Facility Licensing Manual Port Hope Conversion Facility	Doc. No.	FLM
	Version:	5

Record of Revisions		
Version No.	Description of Revision	Prepared/Revised by
0	General revision	K. Vetor
1	Update to reflect organizational changes (all Sections). Update to reflect changes to RPPM in Section 4. Update table 11 for RW18 and RW19 action levels. Update Appendix E.	R. Peters
2	General Revision to align with site program manuals (QA, RPPM, EMoP, EMP, OHS, FPP, ERP, Safety Report) Added Training Section Reorganized to match CNSC Safety and Control Areas Updated References List	R. Peters
3	General revisions including updates to organizational chart and relocation of depleted circuit.	S. Frankcom-Wright
4	General revision for better alignment with CNSC Safety and Control Areas, Licence Conditions Handbook and site programs. Removal of obsolete references and inclusion of relevant references in each section.	R. Peters
5	General revision to address CNSC staff comments on revision 4, alignment with revised LCH and associated REGDOCS and standards.	R. Peters

Reviewers / Approvers			
	Title	Name	
Reviewer	Superintendent, Special Projects	Rebecca Peters	*Electronic signature through document management system*
Reviewer	Coordinator, Regulatory Compliance	Laura Sayeau	*Electronic signature through document management system*
Reviewer	Manager, Technical Services	Tyler Rouse	*Electronic signature through document management system*
Signatory Reviewer	Director, Regulatory Compliance and Licensing	Tom Smith	*Electronic signature through document management system*
Signatory Approver	General Manager, Port Hope Conversion Facility	Dave Ingalls	*Electronic signature through document management system*

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1.0 INTRODUCTION AND GENERAL CONDITIONS

1.1 Scope

The Facility Licensing Manual (FLM) is a document that describes how Cameco Corporation's (Cameco) Port Hope Conversion Facility (PHCF) meets the licence conditions defined in its Fuel Facility Operating Licence (FFOL) and associated Licence Conditions Handbook (LCH) issued by the Canadian Nuclear Safety Commission (CNSC). The FLM provides an overview of the Cameco documents that describe the licensing basis organized by Safety and Control Area (SCA), in order to comply with the licensing requirements under sections 24(4)(a) and (b) of the *Nuclear Safety and Control Act* (NSCA).

1.2 PHCF Overview

PHCF operations date back to the 1930s when the facility was originally developed to recover radium from ores mined in northern Canada. Over the years, the facility was transformed to recover uranium, initially for military/national defence purposes and subsequently as a fuel source material to generate electricity. The merger of Saskatchewan Mining Development Corporation and Eldorado Nuclear Limited in 1988 resulted in the formation of Cameco, the present owner/operator of the uranium conversion facility located in Port Hope.

Cameco is a fully integrated resource development company with uranium mining operations and processing facilities in Canada and abroad. Cameco's Fuel Services Division (FSD) operates a uranium refinery, the Blind River Refinery (BRR), in Blind River, Ontario as well as a uranium conversion facility, known as the Port Hope Conversion Facility (PHCF) and a fuel fabrication facility, known as Cameco Fuel Manufacturing (CFM), in Port Hope, Ontario. CFM also operates a specialty metals fabrication facility in Cobourg, Ontario to facilitate the complete CANDU fuel supply cycle.

The PHCF is operated under a FFOL issued by the CNSC. Licence requirements are prescribed in the *NSCA*. The operations performed at the PHCF are also subject to supporting regulations issued by the Commission with respect to materials, transportation, security and safeguard obligations. The PHCF is a complex operation that produces a variety of uranium-based products for both domestic and foreign customers. Descriptions of the various processes and key safety systems have been summarized in this manual as have the site management system and associated programs that have been developed and implemented to meet corporate objectives and regulatory requirements. Key elements in specific programs are highlighted to demonstrate compliance to the facility licence as well as applicable federal and provincial statutes.

This document forms part of the licensing basis for the site and thus is structured in accordance with the CNSC Safety and Control Areas (SCAs), as denoted in the current revision of the site Licence Conditions Handbook (LCH).

1.2.1 Description of the Site

The PHCF is situated on the north shore of Lake Ontario, in the Municipality of Port Hope (Figure 1). It is comprised of two sites. Site 1 consists of the main site property for operations and storage located at 1 Eldorado Place (designated as "Site 1 – main site operations and storage"). The main site occupies an area of 9.6 hectares and is bounded on the west by Choate Road and the Municipality of Port Hope Waterworks, on the north by Hayward Street, and on the east by the Port Hope Harbour. Canadian National and Canadian Pacific rail lines separate the facility from the closest residential neighbourhood.

Site 2 consists of a single property for storage facilities located at 158 Dorset Street East. The Dorset Street East Warehouse is located approximately 1.5 km north-east of the PHCF property. It is a fenced property of approximately 2.2 hectares adjacent to residential neighbourhoods and other industrial facilities.

1.2.2 Location and Layout of the Facility

Site 1 is shown in Figure 2 and Site 2 is shown in Figure 3. These Figures identify all of the buildings on these sites. The legal description of the facility is provided in Appendix A.

