or stakeholders, including the Municipality of Port Hope.

The proponent also hosted a public consultation meeting on the Project and the EA Process where CNSC and the CEA Agency were available to answer questions from the public regarding the public consultation on the EA Guidelines. This meeting was held in Port Hope on March 19, 2008. On November 6, 2008 a public one-day hearing was held at the CNSC to consider the EA track report and the proposed EA guidelines. The public was invited to submit written comments or to make oral interventions as part of the CNSC's hearing process.

6.2.3 Public Comments and Issues

Cameco's Draft EIS was available for public comment from March 7, 2011 until June 15, 2011. The LOW and the Pier Group provided detailed comments on Cameco's proposed Vision 2010 Project during the comment period on the Cameco's Draft EIS [20], [21].

The Draft CSR was subject to a 30-day public review. The review period commenced on September 22, 2011, the same day a CNSC public Open House was held in Port Hope. At the Open House, the public had the opportunity to question CNSC staff on the technical aspects of the Project on the EA process. Comments were received from the Municipality of Port Hope and 5 members of the public. Responses to the issues raised in these submissions can be found in appendix B. The key areas of concern expressed by the public were:

- the quantity of decommissioning waste and coordination with the PHAI
- exposure to members of the public and workers
- clean-up criteria
- the assessment of the Centre Pier during the comprehensive study

The CSR was revised based on comments received from the public. The public may also comment on the revised CSR during CEA Agency initiated public comment period.

6.3 ABORIGINAL CONSULTATION

Early in the review process, the CNSC conducted research that lead to a preliminary list of Aboriginal groups that may have an interest in the Project. A distribution list was created and included the following Aboriginal groups and organizations:

- Alderville First Nation
- Hiawatha First Nation
- Mississaugas of Scugog Island First Nation
- Curve Lake First Nation
- Chippewas of Georgina Island First Nation
- Mississaugas of the New Credit First Nation
- Mohawks of the Bay of Quinte First Nation
- Union of Ontario Indians First Nation

In April 2010, the Métis Nation of Ontario (MNO) was identified as having a potential interest in the Project and were then added to the distribution list and provided with the relevant information.

Information on the preliminary identification of Aboriginal groups came from various sources such as:

- information provided by the proponent with respect to their Aboriginal engagement program (for this and other projects in the region)
- independent research conducted by CNSC and other federal departments, with support from Aboriginal Affairs and Northern Development Canada
- research on treaties in the project area
- relevant information from previous consultations

The identified groups and organizations were informed of the Project, the regulatory review and Aboriginal consultation processes. Letters (and where appropriate, follow-up phone calls) were sent out at key points in the process such as:

- notification of the Project, including the Project description
- public review period of the EIS Guidelines
- CNSC Public Hearing on scope and track of the EA
- changes to the Project, such as inclusion of the Centre Pier
- Participant Funding Program administered by the CEA Agency
- notification of receipt of Cameco's Draft EIS
- an Open House hosted by the CNSC in Port Hope
- review of the Draft CSR

None of the Aboriginal groups or organizations requested participant funding to participate in the review, nor have any raised concerns with the Project or identified any adverse impacts that this proposed Project may have on any potential or established Aboriginal or treaty rights.

To ensure that the CNSC upholds the honour of the Crown prior to making a decision that may cause adverse impacts to potential or established Aboriginal or treaty rights, Aboriginal consultation will continue through the remainder of the EA including the CEA Agency initiated public comment period on the Proposed CSR and through the subsequent licensing review process.

7.0 EXISTING ENVIRONMENT

7.1 ATMOSPHERIC ENVIRONMENT

7.1.1 Spatial Boundaries

The Regional Study Area (RSA) for the atmospheric environment extends from Oshawa in the west, Belleville in the East and Peterborough to the north. The Local Study Area (LSA) and Site Study Area (SSA) are consistent with the general spatial boundaries described for Vision 2010 (section 4.3.2.2).

7.1.2 Climate and Meteorology

This section describes climate and meteorological data from established stations in the RSA. The climate in Port Hope is characterized by hot humid summers and cold winters with moderate precipitation. The local climate is influenced by Lake Ontario and the Oak Ridges Moraine which moderate temperatures and influence local precipitation.

Temperature

The monitoring stations in the LSA and RSA have similar mean temperatures based on the 30-year monitoring period. The mean annual temperature in Port Hope (from 1971-1992) is 7.4°C. The mean daily temperatures are below 0°C from December through March. The coldest month is January with mean daily temperatures of approximately -5.8°C [22].

Precipitation

Precipitation is consistent throughout the year with slightly more precipitation in the second half of the year. Measurable precipitation occurred on an average of 128 days at Port Hope (1971 – 1992). Port Hope reports an average annual precipitation of approximately 832 mm, of which approximately 85% is rain [22].

Speed and Direction

The prevailing wind directions are east-west with a northwest component. The annual average wind speed is 3.5 m/s.

7.1.3 Air Quality

Uranium, ammonia and hydrogen fluoride are the primary releases to air at the PHCF. Most components used to define the air quality in the Port Hope area do not differ substantially from the general air quality in southern Ontario and the Greater Toronto Area (GTA). These components include: carbon monoxide, nitrogen oxide (NO) and other oxides of nitrogen (NO_x), volatile organic compounds (VOCs), sulphur dioxide (SO_2) and Total Suspended Particulate (TSP). The Vision 2010 Project activities will not contribute measurably to smog, acid rain, CO_2, SO_x and VOCs.

Air Quality Regulations

The Ontario Ministry of the Environment (MOE) point of impingement standards (POI – ½ hour average time frame) and ambient air quality criteria (AAQC – 24 hour and annual average) were used in this assessment. Table 7.1-1 summarizes the standards and criteria that were used.

Table 7.1-1 Applicable Air Quality Criteria

Parameter	MOE 1 hour Average Standard ($\mu g/m^3$)	MOE 24 hour Average Standard ($\mu g/m^3$)	MOE Annual Average Standard ($\mu g/m^3$)	Annual Average National Air Quality Objectives ($\mu g/m^3$)
Uranium	NA	-	0.03[a]	NA
NO_x (as NO_2	400	200[b]	NA	60[b,c], 100[b,d]
Total Suspended Particulate (TSP)	-	120	NA	-
Particulate Matter < 10 µm (PM_{10})	-	50[e]	-	-
Particulate Matter < 2.5 µm ($PM_{2.5}$)	-	30[f]	-	60
SO_2	690	275	-	-
Acrolein	-	0.4[g]	-	-
Arsenic	-	0.3	-	-
Manganese	-	2.5	-	-
Ammonia	-	100	-	-
Fluoride (as HF) (growing season)	-	0.86	-	-

Source MOE [23] and Environment Canada [24]

a. MOE (2011) *Ontario Air Standards for Uranium and Uranium Compounds* [25]contains a uranium in air standard of 0.03 $\mu g/m^3$ (in the PM_{10} size fraction) based on an annual averaging time. There is a five year phase in period for this standard

b. As NO_2

c. Maximum desirable level

d. Maximum acceptable level

e. Interim value

f. CCME CWS – 98th percentile over 3 years (CCME 2000)

g. Ontario Ministry of the Environment [24]

NA. Not Available

7.1.3.1 Air Quality (non-radiological)

Background concentrations for uranium, NO_2, TSP, PM_{10} and $PM_{2.5}$ are summarized in table 4-7 of appendix C of Cameco's EIS. These background concentrations were added to all model predictions.

Particulate Matter – Total Suspended Particulates

Total Suspended Particulate measurements for the RSA are available for 1976-1994; there is no available data for the RSA after 1994 because particulate monitoring shifted to finer particulate matter, namely particulate matter <2.5 μm in diameter. The TSP concentrations for Bowmanville were only available for 1994 and are lower than the concentrations for Oshawa and Peterborough. The geometric mean TSP concentrations for Oshawa and Peterborough varied between 35 and 60 $\mu m/m^3$. For most years, the geometric mean TSP is below the annual AAQC of 60 $\mu g/m^3$ [26].

Measurements of TSP within the LSA and SSA indicated that background levels are approximately 25 $\mu g/m^3$ (annual average) with a 90th percentile 24-hour average concentration of 39 $\mu g/m^3$.

Particulate Matter – PM10 and PM2.5

An existing database was used for the development of the baseline condition. In this case, the data from the PHAI was used to determine the background air concentrations. Only very limited PM_{10} data is available, primarily for Peterborough. In 2000, the 90th percentile 24-hour average PM_{10} concentration was 28 $\mu g/m^3$, with an annual average concentration of 14 $\mu g/m^3$. The annual average $PM_{2.5}$ measurement in Peterborough and Belleville for 2004 through 2008 is 6.4 $\mu g/m^3$, with a 90th percentile 24-hour average $PM_{2.5}$ concentration of approximately 15 $\mu g/m^3$.

PM_{10} concentrations in the LSA and SSA are approximately 13 $\mu g/m^3$ (annual average) with a 90th percentile 24-hour average concentration of approximately 21 $\mu g/m^3$. $PM_{2.5}$ concentrations in the same area are approximately 6.5 $\mu g/m^3$ (annual average) with a 90th percentile 24-hour average concentration of approximately 15 $\mu g/m^3$.

Uranium

The background uranium air concentrations throughout the RSA is 6×10^{-5} $\mu g/m^3$ [27]. A background value of 1×10^{-4} $\mu g/m^3$ has also been considered based on measurements in southwestern Ontario. The uranium concentrations are mainly attributable to naturally-occurring uranium from re-suspended soil.

The primary source of uranium in air in Port Hope is the PHCF. As a result, uranium concentrations decrease with increasing distance from the facility. Cameco measures uranium-in-air concentrations at several locations near the facility as part of their ongoing environmental monitoring program. Since 1982, there has been a substantial decrease in uranium-in-air concentrations in the SSA and LSA. Table 7.1-2 summarizes the uranium-in-air concentrations at various Cameco monitoring locations.

Table 7.1-2 Summary of Uranium-in Air Concentrations (µg/m^3) at Cameco Monitoring Locations (2004-2009)[a]

Location	Minimum Annual Average	Maximum Annual Average	Maximum 24-hour
Canadian Tire[b]	0.0021	0.0029	0.080
Shuter Street	0.0019	0.0040	0.110
Waterworks	0.0028	0.0075	0.2222[c]

a. The MOE uranium in air criteria is under development.

b. Monitoring station decommission in mid 2005.

c. The maximum air concentrations were recorded in September 2008. The second highest 24-hour average U in air concentration at the Municipal Waterworks location, since 2000 was 0.134 µg/m^3.

Uranium-in-air was measured further afield from the PHCF as part of the PHAI in 2002 and 2003. These concentrations were measured by Health Canada in Oshawa and are generally considered background levels (i.e., concentrations that are not influenced by PHCF operations).

Table 7.1-3 Summary of Uranium-in-Air Concentrations (µg/m^3) at PHAI Monitoring Locations (2002-2003)

Location	Annual Average (µg/m^3)	Maximum 24-Hour Average (µg/m^3)
Welcome Station	0.00008	0.00025
Jack Burger Sports Complex	0.00028	0.00087
Brewery Pond East	0.00021	0.00066
PHAI Office (Mill Street)	0.00016	0.00057

Nitrogen Oxides

Concentrations of NO_2 in the LSA/SSA are dominated by contributions from local and regional sources (i.e., Highway 401). Measured concentrations from Peterborough and Belleville between 2004 and 2008 were used to characterize the background concentrations in the Port Hope area. The NO_2 concentrations from Peterborough and Belleville are 15 µg/m^3 (annual average). The 90th percentile NO_2 concentrations on a 24-hour and 1-hour basis are approximately 27 µg/m^3 and 33 µg/m^3, respectively.

Ammonia

No ambient ammonia measurements for southern Ontario were available from either the Ontario Ministry of Environment or Environment Canada.

The MOE Report Ontario Air Standards for Ammonia [28] states that typical levels of ammonia in urban and non-urban sites are in the order of 20 and 5 µg/m^3 respectively; these values are based on levels provided by World Health Organisation (WHO).

7.1.4 Noise

7.1.4.1 Sound/Noise Descriptors

The existing sound environment in the area directly adjacent to the PHCF is characterized by road traffic, rail traffic, activities at the pier, waves breaking along the north shore of Lake Ontario, sounds of nature, and domestic noises. The road traffic noise is continuous and the train noise, though intermittent, is relatively frequent. The wave noise on the shores of Lake Ontario is quite consistent but varies in intensity depending on wind conditions.

7.1.4.2. Ambient Noise Monitoring

Prior to the Vision 2010 Project, between 2002 and 2004, a large scale ambient noise monitoring program was carried out in Port Hope, Welcome and Port Granby as part of the PHAI project. In addition, a continuous ambient noise monitoring program was conducted in August 2010 at two residential locations in the vicinity of the site study area. The data show that the 24-hour day-night level (DNL) sound levels at most of the selected receptors were in excess of 60 dBA. These results reflect the urban nature of Port Hope and the general elevated existing ambient sound levels.

7.2 RADIATION AND RADIOACTIVITY

7.2.1 Regulatory Limits and Evaluation Criteria

7.2.1.1 Regulatory Limits

Atmospheric, Terrestrial, Aquatic and Hydrogeologic Environments

There are no regulations that directly limit radionuclide concentrations in the atmospheric, terrestrial, aquatic and hydrogeologic environments. Radionuclide concentrations in these environments are indirectly constrained by the dose limits for members of the public. Therefore public dose estimates must include exposures from all pathways.

Dose Limits to Members of the Public

Regulations under the NSCA specify regulatory limits on radiation doses to members of the public. Regulatory limits on the radiation dose to members of the public apply to the sum of doses received by all pathways such as air, water and direct radiation from licensed nuclear activities. Doses from background radiation are excluded.

Regulatory limits on the dose from ionizing radiation to the public and workers who are not designated as nuclear energy workers (NEWs) are:

- effective dose – 1 mSv per calendar year
- equivalent dose – 15 mSv to lens of the eye, 50 mSv to skin and 50 mSv to hands and feet per calendar year

The CNSC, as the agency responsible for the regulation of nuclear facilities under the NSCA, also requires licensees to keep doses as low as reasonably achievable (ALARA) taking into account social and economic factors.

Dose Limits to Nuclear Energy Workers

The regulatory limits on radiation doses to NEWs are as follows [29]:

- effective dose – 50 mSv per one-year dosimetry period and 100 mSv per five-year dosimetry period
- equivalent dose – 150 mSv to lens of the eye, 500 mSv to skin and 500 mSv to hand and feet per one-year dosimetry period
- effective dose to pregnant NEWs during the balance of a pregnancy after it has been declared to the licensee – 4 mSv

7.2.1.2 Cameco's Internal Targets

Action Levels, administration levels, operating release levels (ORLs) and derived release limits (DRLs) are used by Cameco to control and monitor radiation doses and radioactivity releases [1]. Cameco uses external dosimetry, lung counting and urinalysis to ascertain doses to its workers.

Contract workers are not permitted to enter radioactive work areas if they are on the premises to perform non-radiological work. These workers are subject to the non-NEW annual dose limit of 1 mSv/y. Contract workers who are on the premises to perform radiological work are NEWs. These contract workers are trained and are subject to the appropriate regulatory limits.

All workers (NEWs and non-NEWs) are required to declare their pregnancy as soon as it becomes known. Visitors on tour at the PHCF will always be escorted by qualified Cameco staff, will follow pre-approved routes, and will not be allowed in areas where potentially hazardous activities are carried out.

Derived Release Limits and Operating Release Levels

Cameco has calculated DRLs to facilitate the control and limitation of radioactivity releases to air and water [30]. The methodology has been approved by the CNSC. A DRL is estimated to determine the releases that would result in a dose to a reasonably maximally exposed member of the public equal to the regulatory limit of 1 mSv/y [29]. The maximally exposed individual is a member of a small group that has doses higher than a typical member of the public due to location, lifestyle and consumption patterns.

The risk assessment for this Project is similar to that done for the calculation of the DRLs described above but includes additional receptors and contaminants to reflect the Vision 2010 Project work and activities.

Cameco has recently updated the DRLs, however since the differences between the previous and updated values are very small, the previous values [30] remain in the operating licence. The DRLs are calculated using site-specific pathway models and parameter values. Updated DRLs are summarized in table 7.2-1.

Table 7.2-1 Updated DRLs for PHCF and Dorset Street East Site

Emission	Receptor	Age Class	Units	DRL
Air Metals Plant	Resident – Mill Street	Toddler	kg U/y	9,700
Waste Recovery/North UO_2 Plant	Resident – Alexander Street	Toddler	kg U/y	7,200
South UO_2 Plant	Resident – Alexander Street	Toddler	kg U/y	22,000
West UF_6 Plant	Resident – Alexander Street	Toddler	kg U/y	21,000
Water	Nearby Resident	Adult	kg U/y	36,000
Gamma	Fenceline Walker	Adult	µSv/h	2.1
	Resident – Alexander Street	Toddler	µSv/h	4.4
	Resident – Mill Street	Toddler	µSv/h	0.78
Dorset Street East Site				
Gamma	Resident – Near Warehouse	Toddler	µSv/h	0.61

Cameco has also developed Operating Release Levels (ORL) for PHCF, which have been adopted as licence limits in the current CNSC licence for the facility [31]. The ORL is based on releases of uranium to the environment and on direct external gamma radiation dose rates and ensure that doses to the public are kept well below the public dose limit of 1 mSv/y. The ORL is based on an annual maximum dose of 0.3 mSv to the public. It should be noted that Cameco has recently updated the ORLs [32]. However, since the differences between the existing and updated ORLs are small, the existing values in the licence continue to be used. The current and updated ORLs are provided in table 7.2-2 .

Table 7.2-2 Operating Release Levels (ORLs) for PHCF

Source	Current Licence	Updated ORL
	(kg U/h)	**(kg U/h)**
Air		
Metals	0.06	0.09
North UO_2	0.04	0.08
South UO_2	0.15	0.19
West UF_6	0.29	0.33
Water	0.24	0.20
	(µSv/h)	**(µSv/h)**
Gamma Radiation	0.14	0.32

ALARA Program

Cameco's ALARA program ensures that radiation exposures are maintained ALARA. The program includes implementing administrative and engineering controls and ensuring proper supervision of employees and contractors.

7.2.1.3 Evaluation Criteria

The existing radiation and radioactivity for the different environmental compartments was evaluated using the criteria listed in table 7.2-3.

Table 7.2-3 Criteria used in the Evaluation of Environment for Radiation and Radioactivity

Radiation and Radioactivity Sub-Component	Evaluation Criteria
Atmospheric Environment	▪ *Radiation Protection Regulations* [29] ▪ Variation in natural background levels[a]
Terrestrial Environment	▪ *Radiation Protection Regulations* [29] ▪ No-effect levels for doses to terrestrial biota (United Nations Scientific Committee on the Effect of Atomic Radiation [33] ▪ Variation in natural background levels[a]
Aquatic Environment	▪ *Radiation Protection Regulations* [29] ▪ No-effect levels for doses to aquatic biota ▪ Variation in natural background levels
Hydrogeology Environment	▪ Action Levels [1]
Members of the Public (including non-NEWs)	▪ *Radiation Protection Regulations* [29] ▪ Operating Release Level (ORL) [31] Updated ORL [32] ▪ Derived Release Limit (DRL) [30] Updated DRL [34] ▪ Variation in doses from natural background
Workers (NEWs)	▪ *Radiation Protection Regulations* [29] ▪ Action Levels [1]

a. They are not regulatory criteria, they were used for comparison

7.2.2 Atmospheric Environment

Cameco has an air quality monitoring program in place at PHCF, the results of which are reported in the annual compliance report [1]. Uranium is released from the normal operation and maintenance of the uranium processing plants at PHCF. The releases affect air quality in the SSA and the LSA.

The annual average release rates of uranium for each plant are small fractions of the DRLs and are below the corresponding Action Levels. The Action Levels are used to identify unusual and unexpected air emissions. Further, the annual average release rate of uranium for each plant represents only a small fraction of the ORL of 0.3 mSv/y (in 2009 less than 0.003 mSv/y) and has been consistent in previous years of monitoring.

7.2.3 Terrestrial Environment

7.2.3.1 Regional Study Area

Gamma radiation levels in the RSA are attributable to naturally occurring radioactivity in soil and rocks. Levels are elevated in some locations due to historic industrial activities.

Measurements in similar geological areas along the north shore of Lake Ontario to the west were used to estimate general gamma radiation levels throughout the RSA. The baseline gamma radiation levels in the RSA were estimated in the range of 2 to 5 μR/h based on measurements of nearby areas. A baseline gamma radiation level of 8 μR/h has been used for many years for estimating incremental gamma dose levels PHCF [34] and [30]. The background on-site at PHCF was set equal to 8 μR/h, as stated in the CNSC licence.

7.2.3.2 Local Study Area

Baseline gamma radiation levels in the LSA are described in relation to general background levels of the area and levels in the vicinity of industrial activities and waste management areas monitored by AECL. Prior to the remediation of properties in Port Hope, the average exposure rate, based on both indoor and outdoor measurements, was estimated at approximately 4.4 μR/h [35]. This average is consistent with the estimated baseline gamma levels in the RSA; however some areas had exposure rates exceeding 7 μR/h.

In 1988 and 1989, Health Canada reported average exposure rates of 8 to 13 μR/h throughout the LSA. Gamma dose rates at the security fences surrounding the site are continuously measured according to an established monitoring program approved by the CNSC to ensure that gamma radiation from the PHCF main site and Dorset Street East site remain low. The monthly dose rates at fenceline monitors (measured by thermoluminescent dosimeter **(**TLD)) vary month to month and are dependent on short-term variation in the amounts and locations of uranium stored at the sites. In 2009 the average dose rates varied from 5 to 440 μR/h, depending on the location.

7.2.3.3 Site Study Area

Gamma radiation levels are higher in the SSA than surrounding area because of gamma radiation from natural uranium in process equipment and shipping containers. Gamma radiation levels are increased in open areas in the south end of the SSA where UF_6 cylinders are stored and in the vicinity of trailers loaded with natural UO_2 for transit from the PHCF. Cameco monitors gamma radiation levels monthly. The monthly dose rates at fenceline monitors vary from month to month and are dependent on short-term variation in the amounts and locations of uranium stored at the sites. In 2009 the average dose rates varied from 0.05 to 4.4 μSv/h, depending on the location.

Fluorine-containing uranium compounds such as UF_6 produce neutrons in addition to gamma radiation. The neutrons are produced from a reaction between alpha particles emitted by uranium and fluorine. Cameco and the CNSC have evaluated potential doses from neutrons and concluded that no special restrictions on monitoring of workers working close to UF_6 cylinders are required [36]. Neutron radiation fields from the cylinders are measurable but relatively small compared to gamma fields and do not present an undue risk to members of the public. Therefore, separate monitoring of neutron radiation levels is not warranted.

7.2.4 Hydrology and Surface Water Quality

Cameco has a liquid effluent monitoring program at the PHCF with the results reported in the annual compliance report submitted to the CNSC. Table 7.2-4 provides the liquid effluent discharges and dose contributions from the liquid effluents to the ORL from 2002 to 2009. In 2006, CNSC requested that Cameco change the calculation of the net uranium load from monthly to daily average loading. The PHCF total net uranium loading increased from 0.005 g/h in 2005 to 0.851 g/h in 2006 as a result of this change. The contribution to the dose is a small fraction of the 0.3 mSv/y ORL (<0.001 mSv/y).

Table 7.2-4 Effluent Discharges and ORL Contribution to Water from the PHCF (2002-2009)

	Year	Average Flow Rate (m3/h)	Net Uranium Loading (g/h)	Approximate Dose (mSv/y)
Station $UO_2N/WR/WUF_6$	2002[a]	589	1.7	<0.001
	2003[a]	592	0	<0.001
	2004[a]	512	0	<0.001
	2005[a]	541	0.002	<0.001
	2006[a]	593	0.601	<0.001
	2007[b]	381	0.049	<0.001
	2008[c]	330	0.058	<0.001
	2009[c]	544	0.004	<0.001
	2010[c]	528	0.000	<0.001
Station UO_2	2002[a]	8	0	<0.001
	2003[a]	8	0	<0.001
	2004[a]	41	0.001	<0.001
	2005[a]	32	0.003	<0.001
	2006[a]	28	0.250	<0.001
	2007[b]	25	0.136	<0.001
	2008[c]	21	0.044	<0.001
	2009[c]	31	0.029	<0.001
	2010[c]	30	0.044	<0.001
PHCF Total	2002[a]	597	1.7	<0.001
	2003[a]	600	0	<0.001
	2004[a]	553	0.001	<0.001
	2005[a]	573	0.005	<0.001
	2006[a]	621	0.851	<0.001
	2007[b]	406	0.184	<0.001
	2008[c]	350	0.102	<0.001
	2009[c]	575	0.033	<0.001
	2010[c]	558	0.044	<0.001

a. Cameco [37]
b. Cameco [38]
c. Cameco [39]

7.2.5 Hydrogeology Environment

Groundwater wells on and around the PHCF site are monitored for a variety of contaminants and metals. The wells are sampled on a regular basis (monthly for pumping wells, quarterly for overburden wells and annually for bedrock wells) and provide information on how current operations affect groundwater at the facility. Each well has action levels to highlight potential deviations. Only those wells that have two or more consecutive samples above the action level are investigated. No well exceeded action levels in consecutive samples; no investigation was initiated. The majority of the groundwater samples that were analysed for radium from the 12 monitoring wells that encircle Building 50 were below the corresponding action levels for the period of 2002 to 2007 inclusive, with only a few exceptions.

No groundwater samples exceeded the MOE criterion for radium. However, there were some groundwater samples that exceeded the MOE criterion for uranium.

7.2.6 Radiation Doses to Members of the Public

7.2.6.1 Regional Study Area

The baseline dose to members of the public in the RSA can be attributed to various components including:

- natural radiation from cosmic rays
- naturally occurring radionuclides in air, soil, water and food
- anthropogenic (man-made) sources of radiation such as that associated with medical procedures and commercial industrial processes

The magnitude of these components varies both spatially and temporally.

7.2.6.2 Local Study Area

Residents in the LSA receive baseline doses from direct gamma radiation from the PHCF and from natural uranium and its decay products released from the PHCF. Residents also receive doses from background radiation associated with natural and anthropogenic sources, as described above. The total annual dose associated with the activities at the PHCF is provided by Cameco in the annual compliance report. Since 2002, over 80% of the total dose is from direct gamma radiation. In 2009, the dose to members of the public from PHCF's operation was less than 3.4% of the public dose limit of 1 mSv/y and less than 11% of the 0.3 mSv/y ORL.

7.2.6.3 Site Study Area

The fenceline gamma radiation dose rates were compared to corresponding Action Levels in order to monitor doses to members of the public in the SSA. Cameco uses group-based Action Levels that were accepted by the CNSC in July 2010. The main site and Centre Pier have action levels for three groups, while the Dorset Street site has action levels for two groups.

- Site 1: Main Site and Centre Pier:
  - Group 1: 0.10 μSv/h for the site 1 critical receptor and station on the east fenceline of the Centre Pier
  - Group 2: 0.14 μSv/h for stations with low/near background exposure based on the ALARA level of 0.05 mSv/y to the critical receptor
  - Group 3: 0.40 μSv/h for the remaining station with elevated exposure due to the current storage of radioactive materials and products
- Site 2: Dorset Street:
  - Group 4: 0.10 μSv/h for station 19, located further away from the fenceline
  - Group 5: 0.25 μSv/h for the critical receptor and remaining stations

All of the 2009 annual average dose rates at each fenceline monitoring location in the SSA were less than the corresponding Action Levels.

7.2.7 Radiation Doses to Cameco Workers

Uranium in process equipment and shipping containers represent potential sources of external radiation to workers at the PHCF. A potential source of internal exposure from inhalation of airborne uranium particulate is the re-suspension of uranium in process equipment. In addition, workers' eyes and skin may be exposed to gamma and beta radiation from exposed uranium surfaces in open shipping containers and process equipment.

Radiation doses to workers are maintained at acceptable levels:

- designing process equipment to provide shielding of workers from beta and gamma radiation
- providing air monitoring and ventilation systems to collect and filter airborne uranium
- implementing work practices that minimize exposure time and maximize distance from radiation sources
- providing personal protective equipment (dust masks, gloves, etc.)

The existing radiation protection programs help to keep doses below regulatory limits and ALARA. As part of the program, doses are recorded and provided to workers as well as the National Dose Registry (NDR). In 2006, Landauer's more sensitive Optically Stimulated Luminescence (OSL) dosimeters replaced the TLDs. OSL dosimeters measure the whole body effective dose from external gamma radiation and measure the equivalent dose to the skin from gamma and beta radiation. All non-site personnel (e.g. contractors) and Cameco staff must comply with the radiation protection program at the site and those who are exposed to radiation will be required to wear dosimeters and submit urine samples, as per the radiation protection manual.

The regulatory limits on radiation doses to NEWs are [29]:

- effective dose – 50 mSv per one-year dosimetry period and 100 mSv per five-year dosimetry period

- equivalent dose – 150 mSv to lens of the eye, 500 mSv to skin and 500 mSv to hand and feet per one-year dosimetry period
- effect dose to pregnant NEWs during the balance of a pregnancy after it has been declared to the licensee – 4 mSv

As per the *Radiation Protection Regulations* annual doses to all workers and contractors (NEWs and non-NEWs), will be maintained below the dose limits and as low as reasonably achievable. The same is true for future scenarios with the proposed mitigation measures in place (i.e. soil berm or concrete barrier).

External Exposure

The maximum and average annual whole body doses (the external component of the effective dose) from 1998 to 2009 have been well below the regulatory limit for NEWs. During that time period, the maximum whole body doses ranged from 4.4 to 9.7 mSv/year and the average whole body doses ranged from 0.1 to 1.1 mSv/year. The annual maximum and average annual equivalent doses to skin during this same period have been small fractions of the limits on the equivalent dose to the skin. During that time period, the maximum equivalent skin doses ranged from 10.2 to 27.8 mSv and the average equivalent skin doses ranged from 0.4 to 1.9 mSv/year.

Internal Exposure

Since the late 1980s Cameco has used lung counting and urinalysis for screening purposes. The assignment of individual doses based on these methods, however, began in 2003. In 2009, a dosimetry service licence for measuring internal doses from uranium through urinalysis and lung counting was issued to Cameco.

In 2008 and 2009, the maximum doses from lung counting were 2.8 mSv/y and 3.5 mSv/y respectively. In 2008 and 2009, the maximum urinalysis doses were 1.31 mSv and 1.15 mSv/y, respectively.

Total Effective Dose

The total effective dose includes contributions from both internal and external exposures and is reported based on a dose group. The dose groups are based on one or a combination of work groups and departments. The overall average for all dose groups has remained fairly consistent between 2001 and 2009, ranging from 1.15 to 2.53 mSv/year. The average dose is mainly affected by internal lung exposure and by external whole body exposure to a lesser extent. The UF_6 dose group typically has the highest maximum and average total effective dose. Both the maximum and total effective dose equivalents were well under the regulatory limit for NEWs [39].

7.2.7.2 In-Plant Air Levels

The monthly averages of the airborne uranium activity concentration for the four areas monitored at the PHCF (UF_6, UO_2, Waste Recovery and Clean Up Program (CUP)) are reported in table 7.2-5 as a fraction of the derived administrative level (DAL) [1998 to 2001] or derived air concentration (DAC) [2002 to 2009].

Table 7.2-5 Annual Average Airborne Activity Concentrations

Airborne Activity Concentration (µg U/m^3)								
Year	Annual Average (Avg) & Number of Samples > DAC (>DAC)							
	UF_6		UO_2		Waste Recovery		Clean Up Program	
	Avg	>DAC	Avg	>DAC	Avg	>DAC	Avg	>DAC
1998	0.13	N/A	0.08	N/A	0.02	N/A	N/A	N/A
1999	0.12	N/A	0.06	N/A	0.02	N/A	N/A	N/A
2000	0.11	N/A	0.05	N/A	0.03	N/A	N/A	N/A
2001	0.17	N/A	0.04	N/A	0.03	N/A	N/A	N/A
2002	0.14	377	0.06	21	0.02	0	N/A	N/A
2003	0.13	259	0.03	1	0.02	1	N/A	N/A
2004	0.08	139	0.03	9	0.02	0	N/A	N/A
2005	0.08	156	0.02	2	0.01	0	0.02	0
2006	0.20	395	0.03	12	0.02	1	0.02	4
2007	0.17	520	0.02	5	0.02	0	0.01	0
2008	0.05	100	0.03	5	0.02	0	0.06	0
2009	0.06	174	0.03	3	0.01	1	0.00	0

On July 1, 2006, a new DAC value of 100 µg U/m^3 was implemented. Prior to July 1, 2006, a DAC value of 150 µg U/m^3 was used. As a result of new DAC value, there was an increase in 2006 compared to 2005. In 2008, there was a decrease in the average DAC and the number of measurements above DAC because the UF_6 plant was shutdown from July 2007 to September 2008.

7.3 GEOLOGY, HYDROGEOLOGY AND SOIL

7.3.1 Spatial Boundaries

The spatial boundaries outlined in section 4.3.2.2 were used for the assessment of geology, hydrogeology and soil.

7.3.2 Geology

7.3.2.1 Regional/Local Study Area

The bedrock in the Port Hope area and along much of the north shoreline of Lake Ontario is composed of a sequence of interbedded limestone and shales of the Lindsay, Verulam, Bobcaygeon and Gull River Formation of the Simcoe Group. Discontinuous Cambrian sandstones overlying Precambrian granite gneisses are found below the Simcoe Group.

7.3.2.2 Site Study Area

Main Site

Information from a deep borehole drilled at the Port Hope Waterworks has determined that the Simcoe Group is about 170 m thick in the PHCF main site area. The uppermost Lindsay Formation comprises almost 30 m of fresh (unweathered), thinly to medium-bedded argillaceous to shaly limestone, containing interbedded thin layers of shale. The underlying

formations of the Simcoe Group are also thinly to medium-bedded and consist of varying proportions of argillaceous to shaly limestone beds with shale interbeds.

Centre Pier

Investigative borings and test pits have been used to define the stratigraphy at the Centre Pier to depths of 4 to 5 m. Much of the Centre Pier consists of fill materials including construction debris, cinders, and sand and gravel. These fill deposits overlie native lacustrine sand and silt deposits and former marsh deposits consisting of peat.

7.3.3 Hydrogeology

7.3.3.1 Regional/Local Study Areas

Regionally, groundwater flow through the joints and bedding planes of the bedrock is to the southeast at a hydraulic gradient of about 2%. Higher hydraulic conductivities were typically measured in the upper 10 m of the Lindsay Formation in the upper unit of the Verulam Formation and are attributed to weathering and opening of the *in situ* joints and bedding planes.

Nitrite, nitrate and chloride levels were below provincial drinking water guidelines at five monitoring stations within the Ganaraska River Watershed.

7.3.3.2 Site Study Area

Main Site

Groundwater elevations drop from an elevation of 82 m near the northwest end of the site to 75 m (corresponding to the water level in Lake Ontario) near the south end of the site. Below Building 50, groundwater is present at depths between 3.5-4.5 m (see figure 3.3-1). The general direction of groundwater movement through the overburden soils is toward the south and southeast across the site, in the direction of Port Hope Harbour and Lake Ontario.

Centre Pier

Groundwater flow occurs in an easterly direction from the Main Site to the Ganaraska River. Flow from the site may be impeded due to the presence of retaining walls around three sides of the site and surface water bodies on these three sides. The retaining walls may also cause a reversal of groundwater flow from the surface water bodies into the site. Groundwater levels under the Centre Pier are expected to be strongly influenced by the levels in Lake Ontario and the Ganaraska River.

7.3.3.3 Groundwater quality

Main Site

Contaminated groundwater plumes have been identified at various locations on the main site based on comparisons to MOE Table 3 criteria [15]. Exceedances of MOE Table 3 criteria at the PHCF are discussed below.

- South plume from Building 50:
    - the plume is characterized by elevated concentrations of ammonia, arsenic, cis-1,2-DCE, fluoride, nitrate, TCE, uranium, vinyl chloride

- East plume from Building 50:
  - concentrations of uranium, arsenic and fluoride are several mg/L
  - TCE is also present in the plume
- Contaminated groundwater near Building 27:
  - elevated concentrations of arsenic, fluoride, TCE, cis-1,2-DCE and vinyl chloride have been detected
- Contaminated groundwater near Building 24:
  - elevated concentrations of uranium fluoride, ammonia, nitrate, TCE, cis-1,2-DCE and vinyl chloride has been detected
  - the likely source of uranium, ammonia and nitrate is the main UO_2 sump in the northeast portion of Building 24
- Contaminated groundwater near former Green Salt Building:
  - elevated concentrations of uranium, fluoride, TCE, cis-1,2-DCE, and vinyl chloride have been detected in the vicinity of the former Green Salt Building, to the east of the main entrance of PHCF
- Contaminated groundwater beneath the Parking Lot and east toward the Harbour:
  - elevated concentrations of TCE, cis-1,2-DCE and vinyl chloride have been detected beneath the parking lot and east toward the harbour
  - the elevated levels of TCE appear to extend from the yard area south of Building 50 through the parking lot to the harbour

Groundwater Recovery systems

Six groundwater wells have been installed east and south of Building 50 to recover uranium lost to the groundwater. The wells have been operational since early 2008. Two other recovery wells have been installed further east between Building 50 and the harbour. An additional pumping well, which has been operational since 2008, was installed between Building 24 and the harbour.

Extracted groundwater is transported to either Building 2 or Building 50 for treatment. The annual discharge to the harbour was 40.7 kg of uranium, 4.1 kg of arsenic, 71.5 kg of fluoride, less than 1 kg of volatile organic compounds, 112.1 kg of nitrate and 236.6 kg of ammonium prior to the operation of the recovery wells. Operation of the pump and treatment system has reduced uranium and arsenic by 50% and 30%, respectively.

Centre Pier

Analysis of samples from eight monitoring wells indicated concentrations of metals, fluoride and total petroleum hydrocarbon (TPH) in groundwater. There were exceedances of MOE Table 3 site conditions standards for lead and silver in two groundwater samples (MOE 2004). At two locations, free petroleum product contamination was observed. Elevated TPH concentrations were detected in groundwater samples from two monitoring wells.

In seven out of eight groundwater samples, uranium exceeded Ontario Drinking Water Standard (ODWS). One groundwater sample exceeded the ODWS for arsenic. It should be noted that the groundwater is not being used as a source of potable water and is, therefore,

not a consideration for human health. Groundwater quality data also exhibited exceedances for the MOE Table 3 criterion for lead and the GW-3 derived criterion for uranium [15].

No COPCs were identified on the basis of human health considerations. Ammonia, arsenic, manganese, strontium, radium-226 and uranium were selected as COPCs in groundwater from an ecological perspective. Chloride, fluoride, nitrate and sulphate were also considered COPC since there are no MOE criteria.

7.3.4 Soil

7.3.4.1 Regional/Local Study Area

The Municipality of Port Hope lies in the Iroquois Plain physiographic region. The area is bounded by the abandoned and present shorelines on the north and south. The Iroquois Plain is made of silty sand to sandy silt till soils that typically overlie the bedrock. Silt and clays are also present in some areas above the till. Alluvium overlie the sandy and silty till, silts and clays, and sands and gravels that are present in the Ganaraska River and the beaches of Lake Ontario. Peat and organic silt or clay also exist in wet depressions and in low-lying lands adjacent to rivers and creeks on the Iroquois Plain.

7.3.4.2 Site Study Area

Main Site

The composition of native soils at the main site is predominately compact to very dense silty sand to silt tills, which contain trace quantities of gravel and clay. Cobbles and boulders may also exist throughout the deposit. The sandy to silty till is underlain by dense to very dense sand and gravel to gravelly sand till deposit, which immediately overlies the bedrock at the site. Variable fill consisting of sand and silt to sand and gravel overlies the native soil at most boreholes at the site.

Investigations conducted in 2003 and 2007 indicated elevated levels of both radiological and non-radiological parameters in the fill soils on the site. Soil samples of varying soil depths were collected and analysed. Native soils were free of contamination. Approximately, 76,800 m^3 of contaminated soil was estimated to be present on the PHCF site. Over 90% of the contaminated soil is located in the northeast quadrant (the location of the original Eldorado buildings) and the southeast quadrant (the location of the hydrogen gas storage area and the South UO_2 plant). These areas, adjacent to the harbour, contain the thickest fill soils.

Ammonia, arsenic, fluoride, manganese, nitrate, PCB's, strontium and petroleum hydrocarbons (F1 to F3) were identified as COPCs from a human health perspective. From an ecological perspective, ammonia, arsenic, fluoride, manganese, nitrate, PCBs, petroleum hydrocarbons (F2 and F3), strontium and uranium were selected as COPCs. The determination of COPCs was achieved through a comparison of soil data and MOE standards [15].

Vision 2010 Contaminants of Concern

The following principle activities may generate emissions during the Project: excavation and handling of contaminated soils, demolition of surplus buildings and the handling of the generated debris. The COPCs that may be released from these activities was determined by

characterization studies of soil and building materials by the PHCF. Based on a 2003 investigation, the dominant COPCs in soil were uranium, radium-226 and arsenic [40].

Centre Pier

MOE Table 3 industrial soil quality standards were exceeded for antimony, arsenic, barium, beryllium, boron, cobalt, copper, lead and zinc. Radiological soil chemistry indicated that uranium and Ra-226 exceeded their respective Ontario Typical Range (OTR) – OTR_{98}.

7.3.5 Seismicity

7.3.5.1 Regional/Local/Site Study Area

The Port Hope area is in the Southern Great Lake Seismic Zone, a zone of low to moderate seismicity compared to more active seismic zones to the east along the Ottawa River and in Quebec. The seismic risk was derived from statistical analysis of earthquake data since 1899. There are no known major fault systems in the immediate Port Hope area. There is, however, evidence of faulting in Prince Edward County and at the Darlington Nuclear Generating Station about 75 km east and 25 km west of Port Hope, respectively.