Figure 1: Port Hope Conversion Facility in the Municipality of Port Hope

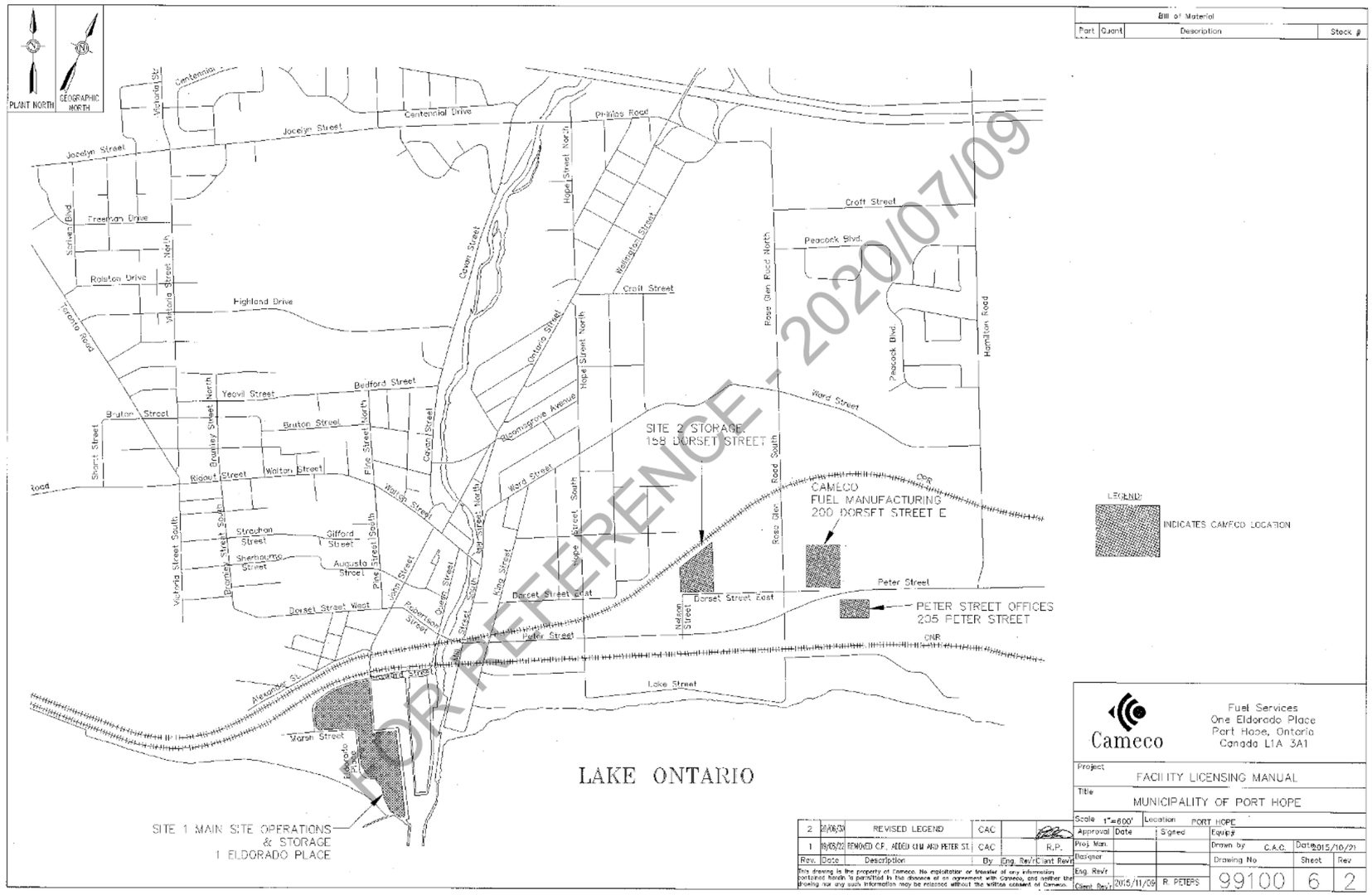


Figure 2: PHCF Layout – Site 1: Main Site Operations and Storage

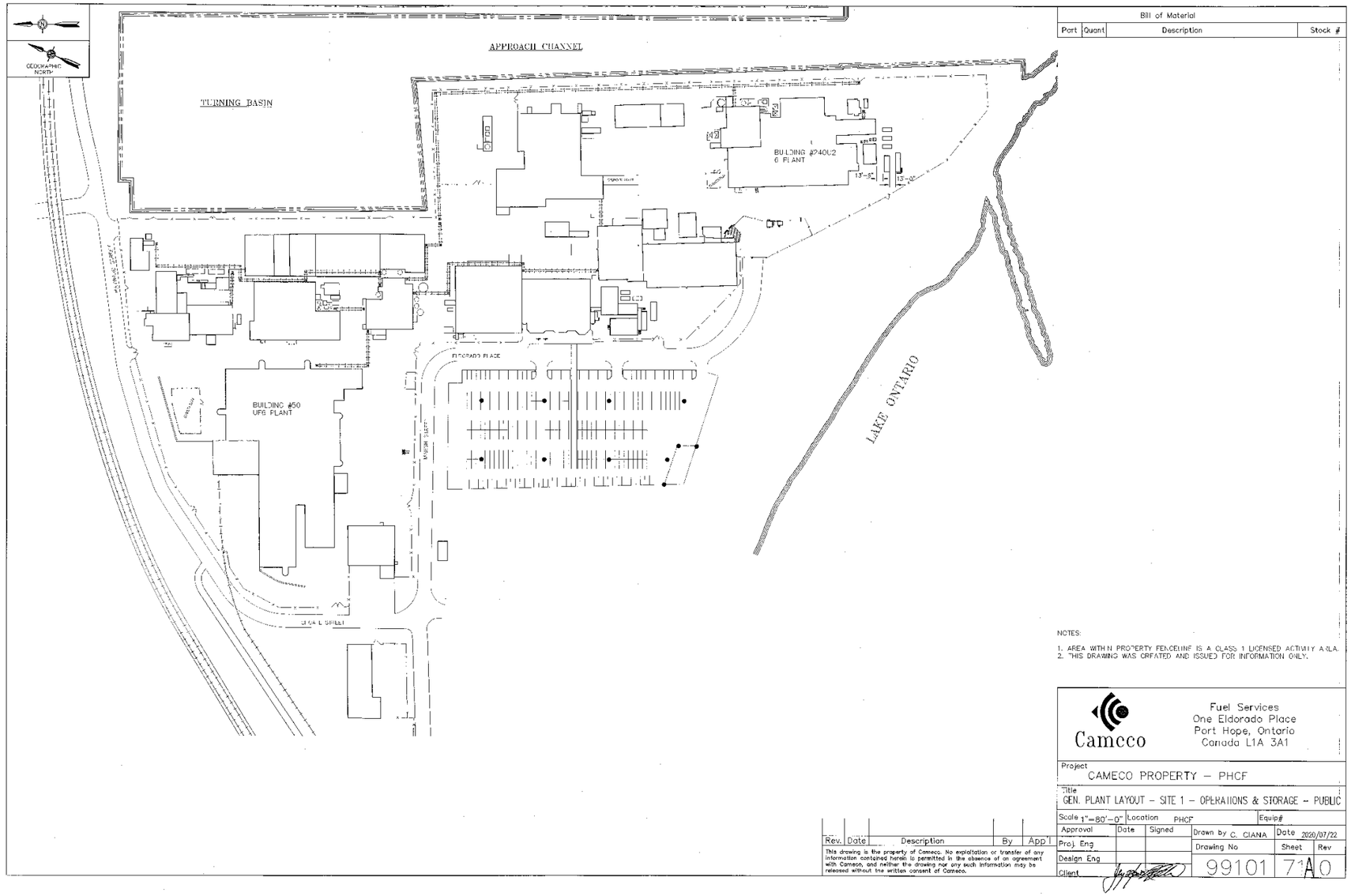
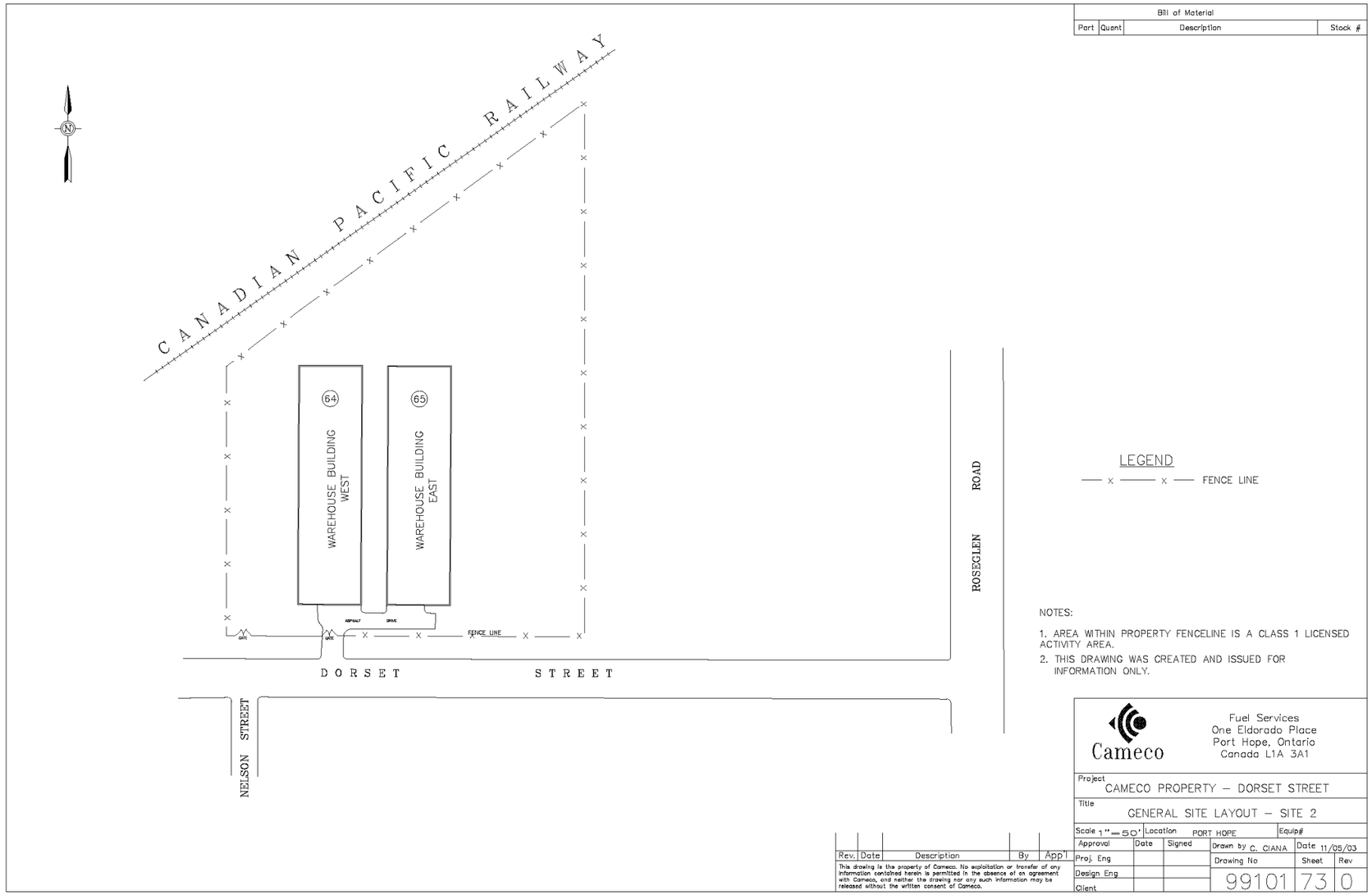


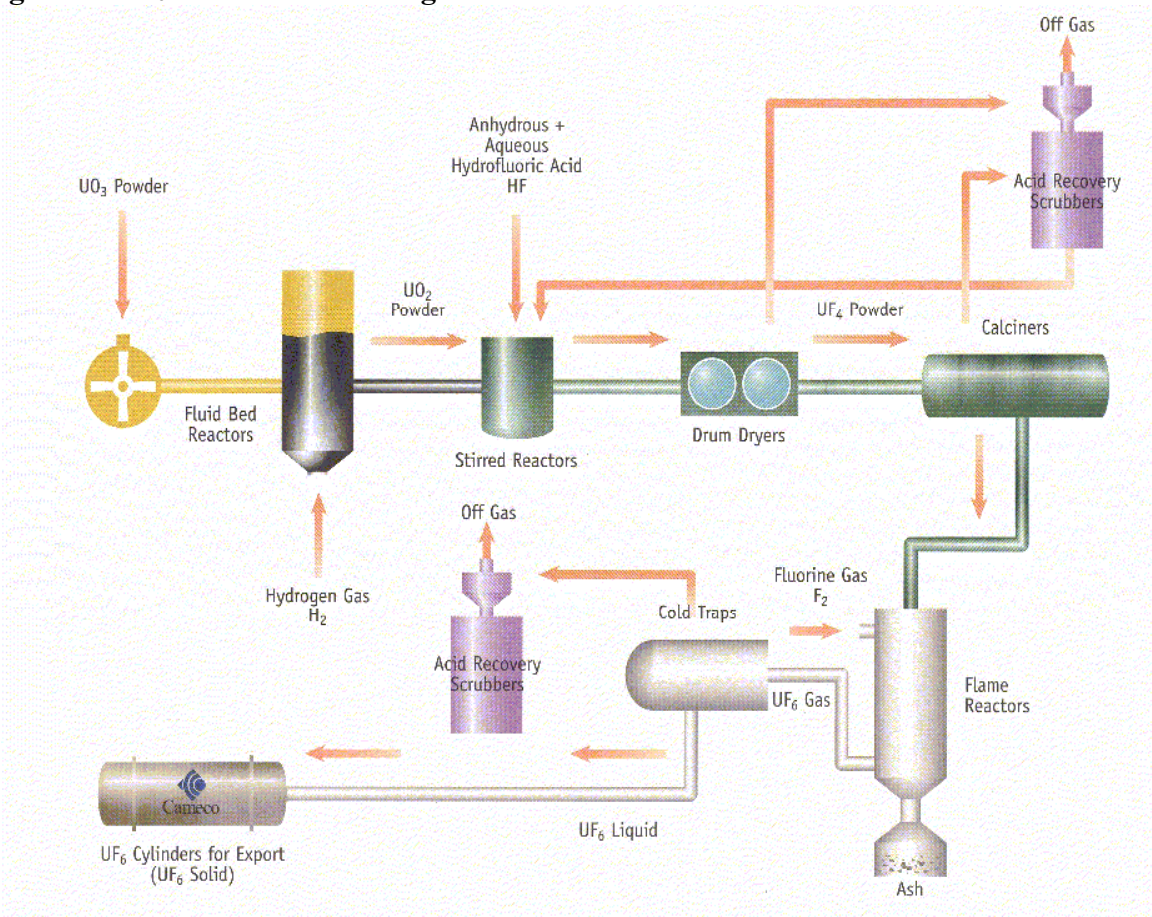
Figure 3: General Site Layout Site 2: Dorset Street East Warehouse



1.2.3 UF_6 Operations

A simplified block diagram of the uranium hexafluoride (UF_6) process is provided in Figure 4. The UF_6 plant has a licensed capacity of 12,500 tonnes U/year as UF_6 and a daily production limit of 45 tonnes U/day as UF_6.

Figure 4: UF_6 Process Block Diagram



In the UF_6 conversion process, uranium trioxide (UO_3) is pulverized and fed into a fluid bed reactor. Hydrogen gas enters at the bottom of the fluid bed reactors, reducing the UO_3 powder to uranium dioxide (UO_2). The UO_2 powder is fed into the hydrofluorination reactors where water, anhydrous hydrogen fluoride (AHF) and dilute aqueous hydrofluoric acid (HF), recycled from the acid recovery system, convert the UO_2 to uranium tetrafluoride (UF_4). The UF_4 slurry is then pumped to a drum dryer which removes most of the water. From the drum dryer, the UF_4 powder passes into calciners, which heat the UF_4 removing the final traces of water.

Cameco produces fluorine by using electrolytic cells, which contain molten potassium bifluoride and HF. An electric current passes through each on-line cell and dissociates the

HF into hydrogen and fluorine. These gases are diverted to separate draw off points and the fluorine is used to convert UF_4 to UF_6.

The calcined UF_4 is then fluorinated (reacted) in a flame reactor with fluorine gas to produce UF_6. The UF_6 gas produced in both the primary and secondary flame reactors is passed through filters to remove any solid particles before entering the cold traps. These cold traps cool and de-sublimate the gaseous UF_6 into a white crystalline solid.

When the cold traps are full, they are heated to liquefy the crystallized UF_6. The liquid UF_6 is drained into specially designed, heavy walled 2, 9 or 13 tonne (30B, 48X and 48Y) steel shipping cylinders. The cylinders are allowed to cool to ambient room temperature causing the UF_6 liquid to solidify. Cylinders containing solid UF_6 under a vacuum are then transported to enrichment plants in other countries.

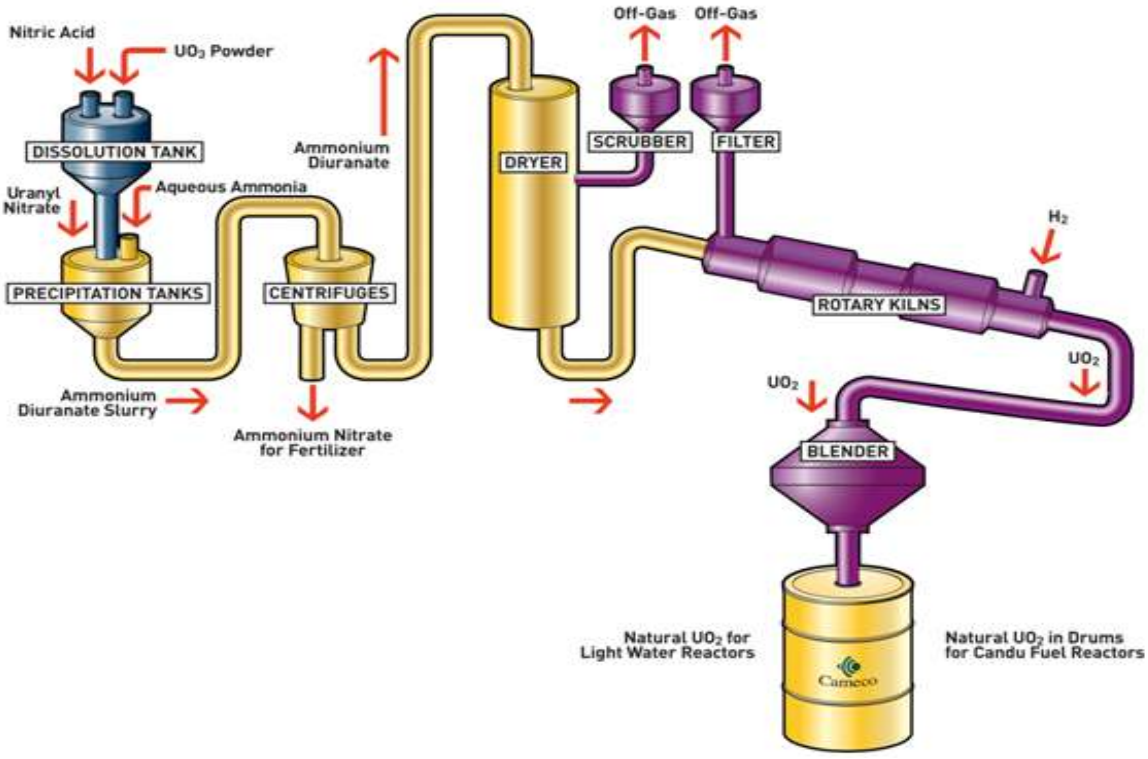
All expended gases leaving the UF_6 conversion process pass through the acid recovery system where they are scrubbed with water to remove the HF. The dilute aqueous hydrofluoric acid is recycled back to the hydrofluorination circuit. The gases from acid recovery are then scrubbed with potassium hydroxide solution to remove the final traces of HF and uranium. Spent KOH from the gaseous effluent system, other uranium and fluoride bearing wastewater are collected and treated in the liquid effluent system.

All aqueous waste streams from across the entire facility are accumulated in one process stream and fed as alkaline slurry to two drum dryers in the liquid effluent area. This drum dryer product is drummed and stored until shipment to a uranium mill for uranium recovery.

1.2.4 UO_2 Operations

A simplified block diagram of the process is provided in Figure 5. The UO_2 plant has an annual licensed capacity of 2,800 tonnes U as UO_2.

Figure 5: UO_2 Process Block Diagram



In the UO_2 process, UO_3 powder is dissolved in nitric acid to produce uranyl nitrate. The uranyl nitrate solution is reacted with aqua ammonia to precipitate ammonium diurante (ADU).

The ADU slurry undergoes solid liquid separation in centrifuges. The liquor is recovered and sent to the ammonium nitrate circuit for treatment. The wet ADU solids cake from the centrifuge is dried continuously by direct contact with hot air in a drier. The dried ADU is then conveyed to the reduction kilns.

The dried ADU solids are reduced with hydrogen to form UO_2 in the heated rotary kilns. The final product of the process is a ceramic grade UO_2 powder. The powder is blended and shipped to fuel fabricators.

The UO_2 process generates an ammonium nitrate (NH_4NO_3) solution as a by-product which is released as per conditional clearance levels in the *Nuclear Substance and Radiation Devices Regulations (NSRDR).*

The UO_2 plant also maintains a depleted uranium circuit. Depleted uranium powders are dissolved to form a uranyl nitrate solution. This solution is pumped directly to the existing

uranyl nitrate storage tank located within the UO_2 processing circuit where it is further processed to ceramic grade depleted UO_2.

1.2.5 Waste Recovery

In general, the waste recovery plant is used to treat waste waters coming from various sources around the site. These inputs include:

- Liquid effluents from the analytical and research lab areas
- Laundry water
- Water used for washing equipment in various locations at the facility
- Groundwater collected through the groundwater treatment system

The evaporation circuit functions by evaporating the waste water to concentrate the dissolved solids content. Overheads from the evaporators are directed to the atmosphere. Sludge from the evaporation process is directed to the UF_6 effluent process for final treatment (Fluoride product).

The function of the groundwater system is to mitigate the risk of migration of contaminated groundwater to the Port Hope harbour.

1.2.6 Material Handling and Logistics

The materials handling operations deal with the loading, unloading, transportation, labelling and/or storage of the various products and other materials (i.e. feed materials, waste) at the facility for production and support purposes. This group coordinates with logistics, technical services and production to move feed materials to designated storage areas and ultimately prepare each consignment for shipment offsite.

The logistics team ensures that all transportation regulatory requirements (i.e. transport of dangerous goods, packaging and labelling, import/export, inventory and safeguard requirements) are met for all shipments of uranium product from the facility.

1.2.7 Waste Management

Clean-Up Program (CUP) operators perform the day-to-day activities of waste management including waste segregation, handling, volume reduction, packaging and storage. CUP operators also perform equipment removal and decontamination including grinding, scarifying, hot water washing, pressure washing and grit blasting to remove fixed and/or surface contamination. CUP may also carry-out projects as described in the Clean-Up Program (WMP-02).

1.2.8 Analytical Laboratories

The analytical laboratories provide analyses of health physics, environmental and quality control samples for the PHCF, as well as samples from other Cameco facilities and other organizations such as fuel fabricators. The analytical services group may also perform analyses of enriched uranium samples. The enriched uranium handled by the analytical laboratories is a subset of the enriched material onsite (i.e. combined enriched uranium in science and technology, storage plus analytical laboratories < 80% smallest critical mass). All safety rules and precautions identified in the Nuclear Criticality Safety Program Manual are followed when handling enriched uranium in the analytical laboratories.

1.2.9 Utilities

A central utility service is maintained at the PHCF. Located in the power plant, this service provides steam and compressed air. The group is also responsible for maintaining heating, ventilation and air conditioning systems, refrigeration units for the cold traps and providing cooling water to the facility.

1.2.10 Engineering

A central engineering department supports operations at the PHCF through drafting, engineering, non-destructive examination and project management. This department manages programs for design control and pressure boundaries.

1.2.11 Maintenance

The maintenance workers at the facility include trades people such as pipe fitters, electricians, sheet metal workers, instrument technicians and carpenters. This group supports both operations and projects.

1.3 Fuel Facility Operating Licence

The Fuel Facility Operating Licence (FFOL-3631/current version) authorizes Cameco to:

(i) operate the Cameco Corporation Port Hope Conversion Facility (hereinafter "the facility") located in the Municipality of the Town of Port Hope, Ontario;
(ii) possess, transfer, use, import, process, package, transport, manage, store and dispose nuclear substances, other than enriched uranium compounds, that are required for, associated with, or arise from the activities described in (i);
(iii) possess and use prescribed equipment and prescribed information that are required for, associated with, or arise from the activities described in (i);
(iv) possess, use, process, store and dispose enriched uranium compounds for experimental and developmental purposes;

(iv) store and dispose enriched uranium compounds contained in legacy waste material and in historically contaminated buildings.

There have been no licence amendments within the current licence term.

1.3.1 Licensing Basis

The licensing basis is the boundary conditions for acceptable performance at the facility and is defined as the information upon which the Commission rendered their decision. It includes information provided in the licence application, its attachments and the documents referenced within, as well as commission member documents and transcripts from the relicensing hearings. The conditions and safety control measures of this Facility Licensing Manual (FLM) and the CNSC Licence Conditions Handbook, and the documents referenced within provide an overview of the licensing basis, and also provide a framework under which facility changes may be made, documents supporting the licensing basis may be updated, and other requirements such as standards and REGDOCs may be implemented, within the licence term.

Table 1: PHCF Documents Relevant to the Licensing Basis

Document Title	Site/Division/Corporate
Cameco Corporation – Port Hope Conversion Facility Renewal of Licence FFOL-3631.00/2017 for a 10-year term (November 20, 2015)	Site
Facility Licensing Manual (FLM)	Site

1.3.2 Notification of Changes

PHCF may make continuous improvements to facility design, operating conditions, policies, programs, methods, studies and third-party reports referred to in the licensing basis that are directly relevant to safety and control measures during the licence term if they remain within the licensing basis.

The following questions are initial screening criteria which would trigger further evaluation of impact to the licensing basis and potential notification to CNSC.

1- Is this a new or different activity than what the licence specifies?
2- Will it require a change to any of the site documents listed in the LCH or licence?
3- Will this change the site layout?
4- Does this change have the potential to negatively impact the safety case for the facility?

In accordance with the operating licence, PHCF will give CNSC written notification in advance of proposed changes with the potential to change designs, operating conditions, documentation or other elements that are integral to the licensing basis outside of the licensing basis approved by the Commission. This notification will include PHCF's assessment of the change to confirm it remains within the licensing basis. Additional information and/or lead time may be required for CNSC staff to complete their assessment of the proposed change. If a change is determined to be outside of the licensing basis, it will be referred to the Commission before it can proceed.

1.3.3 Financial Guarantee

Legislative Requirement: The *General Nuclear Safety Control Regulations* require that a licence application contain a description of any proposed financial guarantee relating to the activity to be licensed.

Table 2: PHCF Documents Relevant to Financial Guarantee

Document Title	Site/Division/Corporate
Port Hope Conversion Facility Preliminary Decommissioning Plan (PDP)	Site

PHCF maintains a financial guarantee in the form of irrevocable letters of credit in the amount of $128,600,000. Each time the PDP is reviewed, the financial guarantee is revised as applicable and approved by the Commission.

1.3.4 Public Information and Disclosure

Legislative Requirement: The *Class I Nuclear Facilities Regulations* require that an application for a licence contain the proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed.

Table 3: PHCF Documents Relevant to Public Information

Document Title	Site/Division/Corporate
Public Information Program (PIP)	Division

The objective of the public information program is to foster open dialogue between the company and persons living in the vicinity of the Cameco's Ontario operations. The program has been designed to meet the requirements of REGDOC 3.2.1: *Public Information and*

Disclosure. The PIP also describes Cameco's Indigenous outreach in both the Blind River and Port Hope areas.

Cameco will provide information to the community regarding how activities at PHCF affect the environment and the health and safety of employees and the community. A key component of the program is a formal public information and disclosure protocol, which has been made available to local residents and other interested parties and is available on Cameco's website.

2.0 SAFETY AND CONTROL AREAS

2.1 SCA - Management System

Legislative Requirement: The *General Nuclear Safety Control Regulations* require a licence application to contain the organizational structure, including the internal allocation of functions, responsibilities and authority. The *Class I Nuclear Facilities Regulations* require that a licence application contain information on the proposed quality assurance program for the activity to be licensed, including the measures to promote and support safety culture.

Table 4: PHCF Documents Relevant to Management System SCA

Document Title	Site/Division/Corporate
Safety, Health, Environment and Quality Policy	Corporate
Management System Program Manual (MSPM)	Site

The PHCF is in the operational phase of its nuclear life cycle. This facility processes natural UO_3 into natural UO_2 and UF_6 as well as depleted feedstock into depleted UO_2. The management system program at PHCF is the framework that guides the processes and programs required to ensure safety objectives are achieved, performance is monitored and a healthy safety culture is maintained. The Management System Program Manual meets the requirements of CSA N286-12 (R2017): *Management System Requirements for Nuclear Facilities* and REGDOC 2.1.1: *Management System*.

2.1.1 Safety, Health Environment and Quality Policy

Consistent with our vision, values and measures of success, Cameco recognizes the safety and health of our workers and the public, protection of the environment, and quality of our processes as the highest corporate priorities during all stages of our activities, which include exploration, development, operations, restoration, decommissioning and reclamation. As such, we are striving to be a world class performer in all aspects of our business through a

strong safety culture, environmental leadership, operational excellence and our commitment to the following:

- Preventing injury, ill health, and pollution;
- Fulfilling compliance obligations;
- Keeping risks at levels as low as reasonably achievable, taking into account economic and societal factors;
- Ensuring quality of processes, products and services; and
- Continually improving our overall performance.

These commitments are reflected in the safety, health, environment and quality (SHEQ) policy which is publicly available on the Cameco website (www.cameco.com). These commitments are approved and supported by Cameco's board of directors. The officers, senior management and all employees are accountable for the performance of their jobs in compliance with this policy and all relevant legislation.

2.1.2 Organizational Structure

Cameco is a fully integrated resource development company and as such maintains a divisional structure to reflect the diversity of operations within the organization. Corporate offices are maintained in Saskatoon.

The vice-president, fuel services, directs the operation of and maintains corporate responsibility for the PHCF. The general manager, PHCF, has the responsibility of operating the facility in accordance with the corporate policies, principles and operating budgets approved by the company's board of directors. To facilitate administrative control within the facility, employees have been organized into a number of departments. Production and service-oriented departments have been segregated, but all departments report to the general manager, Port Hope conversion facility. The Procurement, Vision in Motion, Business Technology Services and Logistics groups are corporate groups that operate at the Port Hope site. Designated personnel are responsible for all operations within their departments which must be carried out in a manner consistent with company policies, programs, plans and procedures. The organizational structures of the FSD and the PHCF are shown in Figures 6 and 7.

In accordance with Section 15 of the *General Nuclear Safety and Control Regulation*s, the persons who have the authority to act for the PHCF in dealings with the Commission, and the names and position titles of the persons who are responsible for the management and control of the licensed activities are documented in writing and provided to CNSC staff. This information is considered confidential and is provided under separate cover. Any change to these names and positions shall be reported to the CNSC using form PHF-TSCL-Z026 within 15 days of the change.