On June 23, 2010, a magnitude 5.0 earthquake was felt in the Southern Great Lakes Seismic Zone. The epicentre of the earthquake was 10 km southeast of Val-des-Bois, Quebec, more than 400 km from Port Hope. No damage was caused in Ontario. Earthquakes of this magnitude occasionally occur in the Western Quebec region, where Val-des-Bois is located.

7.4 HYDROLOGY AND SURFACE WATER QUALITY

7.4.1 Spatial Boundaries

The major hydrological features surrounding the site were used to determine the spatial boundaries for the assessment of hydrology and surface water quality. The Port Hope Harbour was classified as being within the SSA. The LSA included the lower reaches of the Ganaraska River, Alexander Creek and the near shore of Lake Ontario. The upper Ganaraska River and other areas of Lake Ontario comprise the RSA.

7.4.2 Hydrology

7.4.2.1 Regional/Local Study Area

7.4.2.1.1 Ganaraska River

The PHCF is located at the south end of the Ganaraska River. The mouth of the main branch of the River is located approximately 100 m east of the PHCF and is separated from the site by the Port Hope Harbour. The River has many tributaries and empties into Lake Ontario at Port Hope. The Ganaraska River is a substantial river, with flows that exceed 1 m^3/s. River widths range from approximately 12 to 16 m with depths that vary between 0.2 to 0.7 m. Bedrock with boulders dominate as the substrate at some locations [41].

The mean annual precipitation in the Port Hope area is 800 to 900 mm of which 300 mm contributes to the stream flow as runoff. The lower reaches of the River have a long history of flooding. Between 1900 and 1995, the former Town of Port Hope experienced 12 major flooding events; the most severe was in 1980. There has been no significant flooding in

Port Hope since 1980 in part due to the completion of major channel alterations. The 100-year flood flow prediction for the Ganaraska River is approximately 300 m^3/s, corresponding to a flood stage elevation of approximately 77 m. The Regional Storm scenario predicts stream flows of 1000 m^3/s and flood stage elevations of 78 m. These flood stages are below the PHCF ground-level elevation of 78-86 m. The flood waters would not reach any building.

7.4.2.1.2 Alexander Creek

Alexander Creek is an intermittent stream located on the west side of the public beach and drains directly into Lake Ontario. The creek is directed under rail lines through a series of culverts. The creek appears to drain only a localized area. The creek on the south side of the rail lines is dominated by silt and muck with pebbles and coarse gravel at the surface. The creek runs through the Alexander Ravine, a lowland mixed forest area, upstream of the railway. In this area, substrates are mainly muck and organics (detritus) with some silt and sand.

7.4.2.1.3 Near-shore of Lake Ontario

The near-shore of Lake Ontario within the study area is an exposed erosional environment. Substrates in the area are composed of sand, gravel and cobble with some clay.

7.4.2.2 Site Study Area

7.4.2.2.1 Port Hope Harbour

Port Hope Harbour, bounded by concrete cope walls, is located at the mouth of the Ganaraska River. The harbour provides facilities for recreational vessels including boat docking and mooring. The average depth of the inner harbour is 2.5 m and the substrate consists primarily of silt-laden mud. Steel revetments line the entrance to the harbour and the shoreline is stabilized by large diameter rip rap. The harbour receives some overland drainage from adjacent lands and the PHCF site. Surficial drainage from Centre Pier occurs via seepage into the ground.

7.4.2.2.2 Site Drainage

The total drainage area of the existing PHCF is approximately 12.87 ha, with about 83% impervious area, consisting of predominately paved and concrete surfaces [42]. The site is characterized by a sloping topography with drainage directed generally from the west of the site in a south-easterly direction eventually discharging into the Turning Basin of Port Hope Harbour and Lake Ontario.

Runoff generated from storm events is currently directed to a system of catch basins on the site, which are then routed through a network of storm sewers and discharged at multiple outlet points into the turning basin. Runoff from the parking lot is directed directly to Lake Ontario by overland conveyance and municipal storm sewers on Eldorado Place which directs stormwater to the beach area. Water flows from the harbour eventually exit into Lake Ontario.

Cameco will have to comply with provincial guidelines for stormwater management. Redevelopment of the site will include modifications to the existing stormwater management system as per the Ganaraska Region Conservation Authority requirements.

7.4.2.2.3 Flood conditions

Building 24 is not expected to be at risk of direct damage of wave over-topping of the rock armour on the east profile of the PHCF site or the beach and dune crest on the west side of the PHCF based on an analysis of the 100-year Flood Level, the Flood Hazard Limit (100-year flood level plus an allowance for wave run-up) and the Flood Proofing Standard. Building 24 is also not expected to be affected by over-topping flows at the 100-year Flood Level. The drainage path is expected to be toward the east (toward Port Hope Harbour) rather than toward the north (toward Building 24) (see figure 3.3-1).

7.4.3 Surface Water Environment

Cameco's characterization of hydrology, surface water and sediment quality was based on a review of previous studies or undertakings located in the vicinity of the PHCF [43], [41] and [44]. No Project-specific field sampling or measurements were conducted.

7.4.3.1 Spatial Boundaries

The major hydrological features surrounding the site were used to establish the spatial boundaries for hydrology and surface water. The Port Hope Harbour was classified as being within the SSA while the lower reaches of the Ganaraska River, Alexander Creek and the near shore of Lake Ontario were assigned to the LSA. The upper reaches of the Ganaraska River and other areas of Lake Ontario are included in the RSA.

7.4.3.2 Surface Water Quality

Ontario's Provincial Water Quality Objective (PWQO) and the Canadian Water Quality Guidelines (CWQG) were the criteria used for assessment of surface water quality. The surface water description was taken from published reports and information presented at the PHAI Expo '03 in October 2003 [44].

7.4.3.2.1 Regional/Local Study Areas

Ganaraska River

In general, surface water quality in the Ganaraska River is good. Physical parameters including dissolved oxygen, pH, conductivity and alkalinity indicate that surface water quality can be resilient to acidification, eutrophication and chemical additions.

Chloride concentrations have been increasing since 1965. Total phosphorous exceeds the PWQO more than any other nutrient [45]. There has been a decline in total phosphorous measured at monitoring stations; however concentrations appear to increase with an increase in stream flow due to increased surface runoff [45]. Samples from the Ganaraska Region Water Quality Monitoring Network have exceeded the PWQO for un-ionized ammonia 28% of the time. Nitrate never exceed CWQG and has been declining since 2002 [45].

Alexander Creek

The surface water in Alexander Creek is affected by contaminated soils at the Alexander Ravine and Waterworks sites through which it drains. These sites have been identified for remediation by the AECL. Iron, phosphorous, aluminum, boron, zinc and uranium have exceeded applicable criteria (PWQO and CWQG)[46].

Near-shore Lake Ontario

There have been no water quality exceedances in near-shore Lake Ontario.

7.4.3.2.2 Site Study Area

Past studies indicate that water quality in Port Hope Harbour has been influenced by past industrial activities in the harbour area. These past studies also indicate that un-ionized ammonia, aluminum, copper, zinc and uranium exceeded applicable criteria (PWQO and CWQG). Cadmium exceeded the CWQG but not the PWQO.

7.4.4 Sediment Quality

Ontario's Provincial Sediment Quality Objective (PSQO) and the Canadian Sediment Quality Guidelines (CSQG) were the criteria selected for the assessment of sediment quality. The surface water description was taken from published reports and information presented at the PHAI Expo '03 in October 2003.

7.4.4.1 Regional/Local Study Area

Ganaraska River

Cadmium, phosphorous and total organic carbon (TOC) exceeded guidelines at one or more sampling stations. Arsenic, cadmium, phosphorous and TOC exceeded guidelines at one or more sampling stations in tributaries of the Ganaraska River. Arsenic exceedances are likely due to seepage from the LLRW up-gradient [44].

Alexander Creek

Cadmium, total phosphorous and TOC levels exceed guidelines at one or more sampling stations [44].

Near shore Lake Ontario

Sediment parameters did not exceed the PSQO or the CSQG according to information presented at Expo '03.

7.4.4.2 Site Study Area

Port Hope Harbour sediment is contaminated. Arsenic, cadmium, copper, lead, manganese, nickel, phosphorous and TOC levels exceed guidelines [46]. There are also elevated levels of radionuclides (U^{235} and Th^{232}).

The PHAI identified the Port Hope Harbour as one of the sites that will be remediated as part of the Port Hope clean-up. The existing contaminated sediments will be removed; as a result sediment quality was not selected as a VEC.

7.5 AQUATIC ENVIRONMENT

7.5.1 Spatial Boundaries

The RSA/LSA for the aquatic environment includes the Ganaraska River and the nearshore of Lake Ontario. Port Hope Harbour and the immediate shorelines makeup the SSA. The primary source of data is the Aquatic Environment Baseline Characterization Study, carried out in October 2002 and May 2003 as part of the PHAI EA.

7.5.2 Aquatic Habitat

7.5.2.1 Regional/Local Study Areas

Ganaraska River Fish Habitat

The Ganaraska River is known to be an excellent coldwater fish habitat, supporting resident populations of Brown Trout (*Salmo trutta*), Brook Trout (*Salvelinus fontinalis*), Rainbow Trout (*Oncorhynchus mykiss*) and Walleye (*Sander vitreus*). It is also a spawning and nursery habitat for migratory species. Lowland warmwater species, such as American Eel (*Anguilla rostrata*), Longnose Gar (*Lepisosteus osseus*), Bowfin (*Amia calva*) and Common Carp (*Cyprinus carpio*) also use the lower section of the River. The Project activities are not expected to impact the adult American Eel.

Lake Ontario Nearshore Fish Habitat

The Lake Ontario shoreline in the site study area consists mostly of cobble/gravel beaches and bluff. The nearshore substrates are comprised mainly of sand, gravel and clay with some cobble. The shore is exposed to environmental factors, such as strong winds, therefore, nearshore turbidity can be high due to wave action. The spawning of Alewife (*Alosa pseudoharengus*), Rainbow Smelt (*Osmerus mordax*) and Threespine Stickleback (*Gasterosteus aculeatus*) in the nearshore area of Lake Ontario has been documented in the past. The nearshore area of Lake Ontario may also provide nursery habitats as well as a migration route for offshore pelagic species that spawn in the tributaries including Rainbow Trout, Brown Trout, Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*Oncorhynchus kisutch*) and Rainbow Smelt (*Osmerus mordax*).

7.5.2.2 Site Study Area

7.5.2.2.1 Port Hope Harbour Habitat

The sheltered environment of the Port Hope Harbour from the open lake results in warmer waters, an accumulation of fine sediments and the occurrence of colonies of aquatic macrophytes. The Port Hope Harbour supports a warmwater fish community. Smallmouth Bass (*Micropterus dolomieu*), Yellow Perch (*Perca flavescens*), Northern Pike (*Esox lucius*) and Brown Bullhead (*Ameiurus nebulosus*) likely use the harbour habitat for spawning and nursery.

The outer portion of the harbour is found at the mouth of the Ganaraska River. The outer harbour is predominately sand and the area is very shallow due to the sand bars associated with river delta formation. Little fish habitat occurs in this area because of the shallowness and lack of in-harbour cover.

7.5.3. Aquatic Species

7.5.3.1 Regional/Local Study Area

7.5.3.1.1 Lake Ontario Nearshore Fish Community

Two fish surveys were performed in 2002 and 2003. Catches during both surveys were similar, consisting primarily of cool and coldwater forage species. Alewife was the most abundant species captured over the entire near shore study area; Round Whitefish and White Sucker were also fairly abundant. This type of community is typical of the central Lake Ontario nearshore. The widespread occurrence of Lake Trout is an indication of the presence of a suitable coldwater habitat.

7.5.3.1.2 Ganaraska River Fish Community

The Ganaraska River, recognized for its fisheries and aquatic habitat, supports a fish community dominated by Brook Trout, Brown Trout, Rainbow Trout, sculpin (*Cottidae* species), darters (*Etheostoma* species) and cyprinids [45]. Migratory Chinook Salmon spawn in the lower reaches of the Ganaraska River. The river contains runs of naturally reproduced Chinook and Coho Salmons. The number of adult Chinook Salmon returning to the river to spawn is estimated to be between 2 000 and 5 000 fish each year. The river is one of the dominant producers of wild Chinook Salmon on the north shore of Lake Ontario. No significant fish communities were found in the Ganaraska River tributaries.

7.5.3.1.3 Regional Study Area Benthic Community

In general, the benthic communities investigated in the past have been dominated by midge larvae (*chrironomids*) and tubificid worms (*oligochaetes*) [46] and [47]. Amphipods, clams and snails were also present. The benthic communities were reportedly limited by habitat (substrates) rather than by water quality.

7.5.3.1.4 Ganaraska River Benthic Community

The benthic communities in the Ganaraska River were highly variable. The upper section of the river was characterized by bedrock with gravel and cobble substrates. There were 14 to 27 taxa identified at densities ranging from less than 1 000 to over 50 000 organisms/m^3. The lower section of the river was characterized by organic enrichment and pollution-tolerant species. The dominant taxa were tubificid worms and midge larvae with other insect larvae (beetles and/or mayflies) present. Clams and amphipods were dominant in small sandy streams near the lake. In general, the benthic communities of the Ganaraska River were reported as healthy with diversity and density decreasing downstream [48].

The benthic communities in the small tributaries of the Ganaraska River and Brand Creek downstream of the LTWMF are dominated by clams and amphipods. Invertebrate densities were typically low in these streams with fewer taxa.

7.5.3.1.5 Aquatic Macrophytes in the Local Study Area

Few aquatic macrophytes were observed in Port Hope area streams. The species that were commonly observed included Watercress (*Cresson officinal)*, Pondweed (*Potamogeton sp.)*,

Arrowhead (*Sagittaria latifolia)* and Manna Grass (*Glyceria striata*). These plants are able to root in the slower reaches of streams where there has been sediment deposition. They occur in small patches and do not represent a dominant habitat feature for streams in the Port Hope area. Macrophytes generally do not thrive in the Lake Ontario nearshore zone. Phytoplankton (algae) do occur throughout the lake and sparse macrophytic algae occur in the Port Hope area. Port Hope Harbour, in the corners of the turning basin, supports growth of macrophytic algae (*Cladophora sp.*) and Floating-leaf Pondweed (*Potamogeton natans*) [46].

7.5.3.2 Site Study Area

7.5.3.2.1 Port Hope Harbour Fish Community

Catches in the Port Harbour and the Cobourg Harbour were indicative of warmwater fish communities. Some coolwater species (Northern Pike, White Sucker) also use the warmwater habitats.

7.5.3.2.2 Port Hope Habour Benthic Community

Historically, the benthic community in the Port Hope Harbour within the turning basin was dominated by pollution-tolerant oligochaetes and midge larvae. The low number and absence of invertebrates found at locations near the cooling water outfall have been attributed to a high level of toxicity.

In 2003, the benthic community in Port Hope Harbour was dominated by oligochaetes and chironomids [40]. The benthic community present in the harbour was described as typical of areas with soft organic substrates in relatively shallow, protected waters. Under their current operating licence Cameco is carrying out a Thermal Risk Assessment project with the objective of assessing potential risks to fish and benthic invertebrates in the Port Hope Harbour from thermal discharges. The project involves data gathering (i.e., temperature measurements, collection of benthic species, etc.) as well as temperature modeling and risk analysis. The receptors selected for the project include fish and benthic invertebrates species that have been observed in the Port Hope Harbour and/or surrounding area and are considered representative of the species present.

Each life stage of the fish species is being assessed separately because the fish characteristics and environmental conditions vary with season. The study will estimate ambient temperatures in the harbour. The information collected by Cameco on initial discharge temperature will be use to model the extent of the thermal plume. This will provide information on the temperature differential.

7.5.3.3 Fish Species of Concern

An annotated list of all fish species caught during recent surveys in the lower Ganaraska River is provided in appendix F of Cameco's EIS report [7]. There were no fish species found to be sensitive species or species at risk ("endangered", "threatened" or "special concern").

7.5.4. Metals and Radionuclide Concentration in Aquatic Biota

7.5.4.1 Fish

The analysis of metals and radionuclides in fish of the Port Hope Study Area showed levels which are below the screening benchmark values and do not pose a health risk to humans. Only Hg and ^{210}Po concentrations in forage fish approach the benchmark values for human consumption. Any risk is unlikely since people do not generally consume forage fish.

The screening benchmark values for consumption by American Mink (*Neovison vison*) was exceed for aluminum, selenium and vanadium in forage fish.

Radionuclide values for fish in Port Hope Harbour were compared to forage fish in Cobourg Harbour. The concentration of uranium is approximately six times higher in Port Hope Harbour Brown Bullhead and two times higher with respect to other radionuclides. The levels of Po^{210} in forage fish in Cobourg Harbour do not approach benchmark values based on radiological protection of human or wildlife consumers.

7.5.4.2 Macroinvertebrates

In June/July 2003, metals and radionuclides were analyzed in crayfish at three stations in the Port Hope LSA. Levels of aluminum and selenium equalled or exceeded the screening benchmark values for consumption by American Mink [46]. Aluminum and selenium also exceed their screening benchmarks. No other contaminants exceeded benchmarks values [46]. The levels of Po^{210} do not approach benchmark values based on radiological protection of human or wildlife consumers. Earlier studies showed radionuclides and heavy metal concentrations in benthic invertebrates were greatest at the most heavily contaminated stations of the inner habour.

7.5.4.3 Macrophytes

Concentrations of metals and radionuclides in macrophytes were determined from samples collected in October 2003 and July 2003. Benchmark concentrations for Common Muskrat (*Ondatra zibethicus*) were exceeded for five metals (aluminum, arsenic, barium, manganese and vanadium), potentially posing a health risk to wildlife. The levels of ^{210}Po do not approach benchmark values based on radiological protection of wildlife consumers. Radiological doses from macrophyte consumption would be acceptable under baseline conditions.

7.6 TERRESTRIAL ENVIRONMENT

The Terrestrial Environmental Baseline Study carried out by AMEC as part of the PHAI for the Port Hope and Port Granby WMF was the primary source of data for the Terrestrial Environment Baseline Characterization Study [49].

7.6.1 Spatial Boundaries

For this section, the RSA boundary is defined as the County of Northumberland and the Ganaraska River. Wards 1 and 2 of the Municipality of Port Hope comprise the LSA. The SSA consists of the lands owned and/or leased by Cameco including the PHCF main site and the Centre Pier.

7.6.2 Vegetation Communities and Species

7.6.2.1 Regional/Local Study Area

The tree species found in the forest communities in the RSA are typical of those generally found in the Great Lakes – St. Lawrence Forest and Deciduous Forest regions and are dominated by coniferous and deciduous tree species. Approximately 40% of the RSA is covered in forest; most of the original landscape is occupied by agricultural land use and urban development. Marshes and wetlands are common in the RSA, especially along the forest margins.

7.6.2.2 Local Study Area

Within Ward 1, the northern section of the Ganaraska River and the Monkey Mountain Wooded Ravine are habitats with a relatively high richness of plant species. Recreational activities have disturbed the richness of plant species in ravines. In the LSA, forest cover formed the largest habitat type (approximately 68%) when all the different forest types are grouped together (mixed, deciduous, coniferous and other woodlands). Mixed Forest and Cultural Meadow formed the largest percentage of habitat cover in the Ward 1 LSA. The majority of the land in the Ward 2 LSA has been actively farmed and therefore, plant species richness is restricted.

No species at risk or sensitive species were identified within Wards 1 and 2. No federally or provincially rare habitats were located in either area.

7.6.2.3 Site Study Area

There is no natural and successional vegetation or planted trees on the SSA. The Centre Pier is predominately covered in gravel and has limited vegetation, mainly early colonizing species, such as woody (Manitoba Maple, Trembling Aspen, Balsam Poplar, Sumac) and grass species (Sweet Clover, Birds Foot-Trefoil).

7.6.3 Wildlife Communities and Species

7.6.3.1 Regional Study Area

7.6.3.1.1 Amphibians and Reptiles

The Jefferson Salamander (*Ambystoma jeffersonianum*) is the only species that has a reasonable potential of being found in the RSA. This species is included in the National Heritage Information Centre (NHIC) list of Provincial Rarity with a ranking of S2 [50]. No species at risk or sensitive species of reptile was identified in the RSA wildlife survey.

7.6.3.1.2 Birds

In Ontario, there are 30 rare bird species [50]. Only the Loggerhead Shrike (*Lanius ludovicianus*; S2) and the Great Black-backed Gull (*Larus marinus*; S2) were identified as breeding in the RSA during the 2002-2005 surveys.

7.6.3.1.3 Mammals

Eight mammal species are listed as rare (S1 and S2) in Ontario [50]. The Eastern Small-footed Bat (*Myotis leibii*), whose distribution range encompasses the RSA, has been reported to the west, north and east of the study area. It was not observed in close proximity of Port Hope.

7.6.3.1.4 Wildlife Habitat

Sites within the RSA have been classified and designated as Life Science Areas of Natural and Scientific Interest (ANSI) sites by the Ministry of Natural Resources and Environmentally Sensitive Areas (ESA) by various provincial conservation authorities and municipalities. There are 71 designated sites within the RSA. Only seven of these sites are located within or adjacent to the LSA including:

- ESAs: the Ganaraska River and the Monkey Mountain Wooded Ravine Complex
- Life Science site: Port Hope Woods, Peter Rock Marsh #2 and Otty Point Upland Woods
- Regionally significant Life Science-ANSI: Willow Beach Marsh
- Provincially significant wetland: Port Britain Wetland

The Monkey Mountain-Pidgeon Hill Ravine (the Monkey Mountain Wooded Ravine Complex), the Ganaraska River, Peter Rock Marsh #2 and Port Hope Woods are all located within the LSA.

7.6.3.2 Local Study Area

7.6.3.2.1 Amphibians and Reptiles

The American Toad (*Bufo americanus*), Green Frog (*Rana clamitans*) and Spring Peeper (*Pseudacris crucifer*) have been encountered within Ward 1 of the LSA, with the American Toad being encountered the most frequently. All species are common or very common within Southern Ontario. The Wood Frog (*Rana sylvatica*), American Toad, Gray Tree Frog (*Hyla versicolor*), Green Frog and Spring Peepers were encountered in Ward 2.

7.6.3.2.2 Birds

The Port Hope waterfront is an important habitat for sensitive species or species at risk. Fourteen avian species are considered species at risk "endangered", "threatened", or "special concern" based on recent surveys and an additional 8 species have been identified as rare (sensitive) [50].

The LSA is an important staging area for migratory birds because of its position on the Lake Ontario shoreline. The Port Hope Woods and other natural area may be temporary stopovers for a large number of land birds.

7.6.3.2.3 Mammals

The following ten mammal species have been observed in Ward 1 of the LSA [49]:

- Beaver (Castor canadensis)
- Eastern Chipmunk (*Tamias striatus*)
- Coyote (Canis latrans)
- White-tailed Deer (Odocoileus virginanus)
- Red Fox (Vulpes vulpes)
- Meadow Jumping Mouse (*Zapus hudsonius*)
- Raccoon (Procyon lotor)
- Grey Squirrel (Sciurus carolinensis)
- Red Squirrel (Tamiasciurus hudsonicus)
- Meadow Vole (Microtus pennsylvanicus)

The White-tailed Deer, Red Squirrel and Meadow Vole were also observed in Ward 2 of the LSA as well as the Eastern Cottontail (*Sylvilagus floridanus*) and the White-footed Mouse (*Peromyscus leucopus*). All mammals observed in the LSA are considered very common.

7.6.3.2.4 Wildlife Habitat

The habitats in Wards 1 and 2 range from open fields to densely wooded/forested areas. In Ward 1, the Ganaraska River Valley and the Monkey Mountain Wooded Ravine Complex are classified as Primary and Tertiary Corridors, respectively. Habitat corridors provide valuable linkages between otherwise isolated habitats as well as allow for wildlife migration, genetic exchange between populations, seed dispersal and re-population of biologically impoverished area. The Black Creek corridor in Ward 2 is also considered a natural corridor by the Municipality of Port Hope.

7.6.3.3 Site Study Area

Similar to the LSA, 14 bird species were identified as species at risk and a further 8 species were identified as sensitive species [50]. The Port Hope waterfront, harbour and shorelines are important habitats for sensitive species and species at risk. As a result of the alteration of the Centre Pier, the mammal habitat on the Centre Pier is very limited [49].

7.6.3.4 Terrestrial Species of Concern

Within the SSA, the following five species of concern to federal, provincial and regional agencies were recorded in the NHIC database: Northern Bobwhite, Milksnake and Eastern Few-fruited Sedge, Swamp Darner and Eastern Prairie Fringed-Orchid. The Northern Bobwhite and Eastern Prairie Fringed-Orchid are considered endangered species at the Federal level.

7.6.4 Metals and Radionuclides in Terrestrial Biota

Concentrations of inorganic chemical constituents in grass and small mammals were within normal concentration ranges. Levels of barium, boron and copper in grass were greater than concentrations at reference sites.

There is some indication of accumulation of aluminum, barium, iron, manganese, potassium and zinc from historic storage areas. Concentrations in small mammal tissue samples from contaminated sites were above concentrations in samples from reference sites. In either grass or small mammal samples, there were no measurable concentrations of Polycyclic Aromatic Hydrocarbons (PAHs) and Polychlorinated Biphenyls (PCBs). There is possible uptake or accumulation of radionuclides in grass (Lead-210 (Pb^{210}), Radium-226 (Ra^{226}), Polonium-210 (Po^{210})) and in small mammal tissue (Po^{210}, Ra^{226}, Po^{210}, Thorium (Th^{232})).

7.7 BASELINE RISK TO NON-HUMAN BIOTA

Baseline risk to non-human biota reflect current levels of contaminants (i.e., baseline levels) at the PHCF and surrounding areas. The assessment of baseline risks relies primarily on a recent Site-Wide Risk Assessment (SWRA) conducted for the PHCF site in 2009 [36]; and updates [51], [52]. The SWRA followed a tiered approach similar to the assessment methodology described by the CCME [53].

7.7.1 Spatial Boundaries

The emphasis of the SWRA was the assessment of potential existing risk due to on-site groundwater and soil contaminants. For the purpose of this assessment, the site study area was defined as the PHCF site and the grass strip bordering the Port Hope harbour and PHCF fence line. The Port Hope harbour, including the turning basin, channel exit and near-shore Lake Ontario were considered the Local/Regional study area.

7.7.2 Selection of VECs

The PHCF site generally does not provide good habitat for biota. However, several ecological receptors were assessed and considered to be representative of the various trophic levels and biota that could be found at the site or local/regional areas. These receptors included:

- terrestrial receptors (site): Earthworm, Terrestrial Plants, Meadow Vole, Cotton-tail Rabbit, Great Horned Owl, Red Fox, Yellow Warbler, American Robin
- aquatic receptors (local/regional): Aquatic Plants, Benthic Invertebrates, Benthic Fish, Pelagic Fish, Scaup, Horned Grebe

7.7.3 Methodology

COPC were identified according to a selection process involving a comparison of measured concentrations to applicable MOE and CCME standards. All radionuclides measured in soil or groundwater were considered COPC and evaluated in the SWRA. Environmental concentrations used in the SWRA were based on data available prior to December 2008, and additional data collected specifically for the assessment.

Potential baseline risks were identified based on calculated screening indices and supporting field investigations. Screening index values are determined by dividing estimated exposure levels by an appropriate benchmark criterion representing a threshold for an acceptable dose. A screening index value greater than 1.0 indicates a possibility for risk, and therefore additional information is required before an assessment of actual risk is made.

7.7.4 Radionuclides

For aquatic receptors, all screening indices were less than 1.0 with the exception of aquatic plants in the Port Hope Harbour. However, a field investigation determined that the aquatic plant community in Port Hope Harbour is comparable to other near-shore Lake Ontario communities. No potential risks were identified for terrestrial receptors from radiological contaminants at the PHCF site.

7.7.5 Non-Radionuclides

All screening indices were below 1.0 for aquatic receptors, with the exception of pelagic fish resulting from exposure to strontium. A field investigation compared the fish community of the Port Hope Harbour to other near-shore Lake Ontario sites and found no evidence for adverse effects. It is also noted that strontium is not associated with PHCF operations.

For terrestrial receptors, screening indices were greater than 1.0 for Cotton-Tail Rabbit and Meadow Vole from exposure to aluminum, and to the American Robin and terrestrial vegetation from fluoride exposure. Aluminum is a common element of soil and not considered to be associated with current PHCF operations. Average fluoride measurements were highly affected by two measurements taken near Building 27 on the PHCF site. A field investigation determined the grass patch bordering the Port Hope Harbour in this area was healthy. It is noted that much of this grass patch, including areas with elevated fluoride is planned to be excavated as part of the Vision 2010 clean-up (see figure 3.5-1 of the EIS[7]).

7.8 LAND AND RESOURCE USE

7.8.1 Spatial Boundaries

The RSA comprises: the Municipalities of Clarington, Port Hope, Brighton and Trent Hills; the Townships of Hamilton, Alnwick/Haldimand and Cramahe; the Town of Cobourg. The LSA is composed of the southern portion of Ward 2 including the nearshore of Lake Ontario. The PHCF licensed site including the Centre Pier comprises the SSA.

7.8.2 Land Use and Zoning

7.8.2.1 Regional Study Area

Regional and municipal planning initiatives govern the land use in the RSA including Places to Grow, the Greenbelt Plan and the Municipality of Port Hope Official Plan (OP) [54].

The Port Hope Municipality's Growth Management Strategy (GMS) [55] and the OP [54] both involved extensive public consultation and were used to help define and articulate the values and priorities of Port Hope residents. In both documents, emphasis was placed on preserving the unique distinctive small town, 19th Century character of Port Hope.

Places to Grow: A Growth Plan for the Greater Golden Horseshoe

This document provides guidance on where and how urban development should occur within the Greater Golden Horseshoe area. The western edge of the RSA is identified as a "Greenbelt Area" with accompanying areas where urbanization has already occurred ("Built-up Area – Conceptual") and areas where further urban development is encouraged to occur ("Designated Greenfield Area – Conceptual"). Two other areas, including Port Hope, are also identified as "Designated Greenfield Areas". The Oak Ridges Moraine is designated as part of the "Greenbelt Area".

The Greenbelt Plan

Areas where urbanization should not occur within the Greater Golden Horseshoe are identified in the Greenbelt Plan. The goal of the plan is to protect the agricultural land base as well as the ecological features and functions of this landscape. The Municipality of Clarington in Durham Region, at the western portion of the RSA, and the Oak Ridges Moraine Area have lands that are considered "protected countryside". This designation restricts the type of land uses that can occur on these lands.

Municipality of Port Hope Official Plan

The Municipality of Port Hope OP [54] indicates that there will not be any substantive changes in land use for the Municipality over the next 20 years. The plan supports existing land use patterns, preserving rural and historic character and maintaining the relatively slow growth of the Municipality in the current urban boundary. Most of the land use within the RSA is designated as "agricultural – prime", which limits land use within these areas to agricultural and agricultural-related uses. Other land uses in the Municipality include the Oak Ridges Moraine, six hamlets, and a number of natural, agricultural, employment, residential, commercial and institutional uses.

7.8.2.2 Local Study Area

Municipality of Port Hope Growth Management Strategies

Two Growth Management Strategies (GMS) were developed for the Municipality to outline population pressures and recommend where future urban development should occur [55] and [56]. The GMS developed in 2002 recommended that Ward 1 be the focus of residential, commercial and employment uses in the Municipality. No expansions to the urban boundary to accommodate future growth were recommended.

The 2006 GMS [56] indicated that the potential exists to accommodate approximately 9 000 to 11 000 people on land designated for residential development in the OP and concludes the current boundary is enough to support expected residential growth to 2031.

7.8.2.3 Land Use Adjacent to the SSA

The Municipality's waterfront planning initiatives dominates the land use planning adjacent to the PHCF and the Centre Pier. A consolidated conceptual plan was endorsed in 2008 and the Municipality is working toward implementing its redevelopment plans [54]. The plan outlines the nature of current land use (i.e. the mouth of the Ganaraska River, on the eastern side of Centre Pier, is home to the Municipality's marina and public beach/playground area).

The beach south of the PHCF is used for strolling, dog walking and fishing. This beach, which is remote from the activities of the inner harbour, is also home to rare and very rare vegetation species and is considered provincially significant. There is a public playground west along the beach south of the PHCF. Roadway access to the beach and the public playground is shared with traffic associated with the PHCF. Northwest of the PHCF is a VIA rail station building. There are also rail corridors situated to the north of the PHCF. The current vision for the waterfront is to make it accessible to all with public open spaces. The Centre Pier is envisioned as a multi-purpose open space with areas for picnicking and relaxation, outdoor markets, events and celebrations and facilities for seasonal fishing events.

The Municipality of Port Hope inaugurated the "Centre Pier Development Task Force" (Task Force) whose mandate is to identify costs and potential risks associated with possible future development of the Centre Pier. A 30-day public comment period on the fate of the buildings on the Pier was closed on September 6, 2011 and a report by the Task Force was issued on October 25, 2011. In the final report, the Centre Pier Task Force recommended that the PHAI restore the Centre Pier property to it its full use either by retaining or replacing the buildings instead of tearing them down. The Task Force also recommended independent verification of claims by the PHAI regarding costs for restoring the Centre Pier.

7.8.2.4 Land Use Adjacent to the Transportation Corridor

The transportation corridor exits the SSA in the northeast, continues east along Peter Street/Highway 2, north on Hamilton Road, west on Croft Street, north and east along Rose Glen Road and either east or west on Highway 401. Most of the transportation corridor within Port Hope is bordered by commercial and general employment highway areas. There is also prime agricultural land to the east of Hamilton Road and north of Highway 401. The corridor also passes along residential areas. The corridor passes alongside environmentally sensitive areas (the floodplains of Gage Creek and Brand Creek) north of Hamilton Road/County Road 2 intersection and west of the Highway 401 entrance ramps.

7.8.2.5 Site Study Area

Most of the PHCF site within the SSA to the west of the turning basin is zoned as "General Employment" (EMP1) and "Open Space" (OS). EMP1 allows for the operation of a manufacturing facility. Industrial uses are not permitted in Open Spaces. A small area of the site is designated as "Environmental Protection – Flood Plain" (EP-F). Any development of an area with an EP-F designation must be in accordance with the regulations of and subject to approvals of the Municipality and the GRCA. The Centre Pier, west of the turning basin and within the SSA, is zoned as EP-F and OS (HI), where HI indicates a development site requiring a development agreement.

7.8.3 Landscape and Visual Setting

7.8.3.1 Regional/Local Study Areas

The Municipality of Port Hope has a rolling topography. The PHCF is readily visible from the edge of the Ganaraska River, Lake Ontario and from a lesser extent the downtown core (Walton, John and Queen Streets).

7.8.3.2 Site Study Area

Views of fencing, grey buildings, storage cylinders and smokestacks from various sites within the SSA demonstrates the PHCF's industrial nature.

7.8.4 Transportation

7.8.4.1 Regional Study Area

A number of provincial highways and municipal roads intersect the RSA. Highway 401 is the main east-west thoroughfare. The LSA and the RSA may also be accessed by Highway 2, County Road 10 and Highway 28 from the north and County Road 74 from the east.

7.8.4.2 Local Study Area

Ward 1 has a mix of rural (ditched) and urban (curbed) road cross sections. Many ditched and narrow residential roads are found in the historic areas of Ward 1. In the newer and industrial sections of Ward 1, roads are generally wider, curbed and multi-lane. Ward 1 is the primary traffic generator because it contains many of the employment and retail opportunities. However, no traffic congestion occurs during peak periods because of the relatively small population.

7.8.4.3 Site Study Area

The main entrance to PHCF is via Hayward Street, which can be accessed from John and Queen Streets. Approximately 1 000 vehicles access Hayward Street daily. Fifty percent of the daily traffic on Hayward Street occurs during morning and afternoon peak hour traffic, with the remaining 50% occurring throughout the rest of the day. The peak hour traffic on Hayward Street is mostly comprised of personal traffic to the PHCF main site or to the train station. Other traffic that occurs on Hayward street includes maintenance vehicles to and from the water treatment plant, buses during the morning and evening peak hours carrying contractors to and from PHCF. There are also two trains per week to and from the site. The arrival of the train causes Hayward street to be blocked for 15 minutes. The train arrives during off-peak hours and therefore there is no significant impact on traffic on Hayward Street.

7.9 PHYSICAL AND CULTURAL HERITAGE

7.9.1 Spatial Boundaries

The existing cultural heritage environment is described in relation to the SSA, the LSA (Ward 1 of the Municipality) and the RSA (Ward 2 of the Municipality).

7.9.2 Regional Study Area

There are 89 registered prehistoric sites in the RSA [57]. In addition to prehistoric sites there are also registered archaeological sites that range in age from the earliest period of human occupation in southern Ontario (approximately 9 000 B.C.) to the period of European contact (circa A.D. 1580). The different types of sites include: Aboriginal campsites, villages, burial sites, resource procurement sites and ceremonial sites. All of the registered prehistoric sites

with significant historic occupation by Aboriginal groups lie outside the SSA and do not have any direct bearing on the Project.

The RSA also has a number of historic heritage resources and sites from the settlement and growth by Europeans and Americans. These sites include mills, distilleries, smithies, shops and factories, public architecture such as schools, train stations, churches and town halls as well as harbours and railways. These heritage resources have no direct bearing on the Project.

7.9.3 Local Study Area

There are three historic sites registered within the LSA but none of them have any direct bearing on the Project since they are all outside of the SSA [57]. An Aboriginal village with a significant population called 'Ganaraske' and later 'Cochigomink' is known to have existed at the mouth of the Ganaraska River.

The development of the Town of Port Hope has resulted in a wealth of historic heritage resources in Ward 1 of the LSA. The heritage resources include Euro-Canadian buildings such as former sites or architectural remains of 19th century mills, factories, smithies, distilleries, schools, halls, shops and houses. The heritage homes, shops and hotels in the downtown heritage district make it a historical record of 19th century building heritage [58].

The harbour lands, one of the most significant features of the LSA, started as a simple set of piers that ran into Lake Ontario and have expanded to include larger and longer piers, breakwaters, the Queen's Wharf and a turning basin with an approach channel [59], [60]. The harbour, which has been home to different types of industries, is currently owned by the federal government. The Municipality of Port Hope will eventually receive ownership through the DFO Small Craft Harbour divestiture initiative. The Harbour Commission has jurisdiction of the harbour and Cameco leases the fenced portion of the Centre Pier.

7.9.4 Site Study Area

There are no known archaeological sites or historic-period Aboriginal sites registered in the SSA [57]. The majority of the PHCF site has very low archaeological potential. Therefore there is no chance that there are any existing cultural heritage resources at risk due to Vision 2010.

The Centre Pier was the site of the Ideal Standard Sanitary Company and later the Crane Company. Both companies were manufacturers of bathroom fixtures. Four buildings (Building 40, 21, 42 and 43) that were used by the Standard and Crane companies still exist and are currently being used as warehouses by Cameco.

There are currently no registered heritage buildings on the Centre Pier. However, a Heritage Assessment of the Centre Pier concluded that Buildings 41 and 43 could be designated under the *Ontario Heritage Act* because of their rare structural designs and direct associations with Port Hope's industrial past. Further, the character of the area and the historical links to Port Hope's past might allow the landscape of the Centre Pier to be designated as a Heritage Conservation District.

7.10 SOCIO-ECONOMIC ENVIRONMENT

7.10.1 Spatial Boundaries

The existing environment is presented by sub-component since social and economic interactions cross boundaries and are interrelated or integrated spatially.

7.10.2 Population

The information used in this section was gathered from Statistics Canada and the Municipality of Port Hope. Specifically, most of the data is from the 2006 Census, unless otherwise stated. According to the 2006 census, the Municipality of Port Hope has a population of 16 390 [61]. The population of the Municipality is predominately in the working age group, with 53% of its residents between 25 and 64. This is comparable to the rest of the province. However, Port Hope has a greater population of seniors compared to the provincial value of 14%. The Municipality has a very small minority population and as of 2006, 4.5 % of the population is either a visible minority or Aboriginal. Further, 98% of the Municipality are Canadian citizens, with a low number of recent immigrants. Ward 1 of the Municipality has a population of 12,530 based on the 2001 census, and has a similar population structure to the Municipality as a whole.

Since 1991, Port Hope has been experiencing steady population growth, with an increase of 5% from 2001 to 2006. In 2005, the median household income for the Municipality was $68 140 and the incidence of low income is 7%. Comparatively, in Ward 1, the median household income is $46 244 and the incidence of low income is also 7%.

In the Municipality, 30% of the workforce has a college certificate or diploma, 26% have a high school degree and 17% have attended university and have obtained a university degree. The Municipality is predominantly English speaking, only 1% of the population has French as a first language and 5% have neither English nor French as their first language. The family structure of the area is dominated by families with children (76%) followed by single-parent families (13%) and families with no children (12%).

Based on results of analysis in 2001 by Strategic Projection, the Municipality will grow due to job growth in the GTA rather than its own economic development. It is further anticipated that the Municipality will become an attractive location for commuters [62]. The GMS has forecasted 26.59% in population growth for Northumberland County between 2006 and 2031. This would result in 3 146 additional residents, with 80% of the new growth occurring in the urban area.

Sensitive populations are those having a predominance of individuals in the following population groups: the old, young, poor, minority groups, immigrants, people for whom English is a second language and single parent families. In general, these groups are less able to adjust to or manage changes that may arise due to Project works and activities. The available data indicates that there are few sensitive populations within the Municipality (including Ward 1) and this is not expected to change over the next several years.

7.10.3 Economic Base

Considerations of labour force activity and participation rates as well as the relative importance of different economic sectors to the regional and local economies are included in the assessment of the economic base. Manufacturing and Construction is the largest industry category in the Municipality, with 23% of the working population employed in this sector. Services relating to the arts and entertainment, recreation, accommodation, food services and public administration are the second largest industry category with 20% employed in this area. Other major industries that are important in the area include: wholesale and retail, health and education, and business services.