Figure 6: Organizational Structure – Fuel Services Division and Corporate

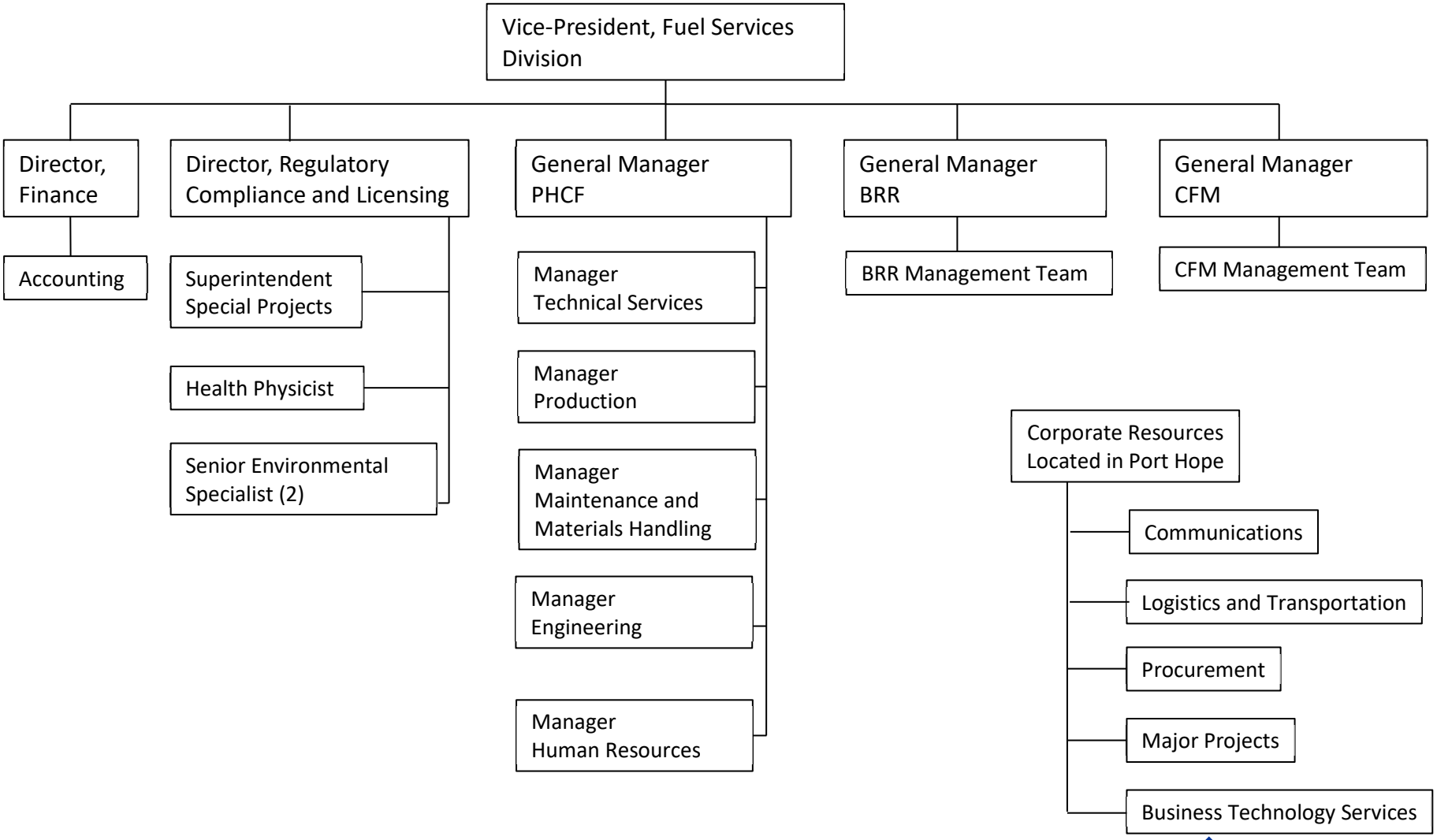
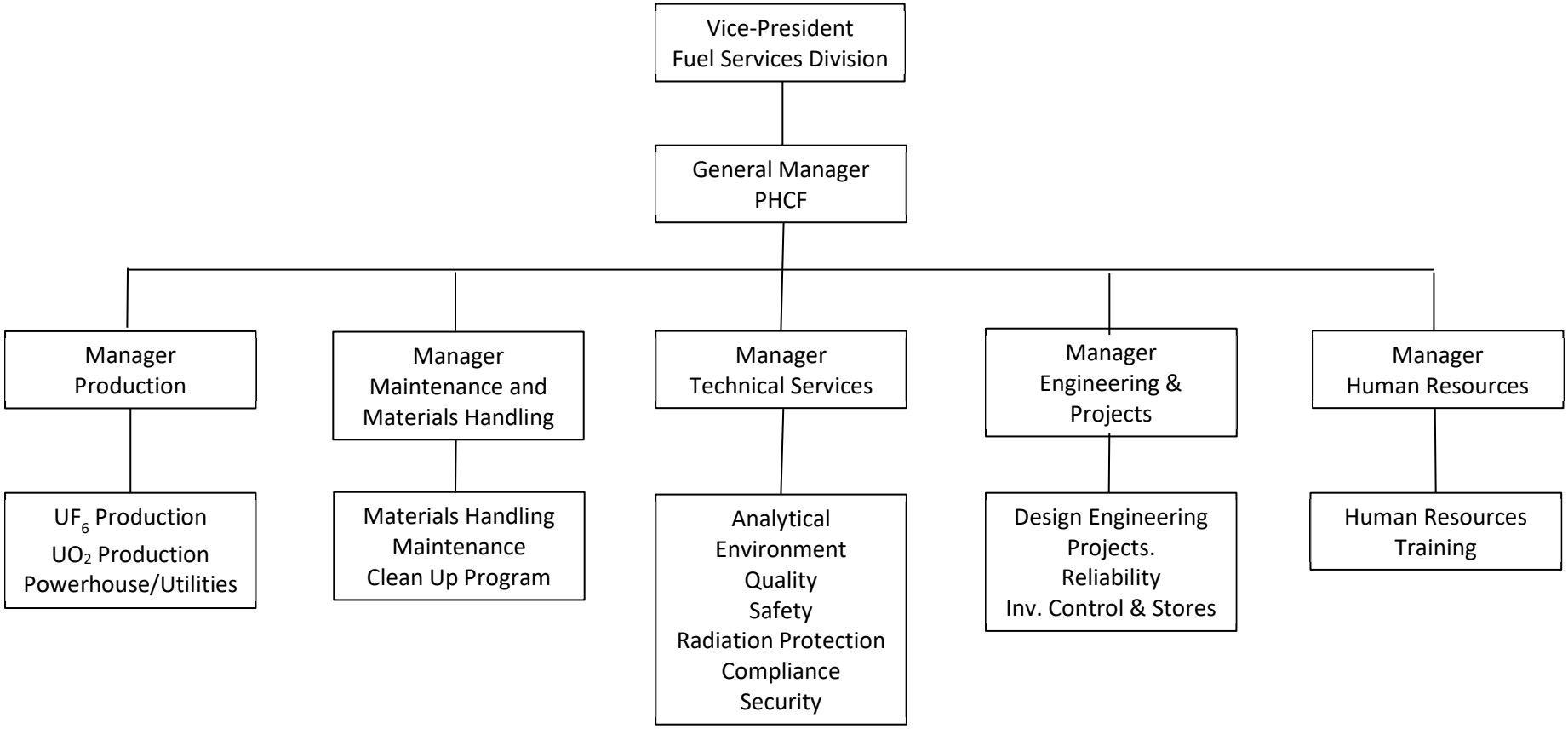


Figure 7: PHCF Organizational Structure



2.1.3 Management System Program

The Management System Program Manual (MSPM) describes the management system program that is in effect to ensure that licensed activities are effectively controlled.
This section of the FLM provides an overview of how the MSPM meets the requirements of the CNSC SCA-Management System. The MSPS is a part of the licensing basis for PHCF and is a controlled document that is periodically reviewed and revised to ensure its continued effectiveness.

Many of the licensed activities are controlled by simply documenting procedures or providing qualified personnel. Additional controls are established commensurate with the safety significance of the activity or system. The equipment and systems with the highest safety significance, with respect to protection of people and the environment, are:

a) liquid uranium hexafluoride;
b) liquid anhydrous hydrogen fluoride;
c) hydrogen;
d) fluorine;
e) emission control equipment;
f) emergency power;
g) civil structures – floors, trenches, sumps, pits, roof and walls.

The management system is based on the following principles, which are described in more detail in MSPM, and applied in a graded manner commensurate with risk.

- Safety is the paramount consideration guiding decisions and actions;
- The business is defined, planned and controlled;
- The organization is defined and understood;
- Risks are identified and managed;
- Resources, generally captured as financial, human and infrastructure, are identified and managed;
- Communication is necessary and must be effective to achieve our business objectives;
- Information is identified and managed;
- Work is identified and managed;
- Problems are identified, assessed for significance and resolved as appropriate to the significance;
- Changes are identified and controlled;
- Assessments are performed;
- Experience is sought;
- The management system is continually improved; and
- Corporate oversight is defined and performed to ensure the management system meets the business needs of the organization.

2.1.4 Safety Culture

Cameco's corporate focus on its management system through governance, quality and safety culture drives accountability and oversight at all operations.

Divisional oversight and collaboration is enhancing the fuel services division safety culture through consistency, management system enhancements and/or divisional program development, to improve safety and environmental performance.

The following are examples of some of the tools that are in place at the PHCF to support a strong safety culture:

- In order to enhance and continue support of a questioning attitude in employees and to ensure that an appropriate level of investigation and/or corrective action, the Corrective Action Process and the associated Cameco Incident Reporting System (CIRS) are used to drive continual improvement. CIRS is available to all employees for initiating records for events, concerns and conditions.

- PHCF's leadership team has an ongoing expectation to ensure their presence in different areas of the facility and to continually improve communications between operators and the leadership team.

- Cameco is a member of several nuclear industry organizations such as the CANDU Owners Group (COG). In addition to ongoing sharing of best practices across sites within Cameco, the nuclear industry organizations share experiences and learn from other organizations.

Cameco conducts safety culture surveys (also called safety culture assessments) on a five-year cycle at all sites within the FSD. These surveys gauge the perception of employees in relation to safety culture in a scientifically meaningful way. From these surveys/assessments action plans are developed in areas where opportunities for improvement are identified. Action plans will be entered into CIRS for tracking and follow-up.

The PHCF and FSD leadership teams are committed to enhancing a sustainable safety culture and will continue to work diligently to ensure that all employees remain engaged to the extent possible.

3.1 SCA - Human Performance Management

Legislative Requirement: The *General Nuclear Safety Control Regulations* require the licensee to: ensure the presence of sufficient number of qualified staff; train the workers; and ensure the workers follow procedures and safe work practices. The *Class I Nuclear Facilities*

Regulations require that a licence application contain information on the proposed human performance program, including measures to ensure workers' fitness for duty.

The *Class I Nuclear Facilities Regulations* require that licence applications include the proposed responsibilities of and qualification requirements and training programs for workers, including the procedures for the requalification of workers; and the results that have been achieved in implementing the program for recruiting, training and qualifying workers in respect of the operation and maintenance of the nuclear facility. The *Class I Nuclear Facilities Regulations* requires every licensee to keep a record of the status of each worker's qualifications, requalification and training, including the results of all tests and examinations completed in accordance with the licence.

Table 5: PHCF Documents Relevant to Human Performance Management

Document Title	Site/Division/Corporate
Port Hope Training Plan (TP-01)	Site
UF_6 Plant Operations Training Procedure (CQP-942)	Site
UF_6 Plant Supervisor Training Procedure (CQP-943)	Site
Emergency Response Team Minimum Staffing (SOG No. 019)	Site
Standard for Minimum Crew Compliment in UF_6 Operations (SO70.3)	Site
Minimum Staffing Requirements UO_2 Production Plant (SO 40)	Site

PHCF maintains programs to ensure that personnel are qualified to perform tasks associated with licensed activities to ensure protection of workers, the public and the environment.

3.1.1 Human Performance Management

The PHCF maintains processes to support human performance in its operations. Aspects of human factors have been considered in the development and continual improvement of site management system programs, work instructions, engineering and operations activities, change control and the corrective action process.

Corporately, Cameco has defined competencies for Cameco employees and which describe expectations for performance and behaviour for all levels of the organization including individual contributors, those leading others and those leading the organization. Supervisors are provided support to effectively coach their employees during performance feedback to develop the critical behaviours of accountability and respect in all employees.

Work instructions and operating documents are developed in consideration of the physical interaction of people and the production plant equipment or systems. Various risk assessment tools are used as part of continual improvement, project design and implementation and change control to identify and control error-likely situations.

Corporate requirements for self-check, personal accountability, fitness for duty, and safety and radiation protection apply to all Cameco facilities to support human performance. These are embedded into the site's operating philosophy through multiple tools and practices intended at engaging employees, promoting awareness of operational status, correcting issues and improving communication within and between crews.

PHCF maintains the minimum complement of sufficient personnel to safely operate the facility and respond to emergency situations. Further detail regarding the minimum complement scenarios for production and security personnel is security-sensitive and considered commercially confidential.

3.1.2 Training

The PHCF maintains a training program that meets the requirements of REGDOC-2.2.2 *Personnel Training* and the corporate training program.

The Systematic Approach to Training (SAT) consists of five sequential phases – Analysis, Design, Development, Implementation and Evaluation. Each phase has an outcome that feeds the subsequent phase. Each phase is necessary to ensure that the training program is systematically based. By utilizing the SAT, the PHCF training program follows a logical progression from the identification of qualifications required to perform a job to the development and implementation of training to achieve these qualifications and competencies, and the subsequent evaluation of this training.

The Cameco training plan:

- Ensures employees are competent on the basis of appropriate education, skills, experience and behaviour(s);
- Provides a means of measuring, monitoring and improving the capability of employees to meet organizational objectives;
- Ensures all training is as efficient and effective as possible;
- Provides a continuous improvement mechanism for the training program.

Department-specific training plans exist for UF_6 (CQP-942 and CQP-943) operations.

Employees are required to meet specified qualification requirements prior to performing assigned task(s) in an unsupervised environment. A qualification consists of related knowledge, skills and attitudes (or behaviours) required to perform a task or set of related tasks.

Training delivery is a formal activity to offer training identified in the needs analysis utilizing various media, (e.g., instructor based, computer based, mentoring). It may take place on-site or off-site.

The evaluation stage measures the effectiveness of the training program through internal/external evaluations. The evaluations validate and identify areas where improvement may be required. The employee is evaluated on how well they have learned the delivered materials and/or how well they can perform specific tasks. Training evaluation includes course and instructor evaluations, and validation assessment with knowledge assessments and/or performance evaluations.

Qualifications have been established for full time trainers. Trainers are trained in the necessary knowledge, skills and attitudes to fulfil these qualifications. These trainers include all training department staff and other subject matter experts who provide training at the site.

3.1.2.1 Contractor Training

The Cameco procurement and project management processes ensure that contractors are qualified to carry out the work they are contracted to do and would typically not require contractors to complete a SAT-compliant qualification process. However, all contractors and some other non-site personnel who will be performing work in designated areas of the facility are required to complete a half-day Contractor Safety Orientation and/or nuclear energy worker (NEW) training under the Contractor Safety Management Plan (OHSPLAN001).

This safety orientation is delivered by the training department and is a structured review of the site hazards, risks and safety procedures that must be followed while on site. Additional work-area specific awareness may be provided through the job hazard analysis and pre-work briefings facilitated by the contractor sponsor. Contractor safety orientation and NEW qualification are valid for a period of one year.

3.1.2.2 Supervisor and Management Training

In addition to the CNSC's regulatory requirements, the requirements of the *Canada Labour Code* apply to the PHCF. Under Part II of the *Canada Labour Cod*e, management and supervisors must take every reasonable precaution for the protection of workers, including ensuring workers use prescribed protective equipment and are advised of potential and actual hazards. It is a requirement that supervisors and management are trained to fully execute these responsibilities and this training is part of the required health and safety related training for supervisors.

In addition, to ensure nuclear security, supervisors and management are trained to anticipate and respond to changes in employee behaviour in accordance with both the violence

prevention requirements under Part II of the *Canada Labour Code,* and the *Nuclear Security Regulations.*

4.1 SCA- Operating Performance

Legislative Requirement: The *Class I Nuclear Facilities Regulations* requires that a licence application contain the following information: the proposed measures, policies, methods and procedures for operating and maintaining the nuclear facility. The *Nuclear Substances and Radiation Devices Regulations* has requirements for records to be kept and retained for nuclear substances.

Table 6: PHCF Documents Relevant to Operating Performance

Document Title	Site/Division/Corporate
Environmental Protection Program (EPP)	Site
Radiation Protection Program (PHF-MAN-RAD)	Site
Radioisotope Source Control (CAP:RAD:13)	Site

This safety and control area defines how the facility ensures that it operates in a safe manner.

4.1.1 Regulated Activities

The Port Hope conversion facility is primarily federally regulated by the CNSC as a Class1B nuclear facility. In addition to the CNSC, Cameco is also regulated by other government agencies through statute, regulation, permit, approval and/or licence. Table 7 provides a list of these agencies along with an overview of the key activities they regulate.

Table 7: Agencies with Jurisdiction over Cameco's Operations

Agency	Activities Under Jurisdiction
Environment Canada	National Pollutant Release Inventory, halocarbon regulations, PCBs, spills reporting, deleterious substances enforcement under the *Fisheries Act*
Department of Fisheries and Oceans	*Fisheries Act* and regulations related to protection of fish and fish habitat
Ontario Ministry of the Environment Conservation and Parks (MECP)	Air discharges and approvals, discharges to surface water and approvals, CCME initiatives, spills reporting, noise
Municipality of Port Hope	Sanitary sewer and noise bylaws
Department of Employment and Social Development Canada (ESDC)	Conventional health and safety issues through the Canada Labour Code
Ontario Ministry of Labour (MOL)	Contractors at the facility may fall under provincial health and safety regulation
Canadian Nuclear Safety Commission	Dosimetry Licence
Ontario Technical Standards and Safety Authority (TSSA)	Regulate boiler and pressure vessels at the facility
Transport Canada	Transportation of Dangerous Goods (TDG), Emergency Response Assistance Plan (ERAP) and navigable waters regulation related to cooling water intakes and outfalls

4.1.2 Corporate Oversight

The PHCF licensed activities are managed and controlled by the site. The site is owned and operated by Cameco Corporation. Direction and overall accountability resides with the site. The corporate office provides policies and guidance to the operating sites which are translated into site-specific management programs. The implementation of these programs is regularly monitored, audited and reported on to assure the site management that these programs are implemented, adequate and effective. Corporate performs audits of the site management programs on a regular basis to verify that site performance meets both corporate requirements and complies with all applicable regulatory requirements.

4.1.3 Operating Limits

Operating limits are defined in the licensing basis upon which the Commission rendered their decision to renew and/or amend the facility's FFOL.

Annual Production Limits for PHCF are:

- 2800 tonnes of uranium as uranium dioxide from the UO_2 plant; and
- 12,500 tonnes of uranium as uranium hexafluoride from the UF_6 plant.

There is also a daily production limit of 45 tonnes of uranium as uranium hexafluoride from the UF_6 plant.

Radiation protection limits and environmental release limits are established to ensure the protection of workers, the public and the environment. These are also defined in the licensing basis and documented in the respective programs (see sections 8.1 and 10.1).

4.1.4 Nuclear Substances and Radiation Devices

PHCF maintains an inventory of sealed sources and tracks and reports their transfer as required by REGDOC 2.12.3: *Security of Nuclear Substances: Sealed Sources and Category 1, II, and III Nuclear Material, Version 2.*

4.1.5 Reporting Requirements

PHCF reports information to the Commission as required under the *NSCA*, its regulations and the operating licence.

Routine reporting includes:

- an annual compliance and performance report covering the period January 1 to December 31 by March 31 of the following year
  - for the duration of the Vision in Motion (VIM) project, this will include an additional section on VIM
- an annual groundwater and surface water monitoring review
- quarterly compliance reports within eight weeks of the end of each quarter

Non-routine reporting includes events as defined in sections 29-32 of the *General Nuclear Safety and Control Regulations*, section 27 of the *NSCA*, and the Licence Conditions Handbook.

5.1 SCA – Safety Analysis

Legislative Requirement: The *General Nuclear Safety and Control Regulations* require that a licence application contain information that includes a description and the results of any test, analysis or calculation performed to substantiate the information included in the application. The *Class I Nuclear Facilities Regulations* require that a licence application contain information that includes a final safety analysis report demonstrating the adequacy of the design of the nuclear facility, and the proposed measures, policies, methods and procedures for operating and maintaining the nuclear facility.

Table 8: PHCF Documents Relevant to Safety Analysis

Document Title	Site/Division/Corporate
Safety Report for the Port Hope Conversion Facility	Site
Fire Hazard Analysis	Site
Environmental Risk Assessment	Site
Derived Release Limit	Site
Nuclear Criticality Safety Program Manual	Site
Spill Prevention and Contingency Plan	Site
Environmental Aspects Registry	Site

The protection of the environment and health and safety of persons is a fundamental principle of the *NSCA*, the associated regulations and the regulatory approval process.

The design, construction and operation of the PHCF is intended to eliminate or minimize the potential of radiological, chemical or other physical hazard to facility personnel, the environment and the general public. This is accomplished not by a single approach but rather by a defense-in-depth approach. The hazards, preventative measures and mitigating controls associated with the licensed activities at the PHCF have been systematically reviewed and documented from several perspectives, including but not limited to the following assessments.

5.1.1 Safety Report

The PHCF utilizes a Process Hazard Analysis (PHA) methodology to systematically identify and analyze hazards associated with the licensed activities. The PHA focuses on equipment, instrumentation, human actions and other factors that impact on the process. When complete, PHAs are documented in CIRS so that corrective actions can be assigned and tracked as appropriate. The area and project PHAs contain the most current information regarding the operations.

The PHCF Safety Report summarizes by area, the hazards, potential accident scenarios and controls documented in the PHAs. The safety report includes an analysis of the probable worst-case release event. The Safety Report is reviewed and updated at least every five years.

5.1.2 Fire Hazard Analysis

Cameco maintains a site Fire Hazards Analysis (FHA) that meets the requirements of CSA N393-13 *Fire Protection for Facilities that Process, Handle or Store Nuclear Substances*

and supporting reference materials. The FHA evaluates the impact of fire on the facility and demonstrates that the fire protection objectives can be met under foreseeable fire events. To satisfy this objective, safety significant systems and equipment as well as fire hazards have been identified. An analysis has been made of the potential for a worst-case fire event to impact safety related systems and equipment.

There is an FHA for every building at the PHCF which is updated as per the N393-13 to reflect facility conditions. This assessment is also relevant to the Emergency Management and Fire Protection SCA.

5.1.3 Environmental Risk Assessment

Cameco maintains an environmental risk assessment (ERA) in accordance with the requirements of CSA N286.6-17*: Environment Risk Assessments at Class 1 Nuclear Facilities and Uranium Mines and Mills*. The most recent assessment found there were no undue risks to human health as a result of PHCF operations and that there were localized potential impacts associated with the cooling water system and along the harbour wall, with follow-up work recommended as appropriate during and after the VIM project. The ERA is updated on a minimum five-year frequency. This assessment is also relevant to the Environmental Protection SCA.

5.1.4 Derived Release Limit and Operating Release Levels

CNSC regulations require that no member of the public receive more than 1 mSv/year. In order to demonstrate that this requirement has been met, the site maintains a derived release limit (DRL) report in accordance with CSA N288.1-14: *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities*. The DRL and associated Operating Release Levels (ORL) are reviewed every five years to ensure that considering the most relevant scientific literature, the facility operations are maintained well below the public dose limit. These reports are also relevant to the Environmental Protection SCA.

5.1.5 Nuclear Criticality Safety

The Nuclear Criticality Safety Program Manual (NCSPM) has been developed to guide the generation and implementation of PHCF's criticality prevention practices as they pertain to licensing and criticality prevention issues. This document is structured to meet the requirements of REGDOC-2.4.3 *Nuclear Criticality Safety*. It should be noted that licence condition 16.2 states that the inventory of enriched material shall not exceed the limits for a small quantity of fissionable material. This assessment is also relevant to the Radiation Protection SCA.

5.1.6 Chemical Hazard Assessment

The PHCF has developed a site-specific Spill Prevention and Contingency Plan (SPCP) in accordance with the requirements of Ontario Regulation (O. Reg.) 224/07. The primary objective of the SPCP is to help prevent or reduce the risk of spills of hazardous chemicals, pollutants or dangerous goods to the environment and to prevent, eliminate or improve any adverse effects that may result from such spills. The SPCP provides detailed information and guidance on actions related to the prevention of spills and procedures to detect and respond to them in a timely and effective manner if they occur.