Agriculture

The agriculture sector is an important component of the Municipality's economic base. Over 53% of Northumberland County's total land base is agriculture. The rural area of the Municipality (Ward 2) has agriculture as its predominant land use. Northumberland supports the various types of farming such as beef (31%), speciality crops (21%), oilseeds (15%), dairy (10%), vegetables (3%), poultry and eggs (3%) and field crops.

Private Sector Industry

Cameco Corporation is the largest single employer in Port Hope. CpK Interior Products, the automobile parts manufacturer, is the second-largest employer. There are also other industries such as automotive parts, food processing, alloy casting and foam/plastic production that are important to the local manufacturing sector. The nuclear industry is a significant contributor to Port Hope's economic base; Cameco represents 13% of all local economic activity [63].

Major Employers

In 2001, the major employers in the public sector included the Trinity College School, the Municipality of Port Hope and the Community Nursing Home. Further there are over 345 retail businesses and 225 service businesses in the Municipality.

Tourism

Port Hope is a popular tourist destination for same-day and weekend trips. In 2009, according to the Municipality, 10 000 people visited Port Hope's Tourism Information Centre. Most visitors were from the GTA, other regional visitors were from Peterborough in the north, Belleville in the east or Pickering in the west. Attractions in Port Hope include shopping for antiques, attending events at the Capitol Arts Centre, viewing architecture and visiting family and friends.

Future Economic Development

The Municipality of Port Hope's Economic Development Strategic Plan identifies the nuclear industry as the back bone of Port Hope's economy [64]. A modern, cleaned-up nuclear industry is expected to enhance the town's prospects for tourism development and as such the two industries are seen as complementary.

7.10.4 Community Infrastructure

Emergency, water and sewage services comprise the community infrastructure of Port Hope. There are 37 full and part time fire fighters in the Municipality. Police Services are provided by the Port Hope Police Service and the Ontario Provincial Police for Ward 1 and Ward 2, respectively.

Most of the Municipality is rural and is served by private wells and septic systems. Municipal sewer and water services are used in urban areas. In Ward 1, municipal water is drawn from Lake Ontario. There are residential homes in Ward 1 that are on private wells due to lack of accessibility to water mains or by choice. All residents in Ward 2 are on private wells because there is no municipal water supply.

Cameco is the only corporate entity drawing water from Lake Ontario. Cameco uses this water for cooling at the PHCF site. Domestic water is supplied by the municipal system. Any process wastewater is managed on site through treatment and evaporation.

7.10.5 Community Services

Community services include health care, schools and recreation services for the Municipality.

7.10.5.1 Health Care

A number of medical facilities exist in the local and regional study area. A medical centre and the recently opened Port Hope Community Health Centre are both located in the Municipality of Port Hope. There is also a regional hospital in Cobourg, approximately 12 km away. A health facility in Bowmanville serves the population of the Municipality of Clarington. In addition, in October 2003, the Northumberland Hills Hospital opened.

The Haliburton Kawartha Pine Ridge District Health Unit provides preventative health care services as well as monitors water quality, inspects food premises and investigates environmental hazards. Cameco also has on-site medical capabilities that complement and work cooperatively with medical facilities within and outside the Municipality.

7.10.5.2 Schools

In the Municipality, there are ten primary schools and two secondary schools, including public, separate and private schools.

7.10.5.3. Recreation

There are a number of public and private parks, facilities, clubs and organizations that members of the community and visitors use for leisure and physical activities. The east and west beach, the Port Hope Yacht Club and the Port Hope Marina are the recreation facilities closest to the PHCF. The western beach is used for dog walking, picnicking and serves as an entry point for kayaks and canoes into Lake Ontario. The Municipality of Port Hope has received federal and provincial funding to support the upgrade/improvement of a waterfront boardwalk and various parks [65].

The Ganaraska River is an important recreational and touristic feature of the community. The river is a well-known fishing resource to anglers. Fishing occurs year-round at the

mouth of the Ganaraska River. Further, in the spring and fall, people travel great distances to fish the trout and salmon runs.

7.10.6 Municipal Finance and Administration

Port Hope's total municipal budget for 2010 was approximately $13 million, with a municipal operating budget of approximately $8 million. The land that Cameco occupies in Ward 1 (91% of Cameco's total) is the most important contributor to Port Hope's property tax base. Currently, PHCF pays approximately $1 million in property taxes, 4.64% of all property taxes levied in Port Hope. Cameco accounts for 46% of all occupied industrial assessments in Port Hope and accounts for 1.6% of the total assessment.

7.10.7 Residents and Communities

The various public consultation activities for the Project, PHAI opinion survey results and public consultation activities for other recent projects in Port Hope have been used to collect information about how residents of the Municipality perceive their community and what they value. The information of the consultation activities was useful in gaining insight with respect to the following community values:

- the character of the community
- satisfaction with the community as a place to live
- the cohesiveness of the community
- perceptions with respect to the Project, i.e. community attitudes regarding Cameco and the effects the proposed activity may have on these perceptions

7.10.7.1 Information from Cameco Vision 2010 Public Consultations

Cameco has been implementing a public consultation process and monitoring community perceptions of and reactions to Vision 2010 throughout and prior to the EA study. These activities provided information on the community's values and priorities with respect to the Project.

Independent Advisory Report

Cameco retained Gartner Lee Ltd. (now known as AECOM) to:

- design and conduct a consultation and communication program for Vision 2010
- document and report back on feedback and input from the community
- make recommendations to Cameco on the community's input

The design aspects of Vision 2010 were the main focus of the initial consultations carried out between November 2005 and January 2006. The main conclusions of these consultations were:

- improving the visual environment and minimizing Cameco's footprint
- integrating with the community character and harmonizing with waterfront improvement and Centre Pier redevelopment
- improving public access and recreation at beaches and waterfront
- fostering public education about Cameco and Port Hope's nuclear heritage

Stakeholder Liaison Committee

The Stakeholder Liaison Committee (SLC) was formed as a result of the initial consultation process and is still ongoing. The SLC has reiterated the main concerns of that were stated in the Independent Advisory Report over a number of different consultations.

Value Ecosystem Components (VECs) Workshop

In May 2008, Gartner Lee Ltd. held a community workshop to specifically seek reaction to the VECs that had been previously identified in the Vision 2010 Draft EA Guidelines (including those related to socio-economic conditions) [4]. The objective of this workshop was public awareness and direct public participation in confirming and refining the VECs. Participants of the workshop felt that the VECs needed to more accurately capture community values.

Cameco polling

Since 2004, Cameco has been conducting regular polling in the community [66]. The polls focus on the residents' attitudes toward Cameco and Vision 2010. In 2008, most residents either "strongly agreed" or "somewhat agreed" that Port Hope is a safe and healthy place to live. Cameco received high scores for community citizenship (i.e. "a supporter of the Port Hope community", "a generator of economic opportunity" and "a creator of quality employment in Port Hope") and received the lowest scores for environmental responsibility ("an environmentally responsible company" and "protect the air, land and water for future use"). However, even the categories to which Cameco polled low were still in the "satisfactory" range.

7.10.7.2 Information from PHAI Opinion Surveys

Public opinion regarding the PHAI has been monitored by AECL through eight waves of telephone surveying since 2002. Vision 2010 and PHAI project activities are linked through the opportunity to dispose of historical waste through the PHAI. However, many residents of the community do not always distinguish between the two projects.

A number of key findings from the most recent survey (November 2009) [67] are relevant to the Vision 2010 Project. Most respondents are very satisfied with living in their community, with 71% responding that they are "very satisfied". Issues related to low-level radioactive waste or radiation and unemployment and lack of economic growth were named as the most important issues facing the community. Most residents are confident that low-level radioactive waste would be safely managed at the recommended PHAI facility over the long term, with 78% of respondents feeling at least "somewhat confident". Low-level radioactive waste/radiation, Cameco and chemicals/waste/uranium were named as community characteristics that residents liked least about their community.

7.10.7.3 Community Values

The following summarizes the common threads of the various consultation activities.

Community character

The various reports and documents described above all emphasize the historic character of the urban area; the friendly, small-town atmosphere; the unspoiled, undeveloped rural area; and the natural endowments such as the Ganaraska River, rolling hills, etc. The Lake Ontario waterfront was left out of most characterizations of Port Hope.

Satisfaction with the community as a place to live

A high degree of satisfaction with the community as a place to live is reflected in all these documents. Lack of economic opportunities and the presence of radioactive waste were identified as the primary sources of dissatisfaction.

Community cohesiveness

The two chief attributes of the town and contributors to the community's character are friendliness of the people and the communal atmosphere. Threats to the community's image are negative publicity and groups publicly complaining about radioactive waste.

Perceptions with respect to the Project; its history in the community and how the proposed Project may or may not change those perceptions

According to surveys, there is a high level of awareness and support of the Vision 2010 Project. The large majority of respondents who were aware of the Project think that it is "very important" or "somewhat important" for Cameco to undertake this initiative. There is a sense in the community that the Vision 2010 Project is needed, will benefit the community and, will help push forward other initiatives to improve the waterfront and the community as a whole.

8.0 ENVIRONMENTAL EFFECTS ASSESSMENT

An environmental effect is a measurable change resulting from an interaction between the Vision 2010 Project and the environment. This section identifies and examines Project-environment interactions and likely environmental effects of the proposed Vision 2010 Project. This section also describes the assessment used to determine if any adverse effects on the VECs can be attributed to Project works and activities and if the effects will remain following the implementation of mitigation measures. Potential mitigation measures and likely affects after mitigation measures are implemented (i.e., residual effects) are identified.

8.1 ASSESSMENT OF THE EFFECTS OF THE PROJECT ON THE ENVIRONMENT

The assessment of the effects of the Vision 2010 Project considered how Project works and activities interact with the environment. For this assessment it was necessary to:

- define and describe the Vision 2010 Project works and activities (section 3.3)
- establish the temporal boundaries of the Vision 2010 Project (section 4.3.2)
- establish spatial boundaries of the Vision 2010 Project (section 4.3.2)
- identify the applicable environmental components (section 7)
- identify VECs for each environmental component (table 4.3-1)

The following process was used to determine if any direct or indirect adverse effects attributable to the Vision 2010 Project will remain after mitigation:

- refinement of Project-environment interactions
- identification of those interactions with likely environmental effects
- assessment of likely environmental effects, including effects of the environment on the Project
- consideration of mitigation measures to reduce potential for adverse effects
- identification of residual effects that may remain after mitigation
- assessment of cumulative effects of other projects in the RSA
- determination of significance of any residual effects and cumulative effects

The Project-environment interactions were revised following the characterization of the existing environment (section 7) and the refinement of the VECs (table 4.3-1). The interactions are further analyzed in the following sections to determine if they are likely to result in a direct measurable effect.

8.1.1 Identification of Project-Environment Interactions

The Project-environment interaction matrix (table 8.1-1 and table 8.1-2) illustrates how potential effects were first identified. Vision 2010 Project works and activities that were considered include: general project activities; demolition; excavation; excavation; construction; transportation; landscaping and site restoration and ongoing site management and operation.

All open and closed circles represent potential interactions with the biophysical and socio-economic environments associated with the Vision 2010 Project. Open circles identify

Project-environment interactions that would not constitute a likely adverse effect. The closed circles identify potential Project interactions with likely residual adverse effects, for which mitigation measures are not available or for which an effect could remain following the implementation of mitigation measures. Analysis was not conducted for positive effects since the CEA Act is only concerned with adverse environmental effects.

In all, 196 potential interactions were identified in the 11 environmental components, with the largest number being found in the socio-economic, atmospheric and radiation, and radioactivity environmental components. When taking into consideration the interactions within the physical and cultural resources components, primarily due to the inclusion of the Centre Pier buildings within the scope of the assessment, the number of potential interactions increases to 205.

8.1.2 Assessing Likely Residual Adverse Effects

Effects that are likely to occur as a result of the Project taking into account the implementation of the proposed mitigation measures are known as residual effects. Only residual effects that are considered adverse were further assessed for significance (i.e., closed circles of table 8.1-1 and table 8.1-2). Table 8.2-2 summarizes the residual effects of the Vision 2010 Project on the environment.

8.1.3 Assessing the Significance of Residual Adverse Effects

Only adverse residual effects were assessed for significance. The assessment of significance of adverse effects of the Vision 2010 Project was carried out using the following broad criteria, as outlined in the EA Guidelines [4]:

- magnitude: the scale or size of the effect
- geographic extent: the area over or throughout which the effects will be measurable
- duration: the time period over which the effect will last
- frequency: the rate of recurrence of the effect
- reversibility: the degree to which the effect can be or will be reversed
- ecological importance: the importance of the environmental attribute or resource to the ecosystem health and function
- societal function: value of the environmental attribute or resource to society

A summary of the criteria used for determining the significance of adverse environmental effects is presented in table 8.1-3. The methodology was used to determine the level of significance that could be assigned to each residual adverse effect. Numerical weighting was not used to calculate significance levels. Instead the individual criteria levels were considered in appropriate balance recognizing that certain effects criteria are more important than others. Each residual effect was assigned one of the following significance levels based on the significance assessment:

- Minor adverse effect: An environmental effect which taking into consideration mitigation measures has "low" or "medium" degree of residual effect for the majority of the criteria. The residual adverse effect is minor or insignificant.

- Significant adverse effect: The residual adverse effect is significant. The environmental effect taking into consideration mitigation measures has "high" magnitude, "high" extent and "high" duration residual effects. Additional or more effective mitigation measures to reduce the impact of the effect are not considered possible.

Table 8.1-1 Project-Environmental Interactions on the Biophysical Environment

Likely interaction between the Project and Environmental Components	Atmospheric Environment		Radiation and Radioactivity							Geology and Hydrogeology			Hydrology and Surface Water quality			Aquatic Environment		Terrestrial Environment		Land use and Transportation		
	Air Quality	Ambient Noise	Atmospheric Environment	Terrestrial Environment	Hydrology, Surface Water Quality and Aquatic Environment	Hydrogeology Environment	Members of the Public	Radiation doses to Workers	Conventional Health and Safety	Geology	Hydrogeology	Soil	Hydrology	Surface Water Quality	Sediment Quality	Aquatic Habitat	Aquatic Species	Vegetation Communities and Species	Wildlife Communities and Species	Land use	Landscape and Visual Setting	Transportation
General Project Activities																						
On-site Traffic	●														●							●
Construction Equipment Fuelling									●						●							
Transportation of Equipment and Materials	●																					●
Demolition Activities																						
Removal of Hazardous Materials and Drummed Wastes from Interiors	●	●	●	●			●	●	●													
Removal of Equipment, Material and Building Services	●	●	●	●			●	●	●			●										
Cleaning of Building Interiors	●	●																				
Building Dismantlement	●	●	●	●			●	●	●					●					●		●	
Management of Demolition Waste		●	●	●			●	●	●				●		●			●	●		●	
Excavation Activities																						
Excavation of Soil	●	●	●	●		●	●	●	●		●	●	●	●	●	●	●	●	●		●	●
Water Management		●		●	●	●	●	●	●		●	●	●	●	●	●	●	●	●			
Construction Activities																						
Construction of New Buildings and Additions or Modifications to Existing Buildings	●	●							●		●		●	●	●	●	●	●	●		●	
Site Infrastructure		●						●					●	●								
Transportation of Waste																						
Transportation and Disposal of Contaminated and Non-Contaminated Materials	●	●					●	●	●										●			●
Landscaping and Site Restoration																						
Landscaping and Site Restoration	●											●	●		●						●	
Ongoing Site Management and Operation																						
UO_2 UO_3 and UF_6 Management		●		●			●	●	●					●							●	
Wastewater Treatment		●	●	●	●		●	●	●												●	
Operation of New Buildings	●	●										●										

Table 8.1-2 Project-Environmental Interactions on the Socio-economic Environment

Likely interaction between the Project and Environmental Components	Physical and cultural resources			Socio-economic conditions				Aboriginal interests	
	Archaeological Resources	Heritage Resources	Cultural Resources	Population and Economic Base	Community Infrastructure	Community Services	Residents and communities	Aboriginal Communities	Traditional Land and Resource Use
General Project Activities									
On-site Traffic				●					
Construction Equipment Fuelling				●					
Transportation of Equipment and Materials				●					
Demolition Activities									
Removal of Hazardous Materials and Drummed Wastes from Interiors				●				●	
Removal of Equipment, Material and Building Services				●	●		•		
Cleaning of Building Interiors				●		●			
Building Dismantlement				●					
Management of Demolition Waste				●					
Excavation Activities									
Excavation of Soil				●		●			
Water Management				●					
Construction Activities									
Construction of New Buildings and Additions or Modifications to Existing Buildings				●		●	●	●	
Site Infrastructure				●	●				
Transportation of Waste									
Transportation and Disposal of Contaminated and Non-Contaminated Materials				●		●	●	●	
Landscaping and Site Restoration									
Landscaping and Site Restoration				●			●	●	
Ongoing Site Management and Operation									
UO_2 UO_3 and UF_6 Management				●			●	●	
Wastewater Treatment				●			●	●	
Operation of New Buildings				●	●		●		

Table 8.1-3 Criteria for Determination of Significance of Adverse Environmental Effects

	Effect Criteria	Effects Level Definition		
Primary Considerations	**Magnitude of Effect**	**Low**	**Moderate**	**High**
		Effect exceeds baseline conditions; however, is less than reference criteria or guideline values	Effect will likely exceed reference criteria or guideline values but has limited effect on VEC or pathway to VEC.	Effect will likely exceed reference criteria or guideline values and may cause an effect on VEC or pathway to VECs.
	Spatial Extent of Effect	**Low**	**Moderate**	**High**
		Effect limited to SSA or immediate surroundings.	Effect limited to LSA.	Effect extends into the RSA.
	Duration (of effect)	**Low**	**Moderate**	**High**
		Effect is limited to short-term events.	Effect is limited to operational and/or decommissioning project phases.	Effect considered long-term (i.e., extends beyond the decommissioning phase).
Other Considerations	**Frequency (or Probability)** (of conditions causing the effect)	**Low**	**Moderate**	**High**
		Conditions or phenomena causing the effect rarely occur.	Conditions or phenomena causing the effect may occur occasionally (i.e., on one or more occasions over the project life).	Conditions or phenomena causing the effect may occur often and at regular and frequent intervals.
	Reversibility	**Low**	**Moderate**	**High**
		Effect is reversible (i.e., ceases once source/stressor is removed).	Effect persists for some time after source/stressor is removed.	Effect is not readily reversible.
	Ecological Importance (of resource or attribute)	**Low**	**Moderate**	**High**
		The VEC being affected is comment and abundant within the LSA.	The VEC being affected is less common and of limited abundance within the LSA.	The VEC being affected is recognized as being a threatened or a rare or endangered species.
	Societal Value (of resource or attribute)	**Limited**	**Moderate**	**High**
		The VEC being affected plays a limited role in maintaining the economic base, social structure, community stability or the well-being of people in the study area.	The VEC being affected plays an important role in maintaining the economic base, social structure, community stability and the well-being of people in the study area.	The VEC being affected plays a highly important role in maintaining the economic base, social structure, community stability and the well-being of people in the area.

8.2 POTENTIAL ENVIRONMENTAL EFFECTS

8.2.1 Atmospheric Environment

8.2.1.1 Air Quality

Description of Project-environment interactions: Potential air emissions from Vision 2010 Project activities include total suspended particulate (TSP), PM_{10}, $PM_{2.5}$, and NO_x.

The following list outlines project works and activities that have the potential to affect air quality:

- general project activities:
  - on-site traffic
  - transportation of equipment and materials
- demolition activities:
  - removing hazardous materials and drummed wastes from interiors
  - removal of equipments, material and building interiors
  - cleaning building interiors
  - building dismantlement
  - management of demolition waste
  - excavation activities
  - excavation of soils
- construction activities:
  - construction of new buildings and additions/modifications to existing buildings
- transportation of wastes:
  - transportation and disposal of contaminated and non-contaminated materials
- landscaping and site restoration
- ongoing site management and operations:
  - operations of new buildings

Demolition, soil excavation and construction activities are the major contributors to emissions compared to general project activities and transportation of wastes. The results of a bounding air quality scenario, which was undertaken to assess the relative effects of project activities indicates that the change in air concentration (excluding NO_2) due to adding demolition, excavation and construction activities will not be significant.

Some Vision 2010 project activities (i.e., demolition and soil excavation) have the potential to produce airborne dust, which may contain low levels of radioactivity. The level of radionuclides associated with airborne dust is predicted to be quite small, of limited duration and spatial extent and unlikely to result in significant adverse environmental effects.

No measurable increases in air concentrations for any of the contaminants are predicted from the reconfiguration of the site. A small decrease in the maximum predicted NO_2 and uranium

concentrations are predicted due to building and source modifications. Cameco will be required to demonstrate that it meets provincial standards relating to NO_2 and uranium. Moreover, the CEA Act follow-up program will be designed to verify air emission predictions.

NO_2 from exhaust from construction vehicles during demolition, excavation and construction activities may exceed the 1-hour NO_2 AAQC of 400 $\mu g/m^3$ under worst-case scenario hourly meteorological conditions.

Specific design elements, operating practices, special technologies, products and equipment, and additional ambient air monitoring will be considered during the licensing process to ensure that air emissions are controlled and meet relevant regulatory requirements.

Mitigation measures: The following air quality mitigation measures could be implemented to reduce or eliminate air quality impacts:

- demolition, soil excavation and construction activities:
  - employing effective dust mitigation techniques.
  - ensuring that all mobile equipment used on site is in good repair.
- transportation activities:
  - ensuring that all dump trucks travelling to and from the PHCF site are in good repair and fitted with functional mufflers.
- ongoing site management and operation:
  - complying with the air quality criteria and any other terms and conditions stipulated in the Certificate of Approval for PHCF.

Residual effects and significance: One minor residual adverse effect on the VEC for this component (nearest residential or recreational receptor) was identified. The effect is due to the potential infrequent exceedance of the 1-hour NO_2 AAQC. However, the assumption that construction, excavation and demolition occur simultaneously is likely conservative.

The residual effect on air quality is considered minor and not significant because it is highly unlikely that the predicted conservative worst-case scenario of the 1-hour NO_2 would be exceeded. Table 8.2-3 outlines how significance was determined for the residual effect on air quality.

8.2.1.2 Noise

Description of Project-environment interactions: The following project works and activities have the potential to generate noise:

- demolition activities:
  - removal of equipment, materials and building services
  - removal of hazardous materials and drummed wastes from the interior
  - building dismantlement
  - management of demolition waste
  - cleaning of building interiors
- excavation activities

    - excavation of soil
    - water management
- construction activities:
    - construction of new buildings and additions or modifications to existing buildings
    - site infrastructure
- transportation of waste:
    - transportation and disposal of contaminated and non-contaminated materials
- ongoing site management and operation:
    - UO_3, UO_2 and UF_6 management
    - wastewater treatment
    - operation of new buildings

Vision 2010 demolition activities will result in the removal of nearly two-thirds of the buildings on the PHCF site. Demolition methods that minimize noise will be favoured. However, demolition activities could result in noise beyond the site boundaries for short periods of time.

Excavation and construction activities could result in sources of near and far-field noise. Sources of excavation noise include excavation of soil and dewatering activities. Construction noise may result from additions and modifications to existing buildings and the installation of new infrastructure.

Key sources of transportation noise include noise from dump trucks transporting waste to the LTWMF and other facilities. Modifications to the physical layout of the site will result in minor changes to existing noise conditions.

The noise effects from the Vision 2010 Project were evaluated based on Health Canada's requirements. A list of all of the heavy equipment that could operate simultaneously during demolition, remediation/excavation and construction activities was created to assess worst-case noise conditions. Six potential worst-case scenarios were assessed. Pile driving activities are considered "highly impulsive" according to ISO1996-2: 2003. Further, given that pile driving activities will not be intermittent in nature, scenarios were considered with and without pile driving.

Noise effects from the various scenarios were assessed in terms of "annoyance", as required by Health Canada. The baseline day-night sound level (DNL) was calculated from baseline monitoring data. The baseline DNL included the various types of noise that the receptors are currently exposed to and was used to calculate a "percentage highly annoyed" (%HA) value. The criterion for severe impact is based on a 6.5% increase in %HA for baseline DNL values from 43 DNL to 77 DNL.

The baseline %HA level will increase by less than 6.5% at all receptors in the study area when pile driving is not occurring. The increase in %HA was predicted to exceed 6.5% at several receptors during periods when pile driving is occurring. The increase in %HA ranges from 0.5% to 15% during pile driving activities. The inclusion of pile driving is overly

conservative given that pile driving will not occur outside of construction time limits as stipulated in the local noise by-law and will not be continuous over long durations.

Mitigation measures: Noise mitigation measures may be implemented during the Project to reduce or eliminate noise impacts from Project works and activities at different receptors in the vicinity of the PHCF. The following provides a list of mitigation measures which may be implemented to reduce noise for each type of noise-generating activity:

- demolition activities:
  - avoiding the use of explosives
  - limiting demolition activities to daytime hours to the greatest extent possible
  - ensuring that all mobile equipment used on site are in good repair, fitted with functioning mufflers and comply with the noise emission standards outlined in MOE guidelines
  - ensuring that all dump trucks travelling to and from the PHCF site are in good repair and fitted with functioning mufflers
  - complying with the time and place restrictions stipulated for construction activities in the local noise by-law
- excavation activities:
  - limiting excavation activities to daytime hours to the greatest extent possible
  - ensuring that all mobile equipment used on site, are in good repair, fitted with functioning mufflers and comply with the noise emission standards outlined in MOE guidelines
  - complying with the time and place restrictions stipulated for construction activities in the local noise by-law
- construction activities:
  - ensuring that all mobile equipment used on site, are in good repair, fitted with functioning mufflers and comply with the noise emission standards outlined in MOE guidelines
  - limiting construction activities to daytime hours, to the greatest extent possible
  - maximizing the separation distance between the construction staging areas and nearby receptors to the greatest extent possible
  - maintaining on-site construction haul roads to prevent pot holes and ruts thereby avoiding the loud noises caused by construction vehicles travelling over uneven road surfaces
  - complying with the time and place restrictions stipulated for construction activities in the local noise by-law

- transportation of waste:
    - Ensuring that all dump trucks travelling to and from the PHCF site are in good repair and fitted with functioning mufflers

Residual effects and significance: The very nature of certain project activities could potentially generate noise even with the mitigation measures described above. However, some of the potentially noisiest activities would be short in duration and would be limited to daytime hours when ambient sound levels are already elevated.

No long-term residual adverse effects on the VECs selected for this environmental component (nearest residential or recreational receptor) are expected due to project works and activities.

Noise effects from Vision 2010-related activities are considered minor and not significant. The noise effects are expected to be limited to the site study area and the immediate surroundings and will be limited to the temporal boundaries of the Project. Table 8.2-3 outlines how significance was determined for the residual effect on noise.

8.2.2 Radiation and Radioactivity

Description of Project-environment interactions:

Atmospheric Environment

The following six project works and activities may result in radiological releases to the environment:

- removal of hazardous materials and drummed wastes from interiors
- removal of equipment, material and building services
- building dismantlement
- management of demolition waste
- excavation of soil
- wastewater treatment

Levels of radiation and radioactivity in the atmospheric environment are indirectly limited by regulatory dose limits to the public and workers. The effects of radiological releases from Vision 2010 Project works and activities to the atmosphere on humans are summarized in section 8.2.2 (Members of the Public), section 8.2.3 (Worker Health and Safety) and in section 8.2.7 (Terrestrial Environment) for effects on non-human biota.

Terrestrial environment

The following project works and activities have the potential to modify the release of external gamma radiation through the removal of contaminated soil and proposed changes to the storage of UO_3, UO_2 and UF_6:

- removal of hazardous materials and drummed wastes from interiors
- removal of equipment, material and building services
- building dismantlement
- management of demolition waste

- excavation of soil
- wastewater management
- UO_3, UO_2 and UF_6 management
- wastewater treatment

Levels of radiation and radioactivity in the terrestrial environment are indirectly limited by regulatory dose limits to the public and workers. The effects of radiological releases from Vision 2010 Project works and activities to the terrestrial environment on humans are summarized in section 8.2.2 (Members of the Public), section 8.2.3 (Worker Health and Safety) in and section 8.2.7 (Terrestrial Environment) for effects on non-human biota.

- Hydrology, Surface Water Quality and Aquatic Environment

Two project works and activities may result in radiological releases to the environment:

- wastewater management
- wastewater treatment

Levels of radiation and radioactivity with respect to the hydrology, surface water quality and aquatic environment are limited indirectly by regulatory dose limits to the public and workers. The effects of radiological releases from Vision 2010 Project works and activities to the hydrology, surface water quality and aquatic environment on humans are summarized in section 8.2.2 (Members of the Public), section 8.2.3 (Worker Health and Safety) and in section 8.2.7 (Terrestrial Environment) for effects on non-human biota.

The provincial radiological standard of 4 Bq/L was considered in the assessment of potential risk from radiological waterborne releases from project works and activities. The uranium activity concentration in water is expected to be well below this drinking water standard.

Hydrogeology environment

The following have the potential to interact with the hydrogeology environment:

- excavation of soil
- water management

There are no interactions between project works and activities on the Centre Pier and radiological groundwater releases.

Radiological groundwater releases from Vision 2010 Project works and activities are used in dose calculations for members to the public. Cameco will monitor groundwater radiological releases due to Vision 2010 activities through groundwater action levels. An investigation would be triggered if an action level is exceeded.

Members of the Public

Nine project works and activities may result in doses to members of the public:

- removal of hazardous materials and drummed wastes from interiors
- removal of equipment, material and building services
- building dismantlement
- management of demolition waste

- excavation of soil
- wastewater management
- transportation and disposal of contaminated and non-contaminated materials
- UO_3, UO_2 and UF_6 management
- wastewater treatment

Annual total doses to members of the public have been estimated both with and without mitigation measures. The largest contribution to the total dose is gamma radiation from the storage of UO_3 totes, UO_2 drums and UF_6 cylinders. The maximum total estimated dose during future operations is 160 μSv/y. However, with each proposed mitigation option the corresponding estimated dose is 71 μSv/y, which is well below 300 μSv/y, the ORL for the PHCF [1].

Mitigation measures: Current measures for Vision 2010, including environmental monitoring programs and action levels, are sufficient to minimize radiation and radioactivity releases to the four environmental components and minimize dose to members of the public. However, mitigation measures must be applied at some locations to decrease the dose from gamma radiation from the storage of UF_6 cylinders and to meet Cameco's fenceline objective of 10μR/h. The two mitigation measures being considered are a concrete block wall (approximately 24 cm thick) and a soil berm (approximately 3 m wide and 1.2 m high). The mitigation measures provide options that reflect space requirements or landscaping needs. Both measures would result in achieving Cameco's fenceline objective of 10 μR/h.

Residual effects and significance: There are no expected adverse residual effects on the VECs, the members of the public, from the Project. No further assessment of significance was carried out.

8.2.3. Worker Health and Safety

8.2.3.1 Radiation Doses to Cameco Workers

Description of Project-environment interactions: Eleven project works and activities are expected to result in doses to workers:

- removal of hazardous materials and drummed wastes from interiors
- removal of equipment, material and building services
- building dismantlement
- management of demolition waste
- excavation of soil
- wastewater management
- construction of new buildings and additions or modifications to existing buildings
- site infrastructure
- transportation and disposal of contaminated and non-contaminated materials
- UO_3, UO_2 and UF_6 management
- wastewater treatment

Estimated doses that NEWs will likely receive during the following scenarios are found in table 8.2-1:

- *Existing scenario* – the dose due to the existing operations.
- *Remediation and Construction scenario* – Includes exposure to existing PHCF operations, construction, demolition and excavation (these doses would only apply to the years in which remedial work was being performed)
- *Future with Manual Operation in UO_2 Drum Storage Building scenario* – includes exposure to future PHCF operations, existing and remediation/construction activities (e.g., soil, groundshine, and vegetation based on buildup of soil), indoor storage of UO_2 drums with Automated Storage and Retrieval System (ASRS) in UO_2 drum storage building and outdoor storage for UF_6 cylinders and UO_3 totes
- *Future with ASRS UO_2 Drum Storage Building scenario* – includes exposure to future PHCF operations, existing and remediation/construction activities (e.g., soil, groundshine, and vegetation based on buildup in soil), indoor storage of UO_2 drums with ASRS in UO_2 drum storage building and outdoor storage of UF_6 cylinders and UO_3 totes

Table 8.2-1 summarizes the total doses for Cameco and construction workers under these scenarios.

Table 8.2-1 Total Doses for Cameco and Construction Workers

Receptor	Location	Age	Existing (µSv/y)	Remediation / Construction(µSv/y)	Future Dose with Manual Option in UO_2 Drum Storage Building (µSv/y)	Future Dose with ASRS in UO_2 Drum Storage Building (µSv/y)
Cameco	Office	Adult	230	230	110	110
Cameco	Plant/Outside	Adult	350	350	160	160
Construction	Construction	Adult	NA	500	N/A	N/A
Construction	Demolition	Adult	NA	250	N/A	N/A
Construction	Excavation	Adult	NA	460	N/A	N/A

The estimated doses summarized in table 8.2-1 are the summation of the air inhalation and external gamma radiation dose from groundshine and materials stored on the site and are all well below regulatory limits.

Mitigation measures: The current measures (e.g. action levels, radiation protection program, including ALARA measures, etc.) are considered sufficient to minimize the dose to workers on site. No additional mitigation measures are required.

Residual effects and significance: No adverse residual effects are expected on the VECs (the workers) as a result of the Vision 2010 Project works and activities. No further assessment of significance was carried out.

8.2.3.2 Conventional Health and Safety

Description of Project-environment interactions: Cameco maintains appropriate programs, practices and procedures to protect workers from non-radiological hazards. When appropriate, programs and procedures specific to Vision 2010 activities will be developed and applied during all phases of the Project to ensure compliance with applicable health and safety regulations.

Mitigation measures: No mitigation measures are required.

Residual effects and significance: No anticipated adverse residual effects on VECs (workers) as a result of Vision 2010 Project works and activities are anticipated. No further assessment of significance was carried out.

8.2.4 Geology and Hydrogeology

8.2.4.1 Hydrogeology

Description of Project-environment interactions: Three project works and activities have the potential to interact with the hydrogeology of the site:

- excavation of soil
- water management
- construction of new buildings and additions or modifications to existing buildings

The scope of Vision 2010 includes the collection and treatment of all contaminated groundwater arising from project excavations. Existing groundwater conditions are outside the scope of the Project; however, Cameco does have an active groundwater treatment process in place.

The site's hydrogeology may be affected if the groundwater table is lowered in advance of the excavation of sub-phreatic soils. Water management (dewatering contaminated soils, treating contaminated wastewater, managing stormwater) could potentially affect the site's hydrogeology if temporary dewatering schemes are installed to lower the groundwater table to excavate in the dry. The construction of building additions are expected to be sited at grade (no basements) but some additions may include buried features that extend below the groundwater table

There are no predicted interactions between the works and activities on the Centre Pier and hydrology.

Mitigation measures: The excavation of soils and construction of new buildings are not expected to have a noticeable effect on the site's hydrogeology. Dewatering of remedial excavation or excavation for some new buildings may occur; no mitigation measures are required for these localized and temporary events.

Residual effects and significance: The groundwater regime in the area of the excavations will return to pre-construction levels once the need for lowering of the groundwater table has passed and the dewatering system is shut down.

There is no predicted adverse residual effect on the site's hydrogeology. A net benefit to groundwater quality, the VEC for the component, is expected as a result of the Project. No further assessment of significance was carried out.

8.2.4.2 Soil

Description of Project-environment interactions: The following activities have the potential to affect the quality of the soil at the site:

- operation of new buildings
- removal of equipment, material and building services
- excavation of soil
- water management
- landscaping and site restoration

The excavation and disposal of contaminated soils is one of the major project activities of Vision 2010. However, incremental soil concentrations associated with excavation and demolition activities are a very small fraction of the uranium in soil based on estimates of ongoing deposition from plant operations.

Mitigation measures: No mitigation measures are deemed necessary because the excavation and disposal of contaminated soils will produce a beneficial and desirable effect.

Residual effects and significance: No adverse residual effects are anticipated on local soil quality, the VEC for this component, due to Vision 2010 Project works and activities. The overall soil quality will improve. No further assessment of significance was carried out.

8.2.5 Hydrology and Surface Water Quality

8.2.5.1 Hydrology

Description of Project-environment interactions: The following seven project activities could interact with hydrology:

- management of removed demolition waste
- excavation of soil
- water management
- construction of new buildings and additions or modifications to existing buildings
- site infrastructure
- landscaping and site restoration

Potential effects on the existing hydrology may include effects on surface water, runoff quantities and peak flows during storm events due to modified site conditions.

The management of stormwater during Vision 2010 would be accomplished, as is the current practice, by the system of catch basins and storm sewers. There will also be infiltration of precipitation into the surface in unpaved areas, similar to the present condition. In the case of an extreme event beyond the capacity of the in-ground stormwater management system and normal infiltration, there could be overland flow to the Lake, but the active excavation areas would be protected from this overland flow by a berm as indicated in section of the 3.5.2.1 of the Draft EIS. Hence, the active excavation areas would only receive direct precipitation. For the areas that require shallow excavations, i.e., above the water table, the precipitation would collect in the excavation opening and infiltration would occur. Work in the area would stop until the water dissipated.

For the areas that require excavation below the groundwater table, as discussed in section 3.5.1.4 of the Draft EIS, these deep excavations would either be conducted "in the wet" or "in the dry". Assuming that deep excavations are conducted in the dry, the areas requiring soil removal would have a coffer dam installed to limit inflow of groundwater. They would be de-watered prior to excavation and infiltration would be collected during excavation. Both the de-watering water and the infiltration water would be sent for treatment. The rate of treatment is yet to be finalized, but a rate of 45 m^3/day is being considered. Only one coffer dam would be in active use at a given time. The area of the largest planned coffer dam is 1,120 m^2 and assuming that this excavation area was active at the time that a 100 year storm event delivered 99.1 mm of precipitation, the extra volume of water to be collected and treated would be 111 m^3. Given the treatment rate, 2.5 days of treatment would be required to recover from the event. Some excavation activities may have to be suspended during the recovery period.

Figure 8.2-1 shows the proposed coffer dam arrangement superimposed on the dissolved uranium plume in the sand and gravel layer, taken from the groundwater modeling report.

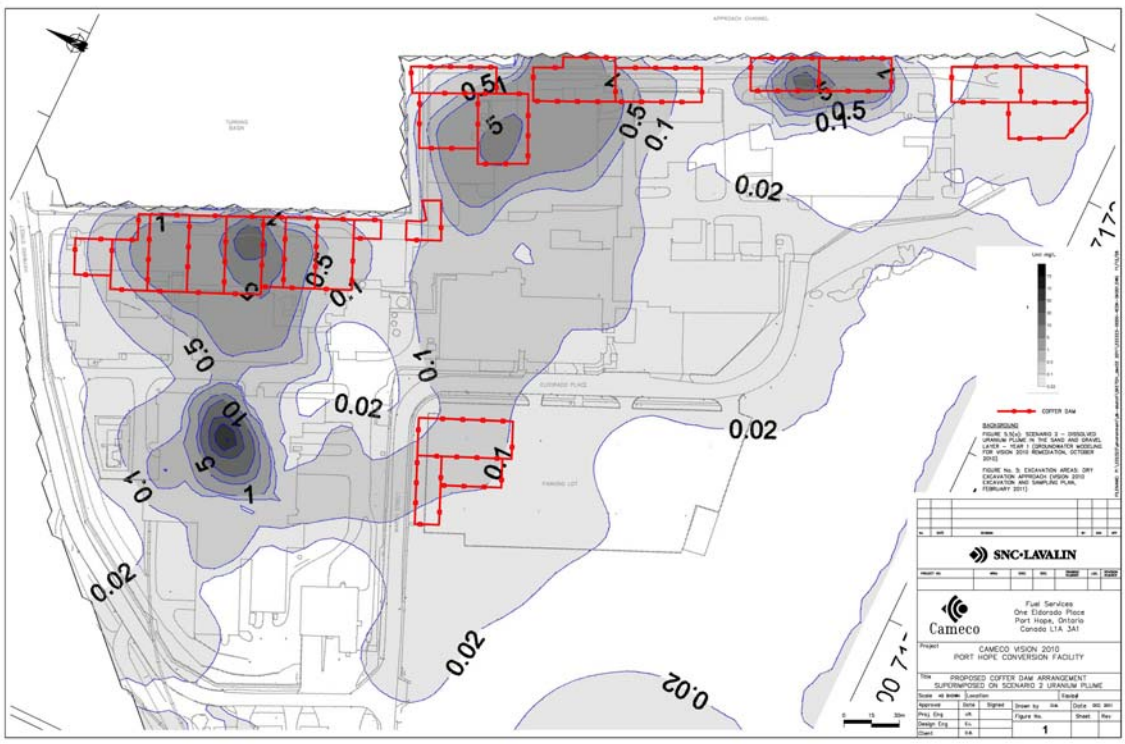

Figure 8.2-1: Proposed Coffer Dam Arrangement

Mitigation measures: The existing stormwater management systems and water management practices are expected to be adequate. No additional mitigation measures are required.

Residual effects and significance: No adverse residual effects are expected for the VECs (the nearest resident or recreational users) of this component. No further assessment of significance was carried out.

8.2.5.2 Surface Water Quality

Description of Project-environment interactions: The following works and activities have the potential to affect surface water quality:

- building dismantlement
- excavation of soil
- water management
- construction of new buildings and additions or modifications to existing buildings
- UO_3, UO_2 and UF_6 management

Surface water quality from stormwater runoff may be affected if demolition/construction debris and contaminated soil, sediment or dust becomes entrained in stormwater. Surface water quality may also be affected due to the deposition of particulate matter to the aquatic environment from Vision 2010 Project works and activities.

There will be no untreated liquid effluent discharges during demolition, excavation and construction activities of the Project. Treated effluent from Vision 2010 activities will be discharged once effluent discharge criteria is met.