5.1.7 Environmental Aspects Registry

In accordance with the requirements of ISO14001 – Environmental Management Systems, the PHCF has documented and analysed its activities, products and services to determine the interactions of the facility with the environment. These interactions may result in environmental impacts of varying significance. Interactions are categorized into actual and potential environmental impacts. Actual environmental aspects (i.e. interactions) are those that result from the plant operation, such as emissions to the air, water and land. Potential environmental aspects are those that may result from the plant operation and for which controls are in place to prevent an event from happening or mitigating the impact if the event occurs. This information is documented in the site Environmental Aspects Registry which is reviewed, and updated as required, on an annual basis. In addition, where opportunities to improve the aspects exist, this information is considered in the annual environmental objectives and targets.

6.1 SCA – Physical Design

Legislative Requirement: The *Class I Nuclear Facilities Regulations* require that a licence application contain the proposed measures, policies, methods and procedures to maintain the nuclear facility. The *Class I Nuclear Facilities Regulations* require that a licence application contain a description of the structures, systems and equipment, including the relevant design information for the facility

Table 9: PHCF Documents Relevant to Physical Design

Document Title	Site/Division/Corporate
Process and Design Change Control (CQP-113)	Site
Drawing no 99101 Sh 71 General Plant Layout – Site 1 – Main Site Operations and Storage	Site
Drawing no. 99101 Sh 73 General Site Layout – Site 2	Site
In Service Inspection of Safety Significant Systems/Structures/Components (CQP-501)	Site
CQP-706 Pressure and Safety significant Piping and Vessel Control (CQP-706)	Site
CQP-707 Registration and Inspection Requirements of Pressure Piping and Pressure Vessels (CQP-707)	Site
Authorized Inspection Agency Services Agreement	Site
Quality Control Manual for TSSA Certificate of Authorization	Site

These processes assess the ability of structures, systems and components to meet and maintain their design basis given new information arising over time and manage changes to ensure that safety is maintained.

6.1.1 Current Facilities

Site details are provided in section 1.2. The licensed area is secured by a metal fence that encloses the entire perimeter except for the front of the main building and shipping/ receiving.

6.1.2 Current Plant Equipment

PHCF contains numerous types of conventional industrial equipment including storage tanks, conveyors and associated piping, as well as specialized equipment for the uranium conversion processes. Due to the nature of the raw materials such as aqueous hydrogen fluoride and ammonia, materials of construction in the facility are specific to the service in which they are located. Pipe specifications are maintained by the engineering department to document the materials of construction and other associated requirements for each type of chemical service.

6.1.3 Facility and Process Changes

All changes to the physical design of equipment, processes and the facility are evaluated from project planning through to the completion of the project. These changes may be physical changes completed through capital projects or maintenance work, or may be administrative through training, procedures or other controls. The design control review process involves subject matter experts and identifies potential implications with respect to operability, health and safety and the environment, including any regulatory and/or code implications.

6.1.4 Design Governance for Safety Significant Systems

All changes to the facility's design and equipment are reviewed and documented throughout the design control process described in CQP-113. However, there are certain systems that are designated to have the highest safety significance with respect to protection of people and the environment. These systems and associated equipment are described in section 2.1.3.

6.1.5 Third Party Review for Fire Protection

Modifications for which the initial assessment indicates a potential impact on fire protection design basis, goals, or criteria are subject to a qualified third-party review. All third-party reviews are conducted by qualified persons from organizations whose management and financial operations are independent of the design organization. All third-party fire reviews are submitted to CNSC staff as required by the licence and LCH.

6.1.6 Pressure Boundary Program

As required by the its operating licence, the PHCF maintains an agreement with an Authorized Inspection Agency (AIA) for the registration, inspection and other activities related to pressure systems.

The Technical Standards and Safety Authority (TSSA) is the AIA for the PHCF. The TSSA approves the quality control program which governs the shop fabrication, field installation, assembly, repairs and erection of piping systems in accordance with CSA-B51: *Boiler, pressure vessel, and pressure piping code,* CSA-B52: *Mechanical Refrigeration Code,* American Society of Mechanical Engineers (ASME) B31.1: *Power Piping*, ASME B31.5: *Refrigeration Piping Codes* and repairs and alterations of boilers and pressure vessels, piping and fittings in accordance with CSA B51, the National Board Inspection Code and Original Codes of Construction.

The Pressure Boundary Program establishes the infrastructure and defines the activities necessary to maintain a sustainable process that allows PHCF to perform activities associated with repairs, replacements, modifications and alterations to pressure retaining items,

components, and systems including installation of new systems. Within this program Cameco maintains Certificates of Authorization with the TSSA to confirm that the quality program for pressure systems is in accordance with the *Ontario Technical Standards and Safety Act, 2000* and O. Reg. 220/01 *Boilers and Pressure Vessels*.

7.1 SCA – Fitness for Service

Legislative Requirements: The *Class I Nuclear Facilities Regulations* require that a licence application contain information including the proposed measures, policies, methods and procedures for operating and maintaining the nuclear facility.

Table 10: PHCF Documents Relevant to Fitness for Service

Document Title	Site/Division/Corporate
Preventative Maintenance (CQP-701)	Site

Critical requirements for maintaining a safe facility are effective maintenance and quality assurance programs. This is to ensure any changes to plant equipment are adequately controlled and authorized, and do not adversely affect the safety of the facility. This SCA covers activities that impact the physical condition of structures, systems and components to ensure that they remain effective over time. This area includes programs that ensure all equipment is available to perform its intended design function when called upon to do so.

7.1.1 Preventative Maintenance

The PHCF has an established preventative maintenance program. All preventative maintenance work is initiated and documented through the work notification system in SAP. The site maintenance program ensures that equipment functions as designed over its lifetime so that safety systems remain available, meet the design intent in the safety report and that equipment failures are minimized. This is accomplished by completion of corrective and preventative maintenance activities along with routine inspections on system components to ensure that they remain in good operating condition.

Maintenance activities are performed by qualified personnel. A series of Cameco Quality Procedures (CQPs) provide guidance on maintenance work orders, preventative maintenance, equipment registration and records, pressure and safety related piping and vessel control, registration and inspection. Maintenance work instructions exist for repairs and/or preventative maintenance activities on selected equipment. All preventative maintenance activities are tracked in a computer database, with preventive maintenance tasks deemed critical for safety and/or regulatory reasons flagged to facilitate tracking and review. The list of critical preventive maintenance tasks is reviewed and updated regularly by the maintenance department.

7.1.2 Operational Reliability Program

PHCF has an Operational Reliability program which is focused on ensuring maximum reliability of production facilities by developing key business processes, education, and tools that would affect almost every employee on site to one extent or another. Operational reliability focuses in four pillar areas:

- *Work Management*, which looks to ensure maintenance-related work activities are properly identified, prioritized, planned, scheduled and executed, so that labour resources are effectively utilized and work results reach the desired outcome.
- *Materials Management*, which looks to ensure the right parts and materials required to support maintenance work activities are of the right quality and condition and available when required.
- *Reliability Engineering*, which looks to ensure integrity of master data and applies a systematic approach to failure prevention and management.
- *Operations Improvement*, which looks to ensure plant issues are clearly and consistently documented and categorized, and that operator personnel play an active role in equipment reliability through basic care, housekeeping, and monitoring activities.

7.1.3 In-service Inspection Program

Cameco has an in-service inspection program which applies to the piping and vessels in the safety significant systems (section 2.1.3). Quality Control Procedures (QCPs) are in place for the methods used to conduct this work. The methods have been selected on the basis of the historical record of operating and inspecting the UF_6 plant. They are considered the most appropriate for detecting potential problems and for revealing the type of deterioration most likely to occur as a result of the service conditions to which the equipment is subjected.

Technicians performing radiographic, ultrasonic, magnetic particle and liquid penetrant inspections are certified in accordance with the Canadian General Standards Board.

7.1.4 Periodic Inspection and Testing for Fire Protection Systems

Fire protection systems are tested according to an established schedule developed using the National Building Code, current version, and the National Fire Code, current version. Reviews of aspects of the fire protection systems are completed as required by CSA N393-13: *Fire protection for facilities that process, handle, or store nuclear substances.*

8.1 SCA – Radiation Protection

Legislative Requirements: The *Radiation Protection Regulations* require that the licensee implement a radiation protection program and also ascertain and record doses for each

person who performs any duties in connection with any activity that is authorized by the *NSCA* or is present at a place where that activity is carried on. This program shall ensure that doses to workers do not exceed prescribed dose limits and are kept as low as reasonably achievable (ALARA), social and economic factors being taken into account.

Table 11: PHCF Documents Relevant to Radiation Protection

Document Title	Site/Division/Corporate
Radiation Protection Program Manual (PHF-MAN-RAD)	Site
Nuclear Criticality Safety Program Manual	Site
Radioisotope Source Control (CAP:RAD:13)	Site
FSD's Internal Dosimetry Program Technical Basis Document (FSD-PRG-RAD-01)	Divisional
Dosimetry Service Licence	Divisional

Radiation protection measures are in place to minimize and control the potential for radiation exposure to both employees and members of the general public arising from the operation of the PHCF. This exposure is due to the alpha, beta and gamma radiation emitted from the natural uranium compounds received, processed and produced at the facility. Exposure can be from beta or gamma radiation outside the body, or alpha, beta or gamma radiation from inside the body as a result of inhalation, ingestion or absorption through the skin of uranium bearing materials.

Uranium levels in the air, water and soil in the vicinity of the facility are monitored to ensure that they are minimized and maintained below levels that affect the environment or the public. The following is a summary of the radiation protection program at the PHCF that meets the requirements of the *Radiation Protection Regulations*. The full details are of how the program ensures that contamination levels and radiation doses received by individuals are monitored, controlled and maintained ALARA are documented in the Radiation Protection Program Manual (PHF-MAN-RAD).

8.1.1 Potential Radiological Hazards

Radiation hazards at PHCF are primarily associated with natural, depleted and enriched uranium and the associated daughter products and impurities. The hazards associated with natural uranium are of greater concern due to the quantities processed. While both external and internal radiation hazards are found at the facility, the potential risk associated with internal hazards are of more significance. Working in the presence of uranium, exposure can result from inhalation, ingestion or contamination of an open wound. The primary hazards are chemical damage to the kidney, radiation dose to the bone, and radiation dose to

the lung. PHF-MAN-RAD further details the dose implications of uranium compounds found at PHCF.

8.1.2 Nuclear Energy Workers

Employees or contractors that have a reasonable probability of receiving a radiation dose greater than 1 mSv are designated as Nuclear Energy Workers (NEWs). As required by the *Radiation Protection Regulations*, all NEWs are notified in writing of this designation, the risks associated with radiation that they may be exposed to in the course of their work and of the applicable effective and equivalent dose limits. Female NEWs are also notified in writing of their rights related to pregnancy and breast feeding, including the benefits of notifying Cameco, as soon as they are aware of their pregnancy or planning to breast feed.

All NEWs receive training in radiation safety when first hired or returning to work after an extended absence. Regular refresher training is completed on a set frequency.

8.1.3 ALARA

Cameco recognizes that the responsibility of the health and safety of its employees is of the foremost importance. To meet this responsibility, Cameco acknowledges and accepts the as low as reasonably achievable (ALARA) principle that doses of ionizing radiation should be kept as low as reasonably achievable, social and economic factors taken into account. An ALARA program that meets regulatory requirements is described in PHF-MAN-RAD.

8.1.4 Personal Dosimetry

The annual dose assignment of NEWs working at the PHCF consists of both external and internal dosimetry inputs. The annual dose assignment is the sum of their whole body dose as measured by dosimeter badges plus dose from uranium in urine plus dose from lung burden and is reported to the NEW on an annual basis. Each of the three components of the personal dosimetry program is described below.

External Dosimetry

Individually assigned dosimeters are used to determine external dose as both deep-dose equivalent and shallow-dose equivalent exposure from external sources of radiation. The external dosimetry service for Cameco is provided through a CNSC approved external dosimetry service provider. Action levels for external dosimetry are shown in Table 12. These action levels are also referenced in the PHF-MAN-RAD and in the appropriate radiation protection procedures. Extremity dose measurements may also be performed using ring-type personal dosimeters that are processed in the same manner as the regular assigned dosimeters. Due to the nature of the work at PHCF there is low probability of high extremity dose and routine use of ring dosimeters is not required.

Table 12: Action Levels for External Dosimetry

External Dosimetry Parameter	Frequency	Regulatory Action Level (mSv)
Whole Body Exposure	Monthly - NEW	2.0
	Monthly - Pregnant Worker	1.0
	Monthly - Pregnant Worker (cumulative dose during pregnancy)	2.0
	Quarterly	2.0
Skin Exposure	Monthly	15.0
	Quarterly	15.0

Internal Dosimetry

Cameco's Fuel Services Division holds a licence from the CNSC that authorizes Cameco to provide internal dosimetry services to the PHCF, BRR and CFM. Additional information regarding this program may be found in FSD's Internal Dosimetry Program Technical Basis Document (TBD).

Internal dose is assessed and assigned through two programs – urine analysis and lung counting. As described in the TBD, when assigning dose through the urine analysis program, it is assumed that the exposure was to a fast (soluble) uranium material. When a dose is assigned due to a lung burden, it is assumed that a combination of medium (slightly soluble) and slow (insoluble) uranium material is present. When the source of the exposure to a NEW is known (e.g. due to a process upset), the dose calculations are specific to that material.

Urine Analysis

All employees and contractor NEWs are required to submit routine urine samples for the analysis of uranium and (depending on their work area), fluorides. Routine urine samples that meet the criteria specified in the TBD are used to calculate and assign dose to the employee. The analysis at PHCF is certified by the Radiation Protection Bureau annually. A computer-based system is used to generate labels for urine samples and to track the submission of urine samples for the purposes of assessing compliance with the program. Any urine result exceeding 13 µg U/L is screened by the radiation safety specialist (RSS) or designate to validate the sample and initiate investigation into an abnormal intake as defined in PHF-MAN-RAD. Urine analysis action levels are shown below.

Table 13: Action Levels for Urinalysis

Frequency	Action Level
Bi-Weekly pre shift (Cameco Employees and Long-Term Contractors)	65 µg U/L
Monthly (Administrative Support)	25 µg U/L
Daily pre shift (Short-Term Contractors)	80 µg U/L
Any post shift (chemical toxicity - uranium)	500 µg U/L
Fluoride toxicity	7 mg F/L

Lung Counting

The dose assessment of uranium in lungs is performed using a germanium detector-based lung counting system. A group-counting technique is used for dose assignment where all employees in a similar work group are assigned an average internal dose. This method involves creating appropriate groupings of individuals based on similar exposure potential and measuring and assessing each individual's spectrum, taking detection criteria and physical conditions (e.g. individual chest wall thickness) into account. The frequency of lung counting of NEWs is based on the work group to which the employee belongs and is described in PHF-MAN-RAD. Individuals who are not lung counted such as administrative support staff and contractors have internal dose based on lung exposure determined through prorating the average dose from the production group(s).

Individuals with lung count results above detection criteria are assigned their own dose and this dose is not included in the group average. The dose from lung counting is assigned to NEWs annually as part of their annual dose report. Individuals with lung burden above the detection criteria are informed of their dose as soon as possible after completing their lung count. The action level for dose due to lung burden has been set at 5 mSv/year.

8.1.5 Zone Control – Contamination Control

The PHCF maintains zone control and monitoring programs as described in PHF-MAN-RAD to identify areas of potential contamination and prevent the spread of contamination from these areas. The site has been delineated into three control zones, and the zones are simply referred to as Zone 1, Zone 2 and Zone 3. The possibility of contamination increases with increasing zone numbers.

8.1.6 Radioisotope Control

The facility uses a number of radioisotopes that are regulated under the CNSC *Nuclear Substances and Radiation Devices Regulation*. Cameco maintains a record of the specific radioisotope sources on site that are present above an exemption quantity, the radioisotope used and the maximum activity of the device as described in PHF-MAN-RAD and the

associated procedures. These sources range in type from nuclear gauges and static eliminators to laboratory calibration sources and tracer solutions.

The controls associated with sealed sources, unsealed sources and radiation devices (including x-ray equipment) are described in PHF-MAN-RAD and associated procedures and include training, certification where required, leak testing, radiation warning signs and limited access to areas where sources are stored.

8.1.7 Worker Dose Control

Radiation safety refresher training is done on on an on-going basis through regular scheduled training sessions for all employee groups. Contractors, whether they are designated as NEWs or not, receive orientation training, which includes a radiation protection component, every twelve months.

The facility has a safety clearance procedure for maintenance work. Where applicable, these procedures have requirements for contacting the radiation safety group prior to starting work. Specific areas and activities in the facility that require a radiation work plan are identified in PHF-MAN-RAD.

A number of air sampling stations are located throughout the facility in process areas where there is a higher likelihood of airborne uranium dust being present and depending on location are operated on a continuous basis or as-needed basis. The air sampling stations serve to assist in identifying process upsets, equipment breakdowns or other instances of loss of containment. There are also continuous air monitors providing real-time results in select areas of the plants. Additional details on the facility air-sampling program may be found in PHF-MAN-RAD. Respiratory protection is required in any area where the airborne concentration of uranium exceeds a set internal level.

8.1.8 Nuclear Criticality Control

The Nuclear Criticality Safety Program Manual (NCSPM) has been developed to guide the generation and implementation of PHCF's criticality prevention practices as they pertain to licensing and criticality prevention issues. This document is structured to meet the requirements of REGDOC-2.4.3 Nuclear Criticality Safety.

Where practicable, the design of processing facilities and equipment handling enriched material includes geometric limitations to prevent a criticality accident. A key limitation to prevent a criticality accident is the present limit on the mass of enriched nuclear materials permitted on site at any one time. The NCSPM applies to all PHCF facilities, equipment and operations that are licensed by the CNSC with respect to the handling of fissile materials.

The NCSPM applies to operations including research, storage and special projects involving small quantities of fissionable material (less than 80% of the Smallest Critical Mass (SCM))

and operations including research, storage and special projects involving large quantities of fissionable material (greater than 80% of the SCM). The operating licence limits the PHCF to possession of a small quantity of fissionable material.

9.1 SCA – Conventional Health and Safety

Legislative Requirement: the *Class I Nuclear Facilities Regulations* require that a licence application contain information including the proposed worker health and safety policies and procedures. As a federally regulated site, PHCF is also subject to the requirements of Part II of the *Canada Labour Code* and the *Canada Occupational Health and Safety Regulations*.

Table 14: PHCF Documents Relevant to Conventional Health and Safety

Document Title	Site/Division/Corporate
Occupational Health and Safety Management Program Manual (PHF-MAN-OHS)	Site

Cameco's SHEQ policy provides the direction for site programs and procedures. The Occupational Health and Safety Management Program manual describes the health and safety program manages workplace safety hazards to ensure protection of personnel and equipment at the site. The manual meets the requirements set out in the corporate Health and Safety Program Manual and Part II of the *Canada Labour Code*.

9.1.1 Conventional Safety Program

A key element of a safe, clean and reliable operation is a comprehensive and well-established worker protection program, which is in place at PHCF. In addition, Cameco's SHEQ policy and corporate Health and Safety Program provide direction for site programs and procedures. The Occupational Health and Safety Management Program Manual describes the health and safety program at the site.

The health and safety management program fosters and promotes a strong sustainable safety culture with a safe, healthy and rewarding workplace. Cameco has five key principles in the area of safety that form the framework of how safety is managed. These are:

- safety is our first priority;
- we are all accountable for safety;
- safety is part of everything that we do;
- safety leadership is critical to Cameco Corporation; and
- we are a learning organization.

The health and safety of workers at PHCF is ensured through site-specific safety and health management programs. Key components of the program include:

- compliance with all safety and health-related legal and regulatory requirements;
- the setting of site safety and health objectives;
- the implementation of corporate safety standards;
- the development and maintenance of a formal hazard recognition, risk assessment and change control processes; and
- the documentation of health and safety significant incidents from the start through to the verification of completion of corrective actions via the CIRS database.

9.1.2 Hazards

The PHCF is a Class IB nuclear facility and a chemical processing plant. There are radiological hazards associated with the various forms of uranium found at the facility as well as chemical hazards from process chemicals including: bulk quantities of anhydrous hydrogen fluoride, aqueous hydrofluoric acid, fluorine, hydrogen, aqua ammonia, nitric acid, phosphoric acid, and smaller quantities of laboratory chemicals, water treatment chemicals and materials used for maintenance activities.

9.1.3 Work Controls

All site personnel have a general awareness of the occupational health and safety hazards that exist at the site and the various means of minimizing these risks. All groups attend regular department safety meetings where employees are encouraged to discuss safety issues or concerns. Safety awareness, training and re-training are done through in-class sessions, safety meetings, and computer-based training depending on the topic.

Hazardous materials are labeled or identified to meet applicable regulations. The proper identification of hazardous materials decreases the likelihood of improper use, handling and disposal, which reduces potential risks and negative consequences. Purchasing procedures are in place for the procurement of chemicals. Safety Data Sheets (SDS) are requested from vendors for each type of chemical purchased. SDS information has also been developed for all of the uranic materials on site. The SDS information is available in the areas where the chemicals are used.

Work instructions, procedures, job hazard analysis (JHA), task analysis safety cards (TASC Card), hazard identification risk assessment and control (HIRAC), safety clearances and hazard specific clearances (i.e. hazardous energy, radiation, anhydrous HF) are some of the tools used to identify and control hazards in the workplace.

Personal protective equipment (PPE) is provided as necessary and is specified in the work instruction, JHA or clearance for the job. All PPE is approved to ensure that the correct PPE is available for each job. Chemical resistant gloves, chemical goggles and/or face shields, chemical suits and disposable coveralls are available for safe chemical handling. Half mask, full-face mask and supplied air respiratory protection with appropriate respirator cartridges are available for tasks where inhalation of uranium, chemicals and/or dust is possible above the respective DAC or exposure limit. In addition to air-purifying respirators, process and emergency response personnel are trained in the use of self-contained breathing air apparatus.

Personal and area monitoring is performed to assess workplace exposures. These include in-plant uranium in air levels, fluoride levels in occupational areas and urine analysis programs for fluoride and uranium. Monitoring for other parameters (e.g. asbestos, lead in paint, heat, lighting etc.) is performed on an "as needed" basis.

9.1.4 Health and Safety Committee

The requirements for a Policy Health and Safety Committee and a Workplace Health and Safety Committee of Part II of the *Canada Labour Code* are met by the Conversion Safety Steering Committee (CSSC). This committee is an employee driven safety committee with subcommittees to focus on specific safety topics. One meeting per month is specifically dedicated to the health and safety committee requirements in Part II of the *Canada Labour Code*.

10.1 SCA – Environmental Protection

Legislative Requirement: The *Class I Nuclear Facilities Regulations* require that a licence application contain the proposed environmental protection policies, procedures, effluent and environmental monitoring programs. The *General Nuclear Safety and Control Regulations* require that every licensee take all reasonable precautions to protect the environment and the health and safety of persons and to maintain the security of nuclear facilities and of nuclear substances. The *Radiation Protection Regulations* prescribe the radiation dose limits for the general public of 1 mSv per calendar year.

Table 15: PHCF Documents Relevant to Environmental Protection

Document Title	Site/Division/Corporate
FSD Environmental Management System (FSD-PGR-EMS-001)	Divisional
Environmental Protection Program (EPP)	Site
Environmental Risk Assessment for the Port Hope Conversion Facility	Site
Derived Release Limits and Operating Release Level Reports for the Port Hope Conversion Facility	Site
Review of Dose to the Public Calculation for the Port Hope Conversion Facility	Site
Review of Environmental Action Levels to Support the Environmental Protection Program	Site
Action Level for Uranium in Sanitary Sewer for Port Hope Conversion Facility	Site

The PHCF maintains an Environmental Protection Program that meets the requirements of CNSC REGDOC-2.9.1: *Environmental Protection: Environmental Principles, Assessments and Protection Measures* (Version 1.1). Cameco Corporation is registered to the ISO 14001 Standard and PHCF is included in that corporate registration. The program identifies, controls and monitors releases of radioactive and hazardous substances and the effects on the environment as a result of licensed activities.

10.1.1 Environmental Management Program

The FSD EMS describes the program elements that meet the requirements of the ISO 14001 standard and applicable CSA N288 series standards. The site environmental protection program (EPP) describes site-specific aspects associated with the environmental sampling that is carried out in support of the EMS and the ERA. This monitoring data is then compared to applicable action levels and limits to ensure operations remain in compliance with applicable regulations and licence limits.