Mitigation measures: No mitigation measures are considered needed. However the following measures may be used during storm events to keep surface runoff away from excavation sites, work areas and snow stockpiles:

- construction of diversion dykes to channel runoff around the excavation areas
- covering of stockpiles and excavated soil with secured tarps or plastic sheeting
- placing sand bags, water-filled bags or equivalent to prevent surface water escape
- allowing surface water inside disturbed work areas to drain to open excavations to be collected for treatment, as required
- protecting catch basin inlets using filter fences, geotextiles or an excavated sediment trap
- implementing of velocity controls and temporary water holding areas

Residual effects and significance: No adverse residual effects on the nearest resident or recreational users, the VECs for this component, are expected as a result of the Project. No further assessment of significance was carried out.

8.2.5.3 Sediment Quality

Description of Project-environment interactions: The potential effects of the following seven project works on sediment quality were assessed:

- on-site traffic
- construction equipment fuelling
- management of removed demolition waste
- water management
- excavation of soil
- construction of new buildings and additions or modifications to existing buildings
- landscaping and site restoration

Sediment quality may be affected from the deposition of particulate matter to the aquatic environment from Vision 2010 activities. Particulate matter may also be emitted from construction traffic and from demolition and soil excavation activities.

Sediment control measures including silt fences and stabilizing exposed areas as quickly as possible will be incorporated as part of the Project design at both the PHCF and the Centre Pier.

Mitigation measures: No mitigation measures are required. However during severe precipitation events, the following may be implemented to restrict work:

- evaluating the safety of haulage to the LTWMF
- evaluating the excavation along the harbour wall and securing equipment and materials, if necessary

- covering stockpiles to minimize runoff
- covering all bins and roll-off containers
- filling excavations in advance, if possible, when flood warnings are given

Residual effects and significance: There are no adverse residual effects are expected on sediment quality and on virile crayfish, the VECs for this component. No further assessment of significance was carried out.

8.2.6 Aquatic Environment

8.2.6.1 Aquatic Habitat and Aquatic Species

Description of Project-environment interactions: The Vision 2010 Project could potentially interact with aquatic biota through five environmental components: surface water quantity, surface water quality, sediment quantity, sediment quality and changes in the physical attributes of the aquatic environment. Surface water quality, sediment quantity and sediment quality are the most plausible components for Project-environment interactions. The following works and activities have the potential to interact with aquatic species:

- water management
- excavation of soil
- construction of new buildings and addition or modifications to existing buildings

Mitigation measures: The measures to preserve surface water quality and sediment quality were incorporated into the Vision 2010 Project design to ensure that aquatic species and their habitats will not be adversely affected.

No additional mitigation measures specific to aquatic biota and habitats were deemed to be required.

Residual effects and significance: There are no anticipated residual effects on aquatic biota or habitat, the VECs identified for this Project. No further assessment of significance was carried out.

8.2.7 Terrestrial Environment

8.2.7.1 Vegetation Communities and Species

Description of Project-environment interactions: The Vision 2010 Project does not involve any clearing of natural areas or successional vegetation. However, local vegetation may be exposed to contaminants from the deposition of particulate matter resulting from project activities. The project works and activities that have the potential to affect vegetation communities and species via this pathway are:

- management of demolition waste
- water management
- excavation of soil
- construction of new buildings and additions or modifications to existing buildings

Mitigation measures: The air quality assessment indicated that the Vision 2010 Project will not result in a measurable increase of suspended particulate matter. Therefore, no measurable effects on terrestrial vegetation communities and species are anticipated, and no specific mitigation measures for this environmental component are required.

Residual effects and significance: No adverse residual effects are anticipated on the wormwood gravel beach community, the VEC for this environmental component. No further assessment of significance was carried out.

8.2.7.2 Wildlife Communities and Species

Description of Project-environment interactions: Due to the limited nature of wildlife communities and species in the vicinity of the PHCF, the primary mechanism through which effects can occur is through aerial transport and deposition of contaminated particulate matter to soil, water and plants. The project works and activities that have the potential to affect wildlife communities and species via these pathways are:

- building dismantlement
- management of demolition waste
- excavation of soil
- water management
- construction of new buildings and additions or modifications to existing buildings
- transportation and disposal of contaminated and non-contaminated materials

Mitigation measures: The air quality assessment indicated that the Vision 2010 Project will not result in a measurable increase of suspended particulate matter. Additionally, measures taken to preserve surface water quality and sediment quality will further ensure that wildlife habitat, communities and species are not adversely affected. No measurable effects to wildlife communities or species are anticipated and no specific mitigation measures for this environmental component are required.

Residual effects and significance: There are no adverse residual effects to VECs (earthworm, northern leopard frog, American robin, double-crested cormorant, lesser scaup, meadow vole, eastern cottontail, or red fox) from this Project. No further assessment on significance was carried out.

8.2.8 Land Use and Transportation

8.2.8.1 Land Use

No interactions have been identified for the land use environmental component, therefore no residual effects are anticipated for this environmental component.

8.2.8.2 Landscape and Visual Setting

Description of Project interactions: There will be a temporary change to the landscape due to the presence of construction equipment at the PHCF during excavation, demolition and construction activities of the Project. Specific Project-environmental interactions that will affect the landscape and visual setting are:

- building dismantlement
- management of demolition waste
- excavation of soil
- construction of new buildings and additions or modifications to existing buildings
- landscaping and site restoration
- UO_3, UO_2 and UF_6 management
- wastewater treatment

Mitigation measures: Visual effects during excavation, demolition and construction activities cannot be eliminated. The Project will result in an improved landscape and visual setting, therefore, no mitigation measures are required.

Residual effects and significance: Short-term residual effects are anticipated on the landscape and visual setting, the identified VECs for this component, during site remediation, demolition and construction activities. A long-term benefit is anticipated for users of the waterfront since the physical appearance of the property will improve with the Vision 2010 Project. No further assessment of significance was carried out.

8.2.8.3 Transportation

Description of Project interactions: Transportation relevant Project-environment interactions include:

- on-site traffic
- transportation of equipment and materials
- excavation of soil
- transportation and disposal of contaminated and non-contaminated materials

One of the elements of the PHCF Emergency Response Plan (ERP) is the Transportation Emergency Response Organization (TERO) in Port Hope, Ontario. Its function is to respond to transportation incidents that occur during Cameco transport activities for this Project.

The immediate area at the vicinity of a potential spill to land will be cordoned off and the access of the public to the affected area will be restricted. The area would be attended by emergency response personnel for cleaning and decontamination activities. Therefore, any potential transient exposures would be limited to the area at close vicinity of the release site and to the emergency response team personnel and workers. Occupational exposure measures will ensure that the personnel will be equipped with personal protection equipment to prevent adverse health effects due to transient exposure. No public exposure is expected from releases to land and, therefore, no dose assessment will be considered necessary.

Mitigation measures: Mitigation measures to address potential transportation-related effects that could occur as a result of Vision 2010 works and activities were identified following a review of the mitigation measures proposed for the PHAI. No further improvements to the proposed measures for the PHAI are required as a result of Vision 2010. Additional measures have been recommended to address pedestrian and truck vehicle conflicts near the site.

Residual effects and significance: No adverse residual effects on traffic or members of the public, the VEC for this component, are anticipated. No further assessment of significance was carried out.

8.2.9 Physical and Cultural Resources

There are no interactions that have been identified for the Physical and Cultural Resources component. Moreover, there are no listed archaeological sites or heritage buildings on the main site of the PHCF or on Centre Pier. However, as discussed in subsection 7.8.2.3, due to community concerns, the Municipality of Port Hope has inaugurated the "Centre Pier Development Task Force". The task force is mandated to identify costs and potential risks associated with possible future development of the Centre Pier. On October 25, 2011, the task force released their final report regarding the fate of the Centre Pier. In this report, the task force recommended that PHAI restore the Centre Pier property to its full use either by retaining or replacing the buildings on the Pier.

8.2.10 Socio-Economic Effects

Indirect socio-economic effects are considered under the CEA Act (i.e. those effects that result from changes to the environment as a result of the Project).

8.2.10.1 Population and Economic Base

Description of Project interactions: All project works and activities have the potential to affect the population and economic base. The activities in table 8.1-1 and table 8.1-2 were considered to have an interaction with this sub-component of the socio-economic effect.

Mitigation measures: Mitigation measures are not required.

Residual effects and significance: No long-term residual adverse indirect socio-economic effects are predicted as a result of the proposed project works and activities. The Project may result in positive effects on population, employment, business activity, tourism and property values. No further assessment of significance was carried out.

8.2.10.2 Community Infrastructure

Description of Project interactions: The project works and activities that have the potential to affect community infrastructure are:

- removal of equipment, material and building services
- site infrastructure
- operation of new buildings

No undue stress is anticipated on approved facilities for the disposal of waste destined for landfill or recycling. No changes to underground municipal services (sewer and water) will be required on Hayward Street, however, some services will be altered at the PHFC, including the replacement of some municipal storm and sanitary sewer lines and the potential need for new sewer and water tie-ins. Cameco does not anticipate the need to draw increased levels of water from the treatment plant, nor to increase its loading on the sewage system during project works and activities.

Mitigation measures: Mitigation measures are not required, in the absence of environmental effects that have the potential to adversely impact the community infrastructure.

Residual effects and significance: No residual adverse effects on the VECs for the components are anticipated. No further assessment of significance was carried out.

8.2.10.3 Community Services

Description of Project interactions: The following four project works and activities have the potential to affect community services:

- building dismantlement
- excavation of soil
- cleaning of building interiors
- construction of new buildings and additions or modifications to existing buildings
- transportation and disposal of contaminated and non-contaminated materials

Mitigation measures: Mitigation measures are not required, in the absence environmental effects from project activities that could adversely affect community services.

Residual effects and significance: No residual adverse effects on the VECs for this component are anticipated. No further assessment of significance was carried out.

8.2.10.4 Residents and Communities

Description of Project interactions: The following project works and activities have the potential to affect resident and communities:

- removal of hazardous materials and drummed wastes from interiors
- construction of new buildings and additions or modifications to existing buildings
- transportation and disposal of contaminated and non-contaminated materials
- landscaping and site restoration
- UO_3, UO_2 and UF_6 management
- wastewater treatment
- operation of new buildings

Mitigation measures: Mitigation measures to address the potential for adverse effects of the Project on residents' use and enjoyment of property include keeping residents informed of activities on and off the PHCF site that might be a disruption to their daily lives.

Noise attenuation measures (section 8.2.1.2) will also be implemented to limit the effects of noise from Vision 2010 Project works and activities.

Residual effects and significance: No long-term significant adverse effects on the VECs selected for residents and communities are anticipated. The Vision 2010 Project is expected to be a benefit to the community.

Disruption to use and enjoyment of property due to nuisance effects of noise are considered minor and not significant. The magnitude of these residual effects is not anticipated to be of sufficient magnitude to preclude the use and enjoyment of property. Table 8.2-3 outlines how significance was determined for the residual effect on residents and communities.

8.2.11 Aboriginal Interests

8.2.11.1 Communities

Description of Project interactions: Project works and activities that have the potential to affect Aboriginal communities are:

- removal of hazardous materials and drummed wastes from interiors
- construction of new buildings and additions or modifications to existing buildings
- transportation and disposal of contaminated and non-contaminated materials
- landscaping and site restoration
- UO_3, UO_2 and UF_6 management
- wastewater treatment

Mitigation measures: No mitigation measures are considered necessary.

Residual effects and significance: No adverse effects on Aboriginal communities are expected. No further assessment of significance was carried out.

8.2.11.2 Traditional Land and Resource Use

No potential interactions between Traditional Land and Resource Use and Vision 2010 Project works and activities were identified.

8.2.12 Summary of Residual Effects

The residual effects from each environmental component are summarized in table 8.2-2.

Table 8.2-2 Summary of Residual Effects

Environmental Components	Sub-components	Relevant VECs	Direct Effect VEC
Atmospheric Environment	Air Quality (includes dust)	Nearest residential or recreational receptor	Measurable increase in NOx (1-hour)
	Noise	Nearest residential or recreational receptor	Effect anticipated on nearby residents – Short duration limited to daytime hours when ambient sound levels are already elevated. No long-term residual adverse effects anticipated.
Radiation and Radioactivity	Members of the Public	Nearest residential or recreational receptor	None
	Radiation Does to Non-human biota	Non-human biota as identified by terrestrial and aquatic environments	None
Conventional Health and Safety	Radiation Doses to Workers	Vision 2010 and PHCF employees and contractors	None
	Conventional Health and Safety	Vision 2010 and PHCF employees and contractors	None
Geology and Hydrogeology	Geology	Bedrock geology and stratigraphy	None
	Hydrogeology	Groundwater quality	None
		Local soil quality	None
	Soil	Members of the public	Net improvement

Environmental Components	Sub-components	Relevant VECs	Direct Effect VEC
Hydrology and Surface Water	Hydrology	Nearest resident or recreational user	None
	Surface water quality	Nearest resident or recreational user	None
	Sediment quality	Virile Crayfish (*Orconectes virillis*)	None
Aquatic Environment	Aquatic Habitat and Species	Smallmouth Bass (*micropterus dolomieu*)	None
		White Sucker (*Catostomus commersoni*)	
		Spottail Shiner (*Notropis hudsonius*)	
		Floating-leaf Pondweed (*Potamogeton natans*)	
Terrestrial Environment	Vegetation Communities and Species	Wormwood Gravel Beach community	None
	Wildlife Communities and Species	Earthworm	None
		Northern Leopard Frog (*Rana pipiens*)	
		American Robin (*Turdus migratorius*)	
		Double-crested Cormorant (*Phalacrocorax auritus*)	
		Lesser Scaup (*Aythya affinis*)	
		Meadow Vole (*Microtus pennsylvanicux*)	
		Eastern Cottontail (*Sylvilagus floridanus*)	
		Red fox (*Vulpes vulpes*)	

Environmental Components	Sub-components	Relevant VECs	Direct Effect VEC
Land Use and Transportation	Landscape and Visual Setting	Visual appearance of Cameco PHCH	A long-term benefit is anticipated for users of the waterfront, as the physical look of the property will be improved with Vision 2010.
	Transportation	Traffic	None
Physical and Cultural Resources	Archaeological Sites	Archaeological Resources	None
	Heritage Resources	Heritage Resources	
		Prehistoric Resources	
	Cultural Landscape Resources	Cultural Resources	
Socio-economic conditions	Population and Economic Base	Business activity	The Project is anticipated to contribute positively to the economic base of the Municipality of Port Hope and to the region. No adverse effects have been identified.
		Community-wide population levels	None
		Direct, indirect and induced employment	The Project is anticipated to contribute positively to the economic base of the Municipality of Port Hope and to the region. No adverse effects have been identified.
		Tourism levels	The Project is anticipated to contribute positively to tourism in the long term.
		Property levels	None
	Community Infrastructure	Use of landfill and recycling	None
		Use of storm sewers and sanitary sewers	

Environmental Components	Sub-components	Relevant VECs	Direct Effect VEC
		Water supply system	
		Recreation and community features and resource use	
	Residents and Communities	Use and enjoyment of property	Effected anticipated on nearby residents – Short duration limited to daytime hours when ambient sound levels are already elevated. No long-term residual adverse effects anticipated.
		Community/Neighbourhood Character	Long-term benefit to community anticipated.
Aboriginal Interests	Communities	Employment and Business Interests	The Projects is anticipated to contribute positively to the economic base of the Municipality of Port Hope and to the region. No residual adverse effects have been identified.
	Traditional Land and Resource Use	Aboriginal and Treaty Rights	None

8.2.13 Summary of Significance Determination for Residual Effects

Table 8.2.13 summarizes how significance was determined for the residual adverse effects.

Table 8.2-3 Determination of Significance of Residual Adverse Effects

Likely Residual Adverse Effect (After Mitigation)	Valued Ecosystem Component Affected	Evaluation: Rating of Criteria	Significance Results
ATMOSPHERIC ENVIRONMENT			
Air quality – NO_2 1-hour exceedance during contruction at residential and commercial receptors	Nearest residential or recreational receptor	**Magnitude: MEDIUM**	**Minor Adverse Effect (Not Significant)** The predicted exceedance of the 1-hour NO_2 results from the analysis of a conservative worst-case scenario that is highly unlikely. The predicted effect is localized and intermittent.
		Spatial Extent: MEDIUM Limited to nearby receptors in the LSA	
		Duration/Timing: LOW Short-term, limited to maximum activity level during demolition, excavation and construction activities.	
		Frequency: MEDIUM Occasionally between 4 and 10 times per year or 0.002% of the time.	
		Reversibility: LOW	
		Ecological Importance: LOW	
		Societal Value: MEDIUM Good air quality is important to a person's physical health and overall sense of well-being.	
Noise at residential and recreational receptors during pile driving activities	Nearest residential or recreational receptor	**Magnitude: MEDIUM**	**Minor Adverse Effect (Not significant)** In general, noise effects are expected to be limited to the SSA and immediate surroundings.
		Spatial Extent: LOW Limited to nearby receptors in the SSA	
		Duration/Timing: LOW Short-term, limited to daytime hours and only when pile driving activities are going on.	

Likely Residual Adverse Effect (After Mitigation)	Valued Ecosystem Component Affected	Evaluation: Rating of Criteria	Significance Results
		Frequency: LOW Infrequent activity (pile driving)	
		Reversibility: LOW Only experienced during pile driving activities.	
		Ecological Importance: LOW	
		Societal Value: MEDIUM Loud noise is considered a nuisance effect and can affect a person's sense of well-being.	
SOCIO-ECONOMIC ENVIRONMENT			
Disruption in the use and enjoyment of property by some nearby residents due to nuisance noise	Use and enjoyment of property	**Magnitude: MEDIUM**	**Minor Adverse Effect (Not significant)** Although those affected will likely experience some nuisance noise effects, these effects are not anticipated to be of sufficient magnitude to preclude the use and enjoyment of their property.
		Spatial Extent: LOW Limited to SSA and immediate surroundings	
		Duration/Timing: LOW Short-term, limited to daytime hours and only when pile driving activities are going on.	
		Frequency: LOW Infrequent activity (pile driving).	
		Reversibility: LOW Only experienced during pile driving activities.	
		Ecological Importance: LOW	
		Societal Value: MEDIUM Use and enjoyment of property is important to a person's sence of well-being..	

8.3 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

8.3.1 Seismic Activity

The Port Hope area, located on the northern shore of Lake Ontario, is in an area of relatively low seismicity. Over the past 30 years, 2-3 earthquakes with a magnitude of 2.5 or larger have been recorded per year in the southern Great Lakes region.

The new, proposed buildings at Cameco's PHCF site are required to meet the National Building Code (NBC). A report with the detailed geotechnical investigations for the new structures as well as geotechnical design details for the new buildings that will take into account effects of seismicity (i.e., including the effects on the building structures from potential soil liquefaction) will be considered during the licensing process. The NBC defines the earthquake design criterion in both spectral and Peak Ground Acceleration (PGA and SA(T)) for an earthquake based on a 2% probability of exceedance in 50 years.

Buildings will be more vulnerable to earthquake damage during Vision 2010 Project remediation, building demolition and construction activities. Buildings slated for demolition or buildings under construction will have limited number of people around them and limited number of operating utility services. No significant adverse environmental effects as a result of an earthquake are likely.

8.3.2 Severe Weather

The severe weather conditions that could affect Vision 2010 include: strong winds, ice storms, tornados and severe precipitation and flooding.

8.3.2.1 Strong winds

Wind speeds above the NBC design requirements could result in some damage; the primary effects would include local failure (e.g., window breakage, loss of roof panels and water penetration). More severe effects that could be caused by severe wind events are building / roof collapse and wind-generated missiles.

Disruption of excavation and demolition activities and potential damages due to wind-blown dust and debris may occur due to strong wind speeds. Therefore, demolition and excavation work may be stopped during these conditions.

8.3.2.2 Ice storms

Ice storms are especially common from Ontario to Newfoundland. The severity of an ice storm depends on several factors: accumulation of ice, duration of the storm and the location and extent of the affected area. Southern and eastern Ontario receive freezing precipitation 12 to 17 days a year, on average. Ice storms are not expected to affect Vision 2010 works; projects works and activities can be suspended during these storms.

8.3.2.3 Tornadoes

In Canada, an average of 80 tornadoes occur a year. In the Port Hope area, less than 1 tornado per 10,000 km^2 can be expected annually; approximately 90% of these tornadoes are light to moderate in nature. The frequency of these types of tornadoes is 10^{-5} per year. The

frequency for larger and more powerful tornadoes occurring in the study area is less than 10^{-7} per year.

Tornadoes will cause disruption to excavation and demolition activities. Further, potential damages from wind-blown dust, debris and missiles may occur. Consequently, demolition and excavation work will be stopped during tornado events.

8.3.2.4 Severe precipitation and flooding

Vision 2010 will be used as an opportunity to enhance stormwater management. Specifically, improvements will be made to the existing system and new portions will incorporate spill mitigation measures. The proposed stormwater management will include an underground sewer system to convey minor and intermediate magnitude precipitation events. Increased flows from major precipitation events will be safely conveyed from the site via overland flow paths.

The design of the stormwater management system, which will be considered during the licensing process for the proposed Project, should take into consideration potential impacts of climate change by including a safety margin and by following the provincial guidelines.

An assessment carried out on the lake flood hazard limits reveals that Cameco facilities are not expected to be at risk of direct damage from wave overtopping. Analysis conducted by AMEC indicates that there would be sufficient conveyance at the site to provide discharge of major flood events, including the Regulatory Flood and the Probable Maximum Flood (PMF). For the Ganaraska River watershed where the PHCF is located, the Regulatory Flood is defined by using a Hurricane Hazel (Regional Storm) based storm event. The PMF is an event greater than the Regional Storm and represents the highest flood that could physically occur at the site. Hence, severe precipitation and flooding is unlikely to adversely affect project works.

8.3.3 Climate Change

8.3.3.1 Impact of the Project on Climate Change - Greenhouse Gas Emissions

The main source of GHG emissions (methane (CH_4) and carbon dioxide (CO_2)) is the use of fossil fuels. Specifically, GHG emissions will be emitted during excavation, demolition and construction activities as well as from the operation of new buildings or building additions associated with Vision 2010. The contribution of project activities to GHG emission is negligible and is not expected to have an adverse effect on the climate.

8.3.3.2 Impacts of Climate Change on the Project

Studies indicate that predicted climate change could result in impacts on the hydrology over the next 100 years. Climate change is a gradual process. Its impacts are unlikely to affect the excavation, demolition and construction activities associated with Vision 2010 due to the short period of time of the Project.

Table 8.3-1 identifies the potential interactions between climate change and the Project. The interactions identified in table 8.3-1. indicate that no climate change parameter would have an effect on the Project's physical structure or system resulting in a risk to either the public

or the environment, provided that the design of the stormwater management system to be considered during the licensing process for this proposed Project takes into consideration the potential impacts of climate change on the magnitude and frequency of storms and floods by including a safety margin and by following the provincial guidelines.

No adverse environmental effects are anticipated on climate change in the long-term as a result of the proposed Project, as it is anticipated that there will be benefits on the environment due to the redevelopment of the PHCF and the remediation of soils, and upgrade of the stormwater management system.

Table 8.3-1 Potential Interactions Between Climate Change and the Project

Structures and Systems	Climate Parameter				
	Precipitation			Weather other than Temperature or Precipitation	Lake Ontario Effects
	Total Rainfall Amount	**Total Annual Snowfall**	**Frequency and/or Severity of Extremes (return period)**	**Frequency and Severity of Extreme Weather Events**	**Lake Ontario Water Level**
Buildings and Facilities	No likely effects since buildings, structures and systems will be constructed based on design weather data (harsh environmental conditions) and will be designed to meet the National Building Code of Canada. **Nil**			No likely effect since buildings, structures and systems will be constructed based on design weather data, a design basis earthquake and a site design earthquake, as well as being designed to meet the National Building Code of Canada. **Nil**	No effect on buildings is anticipated. **Nil**
Stormwater Management System	No effect on the stormwater management system is anticipated. **Nil**		Possible overflow of the stormwater management, causing localized erosion. The stormwater management system will be designed to meet National Building Code Requirements, applicable at the time of construction. An adaptive management strategy will be employed to mitigate against the possible effects of a changing climate. **Low**	No effect on the stormwater management system is anticipated. **Nil**	No effect on the stormwater management system is anticipated because it is located well above lake level. **Nil**

Structures and Systems	Climate Parameter				
	Precipitation			Weather other than Temperature or Precipitation	Lake Ontario Effects
	Total Rainfall Amount	Total Annual Snowfall	Frequency and/or Severity of Extremes (return period)	Frequency and Severity of Extreme Weather Events	Lake Ontario Water Level
Electrical Power Systems	No effect on the electrical power systems is anticipated. **Nil**	No effect on the electrical power system is anticipated. **Nil**	No effect on the electrical power systems is anticipated. **Nil**	Could cause the facility to lose all power including its backup power which could be an issue if the facility did not have enough power to allow a proper shutdown. Due to the many levels of backup at the facility, it is unlikely that all systems would be non-operational. **Low**	No effect on the electrical power system is anticipated. **Nil**

Note: "Nil" rank was assigned if it was determined that the physical structure or system was not sensitive to a change in the climate parameter.
"Low" rank was assigned if it was determined that the physical structure or system was unlikely to be sensitive to a change in the climate parameter.
"Medium" rank was assigned if it was possible that the physical structure or system would be sensitive to a change in the climate parameter.
"High" rank was assigned if it was likely that the physical structure or system would be sensitive to a change in the climate parameter.

8.4 EFFECTS OF POSSIBLE ACCIDENTS OR MALFUNCTIONS (AND MALEVOLENT ACTS)

8.4.1 Methodology

A methodology was developed and followed to identify potential malfunctions and accidents for the Vision 2010 Project. The methodology focused on the potential for the scenario to occur regardless of the initiating event. Specifically, the following steps were used to determine potential accident and malfunction scenarios:

- assess project works and activities to identify potential accident and malfunction scenarios
- group identified scenarios based on accident type and potential environment effect pathway
- assess scenarios and determine potential of scenarios to result in an effect on the environment
- determine potential bounding scenarios for assessment
- assess bounding scenarios and determine effect on the environment

8.4.2 Preventive and Mitigation Measures

Cameco intends to carry out the Vision 2010 activities in a manner that does not impact the health and safety of site and non-site personnel negatively. Further, Cameco will ensure that project works will meet regulatory requirements stipulated by the CNSC and other regulatory authorities.

General

A number of plans and procedures are being developed to provide information and direction to people involved with the Project.

Training

In order to ensure the safe execution of the Project, contractors and Cameco employees involved with the Vision 2010 Project will complete appropriate training commensurate with their duties and records will be maintained of all training.

Emergency Response Team and Transportation Emergencies

An Emergency Response Plan (ERP) and a well-trained Emergency Response Team (ERT) have been established by Cameco. The role of the ERT, which is maintained 24 hours a day and seven days a week, is to mitigate the impact of an incident and terminate the event. As part of the Vision 2010 Project, an ERP has been developed for site remediation activities at the PHCF. The Transportation Emergency Response Organization (TERO), based in Port Hope, Ontario, is one element of the Cameco ERP.

Security

In compliance with the relevant regulatory requirements and to promote a safe and secure workplace, Cameco has a security program in place. The workforce is maintained 24 hours a day and seven days a week.

8.4.3 Malfunction and Accident Scenarios

An evaluation of Vision 2010 works and project activities identified potential accident and malfunction scenarios that could occur. The scenarios identified in table 4-1 of appendix H of the Draft EIS [7] were grouped, as follows, based on the nature and pathway of the potential environmental effect that could result:

- personal exposure and injury
- structural accidents
- contaminant release to land air or water
- fire scenarios
- transportation accidents

The five categories for identifying bounding scenarios represent the scenarios that were not screened out in table 4-2 of appendix H of the Draft EIS [7]. Following the identification of the five categories, accident and malfunction scenarios were developed and mitigation measures that would be applied to prevent the occurrence of the accident and/or mitigate against health and environment impacts were considered. Scenarios were then forwarded for the selection of bounding scenarios as described in the following section.

8.4.4 Selection of Bounding Scenarios for Assessment

The following bounding scenarios were identified and used for a qualitative and quantitative assessment of effects:

1. *Scenario 1* – Release or potential fire or explosion (Natural Gas Fire or Explosion)
2. *Scenario 2* – Failure of the harbour wall resulting in flooding of the excavated areas leading to release of contamination (Contaminants Spill and Potential Contamination of Harbour)
3. *Scenario 3* – Cutting of pipes, panels or equipment containing hazardous material due to human error or equipment failure resulting in release to the environment and exposure to worker or members of the public to AHF of UF_6 (Release of AHF and UF_6 during removal of piping and equipment)
4. *Scenario 4* – Transportation accident involving release of material to water body or to land (Transportation Accident Involving Release of Uranium into the Ganaraska River)
5. *Scenario 5* – Transportation accidents and release of fuel and ignition (Transportation Accident resulting in Fire)

8.4.5 Assessment of Effects from Bounding Malfunction and Accident Scenarios

8.4.5.1 Natural Gas Fire or Explosion

This bounding scenario involves a rupture of a natural gas line and the resulting fire or explosion. Human error leading to the rupture of a natural gas pipe during excavation activities is a possible cause of this scenario. The resulting potential environmental consequences that could occur include:

- an on-site unconfined vapour-cloud explosion due to the release of flammable gas
- an on-site fire ball as a result of confined explosion of flammable gas
- migration of released flammable gas beyond the plant boundary and associated off-site fire

An on-site unconfined vapour-cloud explosion due to the release of flammable gas

There is the potential for adverse health effects to people working at the plant in the event of an accidental release of natural gas during project works. Therefore, prior to digging where underground natural gas pipelines may be present, underground work permits will be obtained and the location of the natural gas lines will be identified. The potential of a natural gas explosion during excavation is not expected to be higher than during similar work at a similar industrial site. Therefore, no significant adverse residual effects are anticipated for workers.

An on-site fire-ball as a result of confined explosion of flammable gas

This scenario considers an explosion at the source of the natural gas leak. The formation of an explosive vapour cloud is very unlikely given that natural gas is lighter than air and the released gases are not confined.

The nearest residential receptor to the area to be excavated would be approximately 150 m away. Damage to residential settings may be possible. Precautions would be taken to prevent the ignition of any natural gas released if there was a rupture of a natural gas line. However, it is anticipated that the cloud would disperse from the source. Therefore, this scenario is not expected to result in adverse effects to members of the public.

Migration of released flammable gas beyond the plant boundary and associated off-site fire

This scenario considers the dispersion of the natural gas and its subsequent ignition a distance from the source. The migration of the vapour cloud and formation of an explosive mixture beyond 100 m is very unlikely based on air dispersion modeling. Therefore, it is not expected that adverse effects will result from this scenario at the nearest residential receptor.

8.4.5.2 Contaminants Spill and Potential Contamination of Harbour

The failure of the harbour wall and the resulting flooding of the excavated areas leading to release of contamination are considered in this bounding scenario. Potential releases to the harbour could include diesel fuel spilled during transportation, storage and refuelling or the release of contaminated runoff or contaminated groundwater to the harbour. The amount of fuel that could potentially be released to the harbour is relatively small due to the limited amount of fuel on site. Similarly, the concentration of uranium, arsenic, fluoride and ammonia in the runoff and contaminated groundwater are low therefore, the total amount of contaminants released to the harbour is expected to be small.

Water in excavated areas is expected to be contained. The contained water will then be sent to the water treatment facility for treatment. If the harbour wall breaches, the spill may find its way to the harbour. If the harbour wall does not fail, a potential spill could still make its way overland to the harbour. The ERT would quickly respond to any spills that occurs as a result of this scenario.

Mitigation measures will prevent the spread of fuel to the harbour. No long-term residual effects are expected to result from a failure of the harbour wall and the resulting flooding of the excavated areas leading to the release of contaminants.

In the unlikely occurrence of a failure of the harbour wall and the co-concurrence of the release of contaminants to the excavated areas behind the wall, Cameco will be responsible for ensuring that contaminants can be contained and cleaned by the ERT and meet the harbour's water quality objectives. If an accident or malfunction were to occur and contaminants were released, the likely contaminants would be uranium, arsenic, fluoride and ammonia. These releases would be expected to be very low. Cameco's estimates for a conservative two-week release scenario were 0.6 kg of uranium, 2.5 kg of fluoride 0.2 kg of arsenic, and 1.8 kg of ammonia. Since an accident and malfunction scenario would be expected to be much shorter, the levels would be predicted to be quite low.

8.4.5.3 Release of AHF and UF_6 during Removal of piping and equipment

Residual contaminants such as anhydrous hydrogen fluoride (AHF) and UF_6 could remain in piping and equipment in existing facilities. Cameco has surveyed existing facilities to identify contaminated piping and equipment and it is anticipated that such materials will be removed before the start of Vision 2010 activities.

This bounding scenario considers the potential release of asbestos, uranium, AHF and UF_6 from the cutting of pipes, panels or equipment containing hazardous material due to human error or equipment failure and the subsequent exposure of workers or members of the public. The probability of this scenario is deemed higher for Building 27.

Cameco has implemented numerous prevention and mitigation measures to reduce the likelihood of this scenario occurring. Section 3.1 of appendix H of Cameco's Draft EIS [7] provides a complete list of the measures. The most important measures relevant to this scenario are the development and implementation of the:

- health and safety plan
- environmental monitoring plan
- radiation protection plan
- dismantlement, decontamination and demolition plan
- hazardous material abatement plan
- emergency response plan

In addition, procedures such as Safety Clearance for Hot Work are in place to prevent such accidents.

8.4.5.3.1 Offsite exposure

Air dispersion modeling was conducted for the demolition of Building 27 to estimate concentrations of UF_6 and AHF at two offsite locations.

UF_6 Exposure

The calculated concentrations at the two receptor locations were well below exposure limits.

No adverse effects from the unlikely accidental release of uranyl fluoride to members of the public at the nearest receptor locations are anticipated.

AHF Exposure

In the unlikely event of an accidental release of AHF, the reference vegetation exposure level would be exceeded at the nearest road but the WHO exposure limits for people would not be exceeded.

No significant adverse effects from AHF exposure are expected from this accident scenario.

8.4.5.3.2 Worker Exposure

Material left in the equipment may be released during the removal of contaminated process equipment. Workers who are involved in removing this equipment could potentially be exposed to release material.

Provisions in the Vision 2010 demolition plan include the following:

- adequate training and use of Personal Protection Equipment for employees and contractors
- sequencing of demolition and equipment removal activities to reduce the likelihood of such releases

It is anticipated that workers involved in the cutting of lines that could contain contamination would not experience physical health effects as a result of exposure due to the mitigation measures that would be in place.

No residual effects to workers are expected as a result of this scenario.

8.4.5.4 Transportation Accident Involving Release of Uranium into the Ganaraska River

This scenario includes a transportation accident involving release of contaminants into the river. The scenario includes the release directly to the river or the release near the river during a precipitation event. This assessment considers major vehicle accidents involving collisions and rollovers. Minor incidents, which do not result in the release of load, such as flat tires or skids were not considered.

The river crossing along the Highway 401 stretch of the transportation route is equipped with guards on both sides of the highway to prevent the fall of vehicles into the river. The direct release of contaminated waste into water due to a truck accident is a very unlikely event ($<4.1 \times 10^{-6}$ per year).

Most of the waste to be transported is excavated soil. The other contaminated waste stored in drums at PHCF is a small fraction of the total waste that will be transported. Therefore, a severe rupture to the drums would be required to cause a severe accident.

Contaminated waste may be released into the water if the contaminants are released within 100 m of the Ganaraska River during an intense rain event. Port Hope experiences

approximately four (4) days, or 1% of the year, of intense precipitation. Intense precipitation is defined as greater than or equal to 25 mm per day. The release of contaminated waste into the water during a precipitation event is very unlikely (1.6×10^{-6} per year).

If uranium from soil excavated from buildings is released into the river, there is a low probability (1.6×10^{-6} per year) that the surface water criterion is exceed for a duration of ten hours. Water treatment facilities within the vicinity of the PHCF would be notified as soon as possible and mitigation measures put in place to protect potable water supplies should such a scenario occur. It is also recommended that the speed of trucks transporting waste materials be limited along Hayward Street toward Queen Street, Queen Street toward Robertson Street and that the stretch of Queen Street along the Ganaraska River be fitted with guards.

8.4.5.5 Transportation Accident Resulting in Potential Fire

The majority of the contaminated waste to be transported is soil, demolition, debris and stored waste. Combustible waste is only a small percentage of the demolition debris. Atmospheric releases originating from diesel fuel and tires are the only anticipated releases during a fire.

If a fire were to occur, efforts would be made to extinguish the fires as quickly as possible to prevent the releases to the atmospheric environment. For trucks containing contaminated soils, measures would be taken to prevent water used for putting out the fires from entering the ground nearby. Berms will be used to contain the firewater, where possible, and the direction the water is directed will consider the surrounding environment. Once, the fire is extinguished, clean up and remediation activities will be undertaken to remove any contaminated ground surface.

No significant adverse residual effects from this scenario are expected due to rapid response and the subsequent mitigation measures.

8.4.6 Summary of Residual Effects of Malfunctions and Accidents

Table 8.4-1 Summary of Assessment of Accidents and Malfunctions

Scenario	Summary of Residual Effects
Scenario 1 – Natural Gas Fire or Explosion	No long-term residual adverse effects to workers, members of the public or the nearest residential receptor are expected.
Scenario 2 – Contaminants Spill and Potential Contamination of Harbour	No long-term residual adverse effects are expected due to mitigation measures to prevent the spread of a fuel spill to the harbour.
Scenario 3 – Release of AHF or UF6 during Removal of Piping and Equipment	No long-term residual adverse effects to the members of public or workers are expected.
Scenario 4 – Transportation Accident involving Release of uranium into the Ganaraska River	No long-term residual adverse effects to human health are expected. Short-term exceedances would be rapidly reduced downstream of the release location.
Scenario 5 – Transportation Accident Resulting in Fire	No long-term residual adverse effects to the environment are expected. A rapid response and full cleanup of the fire will mitigate short-term effects.

8.5 EFFECTS ON SUSTAINABLE USE OF RENEWABLE RESOURCES

This section summarizes whether renewable and non-renewable resources would be affected by project-related works and activities to the point that they are not sustainable.

8.5.1 Renewable Resources

No expected substantive reductions in the availability of renewable resources are expected due to Vision 2010 Project activities.

8.5.2 Non-Renewable Resources

The Vision 2010 Project will require materials derived from non-renewable resources:

- aggregate materials (e.g., crushed stone, sand and gravel), primarily for concrete
- fuels, oil and lubricants used during excavation, demolition and construction
- steel and other materials used in the construction of the facilities associated with the Project

The use of aggregate materials in the construction activities associated with Vision 2010 will be negligible compared to the abundance of aggregate resources. The amount of fuel and lubricants used during remediation, demolition and construction activities will be similar to those used in the construction of a typical industrial facility. Further, the amount of steel and other materials needed for the Project will not be substantial compared to resource availability.

The Project is not expected to measurably affect the availability of non-renewable resources. Therefore, no significant adverse residual effects are anticipated.

8.6 CUMULATIVE ENVIRONMENTAL EFFECTS

This section assesses the cumulative effects of the Vision 2010 Project activities in combination with other project activities. Cumulative effects are incremental effects caused by the proposed Project that are added or combined with the effects caused by other projects or activities on and off-site.

8.6.1 Scoping of Other Projects and Activities

The waterfront area of the Municipality of Port Hope will be the centre of activities associated with normal operations of the PHCF and various clean up and re-development initiatives. In February 2009, a working session with key stakeholders was held to identify those projects (past, present and planned) that have the potential to act cumulatively with the effects of the Vision 2010 Project. The key stakeholders included representatives from the Municipality of Port Hope, AECL, the Cameco Vision 2010 Project team and an engineering consultant. Only those projects likely to have an effect on the VECs were considered in the EA. Table 8.6.-1 presents those identified projects.

8.6.2 Methodology for determining cumulative effects

The three residual effects, relating to VECs in the Atmospheric and Socio-Economic Environments, that have been identified were evaluated to determine if these effects have the potential to act cumulatively with the effects of other projects and activities on and off-site.

Soil excavation, demolition and construction activities associated with the Vision 2010 Project are expected to occur between 2013 and 2019. There may be temporal overlap of Vision 2010 Project works with the Projects listed in table 8.6.1.

Most of the effects of the Vision 2010 Project will be spatially confined to the waterfront area in the immediate vicinity of the PHCF and the transportation route to the LTWMF. The spatial extent of project activities listed in table 8.6-1 must be considered to determine the potential for spatial overlap with Vision 2010 Project activities.

Projects with a likely overlap in effect, time and space with Vision 2010 Project activities were assess for potential cumulative effects. Table 8.6-1 identifies those projects and activities where there is overlap for all three criteria.

Table 8.6-1 Interactions of Effects

	Project or Activity	Rationale	Environmental Components		
			Air Quality Effects to nearby residential or recreational receptors	Noise to nearby residential or recreational receptor	Disruption to use and enjoyment of property
ID#	**Past and Existing Projects and Activities**				
1	Normal operations of Cameco PHCF	Carried forward for analysis.	■✓●	■✓●	■✓●
2	Normal operations at Cameco Fuel Manufacturing	Located adjacent to transportation route, carried forward for analysis (air and noise)	■✓●	■✓●	✓
3	Normal operations at Darling Nuclear Generating Station	Potential air and noise effects from PHCF are limited to within an area approximately 1-2 km of the facility. DNGS is located more than 30 km away, therefore no spatial overlap. Further emissions to air are not common to the facilities so there is no potential for effects to overlap; not carried forward.	✓	✓	✓
4	Port Hope Manufacturing Facilities	Located in designated area in municipality, one such area is adjacent to the designated transportation route. Not anticipated that these facilities will contribute similar contaminants to the air.	✓	✓	✓
5	Special events in Port Hope	Many events are located in the downtown area located approximately 500 m north of the PHCF. Similar air and noise effects from these events are not anticipated.	✓	✓	✓
6	Maintenance dredging of approach channel	No temporal overlap related to air quality or potential for air quality effects to overlap; not carried forward. Noise effects and disruption to use and enjoyment of property carried forward.	✓	■✓●	■✓●
7	Operation of recreational facilities (e.g., harbour, yacht clus, trails, beach, marina, boating)	Many of the waterfront facilities will be closed or access restricted during both the PHAI activities and the Vision 2010 activities. Only noise to nearby residential or recreational receptors has been carried forward.	✓	■✓●	

	Project or Activity	Rationale	Environmental Components		
			Air Quality Effects to nearby residential or recreational receptors	Noise to nearby residential or recreational receptor	Disruption to use and enjoyment of property
8	Railway operation and maintenance	The railway tracks and station are located between a residential neighbourhood and the PHCF, thus any noise generated as a result of rail traffic will exceed that generated at the PHCF during Vision 2010 project activities	✓	■✓●	■✓●
9	Trinity College School (TCS) Visual Arts Centre	Construction of Arts Centre ongoing and anticipated to be completed in Summer 2011 prior to commencement of Vision 2010 activities; thus no overlap anticipated	■●	■●	
10	Residential developments	Various residential development locations, the closest is located off Marsh Road in the vicinity of the LTWMF, thus potential for dust and noise generated by residential development construction activities and Vision 2010 truck traffic to overlap	✓●	✓●	
11	Operation of Municipal sewage treatment plant	Plant located outside of residential area, thus no overlap with the use and enjoyment of property	■✓●	■✓●	
12	Ongoing agricultural activities	Agricultural activities located in Ward 2 or on the periphery of Ward 1. Air quality contaminants generated by those activities different from those generated by Vision 2010 remediation activities	✓●	✓●	
13	East Side Ganaraska River Parkland development	Project now completed, no overlap anticipated	■●	■●	■●
14	Victoria Street Joint Operations Centre	Construction of Operations Centre now completed, no overlap anticipated with the operation of the Centre and the Vision 2010 Project	■●	■●	
ID#	**Certain/Planned Projects and Activities**				
15	Port Hope Area Initiative, Port Hope Project – Waste Management Facilities	Carried forward for analysis	■✓●	■✓●	■✓●

	Project or Activity	Rationale	Environmental Components		
			Air Quality Effects to nearby residential or recreational receptors	Noise to nearby residential or recreational receptor	Disruption to use and enjoyment of property
16	Port Hope Area Initiative, Port Hope Project Activities: ▪ remediation of Port Hope Harbour	Carried forward for analysis.	■✓●	■✓●	■✓●
	▪ remediation of various on-lad sites with LLRW (including remediation of Centre Pier and properties on Mill St. South)	No spatial overlap or potential for effects to overlap; not carried forward.	✓	✓	✓
	▪ remediation of various on-land sites without LLRW	No spatial overlap or potential for effects to overlap; not carried forward.	✓	✓	
	▪ transportation of all contaminated soils to LTWMF	Potential for spatial and temporal overlap; however, no effects from transportation related noise anticipated.	■✓●	■✓	
17	Maintenance dredging of approach channel	Dredging is a wet process, thus no dust is generated.	✓	■✓●	■✓●
18	Development of the property around the PHCF post Vision 2010 construction	Predominately landscaping activities.	■✓	■✓	
19	Port Hope Business Park	Construction of businesses within the designated Park located south of Highway 401 and could potentially overlap with the transportation of waste material to the LTWMF.	✓●	✓●	

	Project or Activity	Rationale	Environmental Components		
			Air Quality Effects to nearby residential or recreational receptors	Noise to nearby residential or recreational receptor	Disruption to use and enjoyment of property
20	New Port Hope Marina	Carried forward; however, since the issuance of the Draft EIS this Project has been indefinitely postponed by the Municipality.		■✓●	■✓●
ID#	**Reasonably Foreseeable Projects and Activities**				
21	Highway 407 Extension to Highway 115	The most easterly section of the highway extension is located over 30 km from the PHCF, thus similar effects in terms of air quality or noise are anticipated.	✓●	✓●	
22	Mill St. South redevelopment	Located on the east side of the Ganaraska River, construction activities associated with the redevelopment carried forward due to potential incremental noise.	✓●	■✓●	■●
23	Dorset St. warehouse construction	Located north of the transportation route, limited overlap in terms of dust generation and noise of Vision 2010 truck traffic.	✓●	✓●	
24	West end active recreation park	Potential for dust and nose generated from traffic to the LTWMF to overlap with the construction of the west end active recreation park; however, the predicted number of trucks per day is low (6). Key use of park will occur predominately in the evenings and weekends, thus limiting the temporal overlap to several hours a day.	✓●	✓●	
25	Jack Burger Sports Complex upgrades	Potential air and noise effects from PHCF are limited to within an approximately 1-2 km area of the facility. The complex is located beyond that, therefore no spatial overlap. Further emissions to air are not common to the Complex so there is no potential for effects to overlap; not carried forward.	✓	✓	
26	Municipal infrastructure works: road resurfacing, sewage, water, and bridge repair	Various infrastructure projects within municipality not anticipated to impact the use and enjoyment of residential properties located in proximity to Cameco.	■✓●	■✓●	

	Project or Activity	Rationale	Environmental Components		
			Air Quality Effects to nearby residential or recreational receptors	Noise to nearby residential or recreational receptor	Disruption to use and enjoyment of property
27	New Nuclear Generating Station at OPG's Darlington Station	The station is located 40 km from the PHCF, thus no spatial overlap of air quality or noise.	✓●	✓●	
28	Highway 2 expansion between Port Hope to Cobourg	Dust and noise generated during highway expansion activities may generate similar air quality effects as those predicted from truck traffic transporting Vision 2010 waste material; however no temporal or spatial overlap. The Highway 2 expansion activities are planned to occur beyond the designated transportation route.	●	●	
29	Darlington Generating Station Refurbishment and Continued Operation	The station is located more than 30 km from the PHCF, thus no spatial overall of air quality or noise effects.	✓●	✓●	

● = Effects are similar to those of the Vision 2010 Project or may combine to result in an adverse effect on a VEC.
✓ = Likely temporal overlap with the Vision 2010 Project.
■ = Likely spatial overlap with the Vision 2010 Project.

8.6.3 Potential Cumulative Effects

8.6.3.1 Air Quality

Normal Operations of Cameco PHCF

TSP, PM_{10}, $PM_{2.5}$, uranium, HF, ammonia and NO_2 emissions from normal operations of the PHCF were considered in the analysis of existing conditions. Concentrations of NO_2 from demolition, excavation and construction activities were determined to have the potential to be above background levels.

Normal Operations at Cameco Fuel Manufacturing; Operation of Municipal Sewage Treatment Plant

Emissions from the Cameco Fuel Manufacturing and the operation of the Municipal Sewage Treatment Plant were included in the air concentrations in the local study area under existing conditions.

PHAI Activities

PHAI project works and activities will take place in proximity of the PHCF and at the same time as the Vision 2010 Project. The excavation of contaminated soil is included in both Vision 2010 and PHAI project activities. Excavation has the potential to release TSP, $PM_{2.5}$, NO_2 (from mobile equipment), uranium, arsenic and contaminants associated with the soils.

The combined effects of the two projects were estimated by adding the maximum predicted 24-hour average concentration reported at each receptor along with the nominal background concentration. A conservative approach was used in this assessment.

The predicted TSP air concentration was below the applicable criteria at all locations, except one along the transportation route. The elevated concentration was related to PHAI activities. The Vision 2010 Project only contributes a small amount to the total TSP concentrations.

Locations that exceeded the 24-hour $PM_{2.5}$ average criteria were locations with no influence from Vision 2010. The Vision 2010 Project contributes less than PHAI to the total $PM_{2.5}$ concentrations.

Predicted NO_2 concentrations from Vision 2010, PHAI and background NO_2 concentration are below applicable criteria. Vision 2010 Project activities have a greater contribution to NO_2 than PHAI activities at some locations close to the PHCF.

Vision 2010 Project activities contribute a small amount to the total concentration of uranium and arsenic. The predicted 24-hour average concentration for arsenic was below the relevant criterion except one location along the transportation route, which has no contribution from the Vision 2010 Project.

In summary, the Vision 2010 Project will not act in a cumulative fashion with PHAI project activities in locations were predicted air concentrations exceed regulatory standards.

Municipal Infrastructure Works

Concentrations associated with future Municipal Infrastructure Works were considered in the nominal background air concentrations in the assessment of environmental effects section for Atmospheric Environment.

8.6.3.2 Noise on Nearby Residential and Recreational Receptors

Normal Operations of Cameco PHCF; Normal Operations at Cameco Fuel Manufacturing

On-site activities including those specific to the Vision 2010 Project, those associated with the ongoing operations of the PHCF and post-Vision 2010 activities were accounted for in the assessment of environmental effects section for Atmospheric Environment.

The remaining cumulative effects addressed in this section consider the interaction between Vision 2010 activities and off-site activities. However, the following discussion of noise effects is qualitative because the actual noise levels associated with off-site activities are unknown.

Maintenance Dredging of Approach Channel

The noise from the heavy construction equipment used in dredging the approach channel could combine with noise generated by Vision 2010 Project activities or with post-Vision 2010 operation noise of the PHCF. The potential noise effects are expected to be short in duration and exposure limited to receptors on the east side of the PHCF.

Railway Operation and Maintenance

Rail noise is a significant component of the existing noise environment at receptors in the vicinity of PHCF. Train traffic noise could potentially combine with Vision 2010 Project activities; however train noise will dominate at receptors closer to the rail lines than to the PHCF. Noise from Vision 2010 Project activities should not be audible at these receptors when trains pass by.

Operation of Recreational Facilities

Beachfront activities and other water activities could generate noise, especially during the summer months. Noise from recreational activities is not considered as disruptive as noise from construction or industrial sources. No noise increment from recreational activities is anticipated even though recreational noise may occur simultaneously with noise from Vision 2010 activities or PHCF operations.

Operation of the Municipal Sewage Treatment Plant

Noise from the Municipal Sewage Treatment plant is unlikely to add to noise associated with Vision 2010 activities.

PHAI Activities

There is potential for incremental noise at some receptor locations if some PHAI activities occur simultaneously with Vision 2010 activities. Incremental noise is likely at receptors in the vicinity in PHAI and Vision 2010 activities. However, it is expected that depending on proximity, either Vision 2010 or PHAI activities would dominate.

New Port Hope Marina

If construction of the marina occurs simultaneously with Vision 2010 activities, nearby receptors may experience incremental noise. Noise closest to the receptor would dominate over the other sources of noise.

Mill Street South Development

The redevelopment of Mill Street, which includes the demolition of some existing structures and construction of new buildings, may be a potential source of noise. There is potential for some nearby receptors to experience incremental noise should the activities for both projects occur simultaneously. Similar to other activities, the source of noise closest to the receptor would dominate over other sources.

8.6.3.3 Disruption to Use and Enjoyment of Property

Nuisance effects such as noise may disrupt residents and recreational users in the vicinity of the PHCF and the waterfront from the use and enjoyment of their property. As a result, individuals may engage in behaviours that avoid or lessen exposure to the noise.

Normal Operations of Cameco PHCF

Residents in close proximity to PHCF could potentially experience incremental noise effects caused by the proposed Vision 2010 Project activities when added to or combined with noise from other unrelated projects or activities off-site.

Other Projects and Activities

As described in section 8.6.3.2 the following projects and activities may have cumulative effects with Vision 2010 Project activities:

- maintenance of dredging approach channel
- railway operation and maintenance
- PHAI activities
- New Port Hope Marina
- Mill Street South development

The noise closest to the receptor is the dominant source. No significant adverse cumulative effects are anticipated with regard to nuisance noise disrupting the use and enjoyment of property.

8.6.4 Mitigation Measures

No additional mitigation measures are considered necessary to protect the environment.

9.0 SUMMARY

The potential effects of the Vision 2010 Project on the environment were evaluated with respect to 11 environmental components. Residual effects for the Atmospheric Environment (Air Quality and Noise) and Socio-economic Conditions (Residents and Communities) were determined and were evaluated for significance. No significant adverse environmental effects on the environment are expected from Vision 2010 Project activities.

No significant adverse residual effects on the health and safety of workers or the general public are anticipated from the Project. Radiation doses from project activities are expected to be below the regulatory limits for human exposure and the dose to the general public will represent a small fraction of the annual dose received from natural background radiation in the vicinity of the PHCF site.

The potential for the environment (seismic activity, severe weather and climate change) to adversely affect the Vision 2010 Project was assessed. Environmental conditions are not anticipated to result in significant effects on the Project.

Thirty other projects and activities (past, present and planned) were evaluated to determine if and how effects might combine with residual effects of the Vision 2010 Project. No additional mitigation measures are necessary to protect the environment from cumulative effects.

A preliminary monitoring and follow-up program was described. The monitoring program will ensure that the assessment remains valid and that any new mitigation measures, if required, are identified and implemented in a timely manner.

10.0 FOLLOW-UP PROGRAM

10.1 EXISTING MONITORING PROGRAM

Federal and provincial agencies including the CNSC, EC and the MOE monitor the PHCF's environmental performance and enforce their powers through various rules and regulations.

The atmospheric pathway is the only plausible mechanism by which Vision 2010 activities can interact with the environment. This section describes Cameco's existing environmental monitoring program at PHCF. The full details of the program are described in *Port Hope Conversion Facility Environmental Monitoring Plan*.

10.1.1 Air

Uranium and fluorides are the primary emissions from PHCF operations. These contaminants are monitored with high volume air samplers, dust fall jars and lime candles. Modelling was used to determine the monitoring locations, which cover all lands surrounding the site, both in the immediate vicinity and at remote locations.

10.1.2 Water

Discharges from the PHCF are sampled from their point of discharge, in accordance with Ontario Municipal / Industrial Strategy for Abatement (MISA) regulations (O.Reg. 560/94). The sampling locations were defined through MISA regulations.

10.1.3 Groundwater Monitoring

Historical and recent activities at the PHCF site have resulted in contaminated soil beneath the site. Building 50 was constructed in the early 1980s. Groundwater flows from Building 50 toward the waterworks water treatment facility (now out of service) to the south. In the early 1980s, a series of monitoring wells were installed around Building 50 and on the former Port Hope waterworks property to identify any potential contamination originating from Building 50.

In 2008, Cameco conducted a site-wide subsurface investigation. This investigation resulted in the selection of long-term wells for monitoring. A total of 133 monitoring wells track ground water levels and 91 wells track groundwater quality.

10.1.4 Soil and Vegetation

In the late 1990s, routine soil sampling was established to determine the rate of deposition and accumulation of uranium in the local area from PHCF uranium air emissions. Vegetation samples are also monitored for potential damage by atmospheric fluorides.

10.1.5 Fish

Periodic fish sampling is conducted to verify that uranium uptake by humans through fish consumption remains small. Only fish that are routinely consumed are collected and tested to establish the level of human exposure.

10.2 AIR QUALITY MONITORING

10.2.1 Source Sampling

Pollution control equipment such as dust collectors and/or scrubbers are used to treat emissions from the PHCF prior to releasing them into the environment through various stacks and ducts. Regulatory requirements are used to establish the acceptable level of air quality at the point of emission (source), ground level outside the facility (ambient) and in the workplace. The predominant constituents that are measured are uranium, hydrogen fluoride and ammonia.

During operations, continuous sampling of uranium occurs at the main UF_6 and UO_2 stacks. The UO_2 stack is also continuously sampled for ammonia and nitrates and the dryer and reduction stacks are sampled for uranium. Emissions from the main UF_6 stack are continuously sampled for fluoride emissions.

The performance of the air emission control equipment that is incorporated into the plant processes is verified using routine and non-routine programs. Routine sampling involves the regular sampling of major emission release points. Non-routine sampling is performed to develop information on new installations, expand existing databases, update emission inventory data or for special investigations to pinpoint the causes of increasing or decreasing emissions.

10.2.2 Ambient Air Sampling

The objectives of the PHCF ambient air quality monitoring program are to:

- ensure that the facility is in compliance with the conditions of the operating licence and applicable ambient air quality criteria
- ensure that the facility is in compliance with internal controls, and that sufficient information is obtained for evaluation of the impact of the facility on the surrounding environment
- verify the results of the facility's source air monitoring program
- validate dispersion modeling results

Cameco's ambient air quality monitoring program measures concentrations of contaminants from the PHCF. Fluorides and uranium are the facility's emissions of major interest. The ambient air program is made up of five sampling programs: lime candles, dustfall jars, high volume samplers, vegetation surveys and soil test plots.

Ten permanent sampling stations around the PHCF have been established to monitor ambient air quality. Additional sampling locations may be added for special campaigns as required.

A meteorological monitoring system for wind direction, wind velocity, barometric pressure, temperature and rainfall is in operation at the PHCF. Monitoring results are evaluated within the context of applicable ambient air quality criteria, as established by the CNSC, Environment Canada and the MOE.

The Project as proposed is not anticipated to trigger a requirement for notification under the *Canada / U.S. Air Quality Agreement*. However, air pollutant loading monitoring will be considered during the licensing phase and notifications will be made, if required.

Fluoride Deposition Monitoring Program

Lime candles, paper impregnated with lime, are used to measure fluoride deposition rates. Samples are collected on a monthly basis in order to compare with the 30-day standard.

Dustfall Monitoring Program

Dustfall monitoring is a measurement of deposition rate. A dustfall jar is used to obtain particulate matter. Samples are collected for a month and are analyzed for uranium deposition rates.

Suspended Particulate Monitoring Program

A high volume air sampler is used to monitor suspended particulate matter. The method involves drawing a large volume of air through a filter housing for a fixed period of time. The samples are analyzed for uranium. Sampling is carried out on a daily basis at 3 stations, Marsh Street, Waterworks and Shuter Street.

10.2.3 Soil

Soil sampling for uranium and vegetation sampling for fluoride is part of the terrestrial sampling program and is carried out at frequencies that are appropriate for determining the effects and concentrations of various contaminants in the area surrounding the facility.

Measurable levels of uranium in soil surrounding the PHCF are due to historical operations of the facility. It is difficult to monitor the effects of current operations as a result of the historical contamination. The sampling surveys have mainly been performed and reported by federal and provincial organizations.

In the late 1990s, routine soil sampling was established to determine the rate of deposition and accumulation of uranium in the local area. Ontario's MOE established soil plots at the marina and town hall, with Cameco establishing more soil plots to complement MOE's plots. Cameco also established some soil plots next to existing monitoring stations to allow correlation of data to soil contaminant levels.

An enhanced uranium-in-soil sampling program was established in 2005. Air dispersion modelling shows that the areas of maximum uranium deposition occur near the facility. Therefore, most of the sampling locations are located within 500 m of the facility.

10.2.4 Noise

Operational noise at the PHCF is regulated by a comprehensive Certificate of Approval (Air), issued by the Ontario MOE in October 1996. The MOE may require that Cameco undertake either Acoustic Assessments or Acoustic Audits should noise sources at the site change. Ongoing noise monitoring is not typically required by the MOE. Noise monitoring and subsequent assessments will be undertaken to resolve specific noise complaints from nearby receptors, should the need arise.

10.3 PRELIMINARY SCOPE OF MONITORING AND FOLLOW-UP PROGRAM

The objective of the Vision 2010 environmental monitoring plan (EMP) is to:

- characterize the condition of environmental media (air, water, soil, sediment) before the start of the Project
- measure the condition of the same environmental media through the implementation of the Project to identify if any changes take place

If adverse effects from project activities are identified, actions can be taken to minimize the effects. The implementation of the EMP will determine whether or not the actions are effective.

The contaminants of concern that warrant monitoring are determined by the contaminants present in the soil being excavated and the buildings being demolished.

The CEA Act follow-up program as described in section 10 of the Proposed CSR and the final EIS shall be implemented by Cameco at its PHCF. The preliminary follow-up plan outlined by Cameco gives consideration to all possible effects of the Project (effects to groundwater, surface water, sediment quality, and air quality).

10.3.1 Air Quality

Airborne Particulate

Cameco's current environmental monitoring program provides a solid basis for monitoring the Vision 2010 Project. Increased concentrations of airborne particulates may arise from remediation projects involving earth-moving equipment and vehicle traffic along roadways. The current air sampling program is largely characterized by contaminants present in airborne particulates and measures TSP, PM_{10} and dust fall.

Dust fall monitoring will be increased to provide a more comprehensive baseline due to the temporary increase in potential dust-generating activities. It is recommended that three additional dust fall containers be added along the transportation route along Hamilton Road and Highway 401 one year in advance of Project implementation. Monitoring will continue during remediation activities and the transportation route will be monitored as long as materials are being shipped to the LTWMF.

Radiological Air Quality

Radon, a noble (non-reactive) gas, and radioactivity in suspended particulate are the main radiological components of the atmospheric environment. The excavation, loading, hauling and unloading of contaminated soil with low-level radioactive waste has the potential for release of radiological components to the ambient air. Specifically, uranium and ^{226}Ra should be monitored to ensure that their releases are identified and controlled.

The potential dust generating activities during Vision 2010 require increased dust analysis for a more comprehensive baseline. It is recommended that high volume air samples be analyzed monthly for ^{226}Ra and other radioactive decay chain nuclides one year in advance of Project implementation. Monitoring will continue during remediation activities. The usefulness of additional radon monitoring will be further assessed.

Heavy Metals

There will be an increase in industrial activities generating dust containing heavy metals during excavation and demolition activities. As a result of Vision 2010, increased dust analysis is required to provide a more comprehensive baseline. One year in advance of Project implementation, representative samples will be analyzed for heavy metals to provide a baseline for Vision 2010. Analysis will be done on a monthly basis with high volume air samples because heavy metals are not the primary contaminants of concern. The monitoring will continue during remediation activities.

Summary of Air Monitoring Activities

The following table summarizes air sampling activities that are part of the current program and will be incorporated in the baseline and remediation program. In sum, the number of stations will increase by three, due to the addition of dust fall stations along the transportation route.

Table 10.3-1 Summary of Air Monitoring Activities

Monitoring Approach		**Hi –vol sampling**	**Hi-vol sampling**	**Dustfall**
Filter (if applicable)		**TSP**	**PM_{10}**	**N/A**
Current Program	No. of stations	4		8
	Dust	7/week/station		1/month/station
	Total Uranium	7/week/station		1/month/station
	Radium (^{226}Ra)			
	Radionuclide decay chains			
	Heavy metals			
Baseline & Remediation Program	No. of station	4	1(sampler5)*	11
	Dust	7/week/station	7/week/one station	1/month/station
	Total Uranium	7/week/station	7/week/one station	1/month/station
	Radium (^{226}Ra)	1/month/station		
	Radionuclide decay chains	1/month/station		
	Heavy metals	1/month/station		

* Sampler rotated weekly among the 4 stations

10.3.2 Soil Quality

The soil underlying the facility has been subject to multiple investigations. In addition, Cameco, the federal government and the MOE have sampled soil in the vicinity of the PHCF to determine if elevated levels of uranium are present in the soil. Cameco has prepared soil plots within 1 km of the plant to sample and test soil annually for the presence of metals including uranium and nitrates.

The existing soil testing program will provide a baseline for the Vision 2010 Project. The soil plot will continue to be sampled and monitored for any potential impacts.

10.3.3 Water Quality

Every effort will be made to minimize the generation of liquid effluents requiring management. For situations where this cannot be avoided, the collected water will be sent for treatment. No new discharge points will be established.

The existing monitoring program is anticipated to be adequate to provide baseline before the start of Vision 2010. No additional monitoring is recommended.

10.3.4 Noise

A noise monitoring program will be developed to determine a baseline and to measure noise during the Vision 2010 Project.

10.4 REPORTING OF RESULTS

Screening criteria are provided for in the monitoring programs so that Cameco can immediately identify any results that exceed criteria. The results of monitoring programs are reported to the CNSC in quarterly compliance reports, in accordance with regulatory requirements. Copies of the compliance reports are also submitted to EC, the MOE and the Municipality of Port Hope.

Cameco will continue to inform the members of the public through the community consultation program during various Vision 2010 Project phases. Existing communication mechanisms (website, regular presentations to the Municipality of Port Hope council) and ongoing opportunities to meet with community groups are proposed as the main lines of continuing communication.

11.0 CONCLUSIONS AND RECOMMENDATIONS OF THE CNSC

CNSC staff conclude that the proposed Project is not likely to cause significant adverse environmental effects. This conclusion is based on predictions outlined in the Draft EIS and in subsequent information provided to the CNSC by the proponent, and includes the implementation of mitigation measures, which will be verified in a CEA Act follow-up program.

CNSC staff recommend that the Commission:

1. adopt the Proposed CSR for the Cameco Corporation's *Proposed Redevelopment of the Port Hope Conversion Facility (Vision 2010), Port Hope, Ontario*
2. provide the CSR to the Minister of the Environment and the CEA Agency for public consultation and Ministerial decision

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APPENDIX A ENVIRONMENTAL ASSESSMENT GUIDELINES

(Scope of Project and Assessment) – Environmental Assessment of the Proposal by Cameco Corporation for the Redevelopment of its Port Hope Conversion Facility (Vision 2010) Port Hope, Ontario (e-DOC 3062932)

Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

Environmental Assessment Guidelines (Scope of Project and Assessment)

Environmental Assessment of the Proposal by Cameco Corporation for the Redevelopment of its Port Hope Conversion Facility (Vision 2010) Port Hope, Ontario

May 2009

CEAR# 06-03-22672

Canada

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1 INTRODUCTION

1.1 Purpose of the Environmental Assessment Guidelines

The purpose of this guidelines document is to provide guidance on the environmental assessment (EA) to be conducted as a result of the proposal by Cameco Corporation (Cameco) to implement the "Port Hope Conversion Facility Vision 2010" project (Vision 2010 Project) in Port Hope, Ontario.

An earlier draft of this EA Guidelines document was released for a comment period, to provide an opportunity for the public to comment on the proposed scope of project, factors to be considered, the scope of those factors and ability of the Comprehensive Study to address issues related to the project. Public comments that have been received have been taken into consideration in this document

A federal EA of the proposed project is required under the provisions of the *Canadian Environmental Assessment Act* (CEAA). Under the CEAA, the scope of the project, the factors to be considered and the scope of the factors included in the assessment are determined by the Responsible Authority (RA) which, in this case, is the Canadian Nuclear Safety Commission (CNSC).

The guidelines document describes the basis for the conduct of the EA, and focuses the assessment on relevant issues and concerns. The document also provides specific direction to the proponent, Cameco, on how to document the technical EA study, which has been delegated to it by the CNSC pursuant to subsection 17(1) of the CEAA since the Minister has made a 21.1(1)(*a*) decision to continue the assessment as a Comprehensive Study. The document indicates the necessary information to be submitted by Cameco to the CNSC to facilitate the development of the EA Comprehensive Study Report by the CNSC. In addition, this document provides a means of communicating the EA process to stakeholders.

1.2 Environmental Assessment Process

The key steps followed by the CNSC during the EA process were:

- determination of the application of the CEAA to the project, including application of the *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements*; establishment of the Canadian Environmental Assessment Public Registry; and stakeholder notification; (step already completed);
- preparation of a draft Environmental Assessment Guidelines document and distribution to the proponent, federal and provincial authorities and the public; (step already completed);
- receipt of comments from federal and provincial authorities and the public (step already completed);
- CNSC review and disposition of comments received (step already completed); and
- revision of the draft EA Guidelines (step already completed).

Following the public consultation that was associated with this document as described in Section 4 of this document and pursuant to Subsection 21(2) of the CEAA, as the RA, the CNSC, provided a report to the Minister of the Environment (the Minister)(step already completed). The report from the RA to the Minister included:

- the scope of the project, the factors to be considered in the EA and the scope of those factors (i.e. the final EA Guidelines document);
- public concerns in relation to the project;
- the potential of the project to cause adverse environmental effects; and
- the ability of the Comprehensive Study to address issues relating to the project.

The CNSC recommended to the Minister whether the EA should be continued by means of a Comprehensive Study, or whether the project should be referred to a mediator or review panel. The CNSC for this proposed project recommended to the Minister that the project proceed as a Comprehensive Study. After considering the RA's report and recommendation, the Minister made the decision to refer the project back to the RA so that it may continue the Comprehensive Study process. Had the Minister refered the project to a mediator or review panel, the project would no longer be subject to the Comprehensive Study process under the CEAA.

As the Minister referred the project to continue under the Comprehensive Study process, the project cannot be referred to a mediator or review panel in the future.

As the Minister referred the project back to the CNSC to continue the Comprehensive Study, the subsequent steps in the process are:

- issuance of the EA Guidelines by the CNSC and delegation of technical studies and some public consultation to Cameco;
- receipt of the technical studies in the form of a draft Environmental Impact Statement (EIS) document from Cameco;
- distribution of the draft EIS to the review team (CNSC, federal authorities) for comment; revision and resubmission by the proponent of the EIS, as appropriate;
- preparation of a draft Comprehensive Study Report by the CNSC, in consultation with other federal departments involved in the assessment;
- public review and comment on the draft Comprehensive Study Report;
- review and dispositioning of public comments by the CNSC, and completion of the Comprehensive Study Report;
- submission of the final Comprehensive Study Report to the CEA Agency by the CNSC;
- public consultation on the final Comprehensive Study Report and review and consideration of comments received; and
- EA decision statement on the Comprehensive Study Report by the Minister.

The Comprehensive Study Report will present a conclusion, by the CNSC, as to whether the project is likely to cause significant adverse environmental effects, taking into account the appropriate mitigation measures. The CNSC will make recommendations to the Minister on making decisions on the EA and project-related public concerns, consistent with section 23 of the CEAA. The Minister will then render an EA decision statement on the Comprehensive

Study Report. If the Minister concludes that the project is not likely to cause significant adverse environmental effects, taking into account the appropriate mitigation measures, then the project will be referred back to the CNSC for an appropriate course of action under section 37 of the CEAA. If a decision is made to proceed to licensing, the CNSC may proceed with licensing hearings and decisions on licensing applications by Cameco to carry out the Vision 2010 project activities.

1.3 Project Background

In a letter dated June 22, 2006, (Reference 1), Cameco submitted its Vision 2010 proposal with a description of the project. The project consists of removing of a number of old or underutilized buildings; removing contaminated soils, building materials and stored historic wastes; transporting those soils and wastes to storage and disposal sites; and constructing new replacement buildings at the Port Hope Conversion Facility (PHCF) with necessary landscaping. The project is proposed to be carried out in conjunction (i.e. similar timing) with the Port Hope Area Initiative (PHAI) project, a joint federal-municipal government undertaking for the cleanup and long-term management of low-level radioactive and industrial waste in the Municipality of Port Hope, Ontario. The PHAI project has undergone a federal screening EA and is not a part of the scope of this project.

1.4 Application of the *Canadian Environmental Assessment Act*

CNSC staff has determined, pursuant to section 5(1) (*d*) of the CEAA, that a federal EA is required before the CNSC can authorize Cameco to proceed with activities involved with the Vision 2010 redevelopment proposal.

The proposal includes the decommissioning and demolition of several buildings, three of which are or were Class 1B nuclear facilities; remediation and restoration of these sites; construction of new buildings and operation of those facilities; and additions to existing buildings. These works constitute undertakings in relation to a physical work and, as such, there is a "project" as defined under Section 2 of the CEAA.

The proposed activities would require either amendments to Cameco's existing Fuel Facility Operating Licence (FFOL) FFOL-3631.00/2012 in respect of the decommissioning and construction components of the project, or an amendment to the current FFOL and the issuance of a new licence to decommission, which would be issued pursuant to subsection 24(2) of the NSCA.

The CNSC is a federal authority as defined in the CEAA. Paragraph 5(1)(*d*) of the CEAA requires that an EA be conducted before a federal authority exercises a regulatory power or duty prescribed in the *Law List Regulations* established under the CEAA. The CNSC issues licences for activities involved in Cameco's proposal under the authority of Subsection 24(2) of the *Nuclear Safety and Control* Act (NSCA), which is prescribed on the *Law List Regulations*. Therefore, there is a "trigger" for an EA. There are no identified exclusions from the EA for this project, pursuant to Section 7 of the CEAA and the *Exclusion List Regulations* established under the CEAA.

Accordingly, CNSC authorization of the proposed project would require that a federal EA be conducted in accordance with the provisions of the CEAA. The CNSC is an RA for the project as defined under the CEAA.

The North UO_2/Waste Recovery Building (Building #2), Metals Plant (Building #5C) and East UF_6 (Building #27) are or were Class 1B nuclear facilities for the refining or conversion of uranium with uranium production capacities of more than 100 t/a.

Paragraph 19(*c*) of the *Comprehensive Study List Regulations* established under the CEAA states the following:

> 19. The proposed construction, decommissioning or abandonment, or an expansion that would result in an increase in production capacity of more than 35 per cent of,
>
> (*c*) a Class 1B nuclear facility for the refining or conversion of uranium that has a uranium production capacity of more than 100 t/a.

Therefore, the decommissioning activities of the project would be captured under paragraph 19(c) of the *Comprehensive Study List Regulations* and a Comprehensive Study for the project is required pursuant to Section 21 of the CEAA. The CNSC must ensure that a Comprehensive Study of the project is initiated, and that a report be provided to the Minister.

1.5 Federal and Provincial Coordination

The CNSC is the only RA under the CEAA identified for this Comprehensive Study.

Through application of the CEAA *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements*, Natural Resources Canada, Environment Canada, Health Canada, Transport Canada and the Department of Fisheries and Oceans (Fish Habitat Management) have been identified as Federal Authorities for the purpose of providing expert assistance to the CNSC during the EA.

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

The CEA Agency is the Federal Environmental Assessment Coordinator (FEAC) as this project is of the type identified on the *Comprehensive Study List Regulations*. The role of the FEAC is to coordinate the participation of federal authorities in the EA process and to facilitate communication and cooperation among them.

1.6 Delegation of Assessment Studies to Cameco

Based on authority given to an RA in subsection 17(1) of the CEAA, the CNSC will delegate to Cameco the conduct of technical support studies for the EA, the development and implementation of a public consultation program, and the preparation of an EIS document. Cameco's public consultation program, in the context of this EA, would include requirements for information about the project and the results of technical studies.

Cameco will submit its EIS and technical support studies to the CNSC. The CNSC, in conjunction with the CEA Agency, will distribute the EIS and supporting documentation to Federal Authorities and the appropriate provincial authorities for review and comment. Based on comments received, the CNSC may request that the proponent revise its EIS. Following formal acceptance of the EIS by the CNSC, the FEAC and all Federal Authorities, the CNSC will use the information and analysis in the accepted EIS to prepare a draft Comprehensive Study Report. The draft Comprehensive Study Report will be made available for review and comment by the public and by Federal Authorities. The CNSC will then consider the comments received on the draft Comprehensive Study Report, make revisions as appropriate and then submit the revised Comprehensive Study Report to the CEA Agency for consideration and decision by the Minister.

2 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

The scope of the environmental assessment includes the scope of the project, the factors to be considered in the environmental assessment and the scope of those factors.

2.1 Scope of the Project

In establishing the scope of a project for a Comprehensive Study EA under the CEAA, the physical works that are involved in the proposal and any specific undertaking that would be carried out in relation to those physical works must be determined.

Cameco's Vision 2010 project is comprised of the following concurrent major activities:

- decommissioning and demolition of buildings currently on the site (see Table 1)
- site remediation and restoration; and,
- construction of new buildings, additions to existing buildings, and related infrastructure (see Table 2).

The principal project is proposed as the decommissioning of buildings designated as Class 1B Nuclear Facilities under the NSCA used for refining or converting uranium, and the construction of new buildings. Other undertakings in relation to these physical works to be considered in this environmental assessment include the demolition of several existing buildings (a preliminary list indicated in Table 1) and the construction and operation of proposed new buildings and infrastructure (Table 2). Figure 2.1 illustrates the existing site and the location of buildings that are proposed for decommissioning and demolition as part of the Vision 2010 project.

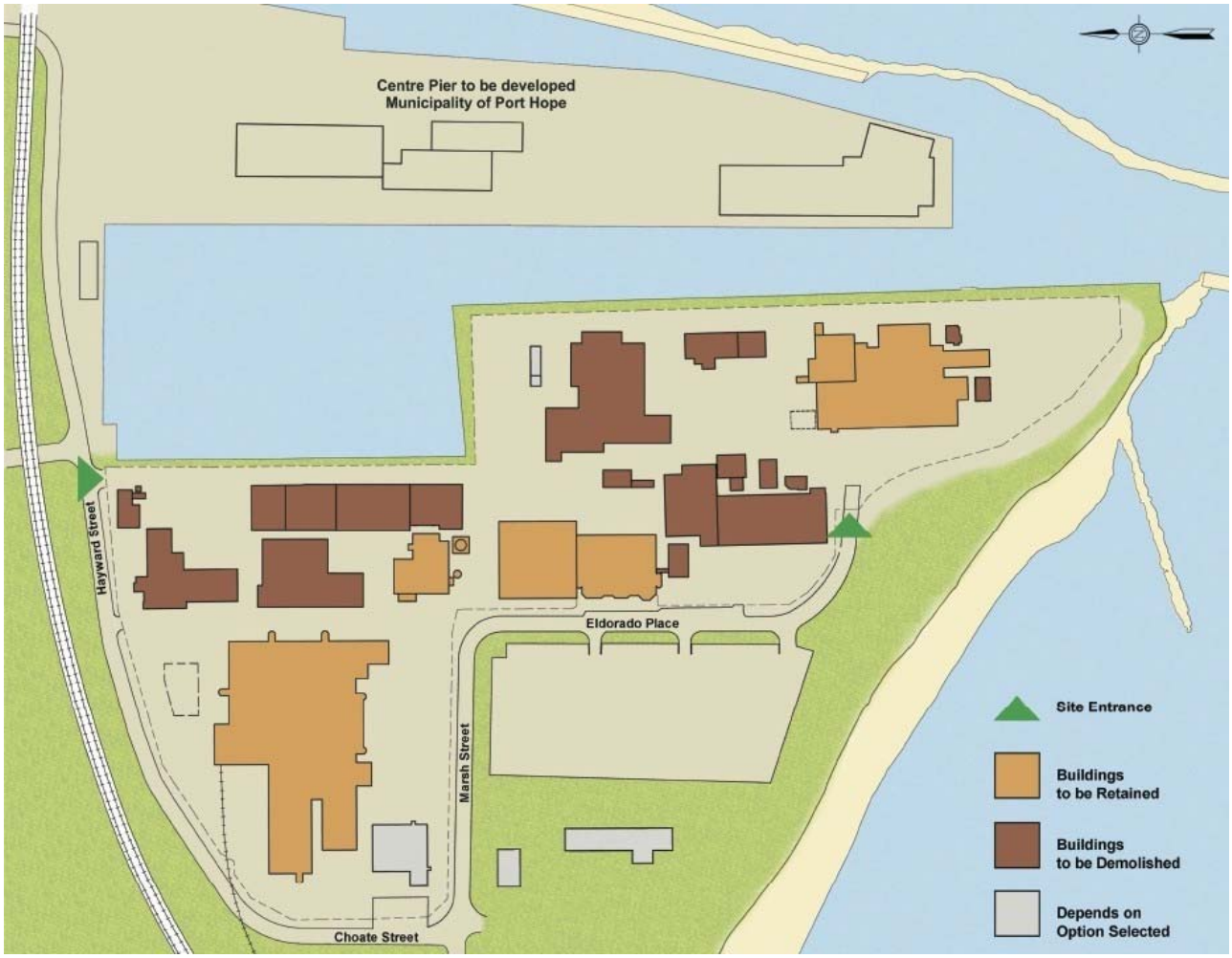

Figure 2.1 - Cameco Port Hope Site 1

Associated activities considered within the scope of the project include remediation and restoration of the site, management of contaminated process equipment and contaminated soils, hazardous and conventional waste, transportation of waste to the Long-term Waste Management Facility or to a conventional landfill site, and transportation of equipment and materials to and from the project site. The associated activities also include the construction, operation and decommissioning of the new buildings.

The interaction matrix included in this guidelines document (Appendix B) provides greater details concerning project activities that will be considered in this environmental assessment. The matrix, once finalized by the proponent during the EIS phase, will be used to perform an initial assessment of the potential interactions of project activities and environmental components and their subcomponents.

A preliminary decommissioning plan for the proposed new buildings will be required and included in the cumulative effects assessment for the proposal.

TABLE 1 – PRELIMINARY LIST OF BUILDINGS TO BE DECOMMISSIONED AND/OR DEMOLISHED

Building Number	Building Name	Approx Footprint (m^2)	Construction Date	Past and Current Uses
2	Waste Recovery	1,903	1937-1944	Past: refining and conversion of uranium Current: technology development labs, maintenance shops, wastewater treatment circuit, back-up $U0_2$ production equipment and the Clean Up Program (CUP) washing facility
5B	Scrap Processing	1,126	1926; 1947; 1957	Past: production of uranium metal Current: houses equipment for processing scrap metal
5C	Metals Plant	1,608	1961	Past: produce depleted uranium metal components Current: used for sorting and temporary storage of waste materials and for marshalling of drums
6	Warehouse	484	1957	Partial (very little): some general storage
7	Warehouse	400	1954	Drum Storage
12	Warehouse	1,130	1957; 1965	Drum Storage
12A	Warehouse	686	1975	Drum Storage
13	Cameco Technology Development Laboratory	373	1946; 1958	In Service
14	Metallurgical Products	234	1950	Past: used to process enriched uranium Current: used for storage of historic scrap enriched uranium in drums/pails
15	North Cooling Water pump house	24	1954	Not in use
22	Analytical Lab	663	1959	In Service
22A	Analytical Lab	466	1968	In Service
23	Radiography	81	1965	In Service
25	Cooling water pump house	88	1968; 1981	In use
26	Depleted Metal Storage & Stores	701	1968; 1978	Storage
27	East UF_6, CUP and Paint Booth	2,934	1969	Past : production of UF_6 Current: used to prepare UF_6 cylinders and temporary storage of $U0_2$ product, UF_4 powder, used anodes and waste materials.
31	Incinerator	104	1979	Out of Service
32	Truck Wash	204	1976 and 1979 (storage addition)	Operational
44	Mobile	193	1976	Operational

Building Number	Building Name	Approx Footprint (m^2)	Construction Date	Past and Current Uses
	Equipment Repair			
45, 45A	Receiving, Stores and Non-destructive Examination	813	1981	Operational
63	Waste management	149	1973	Operational

TABLE 2 – PRELIMINARY LIST OF PROPOSED CONSTRUCTION ACTIVITIES

Building Number	Building Description	Approximate Footprint* (m^2)	Primary Functions
70	Receiving building	3250	Receiving, stores, non-destructive examination, guardhouse, emergency vehicle storage, Emergency Response Team (ERT) command centre and office areas
	Gas bottle storage enclosure at the receiving building	120	Receipt and storage of gas bottles
71	CUP building	1050	Scrap metal processing, electrical substation and office areas
72	Research Centre /Technical Services building	2650	Research and analytical laboratories, pilot laboratory, storage and office areas
73	Cylinder storage building	7950	Shipping, receiving and storage of approximately 1400 - 1700 UF_6 cylinders
74	Visitor centre	700	Guardhouse, interpretive centre and auditorium
75	Drum storage building	4200	Receipt, shipment and storage of approximately 8000 drums. Drums could contain UO_2, ammonium diuranate (ADU), UF_4, KF, depleted U and uranium scrap. Other building functions include chemical storage, vehicle storage, vehicle maintenance and offices
76	Backup UO_2 building	1750	Building shell for future backup UO_2 production facility
3A	Control room addition	60	New powerplant control room
3B	Emergency generator addition	20	Addition to accommodate larger emergency generator
24E	Tote bin unloading addition	150	Indoor rotation and unloading of UO_3 totes
29A	Addition to Building 29	700	Change room expansion and office areas
50B	Wastewater treatment, potassium hydroxide unloading and truck wash addition	390	Wastewater treatment, indoor potassium hydroxide unloading and vehicle wash bay

Building Number	Building Description	Approximate Footprint* (m2)	Primary Functions
50C	Wet CUP addition	200	High pressure water blasting and temporary drum storage
50D	Maintenance addition	340	Radiography, maintenance office areas and storage
50E	Maintenance addition	170	Unassigned offices or storage
50F	Cylinder laydown addition	400	Expansion of existing cylinder laydown area
	New hydrogen and nitrogen tank compound	1900	
	Associated infrastructure and underground services	N/A	Infrastructure associated with new buildings, e.g. pipe racks, walkways, etc
*Areas 1000 m^2 or greater rounded up to nearest 50 m^2. Areas less than 1000 m^2 rounded up to the nearest 10 m^2.			

2.2 Scope of the Assessment

The scope of an assessment includes consideration of the factors to be considered in the environmental assessment and the scope of those factors. Detailed information on these aspects of the environmental assessment is provided below.

2.2.1 *Factors to be Considered in the Comprehensive Study*

The scope of the Comprehensive Study under the CEAA must include all the factors identified in paragraphs 16(1) (*a*) to (*d*) and 16(2) (*a*) to (*d*) of the CEAA and, as provided for under paragraph 16(1) (*e*), any other matter that the CNSC or the Minister requires to be considered.

Paragraphs 16(1) (*a*) to (*d*) and 16(2) (*a*) to (*d*) require that the factors to be assessed include:

- the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project, and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- the significance of the effects identified above;
- comments from the public that are received in accordance with the CEAA and its regulations;
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- the purpose of the project;
- alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;
- the need for, and the requirements of, a follow-up program in respect of the project; and
- the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future.

For the purpose of an EA, the CEA Act defines the "environment" as meaning the components of the Earth, and includes:

- land, water and air, including all layers of the atmosphere;
- all organic and inorganic matter and living organisms; and
- the interacting natural systems that include components referred to in (1) and (2) above.

An "environmental effect" from a project is defined by the CEAA as:

- any change that the project may cause in the "environment", including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act*;

- any effect of any "environmental effect" on:
    - health and socio-economic conditions
    - physical and cultural heritage
    - the current use of lands and resources for traditional purposes by aboriginal persons, or
    - any structure, site or thing that is of historical, archaeological, paleontological or architectural significance;
    - any change to the project that may be caused by the environment, whether any such change or effect occurs within or outside Canada

With the discretion allowed for in paragraph 16(1) (*e*) of the CEAA, the CNSC also requires consideration of:

- the need for the project and the benefits of the project; and
- consideration of traditional and local knowledge, where relevant.

Additional or more specific factors or issues to address in the EA may be identified during the conduct of the EA following consultation with the Minister, FAs and other stakeholders.

2.2.2 *Scope of the Factors to be assessed*

Subsection 16(3) of the CEA Act requires that the RA establish the scope of the factors to be assessed. This involves establishing temporal and spatial boundaries of the factors to be assessed and is typically carried out by defining the *study areas* and *time frames for the factors to be assessed* of the Comprehensive Study assessment, as described in section 3.9.2 of these Guidelines.

3 STRUCTURE OF THE COMPREHENSIVE STUDY REPORT

As the Minister has directed the CNSC to continue the Comprehensive Study process, the CNSC will prepare a Comprehensive Study Report under the following section headings. The CNSC recommends that the proponent's technical study report use a similar structure.

Comprehensive Study Report

Executive Summary
1) Introduction
2) Purpose of the Project
3) Need for the Project
4) Project Description
5) Alternative Means of Carrying Out the Project
6) Scope of the Environmental Assessment
7) Public Consultation Program
8) Description of the Existing Environment
9) Predicted Environmental Effects of the Project
   - Description of Assessment Methodology
   - Spatial and Temporal Boundaries of Assessment
   - Effects of the Project on the Environment
   - Effects of the Environment on the Project
   - Effects of the Project on the Capacity of Renewable and Non-Renewable Resources
   - Assessment of Potential Malfunctions and Accidents
   - Cumulative Environmental Effects
10) Determination of Significance
11) Follow-up Program
12) Conclusions and Recommendations
13) References

The recommended structure serves as a framework for explaining how the factors to be assessed, required under subsections 16(1) and 16(2) of the CEAA, are to be considered in the Comprehensive Study Report. Information about the project and the existing environment is necessary to permit a systematic consideration. The results of the technical study report will be documented in the Comprehensive Study Report to be prepared.

The parts of the assessment that are to be delegated to Cameco, in accordance with subsection 17(1) of the CEAA, are to be documented in the form of a technical EIS in a manner consistent with this structure. The EIS will be made available to the public as a support document to the Comprehensive Study Report.

3.1 Executive summary

This section should briefly describe the project, indicating the main predicted environmental effects. The key aspects of the project and the environment affected by the project should be highlighted, and the proposed mitigation measures that will render effects insignificant should be tied to the predicted effects. Any public concerns and uncertainties should also be noted.

3.2 Introduction

The introduction should include an overview of the project, including location, project components, associated activities, scheduling details and other key features. This section should also identify the project proponent. The intent of this overview is to provide context rather than description.

The introduction should also identify the CNSC's application of the CEAA, describing why the assessment is being carried out, including the triggers that have led to the assessment. This information will provide reviewers with an understanding of the context of the EA and the issues that have been addressed in it.

3.3 Purpose of the Project

The proposed project will be designed to achieve certain specific objectives. These objectives should be adequately described as the "purpose of the project". The rationale for decommissioning these buildings should be provided. Alternative means considered to carry out the Vision 2010 project should be assessed as described in Section 3.6.

3.4 Need for the Project

The "need for the project" should be established from Cameco's perspective and describe the problem or opportunity the project is intending to solve or satisfy.

3.5 Project Description

The main objective of the project description is to identify and characterize those specific components and activities that have the potential to interact with, and thus result in a likely change or disruption to, the surrounding environment under both normal operations and potential malfunction and accident situations.

The description of the project will refer to, and elaborate on, the items identified in the project scope, supported with appropriate maps and diagrams. It will include a proposed schedule for the different phases of the project as well as a detailed description of Cameco, including its ownership, organization, structure and technical capabilities.

Detailed regulatory guidance on how to plan decommissioning activities is provided in the CNSC regulatory guide G-219 (Reference 2). The project description should include the following information, provided in summary form with references made to more detailed information where applicable:

- the geographic location of the project, including site plans of the facility and the facility in relation to the surrounding community;
- a brief description, with diagrams, of the various areas, equipment, components and structures to be decommissioned; a similar description of the various areas, components and structures to be constructed.
- a history of the operation and any past abnormal operations, incidents or accidents that may affect the decommissioning activities;

- a description of specific malfunction and accident events that have a reasonable probability of occurring during the life of the project, including an explanation of how these events were identified for the purpose of this environmental assessment;
- a statement of the final radiological, physical and chemical end-state objectives for the areas in the site subject to decommissioning;
- a description of any requirements for long-term institutional controls;
- results of surveys of the radiological and other potentially hazardous conditions of the buildings to be decommissioned, including a description of any remaining significant gaps or uncertainties in the measurements or expected condition of these facilities;
- an overview of the nature and source of any potentially significant risks from the project (including radiological risks) to the workers, the public and environment;
- planning envelopes indicating the approximate duration and sequence of work to be completed and expected completion, each with their own characteristics, decommissioning objectives and implementation schedules, and final end-state;
- a statement of, and rationale for, the preferred strategic approach to decommissioning within each planning envelope;
- a description of the waste management plan including descriptions of procedures and criteria to be used to segregate waste into different categories (i.e. radiological, non-radiological, hazardous, conventional), estimated quantities for each category and plans for reuse, recycle, storage or disposal of waste; the processes for the collection, handling, transport, storage and disposal of radioactive, hazardous and non-hazardous waste to be generated by the project. (see section 6.3 of G-219);
- a description of a comprehensive environmental protection plan, including a health and safety plan, an erosion control plan, and a contingency plan to address accidental releases of untreated contaminated water and releases of petroleum products;
- a description of a site security program; for example any physical separation between the operations area and decommissioned areas of the facility;
- descriptions of occupational health and safety programs and environmental protection programs for the decommissioning activities and works being proposed;
- a plan for minimizing disruption to business and residences;
- characteristics of nuclear substances and other hazardous materials to be stored at the facility and the location of these substances in the facility;
- the sources and characteristics of any fire hazards;
- the sources and characteristics of any noise, odour, dust and other likely nuisance effects from the project;
- the predicted doses to workers involved with the associated operations and activities that are within the scope of this project;
- the predicted doses to members of the public;
- the key operational procedures relevant to protection of workers, the public and the environment relating to the project;
- the identification and description of engineered and administrative controls;
- the key components of the facility and its physical security systems (excluding prescribed information) that are relevant to management of malfunctions and accidents that may occur during the siting and construction activities, and during the subsequent operations of the proposed new facilities; and

- the predicted sources, quantities and points of release from the project of emissions and effluents containing nuclear substances and hazardous materials.

3.6 Alternative Means of Carrying Out the Project

The Comprehensive Study Report must include various technically and economically feasible ways for the project to be implemented and carried out. Under the CEAA, the consideration of these alternatives requires an environmental effects assessment of alternative means. The selection criteria used to identify a preferred alternative must include environmental factors and may include economic, technical and social factors. The information being used to make that decision and the decision-making process must be documented in the Comprehensive Study Report.

The alternatives must be identified, information must be collected on each alternative and a selection criterion must be applied to determine a preferred alternative.

3.7 Public Consultation Program

The assessment will include notification of, and consultation with, potentially affected stakeholders, including the local public and First Nations, as well as the municipal governments in the project area. Various media will be used to inform and engage individuals, interest groups, local governments and other stakeholders in the assessment.

Cameco will be expected to hold appropriate public consultation/information meetings, and Cameco's stakeholder consultation program will be monitored by CNSC staff throughout the EA process.

The purpose of Cameco's program would be to inform the public on the project and to consult the public on the results of technical studies. The CNSC will retain the responsibility to consult the public on the interpretation of technical studies, on recommendations and conclusions, and on the draft version of the Comprehensive Study Report. The CEA Agency will be responsible to make the final Comprehensive Study Report available for public comment.

Various stakeholders, including the following, will be consulted throughout the EA process:

- federal government;
- provincial government;
- local government;
- First Nations and Aboriginal communities;
- established committees;
- neighbouring residents;
- general public;
- local businesses; and
- Non-governmental organizations and interest groups.

The Comprehensive Study Report will contain a summary review of the comments received during the EA process. The report will indicate how issues identified have been considered in the completion of the assessment, or where relevant, how they may be addressed in any subsequent CNSC licensing and compliance process.

The program will also include opportunities for the public to review and comment on the Comprehensive Study Report prior to its submission to the Minister.

3.8 Description of the Existing Environment

A description of the existing environment is needed to determine the likely interactions between the project and the surrounding environment and, conversely, between the environment and the project, during the life cycle of the project. The description includes both the biophysical environment (such as ecological, radiological, geological, hydrological, hydrogeological and climatic conditions) and the socio-economic environment (human, cultural). The description of the existing environment should include sufficient information on the baseline conditions to allow the environmental impacts of the project to be assessed.

A screening of likely project-environment interactions will be used in identifying the relevant components of the environment that need to be described. In general, the environmental components that are typically described in the various study areas include, but are not necessarily limited to:

- human health;
- surface water;
- atmosphere;
- aquatic environment;
- geology and hydrogeology;
- terrestrial environment;
- land resources;
- cultural heritage and aboriginal environment; and
- Socio-economic conditions.

These environmental components are further divided into environmental subcomponents.

Valued Ecosystem Components (VECs) are environmental attributes or components identified as having a legal, scientific, cultural, economic or aesthetic value. Where relevant, VECs in the existing environment will be identified and used as specific assessment endpoints. VECs should be identified following consultations with the public, First Nations, federal and provincial government departments and other relevant stakeholders. A preliminary table of proposed VECs for this project is included as Appendix A to this document. The final list of VECs to be considered in this assessment must be reviewed and accepted by CNSC staff in the early phases of the EA study.

The required level of detail in the description of the existing environment will be less where the potential interactions between the project and various components of the environment are weak or remote in time and/or space.

Relevant existing information, including traditional and local knowledge, may be used to describe the environment. Where that information is significantly lacking, additional research and field studies may be required. CNSC staff will review any work done by Cameco to fill identified gaps in information as progress is being made.

3.9 Prediction of Environmental Effects of the Project

3.9.1 *Description of the Assessment Methodology*

The consideration of environmental effects in the Comprehensive Study should be done in a systematic and traceable manner, and the assessment methodology should be summarized. The results of the assessment process should be clearly documented using summary matrices and tabular summaries where appropriate.

3.9.2 *Spatial and Temporal Boundaries of Assessment*

The consideration of the environmental effects in the Comprehensive Study needs to be conceptually bounded in both time and space. This is more commonly known as defining the *study areas* and *time frames*, or spatial and temporal boundaries, of the Comprehensive Study assessment.

Both the study areas and time frames will remain flexible during the assessment to allow the full extent of a likely environmental effect to be considered in the Comprehensive Study. For instance, should the results of air modelling demonstrate that there is dispersion of a contaminant that is likely to cause an environmental effect beyond the boundaries identified, it will be taken into account in the assessment. Where the effects of the project are expected to continue beyond the operation of the facility, for example as a result of contamination related to the project, a time frame appropriate for describing and taking into account the potential longer-term residual effects will be used.

3.9.2.1 Study Areas

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

The following geographic study areas are proposed:

- **Site Study Area includes Cameco's PHCF site and the area encompassed by the** routes to transport contaminated soils and materials to and from the site as well as to storage and disposal sites;
- **Local Study Area** is defined as that area existing outside the site study area boundary where there is a reasonable potential for immediate impacts due to either ongoing normal activities, or to possible abnormal operating conditions. It includes the buildings and infrastructure at Cameco's PHCF licensed site. The outer boundaries of the Local Study Area encompass an area that includes lands within the Municipality of Port Hope, and the portion of Lake Ontario abutting and used by the community for such activities as recreation, water supply and waste water discharge. The boundaries may change as appropriate following a preliminary assessment of the spatial extent of potential impact. The Local Study Area has been defined as Ward 1 in the Municipality of Port Hope (i.e. the former Town of Port Hope).

- **Regional Study Area** is defined as the area within which there is the potential for cumulative and socio-economic effects. It includes the lands, communities and portions of Lake Ontario around the Port Hope conversion facility that may be relevant to the assessment of any widespread effects of the project. The Regional Study Area could be described as Wards 1 and 2 in the Municipality of Port Hope, but would be extended when necessary; for example, in the assessment of air quality modelling.

3.9.2.2 Time Frames

The temporal boundaries for this assessment establish the time period over which project specific and cumulative effects will be considered.

The initial time frame will be the duration of the decommissioning and demolition of the existing buildings, including site remediation and restoration activities, and the construction and operation of the proposed new buildings, including their eventual decommissioning, based on the Preliminary Decommissioning Plan (PDP).

3.9.3 *Assessment of Effects Caused by the Project on the Environment*

The assessment will be conducted in a manner consistent with the following general method:

1) ***Identify the potential interactions between the project activities and the components and sub-components of the environment during decommissioning, demolition of existing buildings and associated remediation and restoration activities to be conducted in these areas of the facility, and construction and operation of the new buildings under normal conditions and under the relevant accident and malfunction conditions.***

Specific attention will be given to interactions between the project and the identified VECs. In this step, the standard design and operational aspects from the project description that prevent or significantly reduce the likelihood of interactions occurring with the environment should be reviewed. Opportunities for additional impact mitigation measures are addressed in step 3 below.

Appendix B provides a proposed preliminary matrix of likely project-environment interactions for this project. The final interaction matrix will identify all interactions that need to be assessed in the Comprehensive Study.

2) ***Describe the resulting changes that likely would occur to the components and sub-components of the environment and VECs as a result of the identified interactions with the project.***

Each environmental change must be described in terms of whether it is direct or indirect, and positive or adverse.

Identified changes in socio-economic conditions and various aspects of culture, health, heritage, archaeology and traditional land and resource use may be limited to those that are likely to result from the predicted changes that the project is likely to cause to the environment. The consideration of public views, including any perceived changes attributed to the project, should be recognized and addressed in the assessment methodology.

This would include the identification of First Nations as an important group.

Quantitative as well as qualitative methods may be used to identify and describe the likely adverse environmental effects. Professional expertise and judgment may be used in interpreting the results of the analyses. The basis of predictions and interpretation of results, as well as the importance of remaining uncertainties, will be clearly documented in the EIS.

3) Identify and describe mitigation measures that may be applied to each likely adverse effect (or sequence of effects), and that are technically and economically feasible.

Mitigation strategies should reflect avoidance, precautionary and preventive principles; that is, emphasis should be placed on tempering or preventing the cause or source of an effect, or sequence of effects, before addressing how to reverse or compensate for an effect once it occurs.

Where the prevention of effects cannot be assured, or the effectiveness of preventive mitigation measures is uncertain, further mitigation measures in the form of contingency responses including emergency response plans will be described. Where cost/benefit analyses are used to determine economic feasibility of mitigation measures, the details of those analyses will be included or referenced.

4) Describe the significance of the environmental effects that likely will occur as a result of the project, having taken into account the implementation of the proposed mitigation measures.

The criteria for judging and describing the significance of the residual (post-mitigation) effects will include: magnitude, duration, frequency, timing, and probability of occurrence, ecological and social context, geographic extent, and degree of reversibility.

Specific assessment criteria (including clean-up criteria) proposed in the EA methodology for this project will be submitted to CNSC staff in the early phases of the EA study for review and acceptance. Existing regulatory and industry standards and guidelines are relevant as points of reference for judging significance. However, professional expertise and judgement should also be applied in judging the significance of any effect. All applicable federal and provincial laws must be respected.

The analysis must be documented in a manner that readily enables conclusions on the significance of the environmental effects to be drawn. The CNSC, as the responsible authority for the EA project, must document in the Comprehensive Study Report a conclusion, taking into account the mitigation measures, as to whether the project is likely to cause significant adverse environmental effects.

3.9.4 *Assessment of Effects of the Environment on the Project*

The assessment must take into account how the environment could adversely affect the project; for example, from severe weather conditions such as heavy rainfall, flooding, high winds or fluctuations in lake levels. The assessment must also take into account any potential effects of climate change on the project, including an assessment of whether the project might be sensitive to changes in climate conditions during its life span.

This part of the assessment will be conducted in a stepwise fashion, similar to that described for the foregoing assessment of the project effects. The possible important interactions between the natural hazards and the project will be first identified, followed by an assessment of the effects of those interactions, the available additional mitigation measures, and the significance of any residual likely adverse environmental effects.

3.9.5 *Assessment of the Effects on the Capacity of Renewable and Non-Renewable Resources*

The potential interactions between the project and the environment will be identified and assessed in order to determine the likelihood of interactions between the project and resource sustainability.

3.9.6 *Assessment of Potential Malfunctions and Accidents*

Information on potential malfunctions and accidents is also necessary to permit consideration of relevant environmental effects in the assessment. Early in the conduct of the EA studies, the potential malfunctions and accidents to be considered in the EA will be reviewed and must be accepted by CNSC staff. Information on potential malfunctions and accidents should include:

- a description of specific malfunction and accident events that have a reasonable probability of occurring during the decommissioning, and new build phases of the project, including an explanation of how these events were identified for the purpose of this environmental assessment;
- a description of the source, quantity, mechanism, rate, form and characteristics of contaminants and other materials (physical, chemical and radiological) likely to be released to the surrounding environment during the postulated malfunctions and accidents; and
- a description of any contingency, cleanup or restoration work in the surrounding environment that would be required during, immediately following, or in the longer-term, the postulated malfunction and accident scenarios.

Expected scenarios include, but are not limited to, accidental spills, accidents from heavy equipment/vehicular movements, vehicular accidents during transport of contaminated material, container collapse/failure, failure of the harbour wall, structural failures of equipment being decommissioned or of buildings being demolished, unrestricted release of radioactive materials, extreme weather conditions during remediation efforts (e.g. flooding, heavy rainfall events, high winds).

3.9.7 *Assessment of Cumulative Effects*

The effects of the project must be considered together with those of other projects and activities that have been, or will be carried out, and for which the effects are expected to *overlap* with those of the project (i.e., overlap in same geographic area and time). These are referred to as *cumulative environmental effects*. For example, the Port Hope Area Initiative, which is a proposed project to clean up and safely manage historic low-level radioactive waste in the Port Hope area, would be a potential project to be included in an assessment of cumulative effects.

An identification of the specific projects and activities considered in the cumulative effects will be included in the Comprehensive Study Report. In general, the cumulative effects assessment will consider the combined effects of the Vision 2010 Project with the neighbouring or regional industries and other developments. The assessment will consider the cumulative effects of projects, taking into account whether they are occurring in parallel or in series, and will include an assessment to consider the alternative should there be a possibility that any of the project schedules might change.

The information available to assess the environmental effects from other projects can be expected to be more conceptual and less detailed as those effects become more remote in distance and time to the project, or where information about another project or activity is not available.

Where potentially significant adverse cumulative effects are identified, additional mitigation measures may be necessary.

3.10 Determination of Significance

The preceding steps in the Comprehensive Study will consider the significance of the effects of:

- the project on the environment;
- the environment on the project;
- project malfunctions and accidents on the environment; and
- this project in combination with activities of other past, present or known future projects (cumulative effects).

The Comprehensive Study will consider all of these effects in coming to a final conclusion as to whether the project, taking into account the mitigation measures, is likely to cause significant adverse environmental effects. The CNSC, as the responsible authority, will document this conclusion in the Comprehensive Study Report.

3.11 Follow-up Program

The purpose of the follow-up program is to assist in determining if the environmental and cumulative effects of the project are as predicted in the Comprehensive Study Report. It is also to confirm whether the impact mitigation measures are effective, and to determine if any new mitigation strategies may be required. The design of the program will be appropriate to the scale of the project and the issues addressed in the EA.

If a licence amendment is issued to Cameco pursuant to the NSCA, the CNSC licensing and compliance program will be used as the mechanism for ensuring the final design and implementation of any follow-up program and the reporting of program results. The follow-up program would be based on the regulatory principles of compliance, adaptive management, reporting and analysis.

The follow-up program will include a description of 'what is being monitored' and its rationale. The program will also include thresholds/triggers for implementing contingency plans/adaptive management.

4 PUBLIC PARTICIPATION IN THE FEDERAL ENVIRONMENTAL ASSESSMENT

Discussions of comments received from the public on the draft EA Guidelines document and how those comments were considered are included in Appendix 2 of the draft Track Report and was be submitted to the Minister along with the EA Guidelines.

4.1 Public Consultation on the Comprehensive Study Report

The public will be given an opportunity to participate in the conduct of the EA through public meetings to be held by the proponent, the CNSC and the CEA Agency. The requirements for this participation are set out in Section 3.7 of this document. As the EA is following the Comprehensive Study track, the public will also be provided with an opportunity to examine the EIS and comment on the draft Comprehensive Study Report. Participant funding will be made available by the CEA Agency to facilitate public participation.

The CEA Agency will facilitate public review and comment on the final Comprehensive Study Report.

4.2 Public Registry

A public registry for the assessment has been established as required by Section 55 of the CEAA. This includes identification of the assessment in the CEAR, which can be accessed on the Internet site of the CEA Agency at www.ceaa.gc.ca. The CEAR number for this project is 06-03-22672.

The CEAR Internet site will include the following documentation:

- description of the project;
- notices of commencement and, if applicable, termination;
- notice of the availability of the EA Guidelines document and the EA Track Report;
- notices of Ministerial EA Track Decision and EA Decision Statement;
- notices requesting public input;
- the final Comprehensive Study Report; and
- notice of the RA's course of action decision.

Interested parties will be able to obtain electronic copies of these documents when they are available by accessing the CEAR website. Interested parties may also obtain copies of related documentation included in the CEAR paper-based project file from the CNSC contact for the project (see section 4.3).

4.3 Contact for Assessment

Persons wishing to obtain additional information or provide comments on the EA being conducted on Cameco's Port Hope conversion facility Vision 2010 Project in Port Hope, Ontario may do so through the following contact:

Caroline Ducros, Environmental Assessment Officer
Canadian Nuclear Safety Commission
280 Slater Street
P.O. Box 1046
Station B
Ottawa, ON
K1P 5S9

Phone: 1-800-668-5284
Fax: 613-995-5086
Email: ea@cnsc-ccsn.gc.ca

5 REFERENCES

1. Letter, R. Steane (Cameco) to B. Howden (CNSC), "*Port Hope Conversion Facility Vision 2010 Project Description*", June 22, 2006. Document # 1326142.

2. CNSC Regulatory Guide G-219 "Decommissioning Planning for Licensed Activities", June 2000.

APPENDIX A
Preliminary List of Proposed Valued Ecosystem Components (VECs)

Environmental Components	Sub-components	Relevant VECs	Rationale
Human Health	Radiation Dose to Public	Radiation dose to: • Nearest residents • Recreational land and water users • Public along transportation corridors	Humans are potentially exposed to stressors produced by the Project Works and Activities Protection of human health
	Radiation Dose to Workers	Radiation dose to: • Workers working directly on the Vision 2010 project activities • Other workers at the Port Hope conversion facility	Humans are potentially exposed to stressors produced by the Project Works and Activities Protection of human health
	Public Exposure to Non-radiological Constituents	Air quality at locations of nearest residents and recreation land and water uses	Humans are potentially exposed to stressors produced by the Project Works and Activities Protection of human health
	Worker Exposure to Non-radiological Constituents	Worker air quality	Humans are potentially exposed to stressors produced by the Project Works and Activities Protection of human health
	Conventional Health and Safety	Workers	Humans are potentially exposed to stressors produced by the Project Works and Activities Protection of human health
Surface Water	Hydrology	Water flow experienced by: • Nearest residents • Recreational land and water user	Humans are potentially exposed to stressors produced by the Project Works and Activities during the construction phase Protection of human health
	Surface Water Quality and Quantity (including potable water) – Radiological	Water flow and quality experienced by: • Nearest residents • Recreational land and water user	Humans are potentially exposed to stressors produced by the Project Works and Activities Protection of human health
	Surface Water Quality and Quantity (including potable water)– Non-Radiological	Water flow and quality experienced by: • Nearest residents • Recreational land and water user	Humans are potentially exposed to stressors produced by the Project Works and Activities Protection of human health
	Sediment Quality and Quantity - Radiological	Aquatic invertebrate community (crayfish)	Pathway to VECs

Environmental Components	Sub-components	Relevant VECs	Rationale
	Sediment Quality and Quantity – Non-Radiological	Aquatic invertebrate community (crayfish)	Pathway to VECs
Atmospheric Environment	Air Quality - Radiological	Air quality at: • Nearest residents • Recreational land and water user	Humans are potentially exposed to stressors produced by the Project Works and Activities Protection of human health
	Air Quality Non-Radiological	Air quality at: • Nearest residents • Recreational land and water user	Humans are potentially exposed to stressors produced by the Project Works and Activities Protection of human health
	Noise	Noise level at: • Nearest residents • Recreational land and water user	Humans are potentially exposed to stressors produced by the Project Works and Activities Protection of human health
	Dust	Dust levels at: • Nearest residents • Recreational land and water user	Humans are potentially exposed to stressors produced by the Project Works and Activities Protection of human health
Aquatic Environment	Aquatic Biota and Habitat	• Sport fishery • Port Hope harbour fish community • Forage fish community • Aquatic vegetation • Riparian wildlife – muskrat, scaup, • Cormorant • Amphibians	Aquatic species are potentially exposed to stressors produced by the Project Works and Activities Protection of ecological health during various project phases.
Geology and Hydrogeology	Soil Quality - Radiological	Local Soils	Pathway to VECs
	Soil Quality – Non-Radiological	Local Soils	Pathway to VECs
	Groundwater Flow	• Soil Stratigraphy • Bedrock geology and stratigraphy	Pathway to VECs
	Groundwater Quality– Radiological	Potable Water	Pathway to VECs
	Groundwater Quality –Non-Radiological	Potable Water	Pathway to VECs
Terrestrial Environment	Vegetation Communities and Species	Terrestrial vegetation (grass)	Protection of ecological health
	Wildlife Habitat	None	N/A

Environmental Components	Sub-components	Relevant VECs	Rationale
	Wildlife Communities and Species	• Soil invertebrates • Red fox (omnivore) • Deer mouse (omnivore mostly insects) • Rabbit (herbivore) • Robin (insectivore)	Terrestrial species are potentially exposed to stressors produced by the Project Works and Activities Protection of ecological health
Visual Setting and Transportation	Landscape and Visual Setting	Visual appearance of Cameco PHCF	Residents and visitors enjoy the views of Lake Ontario from many vantage points. The Project may affect the quality (positively or negatively) of the landscape and visual setting of the waterfront
	Transportation Network	Traffic	Project works and activities may change traffic volumes and patterns
Cultural and Aboriginal Environment	Archaeological Resources	Archaeological resources	Potential to affect archaeological resources is limited to the construction phase of the project
	Heritage Resources	Heritage resources	Potential to affect physical and cultural resources is limited to the construction phase of the project
	Cultural Resources	Cultural resources Prehistoric heritage resources	Potential to affect cultural and/or prehistoric heritage resources is limited to the construction phase of the project
	Aboriginal Interests - Communities	Employment and business interests	Potential for construction jobs and business opportunities for Aboriginal workers/businesses.
	Aboriginal Interests - Traditional Land and Resource Use	Aboriginal and treaty rights	Potential to affect archaeological resources during the remediation and construction phases of the project.
Socio-economic Conditions	Population and Economic Base	Business operations Economic base Cameco employment Tourism Property Values	Project works and activities may affect aspects of the local economic community positively or negatively. Tourist activities, businesses and events may be susceptible to the nuisance effects of Project works and activities, project related traffic, and changes in public attitudes related to the Project. Changes in property values may affect (adversely or positively) existing and prospective property owners as result of Project works and activities.

Environmental Components	Sub-components	Relevant VECs	Rationale
	Community Infrastructure	Use of municipal transportation network	Increased use of municipal road to transport material/supplies to the project site and to remove materials from the project site for disposal.
		Contributions to the landfill	Potential to send clean material to local landfill facility.
		Use of storm sewers and sanitary sewers	Potential to contribute additional volumes and / or contaminants to the storm and or sanitary sewers and additional loading at the Sewage Treatment Plant; management of storm water from the site.
		Use of water distribution facility	Potential to disrupt the operations of the water distribution services with the relocation of the facility.
		Water distribution system	Ensure the isolation of the Cameco operations from the Municipal water distribution system.
	Community Services	Recreation and community features/resource use	Recreational features (e.g. waterfront, trails) and activities conducted by residents and visitors may be affected by project-related nuisance effects, and changes in public attitudes related to the Project. The Project may also affect the attractiveness of existing features or directly/indirectly to the creation of new features or opportunities.
	Residents and Communities	Use and enjoyment of property	Residents rely on their property and amenities in their neighbourhoods for a variety of indoor and outdoor social activities. People's use and enjoyment of their property may be susceptible to the temporary nuisance effects arising from the Project works and activities and changes in public attitudes related to the Project.
		Community/Neighbourhood Character	The distinctive or unique qualities of the community give a community or neighbourhood its character

APPENDIX B

Preliminary Proposed Interaction Matrix

Environmental Components

APPENDIX B

Likely Interactions between the Project and Environmental Components	PRELIMINARY PROPOSED INTERACTION MATRIX																																
	ENVIRONMENTAL COMPONENTS																																
	Human Health					Surface Water					Atmospheric Environment			Aquatic Environment			Geology / Hydrogeology					Terrestrial Environment			Visual Setting and Transportation			Cultural and Aboriginal Environment		Socio-Economic Conditions				
	Radiation Doses to General Public	Radiation Doses to Workers	Non-radiological Exposure to Public	Non-radiological Worker Exposure	Conventional Health & Safety (Physical Hazards)	Radioactivity in surface water	Surface Water Quality (Chemical/Thermal)	Flow/Level	Sediments	Drainage Alteration	Radioactivity in Atmospheric Environment	Air Quality(Chemical)	Noise, Dust	Aquatic Biota	Aquatic habitat	Impingement/ Entrainment	Soil Quality – Radiological	Soil Quality – Non-radiological	Groundwater Flow	Groundwater Quality - Radiological	Groundwater Quality – Non-radiological	Vegetation Communities and Species	Wildlife Habitat	Wildlife Communities and Species	Land Use	Transportation Network	Landscape and Visual Setting	Aboriginal Interests	Archaeological, Cultural, Heritage Resources	Population and Economic Base	Community Infrastructure	Community Services	Residents and Communities	Renewable/ non-renewable resources
Decommissioning Activities																																	
Conduct radiological surveys		•			•																												
Conduct non-radiological surveys				•	•																												
Remove remaining chemicals, equipment and materials not required for decommissioning		•		•	•								•																				
Purge and rinse process circuits, tanks and vessels and related systems, remove remaining chemical hazards (flammable materials) and drums (including contaminated drummed waste), and remaining physical hazards		•		•	•	•	•				x	x																				x	
Manage/remove all remaining process equipment and piping, including contaminated process piping and active vessels		•		•	•						•																						

Likely Interactions between the Project and Environmental Components	Human Health					Surface Water					Atmospheric Environment			Aquatic Environment			Geology / Hydrogeology					Terrestrial Environment			Visual Setting and Transportation			Cultural and Aboriginal Environment		Socio-Economic Conditions				
	Radiation Doses to General Public	Radiation Doses to Workers	Non-radiological Exposure to Public	Non-radiological Worker Exposure	Conventional Health & Safety (Physical Hazards)	Radioactivity in surface water	Surface Water Quality (Chemical/Thermal)	Flow/Level	Sediments	Drainage Alteration	Radioactivity in Atmospheric Environment	Air Quality(Chemical)	Noise, Dust	Aquatic Biota	Aquatic habitat	Impingement/ Entrainment	Soil Quality – Radiological	Soil Quality – Non-radiological	Groundwater Flow	Groundwater Quality - Radiological	Groundwater Quality – Non-radiological	Vegetation Communities and Species	Wildlife Habitat	Wildlife Communities and Species	Land Use	Transportation Network	Landscape and Visual Setting	Aboriginal Interests	Archaeological, Cultural, Heritage Resources	Population and Economic Base	Community Infrastructure	Community Services	Residents and Communities	Renewable/ non-renewable resources
Remove radiological and chemical hazardous materials and biohazards (asbestos, PCB, mercury, ODS, halocarbon, lead-based paint containing materials and equipment), and mould and animal detritus	•	•		•	•						x																			x				
The use of hot cutting to disassemble metal objects for removal or preparation for grit blasting.				•	•								•																					
Demolition Activities																																		
In preparation for demolition, remove loose and near surface contamination (radiological and metal) on all internal building surfaces (pressure washing, vacuuming, steam cleaning, scabbing, etc.)		•		•	•																													
Remove building services: water, gas, steam, hydro, electrical, ventilation; interior and near exterior perimeter of building, roof, exterior siding (metal, concrete block/brick or translucent panels), structural steel					•																													

Likely Interactions between the Project and Environmental Components	PRELIMINARY PROPOSED INTERACTION MATRIX																																
	ENVIRONMENTAL COMPONENTS																																
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Demolish roof, walls, floor slabs and foundations					•								•																				
Fuelling heavy equipment, trucks, vehicles and other equipment.					•								•																				
Fuel storage including bulk deliveries and or direct fuelling from tanker trucks.					•								•																				
Management of Removed Decommissioning and Demolition Waste																																	
• **Decontamination activities**																																	
Clean (pressure wash, sandblast, etc.) process equipment, including piping and active tanks/vessels to remove radioactive materials		•			•																												
Clean (pressure wash, sandblast, etc.) process equipment, including piping and active tanks/vessels contaminated with chemicals or metals				•	•																												
Removal of tank/vessel heels		•		•	•																												
Ensure clearance levels with radiological and non-radiological surveys.		•		•	•																												

Likely Interactions between the Project and Environmental Components	PRELIMINARY PROPOSED INTERACTION MATRIX																																
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• **Waste segregation activities**																																	
Salvaging activities				•	•																											•	
Segregation activities (by waste type)				•	•																												
• **Transportation of waste**																																	
Survey and wash/clean vehicles prior to leaving worksite	x						•				x														x					X			
Vehicular movements between PHCF and the Long Term Waste Management Facility	•	•											•												•	•				•			
Vehicular movements between PHCF and conventional landfill site (demolition debris)													•												•	•				•			
Vehicular movements between PHCF and recycle outlets													•												•	•				•			
• **Storage / disposal**																																	
Storage of sludge (tank heels), spent filters and other products from decontamination activities				•		•	•		•								•																

Likely Interactions between the Project and Environmental Components	PRELIMINARY PROPOSED INTERACTION MATRIX																														
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Storage of contaminated wash waters/rinses produced from decontamination of process equipment, pipes and tanks/vessels, wash waters from cleansed internal building surfaces (radiological and metals)				•		•	•										•	•															
Storage of contaminated solid waste produced from decontamination of process equipment, pipes and tanks/vessels (sandblasting, etc.)				•	•	•	•											•															
Disposal of conventional demolition waste					•								•												•	•							
Temporary storage of non-contaminated excavated soil until verification analysis completed. Clean soil to be utilized back fill.					•		•			•			•																				
Site Remediation																																	
Conduct radiological survey and sample soil		•			•	•					•						•																
Locate underground services and features					•													•							•								
Excavate contaminated soils		•		•	•						•	•	•		x			•	x			•												

Likely Interactions between the Project and Environmental Components	PRELIMINARY PROPOSED INTERACTION MATRIX																																
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Dewater saturated excavated (contaminated) soils		•		•	•								•		x			•	x		•	•											
Storage of contaminated groundwater produced during excavations		x		•	•		•								x		•	•	•														
Segregate contaminated soils by activity/contamination level		•		•													•																
Transport contaminated soils	•	•	•	•	•								x												•	•							
Store/Dispose contaminated soils		•		•	•	•	•										•	•	•	•	•												
Transport and backfill excavations with clean fill					•								•									•			•	•							
Site Rehabilitation																																	
Retaining walls (shoring required during excavation)					•					•			•									•			•								
Landscaping																		•							•		•						
Vehicular movements to and from site													•													•							
New Buildings																																	
• **Construction**																																	
Conduct radiological survey		•																															

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Excavate potentially contaminated soils	•	•		•	•	•	•	•		•			•				•	•	•	•	•	•											
Construct new UO_2 drum storage building					•		•	•				•	•					•	•	•		•			•			•	•	•			•	
Construct additions to UF_6 plant for wastewater treatment, indoor potassium hydroxide unloading and scrap metal processing					•		•	•				•	•					•	•	•		•			•			•	•	•			•	
Construct new receiving building, possibly combined with non-destructive examination (NDE) and emergency vehicles storage					•		•	•				•	•					•	•	•		•			•			•	•	•	•		•	
Construct new laboratory building					•		•	•				•	•					•	•	•		•			•			•	•	•	•		•	
Construct new UF_6 cylinder storage building					•		•	•				•	•					•	•	•		•			•			•	•	•	•		•	
Construct a new hydrogen and nitrogen tank compound,					•		•	•				•	•					•	•	•		•			•			•	•	•	•		•	
Construct a new CUP building					•		•	•				•	•					•	•	•		•			•			•	•	•	•		•	
Construct a new visitor center					•		•	•				•	•					•	•	•		•			•			•	•	•	•		•	
Construct additions to buildings 3, 24, 29 and 50.					•		•	•				•	•					•	•	•		•			•			•	•	•	•		•	

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Wash/clean vehicles prior to leaving worksite							•																										
Vehicular movements between PHCF and the Long-Term Waste Management Facility	•	•											•												•	•				•				
Vehicular movements between PHCF and conventional landfill site (construction debris)													•												•	•				•				
• **Operation**																																		
Storage of UO2 drums (drum handling, etc.)		•			•	•					•						•			•										•		•	•
Wastewater treatment		•		•			•	•						•	•															•		•		
Laboratory (analytical and research)		•		•																											•		•		
Storage of UF6 cylinders (cylinder handling, etc.)		•			•	•					•						•			•										•		•	•
Abnormal Events																																		
Accidental radioactive/chemical spills	•	•	•	•	•	•	•				•	•		•	•		•	•		•	•	•			X			•	•		X	•	•	
Structural failure while conducting dismantling/demolition activities (physical hazard)		•		•	•							•	•																	•		•		

Likely Interactions between the Project and Environmental Components	PRELIMINARY PROPOSED INTERACTION MATRIX																																
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Fire	●	●	●	●	●	●	●	●				●	●	●	●		●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	
Vehicular/heavy equipment accidents (on-site and off-site)	●	●	●	●	●	●	●	●			●	●	●	●	●		●	●	●	●	●	●	●	●		●		●	●	●	●		●	
Release of hydraulic oil due to equipment failure							●														●													
Environment on the Project																																	
Extreme climate events (heavy rainfall, rise in nearby water levels)	●	●	●	●	●	●	●	●	●	●				●	●	●			●	●	●						●	●	●	●			●	

LEGEND:

● Proposed interactions (proposed during the drafting of the EA Guidelines by CNSC staff

x Proposed interactions (proposed during the public review of the EA Guidelines by the Municipality of Port Hope)

APPENDIX B COMMENTS AND RESPONSE TABLE

Comments and Response Table – Public Comments on Draft Comprehensive Study Report for the Proposed Redevelopment of the Port Hope Conversion Facility (Vision 2010) – Public Comment Period: September 22, 2010 to October 22, 2010. e- DOC: 3825617

APPENDIX B COMMENTS AND RESPONSE TABLE – PUBLIC COMMENTS ON DRAFT COMPREHENSIVE STUDY REPORT FOR THE PROPOSED REDEVELOPMENT OF THE PORT HOPE CONVERSION FACILITY (VISION 2010)

Public Comment Period: September 22, 2011 to October 22, 2011

#	Name and Organization	Section	Summary of Comment	CNSC Response
1	**Citizen/** **Citizen Group #1** Families Against Radiation Exposure (FARE)	General comment	As per Families Against Radiation Exposure's Funding with CEAA, it was our intent to reduce avoidable radioactive emissions in Port Hope to zero. By avoidable, we referred to radioactive emissions other than Background Radiation. In order to meet this goal, it implied the closure of Port Hope operations of Cameco and Zircatec and the complete removal and eradication of all pollution and waste at the Cameco and Zircatec's operational sites and elsewhere in Port Hope and surrounding natural environment.	Funding to Families Against Radiation Exposure (FARE) was allocated by the Canadian Environmental Assessment Agency (CEA Agency) for participation in the Environmental Assessment (EA) process. Projects are assessed in accordance with the project description and the scope of the project. This proposed project was not, as indicated in this comment, for the removal of all waste and eradication of all pollution and waste at the Cameco and Zircatec operational sites and elsewhere in Port Hope and the surrounding natural environment. This objective as described by the FARE is beyond the scope of Vision 2010. No change to the CSR.
2	**Citizen/** **Citizen Group #1** FARE (Review of Vision 2010 as delivered by Dr. Helen Caldicott on November 16th, 2010).	General comment	The information that Port Hope citizens receive on health effects of radiation come mainly from Cameco, the Mayor and the Town Council, CNSC, Health Canada, and the Ontario Ministry of the Environment. These are respectively a component of the nuclear industry; a municipal government of elected officials; and agencies, staffed by civil servants, or provincial and federal governments. All of these support nuclear power. None of these institutions is staffed by MDs or practising medical scientists with expertise in the effects of radiation on humans, and all of these bodies are, because of their support of the nuclear industry, in a conflict of interest with respect to the issues of nuclear safety.	The Canadian Nuclear Safety Commission (CNSC) does not promote the use of nuclear energy. The CNSC regulates the use of nuclear energy and materials to protect the health, safety and security of Canadians and the environment; and to implement Canada's international commitments on the peaceful use of nuclear energy. CNSC reports to Parliament through the Minister of Natural Resources Canada. CNSC's Commission Tribunal has up to seven appointed permanent members whose decisions are supported by more than 800 qualified employees, including staff with expertise on the health effects of radiation exposure. These employees review applications for licences according to regulatory requirements, make recommendations to the Commission, and enforce compliance with the *Nuclear Safety and Control Act*, its regulations, and any licence conditions imposed by the Commission. The CNSC is an independent regulatory body and thus, the claim that it "supports industry" is false. No change to the CSR.

#	Name and Organization	Section	Summary of Comment	CNSC Response
3	**Citizen/** **Citizen Group #1** FARE (Review of Vision 2010 as delivered by Dr. Helen Caldicott on November 16th, 2010).	General comment	The citizens of Port Hope are not being informed that independent science (i.e. science independent of nuclear industry funding and independent of pro-nuclear government agencies) does not agree with the information that Port Hope citizens have received about the safety of radiation in Port Hope. The citizens have been and are being misled by the very government agencies that we should be able to rely on for our information. Contrary to what citizens have been informed, there are no comprehensive publications in prestigious peer-reviewed journals that show Port Hope to be safe from nuclear radioactive contamination. Those few, outdated and incompletely rigorous studies that do exist suggest the opposite. Unfortunately the agencies that are dispensing misleading information are also in possession of overwhelming financial and media resource. Port Hope is the deep dark underbelly of the Canadian nuclear industry, representing dangers that so far, have escaped sufficient scrutiny and cleanup.	CNSC decisions are based on an accumulation of scientific evidence that has been arrived at based on consistency and consensus from the most current scientific information (e.g. the United Nations Committee on Atomic Radiation which is made up of leading researchers in 23 countries), and from scientifically peer reviewed journals. Where there are differences of opinion, this is taken into consideration by the scientific bodies and a precautionary approach is adopted. A synthesis of reliable, scientifically peer reviewed health studies can be found in the Synthesis Report – *Info Document 0781 "Understanding Health Studies and Risk Assessments Conducted in the Port Hope Community from the 1950s to the Present"* (April 2009), *http://www.nuclearsafety.gc.ca/eng/mycommunity/facilities/porthope/health_studies.cfm*. This work has also been published in a peer reviewed journal: Journal of Environmental Protection (2011, Vol.2, p. 1149-1161) No change to the CSR.
4	**Citizen/** **Citizen Group #1** FARE (Review of Vision 2010 as delivered by Dr. Helen Caldicott on November 16th, 2010).	General comment	Contrary to statements provided by federal government agencies and Cameco, no level of radiation is safe and it is cumulative – each dose adds to the risk of cancer. Children are 10 to 20 times more radiosensitive than adults, and fetuses (sic) are extremely sensitive. Uranium waste is radioactive for billions of years, decaying sequentially to radioactive elements ("daughters"), all of which can induce cancer or genetic diseases when entering the human body as hot spots or "internal emitters". Dr. Caldicott noted the two most dangerous forms as Radon gas (possibly inducing cancer decades later) and Radium (which can induce cancer or leukemia).	The linear, no-threshold relationship (LNT) is used to represent the relationship between ionizing radiation exposure and development of cancer in humans. The LNT is based on the assumption that the adverse health effects are directly proportional to dose, although the epidemiological evidence to date indicates that no health effects occur at chronic exposures below about 100 mSv. The National Council on Radiation Protection (NCRP), the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the International Commission on Radiation Protection (ICRP) and Biological Effects of Ionizing Radiation (BEIR) VII support LNT for radiation protection purposes. Additional discussion of LNT and health studies in Port Hope is provided in the response to comment #23. Children and foetuses are more radiosensitive than adults, however the public dose limit (1 mSv/year) and the dose limit for pregnant workers

#	Name and Organization	Section	Summary of Comment	CNSC Response
				(4 mSv/duration of pregnancy) protect accordingly. There are no genetic effects observed from radiation exposure (UNSCEAR, 2001). INFO 0781: provides a weight of evidence-based approach to the levels and health effects of radiation and other historic contaminants in Port Hope. Overall, there is no evidence of adverse health effects because exposures are too low. (Lane et al., 2011 (JEP)) including Port Hope workers (Lane et al; 2011 (Radiation Research)). Based on the experimental and epidemiological literature, the most plausible health effects of the radium and uranium refining and processing industry includes bone cancer; however, bone cancer is not plausible in Port Hope because radium has a high threshold of 10 Sv for bone cancer [INFO-0781, Understanding Health Studies and Risk Assessments Conducted in the Port Hope Community from the 1950s to the Present, April 2009]. There was no evidence of excess adult leukemia in Port Hope. The rate of all childhood cancers was comparable with the general Ontario population, as was childhood leukemia. Low levels of radiological and non-radiological environmental exposures within the town, resulting from the radium and uranium industry, have not caused any adverse effects on human health. [INFO-0781, Understanding Health Studies and Risk Assessments Conducted in the Port Hope Community from the 1950s to the Present, April 2009].
5	**Citizen/** **Citizen Group #1** FARE (Review of Vision 2010 as delivered by Dr. Helen Caldicott on November 16th, 2010).	General comment	The continued presence of Cameco on the waterfront in Port Hope, with no buffer zone to protect the citizens of Port Hope in the event of an accidental release of deadly UF_6 gas along with continual release of toxic emissions, fugitive and regular, should not be tolerated.	In a normal operational scenario limits are set for UF_6 at the boundary of the site. These limits are set to ensure that there will be no health effects to citizens. With respect to an accidental release, the CNSC's only requirement for a buffer zone dates back to the mid 1970's when the Atomic Energy Control Board (the predecessor of the CNSC) identified that a buffer zone approximating 940 m on the landward side of nuclear reactor facilities was required. The size of the buffer zone was established taking into consideration the fact that air dispersion models used at the time could not accurately predict levels of contaminants within 1 km of the source. The CNSC does not have a comparable requirement for a buffer zone

#	Name and Organization	Section	Summary of Comment	CNSC Response
				for facilities which are not reactors and thus, these are treated on a site-specific basis. In the case of the PHCF, several engineered and procedural barriers were put in place to ensure public safety. : • All effluent gas scrubbers and dust collectors were installed to handle process upset and emergency situations. • All anhydrous hydrofluoric acid (AHF) unloading, storage and handling is carried out in an enclosed building vented to a scrubber. The fluoride emissions from the main stack are monitored continuously. • A Quality Assurance program has been developed and is implemented to control the construction, operation and maintenance of the UF_6 plant. This includes a periodic in-service inspection of piping, pressure vessels and safety-related equipment. • Emergency Preparedness and Response Plans have been developed and are implemented. A further measure is the CNSC requirement that the public does limit for the facility is 0.3 mSv/y, which compares favourably with the internationally accepted standard for public dose of 1 mSv/y. Uranium emissions have a limit corresponding to 50 µSv/year providing an added level of safety.
6	**Citizen/** **Citizen Group #2** Municipality of Port Hope – Municipal Peer Review Team (MPRT) (will be providing more detailed comments during the Minister of	Conclusions	The conclusions of the Draft Comprehensive Study Report (CSR) state that Cameco is ready to proceed.	The conclusions of the draft CSR as posted for public comment are: “CNSC staff concludes that the proposed project is not likely to cause significant adverse environmental effects”. This conclusion is based on predictions outlined in the EIS and in subsequent information provided to the CNSC by the proponent, and includes the implementation of mitigation measures, which will be verified in a Canadian Environmental Assessment Agency (CEA Agency) follow-up program. CNSC staff recommend that the Commission: 1. adopt the Proposed CSR for the Cameco Corporation’s proposed Redevelopment of the Port Hope Conversion Facility (Vision 2010), Port Hope, Ontario.

#	Name and Organization	Section	Summary of Comment	CNSC Response
	Environment and CEAA public comment period on final CSR)			2. transmit the CSR to the Minister of the Environment and the CEA Agency under section 21.3 of the CEAA, for public consultation and Ministerial decision." The CSR does not indicate that Cameco is ready to proceed. In order for Cameco to proceed, the Minister's EA decision, following the CEA Agency public comment period and taking into consideration the public's comments and the comments of the federal and responsible authorities, must be that the project is not likely to result in significant adverse environmental effects. If this is the Minister's decision, the project will proceed to a licensing review. Cameco cannot proceed without a licence under the NSCA, or any other relevant licences or any permits or authorizations required from any other jurisdiction. No change to the CSR.
7	**Citizen/** **Citizen Group #2** MPRT	Conclusions	The CSR concludes that several items addressed during the Environmental Assessment (EA) would be more appropriately addressed in the licensing phase. The MPRT recommends that there should be the opportunity to review how these items are to be addressed.	If the Minister of the Environment concludes that the Project, as proposed, is not likely to result in any significant adverse environmental effects, then the Project will undergo a CNSC licensing review. The public can engage/intervene (whether in writing or in the case of an open hearing in writing or in person) during CNSC Commission Hearings. Hearing dates will be posted on the CNSC website - *http://www.nuclearsafety.gc.ca/eng/* No change to the CSR.
8	**Citizen/** **Citizen Group #2** MPRT	Licensing	We recommend that the MPRT process continue into the licensing phase.	Noted, please see response to #7.

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9	**Citizen/ Citizen Group #2** MPRT	Effects Assessment General comment	Cameco has been careful to fully assess the health effects and safety effects. Design changes have occurred from the original EA documents to facilitate the amendment from inside storage to outside storage. The CSR has confirmed and endorsed this approach.	No change to the CSR.
10	**Citizen/ Citizen Group #2** MPRT	Mitigation measures	There are opportunities for strengthening the impact avoidance and mitigation measures which appear to be tentative in the draft CSR. Many of the related statements use "may" instead of "will". Confirmation on what will actually be implemented is required and can be strengthened in the associated sections.	It is the responsibility of the proponent, Cameco, to propose mitigation measures that will reduce effects to a level acceptable to the CNSC and in accordance with any regulations. The word "may" is used when there is the possibility that the proponent will amend the proposed mitigation measure to another one that may be more effective. If the project is licensed, Cameco will be subjected to all regulatory requirements. Specific criteria, mitigation measures and follow up may be included as licence conditions. No change to the CSR.
11	**Citizen/ Citizen Group #2** MPRT	PHAI and MOE clean-up criteria	The MPRT and the Municipality have been active participants in the discussion of clean up criteria with the Ministry of the Environment (MOE) and the Port Hope Area Initiative (PHAI). Cameco's proposed cleanup criteria are based on the PHAI cleanup criteria that used MOE generic criteria from 2004. Recent changes to MOE generic criteria in 2009 and 2011 are not reflected in the CSR.	CSR has been amended, see subsection 3.3.4.1.
12	**Citizen/ Citizen Group #2** MPRT	General	The MPRT will provide a more thorough review of the final CSR during the Minister of the Environment and Canadian Environmental Assessment Agency's public comment period.	Comment noted.
13	**Citizen/ Citizen Group #3** Atomic Energy of Canada Ltd.	Section 3.3.3 Demolition Activities/	These sections refer to material that could be sent to the PHAI LTWMF. Section 3.3.7 states that approximately 150,000 m^3 of decommissioning waste is to be accommodated in the	Section 3.3.7 of the CSR was amended to reflect this clarification.

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	(AECL) – Port Hope Area Initiative Management Office (PHAI MO)	Section 3.3.4 Excavation Activities and 3.3.7	LTWMF in Port Hope. "It must be noted that The Legal Agreement [2] specifies the maximum limit of Cameco decommissioning wastes that can be sent to the PHAI LTWMF: 150,000 $m^{3.}$ The agreement provides a description as to what the Cameco decommissioning waste comprises and the fact that they must be attributable to Eldorado operations in the town of Port Hope – pre 1988 (i.e., pre Cameco). This does not appear to be clear in the Study Report.	
14	**Citizen/ Citizen Group #3** PHAI MO	Section 3.3.11.1 Decom-missioning	**Decommissioning Stages** implies that the LTMWF will remain open until Vision 2010 is complete. It should be noted that there is a window of time in which the 150,000 m^3 of Vision 2010 waste can be sent to the mound at the PHAI LTMWF. In close consultation with Cameco's Vision 2010 project team, the PHAI Management Office is endeavouring to ensure that all the Vision 2010 wastes are delivered and emplaced within the LTMWF during the approximate 5-year window for receipt of off-site wastes. If there are remaining Vision 2010 decommissioning wastes to be delivered following the emplacement of all other (non Vision 2010) wastes, alternative disposal/storage may need to be found by Cameco.	Section 3.3.11.1 has been amended to clarify this issue.
15	**Citizen/ Citizen Group #3** PHAI MO	Section 3.3.11.5 Final Acceptance	Final Acceptance states that following demolition or clean up of the Centre Pier buildings, Cameco will turn over the decommissioned site to the Harbour Commission and that the sub-surface will be remediated by Atomic Energy of Canada Limited. It should be noted that the Centre Pier comprises "surficial" LLRW that is the responsibility of Cameco (as part of the 150,000 m^3) and underlying Industrial waste that is part of the industrial waste category that the PHAI is responsible to clean up. There are a total of five industrial sites within Port Hope and the limit on total volume of industrial waste that that PHAI will clean up has been established in the	Section 3.3.11.5 has been amended to provide this clarification.

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			amended Legal Agreement 20 as 51,250 m^3. It is the municipality's responsibility to decide how best to use their 51,250 m^3 limit and the PHAI will remediate those industrial sites as directed by the municipality.	
16	**Citizen/** **Citizen Group #4** Radiation and Health Committee: Physicians for Global Survival	p.10	Asbestos containing materials contaminated with radionuclides are discussed. These will be transported to the LTWMF, i.e. the facility being prepared for waste materials from both the Cameco Vision 2010 clean-up and the PHAI clean-up of the Town of Port Hope, which will occur concurrently. The paragraph mentions that asbestos containing material which meets the criteria for unrestricted release will be disposed of at a provincially run landfill. What are these criteria? We are not able to find them in the two references provided in the text. Our assumption is that they deal with residual levels of radioactivity low enough to be considered safe for a regular landfill. It would be important to know exactly what these levels are, so that their safety can be properly assessed, and also how measurements are being done, particularly in the case of alpha emitting materials as measurement is not always easy. If this is not what the text is meant to convey, we would appreciate clarification, as the issue of unrestricted release comes up in regard to a number of other materials (P.10, p.11, p.22 and more).	The criteria being referred to here are the *Nuclear Substances and Radiation Devices Regulations* (NSRD) which define unconditional clearance levels. An unconditional clearance level is an activity concentration value in Bq/g which applies to bulk material in which the radioactive nuclear material is uniformly distributed. In concentrations at or below the clearance levels, material can be disposed of without a licence. Disposal options include landfills. Further details may be found on the NSRD Regulations. These values and the safety significance of their application were fully assessed when the NSRD regulations were developed. Details of the measurements have not been provided at this time, but if the project is licensed, the licensee is bound by the NSRD Regulations and this aspect will be monitored through compliance activities.
17	**Citizen/** **Citizen Group #4** Radiation and Health Committee: Physicians for Global Survival	p.12-13	Methods for removing surface contamination inside buildings are discussed. Many of these involve the production of radioactive dust or the spraying of water which can become contaminated. Respiratory protection is to be worn, presumably of an appropriate type. What advice will you be giving your workers about the potential for contamination of clothing and exposed skin with alpha-emitting substances, of which uranium is one, and the importance of making sure this material is not taken internally? Or will you be providing	The EIS for this proposed Project describes the occupational health and safety considerations that will be adopted in subsection 3.13.2. Moreover, as indicated in the Project description under occupational health and safety considerations, all remediation workers on the site will receive training for: radiation and radioactive material handling safety, personal monitoring, protective clothing and equipment, emergency procedures, and any other measures prescribed. No change to CSR.

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			them with protective clothing as well? What about containment of waste water from pressure washing, or escaping dust from scarification/scabbling? This facility is in the middle of downtown Port Hope, and on the edge of Lake Ontario. These same concerns apply to volumetric decontamination and dismantling procedures. The devil is in the details, and it is these details which can make the difference between a carefully done clean-up and a worse mess than you started with. In the case of radiological contamination, which is colourless, odorless, and deadly, this is not a trivial consideration. What levels of contamination are inside these buildings? What substances are involved? It is our understanding that Cameco has had post-reactor material on site- this can contain many isotopes not represented in the decay chain of natural uranium, some of them extremely dangerous. Mobilizing this material into air and water in a populated area may not be a good idea. Port Hope town is downwind of the Cameco facility and takes its drinking water from Lake Ontario. Vague reassurances that no adverse impacts are expected are not enough. Clearly more information is needed on these issues in order to be sure that clean-up workers and the population of Port Hope will be protected.	
18	**Citizen/** **Citizen Group #4** Radiation and Health Committee: Physicians for Global Survival	p.17-18	Waste water treatment of the expected 48,000 m^3 of contaminated water generated by the project will be by evaporation or by reverse osmosis. Evaporation of contaminated water which has been in contact with Port Hope soils may be expected to release a certain amount of radon gas, as well as its complement of volatile organic compounds and other volatile material. Will you be testing this water before it is subject to evaporation? What are your cut-off	Cameco currently evaporates process effluent and groundwater at the PHCF. The wastewater from Vision 2010 activities will be comprised largely of additional groundwater and therefore will be similar to the water currently evaporated on site. Environmental monitoring to date has indicated that this practice and the operations at the facility are in compliance with limits protective of health and the environment. As stated in the EIS, Cameco is currently considering water treatment technologies.

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			criteria? Have you calculated the amount of radon gas coming off at different levels of contamination, and estimated the effect this will have on the population of Port Hope, which is downwind of your operation? It will not be zero. It is important to remember that exposing a large population to even a very low level hazard increases the odds that some of those people will suffer harm. You may not ever know who they are, but every person's burden of illness is important to that person, to their families and their community. It is also important to remember that the residents of Port Hope will be subject to not only this tiny insult, but many, many more which will occur during the course of this clean-up from dust, passing trucks, dust-contaminated rainfall, etc. The effects of radioactivity are cumulative, over the lifetime of the individual.	Cameco will continue to be required to ensure that releases are protective of human health and the environment. Dose limits protect workers and the public from cumulative effects of radiation exposure. Health studies have demonstrated that even residents with the highest radiation exposures in Port Hope (i.e., Port Hope Uranium workers that live in Port Hope) had no adverse health effects. (Lane et al., 2010). No change to CSR.
19	**Citizen/** **Citizen Group #4** Radiation and Health Committee: Physicians for Global Survival	p. 81-82	Discusses baseline risk to non-human biota from radionuclides and other material. There are no measured values given for levels of contaminants in various organisms. Instead, reliance is placed on a calculated screening index "determined by dividing the estimated exposure levels by an appropriate benchmark criterion representing a threshold for an acceptable dose." The distribution of radioisotopes, and other contaminants, in biological systems is often surprising and unpredictable. For reasons relating to the ethics and acceptability of tissue sampling, it is not possible to get this data from humans. It might be highly instructive and important to have this data for other species.	Concentrations of radionuclides and other contaminants in non-human biota are integral to the exposure calculations used in determining the screening indices for non-human biota. Tissue analysis of biota collected from the site is neither always possible nor warranted. Several compendia of transfer parameters are available which describe the movement/accumulation of substances in various biota. One example is the ERICA software tool (as described in Brown et al., 2008), which provides transfers factors for radionuclides from a large database of scientific literature. Additionally, several conservative assumptions are typically applied into the exposure estimates to account for potential uncertainties. Brown, J.E., Alfonso, B., Avila, R., Beresford, N.A., Copplestone, D., Pröhl, G., Ulanovsky A. 2008. The ERICA Tool. J. Environ. Radioactive, 99, 1371-1383. To address human risks from radionuclides, dose estimates have been provided for members of the public as a result of this project. These calculations are based on Canadian and international standards which use conservative assumptions and which incorporate current knowledge on the transfer and distribution of radioisotopes to humans.

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				No change to CSR.
20	**Citizen/** **Citizen Group #4** Radiation and Health Committee: Physicians for Global Survival	p.99-100	Air quality is an important issue. This section is extremely vague and contains nothing of substance other than on NO_2. No models, no measurements and no calculations are given. Dust mitigation techniques are not described; no mention is made concerning whether the contents of trucks will be covered or enclosed.	The Ontario Ministry of the Environment regulates PHCF for its air emissions through Ontario Regulation 419. This regulation requires PHCF to maintain a current *Emission Summary Dispersion Model Report* (ESDMR) which documents the emission sources onsite, including their key characteristics and emission rates. This information is then entered into a ministry-approved model (AERMOD) which generates a maximum point of impingement (POI) concentration for the contaminants of concern for the facility. Dust suppression is a management practice. Cameco is expected to follow good practices and reduce the fugitive emissions from their activities. This would be observed/inspected during the Vision 2010 activities. It is Cameco's practice to use water dampening techniques for dust suppression rather than chemical dampeners Mitigation measures can be found in Appendix I: Traffic Impact Study, which includes covers and hoardings as required around the security perimeter of the Site Study Area (to be consulted with the Municipality). No change to CSR.
21	**Citizen/** **Citizen Group #4** Radiation and Health Committee: Physicians for Global Survival	p.103	It is mentioned that waterborne releases of uranium will be assessed using the radiological standard of 4 Bq/L, rather than the more common chemical standard of .02 mg/L. No reason is given for this. It would make sense primarily if enriched uranium and/or recycled (post-reactor) uranium, which have a much higher radiological activity, were present on the property. If this is the case, then this changes completely the potential for radiological harm to both workers and residents of Port Hope through a variety of mechanisms and routes. If enriched or recycled uranium is among the substances present on the Cameco site, this must be on the table and the implications and effects of this must be dealt with fully.	The radiological standard of 4 Bq/L for uranium is proposed in section 8.2.1.3 (radiation and radioactivity) of the Proposed CSR because the objective of the monitoring discussed in this section is for radiological releases. Section 6.15.2.3 discusses drinking water quality in the context of Vision 2010. The risk assessment provided in Appendix E of the EIS also addresses human health risk from both radionuclides and non-radionuclides and includes consideration of water ingestion. In terms of the drinking water standard, for which the limit is 20 µg/L, Cameco's estimated contribution of uranium in the town's drinking water is 0.003 µg/L. No change to the CSR.

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22	**Citizen/** **Citizen Group #4** Radiation and Health Committee: Physicians for Global Survival	p.103	Radiation doses to members of the public: Estimates of gamma radiation doses to members of the public from cylinders of UF6 are presented, and remediation measures suggested. No mention is made of neutron radiation from these cylinders. This is known to occur and is quite damaging to biological tissue. It is also additive to the gamma radiation from the same source. Fence line objectives and mitigation measures for neutron radiation should be discussed. Lastly, the only radiation dose which could reasonably be predicted to yield "no expected adverse residual effects" is zero."	The neutron dose rates to workers and members of the public have been studied at the PHCF. Based on study findings, neutron dose rates at the fence line are less than 1% of Cameco's annual public dose limit of 0.3 mSv/year and do not represent an undue risk to workers or the public. CNSC staff concurred with the study and determined that routine neutron dose rate measurements are not required. With respect to concerns regarding radiation health effects, there is no clear scientific evidence of any adverse health effects at chronic radiation doses below 100 millisieverts (mSv). CNSC has adopted the Linear No-Threshold model (LNT) relationship which is the most widely accepted risk model used by health agencies and nuclear regulators around the world. This model assumes a direct and proportional relationship between radiation exposure and cancer risk with all radiation doses. In addition, several scientific reports have highlighted scientific evidence suggesting that low-level radiation is less harmful than predicted by the LNT. No change to the CSR.
23	**Citizen/** **Citizen Group #4** Radiation and Health Committee: Physicians for Global Survival	p.104	Radiation doses to Cameco workers: It is impossible for seriously interested members of the public to evaluate the adequacy of worker protection measures based on the information that is presented here. Vague reassurances that "current measures are considered sufficient…" are unhelpful. It might be important to pause, here, and look at the question of standards. Just because something is "within current standards" does not mean it is safe. It may simply mean that certain hazards associated with that material are not known, or not fully appreciated. There may be political or economic considerations, sometimes. In the case of radioactive materials and radiation, standards have generally plummeted as we understand more about the hazards of these materials. From its discovery in 1896 to 1925, there was no standard for radiation exposure. In 1925 it was set at 500 mSv/yr, the dose that caused reddening of the hands in X-ray technicians. It has	In general, the objectives/standards derived by, or adopted for regulation by the CNSC, represent current scientific knowledge and values that are considered adequately protective of human health and the environment. Standards and requirements undergo periodic review and will continue to be revised, if warranted, based on new information. In addition to ensuring compliance with the *Nuclear Safety and Control Act* (NSCA) regulations and other regulatory requirements, there is an expectation that licensees strive towards continual improvement and that they accept and practice industry standards. Moreover, CNSC does not rely solely on these criteria for regulation, but also requires various monitoring programs to further ensure human health and the environment are being protected. The concept of "no safe level of radiation" arises from the use of the linear, non-threshold theory, which states that there is a cancer risk with any exposure to radiation. The LNT has been derived from many different studies of radiation exposures to people and has been accepted to be a prudent approach for radiation protection purposes. It can be used to predict risk to very low doses of radiation and while there may still be a corresponding risk, at low doses, the risk is considered

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			since come down in a series of steps to its current level of 1 mSv/yr for the public and 20 mSv/yr for nuclear industry workers, or 100 mSv in 5 yrs with a maximum of 50 mSv in any one year. Is this protective? According to guidelines from the ICRP (International Commission on Radiological Protection), the cancer risk from radiation exposure is .04/Sievert. Over a 40 year career (age 20-60), at 20 mSv/yr, a worker will be exposed to 800 mSv, or .8 Sv. His odds of getting cancer are then .8 x .04 or .032, that is approximately 3 in 100. If 100 workers are so exposed, three of them will be expected to get cancer. The nuclear industry in Canada employs approximately 70,000 workers. Over a lifetime in the industry, 70,000x .032, or 2,240 of them would be expected to get cancer as a result of this level of exposure. Clearly this standard is not protective. In reality most nuclear workers are not exposed to anywhere near this amount of radiation, and relatively few of them get sick. But this exposure is allowed. Clearly this standard is unrealistic. Similarly, the standard for tritium in drinking water was initially 40,000 Bq/L. Many European counties now have a standard of 100 Bq/L, and the Advisory Committee on Environmental Standards recommended to the Ontario government in 1994 that the Ontario standard be set at 100 Bq/L, with a 5-year target of 20 Bq/L. The current Canadian standard for tritium in drinking water is 7,000 Bq/L. It is unlikely that this is protective. The new uranium in air standard of .03 ug/m3 (micrograms/cubic metre) is also not protective. According to material published in the CCME (Canadian Council of Ministers of the Environment) 2007, soil levels of uranium can increase as a result of airborne deposition. In order to	negligible. To determine at which point risk becomes “unsafe”, if it exists at all, the International Commission on Radiological Protection has set limits on doses of radiation considered acceptable to society. In addition, because they acknowledged that there may still be a risk at these levels, they also recommended using the ALARA principle to keep doses as far below the dose limits as reasonably practical. Note that no adverse health effect has yet been seen at radiation doses below about 100 mSv, which is twice the occupational dose limit. Like most other countries, the CNSC has adopted these limits and requires that doses be kept ALARA. As a result, doses to workers and members of the public are all well below the respective dose limits. CNSC regulates the nuclear industry using dose limits and the ALARA principle. *Lane et al., 2010* found that overall, male uranium workers had lower mortality rates of all causes of death and all cancers (1950-1999) and lower incidence rates of all cancers (1969-1999) compared with the general Canadian male population. Port Hope uranium workers did not have a significant relationship between radon progeny, gamma exposure and any cancer mortality or incidence, or any other cause of death. Lane et al., (2011) and CNSC Info 10781, also reported that Port Hope residents had no evidence of adverse health effects from the radiation industry (INFO- 0781). Finally, 42,000 Canadian NEWs had no relationship between their radiation exposure and solid cancer risk (1957-1994) (INFO 0811; Zablotska et al., (2012) – submitted for publication). Note that the cohort and case-control studies conducted in Port Hope included Port Hope residents. Lane et. al., (2010) and McLauglin et al., (1993) studied Port Hope uranium workers, many of whom lived in Port Hope. These residents would have the highest radiation exposures and had no adverse health effects. Lees et al., (1987) looked at Port Hope residents’ radon exposures and Lane et al., (2011) conducted a weight of evidence approach, looking at the known toxicological and radiological properties of the sources of contaminants within Port Hope using current evidence on the risks of expected health effects based on these low doses; over 30 environmental studies and 13 epidemiological studies conducted in Port Hope. These results were compared with over 40 international studies to look for

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			maintain a level they consider safe for residential soils, that is 23 ug/g (micrograms/gram), levels in air should not exceed .002 ug/m3. Appendix A contains a presentation given to the Uranium Science Discussion Meeting, Dec. 13, 2008 in Port Hope on the development of the Air Standard, and it gives more detail on this calculation. The uranium in drinking water standard of .02 mg/L is probably reasonable, although some would like to see it reduced to .01 mg/L. Australia allows .07mg/L, but Australia has large uranium mining interests, and many places are short of water. So you can see that standards need to be treated with thoughtfulness and examination. Hiding behind the assumption that because something is "within the standard" it is safe is indefensible. Now a word about the ALARA principle: ALARA is not a public health standard. If there is enough concern about a contaminant to warrant trying to get levels lower, it would be more appropriate to do the research necessary to find out what a safe level is and set the standard there. It will be important to keep these points in mind as various aspects of this project are examined. Is there any evidence that there has been harm done to the residents of Port Hope to date through exposures considered by the nuclear industry to be safe? Let us look at the data. Most of this is in the form of statistical surveys. Data in this form has a number of limitations. One is that there can be no information on causation given in such a study. Often the categories in which data are place are broad, and they may not be appropriate for the questions being asked of this data. In the case of Port Hope, the population size is relatively small.	consistency of findings between Port Hope workers and community and similar workers and communities elsewhere. Based on this weight of evidence approach, there was no evidence that the past or current uranium industry in Port Hope was causing adverse health effects within the town. Cameco has included an assessment for public doses in the EIS. Dose to members of the public as a result of this project was conservatively estimated to be well below the dose limit for members of the public. It should be noted that the 1 mSv per year dose to a member of the public is based on exposures related to activities licensed by the CNSC, not background radiation, such as those mentioned by the commenter. Radiation doses from medical procedures and cosmic radiation, are not controlled by the CNSC and are not part of the CNSC's mandate. The public doses received are below the lowest limit of detection of most dosimeters. The storage, wearing and treatment of dosimeters must be controlled and doing so outside of the work place would be difficult and would lead to significant additional uncertainties in measured doses. Doses in Port Hope were assessed using pathways analysis which is the appropriate method of estimating doses from this activity for members of the public. Dose estimates to members of the public (including children (10 years) and infants (1 year)) are provided in the EIS. Annual intakes (from inhalation or ingestion) of radioactivity are determined from modeled environmental concentrations of media affected by facility emissions. Inhalation and ingestion rates, and dose coefficients used to estimate doses to members of the public as a result of inhalation and ingestion of radioactive dust are from standards that are recognized in Canada. Dose coefficients specific to children are available and used to estimate dose for this project. There is no need for respiratory protection for members of the public as doses from inhalation are so low that it is not warranted nor recommended. The use of respiratory protection in and of itself carries some conventional health and safety risks, which far outweigh the radiological risks.

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			It is currently about 16,000; it was 10,000 or less when some of these data were collected. Given that some endpoints, such as cancers of specific organs, are relatively rare and variable within a population, it is unlikely that many effects found in this scenario will ever reach statistical significance. Apart from a very small number of more narrowly focused cohort and case-control studies which do not involve the townspeople of Port Hope as a whole, this is the data we have. This data will never fully answer the question: 'Has there been or has there not been harm to the population of Port Hope as a result of the activities of the nuclear industry." It can't. What then can we learn from this data? If we are really serious about understanding what is happening in the town of Port Hope, we will look at the numbers for signs of trends and patterns. Any number by itself which does not reach statistical significance may be due to chance. A group of numbers which follow a trend or pattern are much less likely to be due to chance, and more likely to reflect a process or influence that exists in reality. Much of the health data that exists on Port Hope has been gathered into a report entitled "Synthesis Report: Understanding Health Studies and Risk Assessments Conducted in the Port Hope Community from the 1950's to the Present " put out by CNSC in April, 2009. We will refer to this as it is easily accessible to those reviewing this material. Firstly, let us consider cancers relating to the nose, sinuses, pharynx, trachea, bronchus and lung. Why this choice? Because much of the radiological pollution in Port Hope is in the form of airborne uranium releases from Cameco stacks, radioactive dust and radon gas. The body structures which would be exposed to this material first and most strongly are	No change to the CSR.

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			those listed above. These structures are also most likely to be affected by pollution resulting from the clean-up operations. Table 1 (p. 32) shows mortality data for Port Hope as compared to Canada for the period 1954-78. There are no statistically significant effects, although very nearly significant increases in "all causes" and ischemic heart disease appear. There is no obvious elevation in cancers of the trachea, bronchus and lung. In Table 9 (p. 42), which contains more recent data, there are significant increases in the incidence of cancers of the trachea, bronchus and lung in Port Hope as compared with Ontario for the period 1971-1996. (Recent improvements in the treatment of cancer make incidence rates more relevant than mortality rates for current data.) Table 8 (p. 40) shows increases in cancers of the trachea, bronchus, lung and pharynx for females only, for the period 1986-92. Table 10 (p. 43) shows significant or highly significant increases in the incidence of cancers of the lung and pharynx for females, and the nose and sinuses for males within the period 1971-1996. In summary, there are significant excesses of cancers of the trachea, bronchus and lung in Port Hope, as well as associated structures such as nose, pharynx and sinuses, which are more prominent in recent as opposed to earlier time periods. This data, much of which is in fact statistically significant, should be a red flag to both regulators and industry that harm is being done to the residents of Port Hope. In the absence of another plausible explanation for this configuration of findings, it is reasonable to suspect that inhaled contaminants from the nuclear industry are involved. The fact that these cancers figure more prominently in the	

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			more recent data may reflect either a slowly increasing burden of contamination, or perhaps some excess exposures resulting from the 1976-1981 clean-up. This is not a question which can be answered from these data alone. This has profound implications for both the proposed clean-up and the nuclear industry in Port Hope as a whole. The data on childhood leukemia, presented on Tables 3 & 4, p. 34-35, show a very consistent excess of observed vs. expected cases and/or deaths in all but one of the 12 categories examined, in children living within 25 km of the Port Hope facility. While none of these excesses reached statistical significance, the chances of this configuration of data happening in the absence of any real effect are small. A precautionary approach would dictate that these data be taken seriously. There is a very real possibility that people in Port Hope have fallen ill as a result of exposures created to date by the nuclear industry. It is imperative not to create more illness in the course of this clean-up. This means being extremely careful about disturbing contaminated material and allowing it access to air and water, and through these to human living spaces. At the very least, scrupulous attention to dust control is an imperative. It may mean moving residents that live along transport routes for the duration of that portion of the clean-up, remediating these properties and then allowing residents to move back home. It may mean covering sites with protective materials while excavation occurs. It will certainly mean additional research, testing and calculation regarding the amount of radioactive contamination reaching human targets	

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			in each scenario you will be working with. You will need to be able to be able to answer the following questions: • Will residents in areas where soil disturbance is going on get dosimetry badges? If it is deemed they are unnecessary, on what basis is this decision made? Where is the science? How will inhaled and ingested alpha burdens from mobilized radioactive dust be calculated? This is not easy. What specific measures will be taken to protect citizens, including children, from this dust? Given that internally deposited alpha-emitting substances can stay in the body for a very long time, and that children are still in the stage of active cell division and growth, this becomes doubly or triply important for them. Are you going to evacuate children while neighbourhoods are being remediated? This should be given careful consideration. • What about respiratory protection for citizens along the truck routes? Monitoring of air quality and dust deposition? Estimation of both alpha and gamma exposures for them? Criteria for alternate accommodation, should they require it? There is little, if anything, in the available written material on either the Port Hope clean-up or Cameco's Vision 2010 which answers these questions. They must be answered, and proper procedures must be in place in order for the residents of Port Hope to be properly protected.	
24	**Citizen/**	General	In summary, we feel that there are certain pieces of	The documentation related to this environmental assessment is all publicly

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	Citizen Group #4 Radiation and Health Committee: Physicians for Global Survival	comment	information absent from this document which would make it possible for us, as interested members of the public without access to internal CNSC or Cameco material, to properly assess the quality and adequacy of the preparations for this clean-up. There are other areas in which the material presented is clear and well organized. We do have concerns about the degree of understanding of health issues and awareness of current research and thinking on these issues manifested in this report. We feel it is absolutely critical that the health of Port Hope residents be given the very top priority in the execution of this project, no matter how inconvenient this is. In order for this to occur there must be full, proper and thoughtful attention paid to the medical parameters of this endeavour.	available. See information provided on the Canadian Environmental Assessment Agency web site: *http://www.ceaa.gc.ca/050/details-eng.cfm?evaluation=22672* Detailed information on this project can be found in the Environmental Impact Statement. Many health studies have been performed because of historical and current presence of the nuclear industry in Port Hope and because residents have expressed concerns about possible health effects in the community. Detailed information on Port Hope health studies is available on the CNSC web site: *http://www.nuclearsafety.gc.ca/eng/mycommunity/facilities/porthope/health_studies.cfm*
25	**Citizen/** **Citizen Group #4** Radiation and Health Committee: Physicians for Global Survival	Uranium in Air, Soil and Non-Human biota	I would like to recommend a uranium in air standard of 0.002 ug/m^3 (micrograms per cubic metre). I will explain to you, as carefully as I can, how I derived this, from Ministry of the Environment information. Then I will explain why I feel it is imperative, given the little we actually know about the behaviour of uranium in the human body, that the lowest possible modeled value should be taken as the standard. If anyone can cogently argue for a standard less than mine, I will support theirs.	With respect to the uranium in air standard. The decision lies with MOE. MOE consulted the public, considered their comments and finalized its decision on the uranium in air standard. Both Health Canada and CNSC submitted their comments on the new Ontario standard for uranium in the air. The Health Canada approach was based on radiological properties of natural uranium and various uranium isotopes as well as the solubility of various uranium compounds. Health Canada recommended an average annual uranium concentration in air of 0.06 µg/m3 which is deemed to be protective against all radiological effects in both adults and children at 0.1 mSv/year level. CNSC staff recommended an ambient air quality criterion of 0.05 µg/m3 based on consideration of the radiological dose, solubility of various uranium compounds and potential build-up of uranium levels in Port Hope soils. Using highly conservative assumptions for both uranium air concentrations and uranium deposition rates, the CNSC staff estimated that operation of the facility will not result in accumulation of uranium to levels that would be a concern for human health or the environment even for an assumed additional operating period of more than 100 years.

<table>
<tr><th>#</th><th>Name and Organization</th><th>Section</th><th>Summary of Comment</th><th>CNSC Response</th></tr>
<tr><td></td><td></td><td></td><td>In a document entitled “Canadian Soil Quality Guidelines for Uranium: Environmental and Human Health”, prepared by the Canadian Council of Ministers of the Environment in 2007, and referred to in your Uranium Science Discussion Document as “CCME 2007”, a standard for uranium in soil is developed. Their guideline for residential areas, parkland and agricultural land, based on exposures experienced by, and presumably tolerable to, a toddler living in the area, is 23 mg/kg (=23 ug/g or micrograms/gram) in soil. The guideline for commercial land is 33 µg/g. The level for industrial land is 300 µg/g , provided that wind and water action do not carry contaminants onto adjacent lands in excess of their guidelines.

The USDD, on p. 47 indicates that a uranium level in air of .03 ug/m^3 has been determined to prevent build up of uranium by deposition in soil to levels in excess of 300 µg/g. They do not give a level in air which will prevent build up in soil in excess of the 23 µg/g level for residential areas. Given that deposition is likely to be roughly proportional to quantities in the air, this would give a uranium air standard of .0023 ug/m^3.

The model used to develop the 23 µg/g guideline did not make provision for that toddler eating produce grown in local soil. This would represent an additional exposure for that toddler. In my community, an agricultural one living in proximity to proposed uranium mining, most of our food products are local. As uranium mining is contemplated or underway in many areas of southern Ontario, this is not a unique situation. In addition, wells in these areas will become increasingly contaminated and this water will be used for vegetable crops and livestock, as well as human consumption, as there is realistically nothing else available. These are two new sources</td><td>Since 2005, Cameco has collected soil samples at 27 locations in Port Hope annually to monitor uranium concentrations in soil near the PHCF and to demonstrate that there is no accumulation of uranium in the soil due to continuous Cameco operations. Results of Cameco's long-term soil monitoring program in the vicinity of the facility demonstrate that uranium soil concentrations do not increase in the top or any other soil horizon at the Waterworks Parking Lot remediated with clean soil in 2005 (Table X).

Table 1: Uranium concentrations at Waterworks Parking Lot remediated with Clean Soil (µg/g):

<table>
<tr><th>Depth, cm</th><th>2005</th><th>2006</th><th>2007</th><th>2008</th><th>2009</th><th>2010</th></tr>
<tr><td>0-2</td><td>1.3</td><td>1.2</td><td>2.3</td><td>1.1</td><td>1.4</td><td>1.1</td></tr>
<tr><td>2-6</td><td>1.1</td><td>1.1</td><td>1.0</td><td>0.9</td><td>1.1</td><td>1.0</td></tr>
<tr><td>6-10</td><td>4.3</td><td>0.9</td><td>1.1</td><td>0.9</td><td>1.1</td><td>1.0</td></tr>
<tr><td>10-16</td><td>0.8</td><td>0.9</td><td>0.9</td><td>1.0</td><td>1.1</td><td>1.0</td></tr>
</table>

Also, no statistically significant accumulation of uranium in soil was observed in any other sampling location during 2005-2010. Based on these results, CNSC staff concludes that there is no measurable impact on soil due to current uranium emissions from PHCF.

No change to the CSR.</td></tr>
</table>

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			of exposure which are not accounted for in the original model. I would like to propose an extremely conservative correction of the air standard derived above from .0023 µg/m^3 to .0020 ug/m^3. Proper calculation of the magnitude of the new exposures may lead to modification of this value, I suspect downwards. Unfortunately, soil levels in much of downtown Port Hope are already much higher than the recommended 23µg/g. The USDD, on p. 79, indicates that, according to 1986 data, soil in approximately 1 square km of the town east and west of the plant has soil uranium levels of over 50 ug/g, and there are levels of over 100 µg/g immediately adjacent to the plant (hopefully on industrial land). It's not clear from existing data where in the town levels drop to 3 µg/g or less. Clearly the emission patterns of the industrial complexes in Port Hope have not resulted in soil deposition levels within residential standards. (Even if standards were different or absent in the past, the lesson is this: there has been a failure, either in the area of providing standards or in enforcing them, to keep the residents of this town safe. Perhaps we didn't know as much then. Perhaps we don't know everything we need to know now either. Humility, honesty and conscientiousness are in order.) We are left, now, with a plant that wants to emit uranium, and residential soils which are already overloaded. This is a very unfortunate situation. In the USDD, on p. 93, an air standard of .06 µg/m3 is proposed. This is already inappropriately high, given the	Cameco must respect the release limits for uranium in air. These limits are provided in the facility license. If a critical receptor were exposed to these quantities for 1 year, the maximum resulting dose from this pathway would be 50 µSv. Furthermore, Cameco operates using an Operating Release Limit of 0.3 mSv

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			above. In addition, if air exposure typically makes up 10% of total exposure to uranium, and air exposure results in a radiation dose of .1 mSv/yr to a hypothetical 15 year old, that person's total uranium radiation burden would be expected to be 1.0 mSv/yr. This is the total permissible non-background yearly dose for a member of the public. This child would then not be able to have a medical X-ray, or fly in at altitude in an aircraft, or visit us and drink our well water, without exceeding the limit. This is an unacceptable degree of risk for this person. If some of this uranium were enriched, or recycled (post-reactor) uranium, that would further increase the exposure. Two other considerations arise in this situation. One is that uranium never travels alone. It is always found in some sort of equilibrium with its decay products, which are themselves radioactive and represent an exposure not accounted for in this model. The second is that 1.0 mSv/yr is not a safe dose of radiation, it is one which causes an "acceptable level of harm". The lesson here is that all of our models are prone to flaws, and I would suggest we are more likely to overlook things or underestimate them than the reverse. We know what we know; it's what we don't know that will sneak up and bite us. I am struck, in reading the material provided, by the large number of instances in which human data are lacking and in which, instead, animal data with an arbitrary correction factor or mathematical models replete with "estimates" are used.	(300 µSv) per year, for all pathways (air, water and direct external exposure from gamma rays). Note that these are licence limits and are based on conservative estimates of dose if releases were to occur at licence limits. In fact, the measured releases from Cameco are much lower. In 2011 Cameco estimated dose to the public associated with its air, water and direct gamma pathways to be 0.023 mSv (23 µSv), a very small fraction of the public dose limit. This statement is false. The appropriate decay products of uranium are, and have been taken into account into all dose assessment methods. These methods are reviewed by CNSC staff that has the required expertise. The International Commission on Radiological Protection has set limits on doses of radiation that they feel are acceptable to society. However, because they acknowledged that there may still be a risk at these levels, they also recommend using the ALARA principle to keep doses as far below the dose limits as reasonably practical. Note that no adverse health effect has yet been seen at radiation doses below about 100 mSv, and this is twice the occupational dose limit. Like most other countries, the CNSC has adopted these limits and requires that doses be ALARA. As a result, doses to workers and members of the public are all well below the respective dose limits. Members of the public in Port Hope are protected and considered to live in a safe environment with respect to radiation exposure. Radiation is one of the most widely understood and studied carcinogens. In assessing its possible health effects, both laboratory studies (using animals in some cases) as well as human epidemiological studies have been used. The incidence of disease in Port Hope has been studied and disease incidence in Port Hope is no greater than elsewhere in Canada. The CNSC took a weight of evidence approach in producing a report of Port Hope in April 2009. Based on the

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			This tells me quite clearly that our understanding of the behaviour of uranium in humans is incomplete, and that if we are to effectively protect humans, we will need to use conservative standards rather than generous ones. I am 57 years old; I grew up in the 50's and 60's to a litany of reassurances that pesticides, food additives, preservatives etc. were safe. Even after Rachel Carson's book Silent Spring came out and 'carcinogenic' became a household word, the story was- "there's not enough of it to do you any harm" "it can't possibly hurt you, there's so little". We have cancer rates of 42% now, and many of these substances have been removed from the market. Uranium, with a half-life of 4.5 billion years and a propensity to morph into over a dozen other elements and isotopes over time, will not be easy to contain or remove from our environment. Uranium is radioactive. There is no safe level of radioactivity. Any ionizing radiation is capable of damaging genes if it reaches them inside the cell. A singe alpha particle or gamma ray can alter a gene. Some of these defects can be fixed by the cell's repair enzymes, many of them can't. They're permanent. When that cell divides, it will either die, or it will pass on the flaw to its daughter cells. In the case of egg or sperm cells, the defect will be passed on to the next generation. And the next. We have a very shaky understanding of what this means for a population (e.g. us) over time. We know some of these defects can be involved in the creation of cancers. We know some of these defects will remain hidden, sometimes for	environmental and epidemiological studies conducted in PH and the findings of research studies conducted in other countries, the CNSC concluded that no adverse health effects have occurred or are likely to occur in PH as a result of the operation of the nuclear facilities in the community. The CNSC uses a conservative approach in setting all its standards. In addition to limits on dose and releases of radioactive material, the CNSC also requires that doses are kept as low as reasonably achievable (ALARA). As was mentioned above, no adverse health effect has yet been seen at radiation doses below about 100 mSv which is orders of magnitude higher than typical doses that members of the public receive from the nuclear fuel cycle. Of course, this activity is associated with some risk, but this risk is very low. As mentioned previously, radiation is one of the most widely understood and studied carcinogens. In assessing its possible health effects, both laboratory studies (using animals in some cases) as well as human epidemiological studies have been used. The life span study which investigated the health effects associated with the atomic bombing of Hiroshima and Nagasaki is one of the most comprehensive epidemiological studies conducted to date and has provided a wealth of information for the scientific community.

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			generations, until conditions are right for them to manifest. Not enough time has elapsed since the first atomic bomb blast at Hiroshima for us to have a handle on this process, and, quite frankly, we've done an abysmally poor job of even trying. The reasons for this are largely political. Uranium is known to bind tightly to DNA, that's one of its chemical properties. Research is under way to see whether it does this in living tissue to any extent. I don't know what the answer is, yet, but if it does, it will have a point-blank shot at the cell's genetic material when it releases its alpha particle. There is also some evidence, still at the research stage, that uranium atoms can absorb gamma rays (we know they do this much) and re-radiate them in a form much more damaging to the cell. This could make the dose "estimates" used by the ICRP to determine safety way off base. Given the difficulty, impossibility actually, of removing uranium from our environment once it is disseminated, a difficulty we see clearly when faced with the clean-up of Port Hope, and given the reasonable probability that we may yet discover something about the toxicity of uranium that we don't currently know, I would suggest caution. Our regulatory system has allowed an unfortunate situation to develop in Port Hope; it did not happen by itself. Let's not repeat our mistakes.	We believe this statement is based on a theory described by Chris Busby. CNSC staff traced the source of the information and concluded it was not scientifically defensible. Mr. Busby states that studies have shown that UO2 will selectively attach itself to DNA. In this paper, uranium oxide was used to dye histological slides of cross sections of tissues. UO2 is generally insoluble, so it would not enter the blood stream, so certainly not through cell and nucleus membranes.
26	**Citizen/** **Citizen Group #5** Pier Group		The CSR's Table 4.3-1: Valued Ecosystem Components states that for heritage resources, "*Potential to affect and cultural resources is limited to the demolition and remediation phases of the Vision 2010 project"*. This statement is patently ridiculous. Is the author of this report stating that the impact of demolishing a heritage structure is over once the dust has	CSR **Table 4.3-1** Valued Ecosystem Components, has been amended as follows, "A proposed project option is to permanently remove physical and non-designated cultural heritage resources on the Centre Pier". Comment #26 is correct, if the Harbour Commission decides to have Cameco demolish the buildings; the destruction of the buildings will be permanent.

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			settled? Demolition is permanent. Once a heritage asset is destroyed, there is a permanent lasting and highly adverse impact on the cultural heritage environment of Port Hope, directly attributed to the Vision 2010 works if demolition is carried out. The question of course is whether the Pier Buildings are or are not cultural heritage resources. On the grounds that these buildings are not currently designated under the Ontario Heritage Act, Cameco's IES states that "*there is very low potential for … heritage or cultural resources to be at risk*". My previous communications to you appear to be ignored since your Draft CSR states quite clearly in both Table 8.1-2: Project- Environmental Interactions and in Table 8.2-1: Summary of Residual Effects that the impact on heritage resources is zero. The CEAA Reference Guide on Physical and Cultural Heritage Resources states: "*It is important to note…that not all valued cultural heritage resources have official designation status and therefore may not always be identified in government registries. They may not even be formally recognized or documented.*" Further more, the Reference Guide states that "*Many important heritage sites have not been identified or formally recognized…Appropriate stakeholders, professional experts, the public and organizations dealing with cultural heritage matters are all important sources of information in identifying and evaluating these sites.*" There many organizations in Port Hope dealing with heritage matters in general and with the Pier Buildings in particular: The Pier Group, the Architectural Conservancy of Ontario (Port Hope Branch), Heritage Port Hope (the Municipality's advisory Body). As well, some this country's pre-eminent	The EIS for this project submitted options to demolish and clean, and to clean without demolition. All options were considered. The CNSC and the Federal Review Team assessed all options as proposed by Cameco. In terms of the assessment of socio-economic, cultural and heritage effects, these are assessed in terms of how changes to the environment impact them, i.e. the indirect effects are assessed. In other words, physical and cultural heritage are assessed in terms of the impacts on physical and/or cultural heritage as a result of any change that occurs in the environment, i.e. "indirect effects". "Environment" is defined as "the components of the Earth and includes, section 2(a) land, water and air, including layers of the atmosphere, (b) all organic and inorganic matter and living organisms, (c) the interacting natural systems that include components of (a) and (b). Direct effects on physical and cultural heritage are not considered under CEAA, as per section 2 (b) of the act, which states, "any effect of any change referred to in paragraph (a) on…physical and cultural heritage". In terms of recognizing the Pier buildings as heritage buildings, the Municipality has considered the matter. The Municipality of Port Hope inaugurated the "Centre Pier Development Task Force" whose mandate was to identify costs and potential risks associated with possible future development of the Centre Pier, including the options to retain or demolish the buildings. The report examined the restraints and financial implications associated with the decontamination of the harbour and pier as part of the LLRW remediation project. A 30-day public comment period on the fate of the building on the Pier was closed on September 6th, 2011 and a report by the Task Force issued on October 25, 2011. In the final report, the Centre Pier Task Force recommended that the PHAI restore the Centre Pier property to it its full use either by retaining or replacing the buildings instead of tearing them down. The Task Force also recommended independent verification of claims by the PHAI regarding costs for restoring the Centre Pier. *http://www.infomedia.gc.ca/cnsc-ccsn/articles/unrestricted/2011/09/nau20119361824182.htm* Regarding table 8.1.2., no indirect effects identified, i.e. the effects of the project on cultural and heritage values, if the buildings remain standing, were identified, see CEAA, section 2(1)(b)(i and ii), thus, no project interactions were identified. If the buildings which are not protected under the *Heritage Act* are to be demolished, the

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			heritage restoration architects and builders are resident in Port Hope. Their support for the retention of the Pier Buildings, based on extensive professional expertise, is virtually unanimous, unless there is conclusive and objective evidence that the buildings cannot be realistically saved. And yet not one of these groups or individuals has ever been contacted for their input to either the EIS of the CSR.	indirect effects will not apply. The CSR was amended to reflect the conclusions of the Municipality of Port Hope Task Force on the Pier Buildings. With respect to the last part of the comment, all groups were welcome to comment on the draft CSR. The Pier Group was specifically asked to comment and a copy of the draft CSR was provided to them. In addition, the draft CSR went out for a 30 day public comment period by the CNSC and will be going out for CEA Agency initiated public comment period in the first quarter of 2012.
27	**Citizen/** **Citizen Group #5** Pier Group		This VEC "Visual appearance of Cameco PHCF" should not be addressed in isolation. It directly impacts tourism, community recreation uses, and community / neighbourhood character, all important VEC's. Unlike the heritage question, both the EIS and the CSR do acknowledge that these are relevant if minor issues, and that these aspects of the environment should be addressed. Port Hope has, unquestionably, an ugly waterfront and this ugliness is centred on the Cameco PHCF. Waterfronts, if attractive, can be an important stimulus to business growth. All of these activities are dependent on 'quality of place', but the 'quality of place' on Port Hope's waterfront has been eroded for decades by Cameco and by their Federal predecessor, Eldorado Nuclear. Cameco to their credit, participated in the Vision 2010 Stakeholders Liaison Committee with a number of citizens of Port Hope several years ago. Their work resulted in a Memorandum of Understanding which included, among other things, an undertaking by Cameco to return to the municipality sufficient land along the west side of the Port Hope Harbour to provide a green, well landscaped water's edge. The EIS makes frequent reference to this 'green edge', and your CSR picks up on the theme. In Table 8.2-1: Summary of Residual Effects you state that a *"a long-term benefit is anticipated for*	Enhancing beautification potential is not within the scope of an environmental assessment. However, the mitigation of effects is within the scope of an EA. Thus, the reduced width of green space along the Harbour was assessed in terms of its potential impacts on the environment. Where there may be likely significant adverse environmental effects, the responsible authority would require the proponent to submit, "measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project". The CEAA EA process does not assess economic gains as part of its assessment. No business models are considered. Projects are assessed in terms of 16(1) and (2) of the CEAA and in accordance with the definitions in section 2. While the EIS did comment on indirect socio-economic effects of the project, it is not within the mandate of CEA Act to assess benefits to the project. What is assessed in the project is based on the project description, the approved scope of project and scope of assessment (as per the guidelines). The Municipality of Port Hope and its policies and planning are not within the mandate of the CEAA EA process nor is tourism part of the scope of assessment for this project. Thus, the community and neighbourhood character would be assessed in terms of indirect socio-economic/cultural etc. effects, not in terms of direct impacts. The EA process considers the environmental effects of a project as proposed by the proponent, in the case of Vision 2010, the CNSC and the Federal Review Team

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			users of the waterfront, as the physical look of the property will be improved with Vision 2010". Also the CSR states that *"the project is expected to contribute positively to tourism and to the economic base of the Municipality of Port Hope. No residual adverse effects have been identified."* This is all well and good. The problem is that it's no longer entirely true. The promised land widening along the approach channel to the harbour will not happen, as indicated on Cameco's latest master plan releases in September of 2010. The are where Cameco's unsightly property is closet to view, where tree planting for visual screening is most important, where trees for shade and ambiance for pedestrians on the water's edge is critical will remain bare, with no more than token ground level planting. And of particular note is the fact that the narrow strip of land widening, which Cameco refuses to hand over to the community, does not even belong to Cameco; it already belongs to the Community. Cameco is not entirely at fault in this obvious shortcoming. They are a private corporation with a legitimate obligation to maximize their assets and minimize their costs. The land widening which is so essential to the greening and landscaping of Port Hope's waterfront will likely remain unimproved, in Cameco's possession, simply because Port Hope Council hasn't insisted that Cameco fulfill its obligations.	assessed the preferred master option as proposed by Cameco in the EIS.
28	**Citizen/** **Citizen Group #5** Pier Group		The *CEAA Reference Guide* states that cultural heritage resources must be considered when undertaking federal environmental assessment (EA). The statements in the Guide, direct the proponent to examine the physical and cultural resources within the area of potential impact, objectively identify those of cultural value and take into account any sites so identified in the consideration of potential adverse effects and mitigation strategies.	While it is true that heritage resources are relevant VECs, these were assessed in terms of the changes to the environment that may have an impact on them, and not their direct removal. However, CNSC included project interactions on the buildings in its assessment. The CSR was amended in subsections section 7.8.2.3 - Land Use Adjacent to the SSA and section 8.2.1.10 - Physical and Cultural Resources, for clarification purposes.

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			The Cameco Vision 2010 EA has not fulfilled the requirement for responsible review of physical and cultural heritage resources. The intention to demolish "old or underutilized buildings" is clearly stated as a basic component of Vision 2010. The buildings of Centre Pier (along with others on the main site) are further identified for demolition in Figure 3.2-1 and Table 3.4-1 of the EIS. The specific rationale for demolition of the Centre Pier Buildings is provided in Section 3.4: "Cameco's existing agreement with the Harbour Commission requires that these buildings (40, 41, 42, and 43) be demolished prior to the termination of the lease unless directed otherwise". This is particularly troubling given that the demolition of the cultural heritage resources at Centre Pier is the ultimate negative impact as far as heritage structures are concerned.	Refer to the response to comment #26.
29	**Citizen/** **Citizen Group #5** Pier Group		Section 5.11.1.3 of the EIS acknowledges the conclusion of the Heritage Assessment of the Centre Pier by *Historical Research*, which states that several of the buildings and possibly the cultural heritage landscape should be understood as *bona fide* cultural heritage resources. However there is no further comment on the validity of these conclusions, reference to follow-up investigations/research nor any further or alternative evaluation provided.	The EIS on page 5-123, subsection 5.11.1.3 reports the results and conclusions of the Heritage Assessment of the Centre Pier (HRL 2008), which was prepared for the Pier Group; it does not assess their conclusions. This statement therefore, does not necessarily represent the position of Cameco, nor does it necessarily represent the position of the Municipality or the Harbour Commission.
30	**Citizen/** **Citizen Group #5** Pier Group		Section 6.12 states that "there is very low potential for…heritage or cultural resources to be at risk…" Further in Table 6.3-1: 'Likely Interactions between the Project and Environmental Components" no interaction between building dismantlement and heritage resources is acknowledged. This disconnect, without any rationalization cannot be considered acceptable within the EA process.	Please refer to the response to comment #26. Environmental Assessment experts at the CNSC reviewed the HRL 2008 reports, the Municipality Task Force Report and the submission from the Pier Group on the EIS review and media releases prior to making a recommendation. The CEAA EA process for the identification of significance was followed.

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			The EA process, undertaken responsibly and according to the approach mandated in the CEAA Reference Guide, should have involved a professional expert(s) in the area of cultural resources with experience in dealing with industrial heritage undertaking first hand review of the cultural resources of the Centre Pier, an objective evaluation using established criteria and finally an opinion regarding the cultural value of the resources under review. This would then have formed the rationale for the approach to these resources with the EIS. The proper EA process have been clearly truncated in deference to the Owner's wishes to demolish these structures. The EA process however is intended to be an objective assessment of resources and values beyond the interests/intentions of the proponent or any particular stakeholder no mater how important. Thus, this EIS, in regards to Cultural Resources, must be considered incomplete and flawed.	
31	**Citizen/** **Citizen Group #5** Pier Group		The *Heritage Assessment of the Centre Pier (Historical Research 2009)*, which was prepared for the Pier Group asserts that there is little to argue against the following: • The importance of the Harbour and the Centre Pier to the development of Port Hope. • The importance of Standard Ideal Sanitary Company and its successor firms to the harbour and the economy of Port Hope. • The complex of buildings remaining on the Center Pier, ranging from turn of the 20th century until c. 1960, along with such features as the remaining track of the former spur line, remain an evocative representation of the history of the manufacturing of sanitary fixtures at the site and the processes associated with their manufacture.	CNSC recommends that Cameco preserve a heritage record of these buildings.

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			• That portions of Building #41 and #43 are good examples of the survival of heavy timber (slow burning) mill construction into the 20th century within a Vitoria/Edwardian brick envelope featuring large arched opening within niches between brick pilasters. • That the rhythm created by the brick pilasters and the fenestration, as well as features such as the large monitor at Building #43 , are noteworthy heritage attributes and representative of 19th and early 20th century industrial structures. • That surviving details such as the painted sign "Port Hope Sanitary Manufacturing Company Limited" are important features in understanding the history of the site.	
32	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		The current baseline characterization provided in the EIS is inadequate. Specific details of the existing Cameco PHCF groundwater and surface water quality monitoring programs are not provided in the EIS. Further, ground and surface water sampling data is sparse or absent. No information of groundwater sampling wells or maps or contaminant plumes are provided. Surface water quality data for the Port Hope Harbour and Lake Ontario, which are the receiving bodies for runoff, groundwater discharge and effluent discharge, are also not provided in the EIS. Additional surface water quality data for the Ganaraska River, the Port Hope harbour, Alexander Creek and Lake Ontario near the property must be included in the EIS. If this data exists in the various reports recently identified by Cameco (i.e., the facility's Site Wide Environmental Management Plan, Environmental Management Plan, Annual Reports and PHAI documentation from "Expo '03"), it should be formally appended to the EIS. These additional documents should be made available to all interested parties and members of the	Cameco's response: *When requested by Waterkeepers, Cameco produced a number of documents and references to documents that may contain the information missing from the EIS. These documents include the facility's site-wide risk assessments, environmental management plan, annual reports and PHAI documentation from "Expo '03".* CNSC response: Many reports are available from Cameco's web site which include data from Cameco's environmental monitoring programs. This includes annual and quarterly reports, and both the site-wide risk assessment and site-wide management plan which provide information on groundwater plumes at the PHCF. As a general note, it should be realized that the driver for excavating soils during Vision 2010 is the removal of soil that is above the set clean up criteria. Groundwater quality is not a factor in determining what soil will be removed. The

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			public. They should be reviewed by all Federal Authorities and the Responsible Authority, reflected in the Comprehensive Study Report and used to inform the ultimate environmental assessment decision. Any additional data that does not exist in identified reports should be collected through further sampling on and around the site.	change in the groundwater quality that will occur is simply a consequence of the soil excavation. No change to CSR.
33	**Citizen /** **Citizen Group #6** Lake Ontario Waterkeepers		Fish contamination data reflects the long-term contamination levels available for uptake by aquatic life. Information on fish sampling provided in the EIS is limited and an insufficient basis for an environmental assessment. Further, no contamination information on fish in included. Additional fish and biota sampling data is required for the river, harbour, creek and lake near the site. As stated in Comment LOW-1, if this data exists, it should be collected from other sources and included in the EIS. If this data does not yet exist, the CNSC should require Cameco to conduct sampling to complete the record before the EA proceeds.	Cameco's response: *At a meeting on July 6th between Lake Ontario Waterkeepers (Waterkeepers) and Cameco staff, Waterkeepers was told that Cameco is not aware of a source of information on contamination in fish in the area, nor does the company plan to conduct any fish sampling.* CNSC's response: As indicated in the EIS, the Vision 2010 project is not expected to have any measurable effects on surface water or sediment quality. Mitigation measures will be applied to ensure that aquatic species are not adversely affected. Therefore, the CNSC does not feel it is warranted, under the Vision 2010 project, to add additional data collection for aquatic species as a project requirement. No change to the CSR.
34	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		In addition, to missing sampling data, Cameco's environmental track record is not provided as part of the EIS. This limits the potential to evaluate the proponent's ability to prevent or deal with spills, leaks and other forms of contamination. Based on the public record, it is apparent that Cameco has a record of spills and leaks at the Port Hope facility that have added to, and potentially compounded, existing contamination. Information on Cameco's record of emissions, pollution control, and spill response should be before the public, the CNSC and the Minister as a formal part of the EA	Section 7 of the EIS (and appendix H) addressed the potential for environmental effects resulting from accidents and malfunctions specific to activities associated with the Vision 2010 project. Documentation on Cameco's environmental track record is publicly available but is not a requirement for consideration at the EA stage. Should the EA be approved, Cameco will need to demonstrate a competency for carrying out the project with adequate protection for the environment which includes having appropriate protocols and procedures in place to prevent and/or effectively respond to any accidents and malfunctions should they occur. Proponent track records are considered in licensing decisions under the NSCA.

#	Name and Organization	Section	Summary of Comment	CNSC Response
			documentation.	No change to the CSR.
35	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		A program to collect and monitor water quality during and following the project must be established. Without such monitoring, it will be impossible to ensure that effluent discharges from the site do not exceed provincial and federal standards. A thorough and standardized water quality monitoring program must be designed specifically for the Vision 2010 project and implemented prior to work commencing on the site. The details of the proposed monitoring plan should be provided for review as part of the EIS, as its design will help determine the extent and degree of the potential environmental impacts of the proposal.	Cameco's response: *On July 6th, Cameco explained that the company does not intend to rely on its existing monitoring program and plans to develop a project-specific monitoring program.* CNSC response: If Vision 2010 proceeds, Cameco will be required to meet both federal and provincial requirements. No change to the CSR.
36	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		There is currently no stormwater quantity or quality management system on the Cameco property. At a minimum, stormwater should not be contaminated by contact with Cameco's property before discharge into the lake. The EIS notes that stormwater will be collected in underground drainage pipes and conveyed to the harbour and the lake. The document indicates that Cameco plans to improve the storm sewer system, including installing outflow control valves, stormwater quality control structures and reducing the number of storm sewer outfalls to the harbour. However, the storm sewer system will continue to handle only 2 to 5 year storm events. Any larger storms will result in water flowing overland and directly into the lake. There is no overflow system in place to deal with larger storm events. This worst-case scenario is not considered in the EA. This is a major shortcoming of the site and should be remedied during the Vision 2010 process.	Cameco is required to comply with provincial guidelines for stormwater management. Redevelopment of the site will include modifications to the existing stormwater management system as per the Ganaraska Region Conservation Authority requirements and Ontario Ministry of the Environment. Stormwater management will consist of minor and major outlets. The minor stormwater system will include sub-surface drainage pipes designed to handle small and intermediate storm events. The major system will consist of overland flow paths to safely convey major stormwater flows, in excess of the capacity of the minor system, offsite. The minor system would be designed to handle flows for storm events up to the 5-year return period (AMEC 2008, p. 22). Overland surface drainage, primarily utilizing the roadway network, would convey flows in excess of the minor system capacity. Analysis conducted by AMEC indicates that there would be sufficient conveyance at the site to provide positive discharge of major flood events, including the Regulatory Flood and the Probable Maximum Flood (PMF) (AMEC 2008, p. 32). For the Ganaraska River watershed, the Regulatory Flood is defined by using a Hurricane Hazel (Regional Storm) based event (AMEC April 2006, p 3-3). The Probable Maximum Flood is an event greater than the Regional Storm and represents the highest flood that could physically occur at

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			A stormwater quantity and quality management system should be added to the site during the Vision 2010 process. It should have the capacity to hold stormwater from a 100-year storm, either in ponds or tanks so that no stormwater is released directly to the lake.	the site. It is the opinion of the CNSC that Cameco has addressed this matter satisfactorily. No change to the CSR.
37	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		Section 3.5.2.1 of the EIS lists a number of mechanisms that "may be" used to prevent runoff of sediment laden surface water during rain events, such as diversion dykes, sandbags and temporary water holding areas. However, the rating of storm that these mechanisms will be built to withstand has not yet been established by Cameco. Cameco must clearly articulate firm commitments in the EIS to meeting specific standards with respect to stormwater. In particular, the magnitude of storm that the diversions will be built to prevent from entering excavations must be included in the EIS to allow for fulsome review and evaluation.	Cameco's response: *During discussions on July 6th, Cameco indicated that they have not conducted the modeling required to determine how high the diversion dykes and other measures would have to be to protect the excavations. Both the choice of specific diversion measures, and the magnitude of storm that the measures will address, will be selected later on, at the licensing stage*. CNSC accepts Cameco's response and will address details during the licensing review. Cameco's stormwater management plan will be required to meet provincial guidelines.
38	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		If the barriers intended to keep stormwater out of excavation areas are not built to withstand at least a 100-year storm, Cameco risks allowing overland flow to directly contact exposed contaminated soils and be discharged directly into Lake Ontario. Cameco should be preparing all stormwater management and sediment control measures for the Vision 2010 Project to be adequate to handle 100-year storm events for varying durations. Mechanisms to prevent stormwater from entering excavation areas should also be built to withstand a 100-year storm.	During licensing, Cameco will be required to demonstrate how they will follow MOE and Ontario Ministry of Natural Resources (MNR) guidelines for stormwater management planning. Please see the CNSC response to public comment #36 for additional information. No change to the CSR is required.
39	**Citizen/** **Citizen Group #6**		The EIS lacks any detailed plans to deal with contaminant spills or overflows of contaminated soil excavation sites	Please refer to the response to public comment #36 and #38. Specific mitigation measures to attenuate possible effects of contamination to the

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	Lake Ontario Waterkeepers		during storms or floods. Cameco must have a stand-alone plan to deal with all potential spills and floods and must describe these plans in enough detail in the EIS to allow for evaluation.	land, air and water are provided in section 7 of the EIS and include among others: • Any digging in areas with natural gas pipelines will be conducted only after an underground work permit is granted and only conducted by qualified personnel. • During excavation activities work will be carried out in conjunction with the PHAI timelines; the harbour will be isolated by a silt curtain and wave attenuator (as a minimum) so that if material from the excavations enters the water, it will be contained in the harbour and, if necessary, can be cleaned up effectively. • The Emergency Response Team would be quick to act in the event of any spills that occur during excavations. • Workers will be trained in the specific areas of demolition and appropriate Personal Protection Equipment will be required. • Demolition plans will include an appropriate sequencing of demolition and equipment removal to minimize the potentiality of accidental releases. The PHCF has an Emergency Reponse Plan that involves the Transportation Emergency Response Organization in Port Hope. Emergency kits are maintained on vehicles that Cameco uses for transporting UO_3, UF_6 and UO_2. Cameco's ERP includes a plan for both minor and major malfunctions, collisions and fire incidents during transportation. This plan is a requirement for licensing.
40	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		Cameco estimates that 48 000 m^3 of wastewater will be produced by Vision 2010. These numbers were found to be low given the project description. Cameco has not provided details for how these figures were calculated. Actual amounts of wastewater will be far higher and this has important implications for wastewater treatment and ultimately for contaminant levels in effluent from the project. Either Cameco must make a firm commitment in the EIS to using the specific wastewater technologies used to calculate their base-case scenario or a number that reflects the worst-	Cameco has increased this estimate to 58,000 m^3. *During our July 6th discussions, Cameco staff indicated that the wastewater numbers are based on estimates provided by SNC Lavalin. Cameco cautioned that the estimates are based on "in-the-dry" excavations, using Waterloo barriers to limit infiltration to the excavations. Further, the estimate have been increased to 58 000 m^3, in response to a similar question from the CNSC.* CNSC accepts this response. No change to the CSR is required.

#	Name and Organization	Section	Summary of Comment	CNSC Response
			case scenario (considerably more wastewater) should be used.	
41	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		The EIS states that wastewater will be collected and treated for particulate removal. Cameco is considering a variety of options for treating wastewater, including reverse-osmosis and/or evaporation to treat wastewater onsite. However, no firm commitment to using any particular technology is included in the EIS. Also, the EIS does not describe the details of how wastewater from the Cameco PHCF is currently being treated. Cameco must either make a firm commitment in the EIS to using reverse osmosis or evaporation for all wastewater, or expand their consideration of wastewater treatment to include the worst case scenarios. This expansion must include a list of all potential contaminants and whether the various potential treatment options will effectively reduce those contaminants to below federal and provincial standards.	*During the July 6th discussion, Cameco indicated that they are in the process of testing the reverse osmosis technology. Regardless of which treatment technology Cameco chooses, CNSC will ensure that the treated effluent discharges will be protective of human health and the environment.* This response is acceptable to CNSC.
42	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		Cameco should include a detailed description in the EIS of the solid residue remaining after evaporation, including its content and a commitment to continuing to dispose of it in the current fashion. Additionally, information on any volatile substance released to the atmosphere during the process of evaporation should be listed in the EIS.	Cameco's response: *The solid residue left after its evaporation process is collected, sealed in barrels and shipped to the US for uranium recovery. The possible release of any volatile organics to the air during evaporation is being reviewed.* CNSC response: Cameco has indicated they are currently in the process of reviewing releases from the evaporators. CNSC will consider the outcome of Cameco's review and will take any necessary actions under the NSCA to ensure that human health and the environment are protected.
43	**Citizen/**		Depending on the wastewater treatment option selected by Cameco, treated effluent may be released into Lake Ontario.	Cameco's current operating licence prohibits the discharge of process waste water effluent. If Cameco proposes to discharge process waste water effluent, for example in connection with Vision 2010 activities, a licence amendment will be required.

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	Citizen Group #6 Lake Ontario Waterkeepers		The EIS must reflect all these expected contaminants and either establish or point to the discharge standards that will be applied to them prior to release into the lake. In all cases, where they exist, federal and provincial standards should be applied. Cameco must include information on discharge criteria, monitoring and reporting for a full list of parameters in the EIS.	Under the licensing process licensees must demonstrate that they will, in carrying on that activity, make adequate provision for the protection of the environment and the health and safety of persons. Amongst other things, this includes compliance with all applicable municipal, provincial, and federal regulatory requirements. No change to the CSR.
44	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		The Port Hope Conversion Facility (PHCF) is bounded on the west by the Port Hope harbour, which is extremely contaminated and has been identified as an Area of Concern on the Great Lakes. The Port Hope Area Initiative (PHAI) plans to remediate the harbour, potentially by excavating the sediments. A wall topped with concrete and a thin strip of grass divides Cameco's property from the harbour. Below the concrete, the wall is permeable. The EIS states that the integrity of the wall will be maintained during the excavations by PHAI. This is necessary because if excavated areas near the wall fill with water, the increased weight of water could cause the wall to collapse. Options to ensure harbour wall integrity beyond the reliance on timing with the PHAI project should be considered in the EIS. For instance, sheet piling used in the excavations could be left in place after the project to reinforce the wall's integrity and prevent future collapse of the wall into the harbour.	Cameco's response: *At the July 6th meeting it was stated that it is hoped that Vision 2010 will correspond to the PHAI's work in the harbour.* CNSC response: Please also see the response to public comment #39 for mitigation measures that will be put in place to protect the Harbour. Specific mitigation measures to protect the Harbour wall are part of the Port Hope Area Initiative (PHAI). No change to the CSR.
45	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		On page 3-27 of the EIS there appears to be commitment not to stockpile, in any form or for any length of time, any contaminated soils on the site. If this commitment reflects the proposed project accurately, it will greatly reduce the potential impact of runoff and dust on	Cameco's response: *On July 6th, Cameco indicated that soils may be stockpiled while staff prepares them to meet the acceptance criteria for the LLRWMF. Company staff indicated that, should this occur, it will likely happen under tarps or in a building to prevent potential runoff during rain events.*

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			the lake. If, however, contaminated soils will be stockpiled on site during the project, the EIS is deficient as it fails to address rain protection and dust suppression for the piles. If there is no such commitment and there are in fact plans for stockpiles of contaminated soils on-site, then the EIS must be considered deficient because there is no discussion anywhere in the EIS about the dust and water management measures which must be implemented for such stockpiles. Cameco's commitment to cover stockpiles of contaminated soils at all times should be enshrined in the EIS and any subsequent approvals for the project.	CNSC accepts Cameco's response.
46	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		Dust suppression remains a concern for the site. Dust suppression plans for the duration of the project should be provided in the EIS.	Cameco's response: *Cameco indicated that they tend to use dampening for dust suppression, and do not typically use chemical dust suppressants.* CNSC's response: Cameco should follow the document prepared by Environment Canada – *Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities*, March 2005, prepared by Cheminfo Services Inc. Dust suppression is a management process. Cameco has to follow good practices and reduce the fugitive emissions from the activities. This would be observed/inspected during the Vision 2010 activities.
47	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		Details of Cameco's dust suppression plans, as well as a plan for monitoring air emissions, are not currently included in the EIS. An air emission monitoring plan for the duration of the project should be provided in the EIS.	Cameco has a continuous stack monitoring plan for both of the main stacks on a daily basis and an elaborate environmental monitoring plan conducted throughout the year. Cameco has a document on the environmental monitoring plan that covers stack monitoring (see subsection 11.2.2 of the CSR).
48	**Citizen/**		Cameco is applying the PHAI's clean-up criteria for sites	As discussed in the draft CSR, the CNSC is currently reassessing the PHAI soil

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	Citizen Group #6 Lake Ontario Waterkeepers		without development constraints. Table 3.5-1 on page 3-24 lists the most relevant criteria. Soil that meets this criteria will be stockpiled on the site and used for fill. However, in some instances, the listed clean-up criteria exceed federal and provincial soil quality standards. There is no discussion of the handling of excavated materials that do not meet the waste acceptance criteria and are returned to the PHCF site for further processing. Will this material also be stockpiled temporarily on site? Any soil stockpiled on the site or used for fill must meet federal and provincial standards.	clean-up criteria in light of recent updates to the MOE standards for several constituents including the adoption of a uranium soil criterion lower than the adopted PHAI soil clean-up criterion. This could result in the adoption of more stringent soil clean-up criteria at the time of CNSC licensing for the Vision 2010 project. With respect to the comment regarding temporary stockpiling, material that remains on site is regulated by the CNSC as part of the operating licence for the PHCF. No change to the CSR is required.
49	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		The EIS is silent on how, when and where material will be sampled to determine whether they can be accepted at the low-level radioactive waste management facility (LLRWMF). The lack of contaminant limits for acceptance at the LLRWMF must be confirmed. If they do exist, a plan for materials that exceed such standards, or are rejected from the LLRWMF on other grounds, must be created.	There is no upper limit to the waste concentrations that will be accepted by the LLRWMF; waste will not be rejected. No change to CSR needed.
50	**Citizen/** **Citizen Group #6** Lake Ontario Waterkeepers		It is imperative that Cameco undertake Vision 2010 with the highest safety and environmental standards in place, to ensure that no further harm is caused to the community or the lake in the course of the remediation. Cameco should explicitly commit to implementing Best Industry Management Practices throughout the Vision 2010 project.	If the Vision 2010 project is licensed, the CNSC will regulate according to the ALARA principle in terms of radiological and environmental protection. This would normally include implementation of mitigation measures aligned with Best Industry Management Practices. No change to CSR needed.