10.1.2 Environment and Public Assessments

As described in earlier sections, the PHCF has developed multiple risk assessments which are periodically revised to reflect changes to the facility, corporate or divisional policies and/or external standards and guidance as well as verify that PHCF operations do not pose an unreasonable risk to employees, the public or the environment.

The list of environment-related assessments includes:

- Environmental Risk Assessment
- Environmental Aspects Registry
- Spill Prevention and Contingency Plan
- Emission Summary and Dispersion Modelling Report (ESDM)
- Derived Release Limit and Operating Release Levels
- Safety Report

10.1.3 Environmental Regulation

Airborne and liquid effluent discharge quality is defined and regulated by federal and provincial regulators. For Cameco, the federal regulators are the CNSC and ECCC. Provincial regulation is performed through the Ontario MECP. The acts (and associated regulations) enforced by these groups include the *NSCA, Canadian Environmental Protection Act, 1999, Fisheries Act, Ontario Water Resources Act,* and the *Environmental Protection Act.* PHCF must also comply with applicable municipal bylaws related to storm and sanitary sewers.

10.1.4 Airborne Emission Program

The primary air emissions associated with the PHCF operations are uranium, fluorides ammonia and nitrogen oxides. These contaminant emissions are measured using source monitoring and/or estimated using available monitoring data.

The main process stacks in the UF_6 plant and UO_2 plant are continuously sampled during operations. In the UF_6 main stack, fluoride and uranium emissions are monitored and in the UO_2 main stack, ammonia and uranium emissions are monitored. All other stacks and discharge points are sampled on an occasional or as requested basis. The details of this program are provided in the EPP.

The current air emissions action levels and limits for the main production stacks are presented below.

Table 16: Summary of Air Discharge Limits and Environmental Action Levels

Source	Parameter	Limit	Action Level	Averaging Period
UF_6 Plant Main Stack	Uranium	280 g/hr	40 g/hr	Daily
	HF	650 g/hr	230 g/hr	Daily
UO_2 Plant Main Stack	Uranium	240 g/hr	10 g/hr	Daily
	NH_3	58 kg/hr	10 kg/hr	Daily
UO_2 Plant Depleted Operations Stack	NOx	78 kg/hr	60 kg/hr*	Daily
*To be re-evaluated after the next dissolution campaign in order to statistically set an appropriate action level as per N288.8.				

Validation of Cameco's emissions and samplers on the UO_2 main stack and UF_6 main stack is completed by compliance testing conducted by an independent third party every five years. These sources are tested using approved stack sampling protocols. A pre-test plan is prepared, submitted and approved by the MECP prior to each independent stack testing campaign.

Air emissions are also regulated by the MECP under O. Reg. 419/05 *Air Pollution - Local Air Quality*. Site air emissions are documented and compared against point of impingement standards in the site ESDM. The ESDM predicts contaminant concentrations from the facility at the facility fence line and into the community using a developed worst-case emission scenario and an air dispersion model that meets the requirements of O. Reg. 419/05. The ESDM report is updated annually to reflect the most recent air emissions data.

In support of the source sampling program, an ambient air sampling program has been established to measure the quality of ambient air near the facility. The facility's emissions that have the greatest potential impact are fluorides and uranium; therefore, the program's focus is on these two constituents. The ambient air program is comprised of four sampling programs: lime candles, dustfalls, high volume air samplers and vegetation surveys. All permanent sampling stations have been assigned a unique station number. Each station may have one or more components of each of the sampling programs. Details with respect to the individual sampling stations and sampling programs are provided in the EPP. Annual vegetation and soil surveys at selected locations around the facility and local area are also performed.

10.1.5 Liquid Emission Program

The PHCF liquid management and discharges are summarized as follows:

Most of the PHCF cooling water requirements are met by the facility's cooling water intake located at the entrance to the Port Hope harbour. The PHCF cooling water intake operations are regulated by a Permit to Take Water (PTTW) issued by the MECP. The remaining cooling water requirements are met by municipal potable water. A once-through non-contact cooling water system is used, and wherever possible, the cooling water pressure is higher than the process streams. The cooling water system includes three discharges. The filter backwash stream consisting of backwash water from the cooling water pumphouse and filter room is routinely monitored before it is discharged to the harbour. There are two cooling water effluent sampling locations with monitoring requirements defined through the Environmental Compliance Approval issued by MECP. The south cooling water return consists of UO_2 plant non-contact cooling water return which is discharged to the harbour. The north cooling water return consists of UF_6 plant non-contact cooling water return and a minor contribution of non-contact cooling water by-pass from waste treatment which is discharged to the harbour.

The municipal sewage treatment plant processes the sanitary sewer discharges from the PHCF and sewage quality is defined by the municipal sewer-use by-law. The sanitary sewer discharge consists of contributions from steam boiler operation in the powerhouse, air compressor operation in the powerhouse, instrument cooling water from laboratories, personnel showers, and general facility operations (lunchroom, toilets, etc).

Process waste water stream consisting of all process waste water effluents, and groundwater recovered from the pump and treat system is discharged to an evaporator for treatment or re-used within the process.

The ambient water quality monitoring program is established to monitor and assess potential impacts of PHCF operations on the local watercourse. Harbour water quality at the cooling water intake is sampled continuously and a composite sample is analyzed daily. The surface water sampling program for the harbour has been suspended during the remediation of the harbour by the Port Hope Area Initiative. It will be reactivated once these activities are complete.

Storm water from the facility is collected in catch basins/manholes and directly discharged to active outlets at the Port Hope harbour turning basin and approach channel. Storm water monitoring is completed on a semi-annual basis. Considerable updates to the stormwater monitoring program will be made once the storm sewer works upgrades are completed as part of the Vision in Motion project.

Groundwater sampling and groundwater level monitoring is completed at numerous monitoring wells and pumping wells throughout the facility, and in some cases at monitoring wells beyond the facility fence line. Groundwater collection and treatment is also regulated under a PTTW from MECP. A comprehensive review of the groundwater monitoring is completed and submitted to the CNSC, MECP and ECCC annually.

10.1.6 Derived Release Limit - Estimated Dose to the Public

The Derived Release Limit (DRL), in simplified terms, is the amount of radioactivity released by a nuclear facility that results in a radiation dose of 1 mSv/year to a representative member of the public. For the PHCF, there are three components to the DRL: dose to the public arising from discharges of radioactivity in water, dose to the public arising from discharges of radioactivity from the conversion processes in air, and dose to the public arising from gamma radiation emitted from the facility. The dose to the public is calculated for each of the sites under the PHCF operating licence.

Each of the components has a different critical receptor, or most exposed member of the public. The following table summarizes the most restrictive DRL values for each component; corresponding to a 1 mSv/y dose.

Table 17: DRL Values Corresponding to a 1 mSv/y Dose

	Air Emissions (kg/year U)	Water Discharges (kg/year U)	Gamma Radiation (µSv/h)		
DRL	8035	36,492	Fisherperson	Alexander Resident	Dorset Resident
			0.78	2.0	0.87

The total dose to a member of the public can be controlled through the use of the following sum rule:

$$1 \geq \frac{r_{air}}{DRL_{air}} + \frac{r_{water}}{DRL_{water}} + \left(\frac{r_{gamma\ resident}}{DRL_{gamma\ resident}} + \frac{\gamma_{gamma\ fisherperson}}{DRL_{gamma\ fisherperson}} \right)$$

where, r_{air} = the release rate of uranium from the facility air sources (kg U/year);
r_{water} = the release rate of uranium from the water sources (kg U/year);
γ_{gamma} = the gamma exposure rate for the receptor component(µSv/h).

The DRL values in the equation will vary based on which receptor is being used to calculate the public dose. However, as long as the total of the four ratios in the above equation is less than one, the public dose at that particular receptor will remain below 1 mSv/year. The DRL calculates a dose to the public that is higher than the actual public exposure during normal facility operations.

10.1.7 Reported Dose to the Public

Dose to the public from air and water emissions is a very small fraction of the calculated public dose. Gamma emissions from the radioactive material stored and processed at the facility dominate the reported dose to the public. Therefore, it is essential to monitor gamma emissions at the fence line to ensure that the dose to the public is maintained as low as reasonably achievable and well below the public dose limit of 1 mSv/year. The gamma emissions for both site 1 and site 2 are measured at key locations along the fenceline of each site using environmental dosimeters supplied by a licensed dosimeter service. Action levels for fenceline gamma emissions at site 1 and site 2 are presented below.

Table 18 Fenceline Gamma Emissions Limits

Fenceline Location and Receptor	**Limit (µSv/h)**
PHCF main site – Fisherperson at TLD 2	0.57
PHCF main site – Resident (infant) at TLD 10	0.61
Dorset site – Resident at TLD 21	0.26

Fenceline action level groups are in place for both the main site and Dorset Street site and each station has an administrative level. The action levels are summarized below:

Site 1:

- Group 1: 0.14 µSv/h action level for locations with low/near background exposure based on the ALARA level of 0.05 mSv/y to the critical receptor
- Group 2: 0.40 µSv/h for the remaining locations with elevated exposure due to the current storage of radioactive materials and products

Site 2:

- Group 3: 0.10 µSv/h for location 19, located further away from the fenceline
- Group 4: 0.25 µSv/h for the critical receptor and remaining locations.

11.1 SCA – Emergency Management and Fire Protection

Legislative Requirement: The *Class I Nuclear Facilities Regulations* require measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment, the health and safety of persons and the maintenance of national security, including measures to assist, notify, report to off-site authorities including the testing of the implementation of these measures.

Table 19: PHCF Documents Relevant to Emergency Management & Fire Protection

Document Title	Site/Division/Corporate
Emergency Response Plan (ERP)	Site
Fire Protection Program (CQP-1200)	Site
Fire Safety Plan (CQP-1201)	Site

PHCF maintains emergency preparedness and fire protection programs to ensure that licensed activities do not result in an unreasonable risk to the health and safety of persons and the environment.

11.1.1 Emergency Planning

Emergency planning for nuclear facilities is a requirement of the *NSCA* (Section 24 (4)) and the *Class 1 Nuclear Facilities Regulations* (Section 6(k)). The PHCF Emergency Response Plan (ERP) is compliant with the requirements of REGDOC 2.10.1: *Nuclear Emergency Preparedness and Response*. In addition to the ERP, Standard Operating Guidelines and Pre-incident Plans provide additional emergency response information. These documents outline the requirements for training, drills and exercises as well as emergency response facilities and equipment and interface with offsite organizations and community notification in event of an emergency.

11.1.2 Emergency Preparedness and Response Organizations

Depending on type and magnitude of an incident, the site may activate any or all of the following response organizations for the protection of human health, the environment and property: Emergency Response Team (ERT), Emergency Medical Team, Emergency Response Organization, Local Crisis Management Team, and the Corporate Crisis Management Team.

The emergency response team will consist of approximately forty members, with six members scheduled on each of the four continuous shift crews, to provide a minimum of four ERT members on-site at all times while the facility is operating. In addition to the minimum four ERT members there will also be one incident commander (IC) on-site at all times. This allows for a two-person entry team, and a two-person rapid intervention team to respond to incidents at the facility within 10 minutes, 24-hours/day when the facility is operating.

11.1.3 Fire Protection Program

The Fire Protection Program (FPP) has been developed and implemented to comply with the requirements of the National Fire Code, National Building Code, and with CSA N393-13: *Fire Protection for facilities that process, handle, or store nuclear substances*.

The FPP consists of the following main elements: the Fire Hazard Analysis (FHA), the Fire Safety Plan (FSP), Pre-incident Plans and related fire safety procedures. These documents are reviewed and updated on a periodic basis by qualified personnel, as required.

Routine inspections and testing of the fire protection system are conducted by or under the direction of Cameco personnel. A system is in place to enable detection and notification of fire. Emergency pull stations are located strategically throughout the facility. Areas with potential fire hazards are equipped with appropriate fire detection and/or suppression systems. Fire safety equipment is maintained with the use of preventive maintenance and periodic inspections.

11.1.4 Recovery Program

The recovery plan will depend on the nature of the emergency situation, i.e., whether the emergency is local (within the plant), external (off-site) or a transportation event. Depending on the situation, the recovery plan may require regulatory review and approval. Recovery plans would be developed to minimize the impact to personnel involved in the clean-up, the environment and the general public. Additional information on recovery plans is provided in the ERP.

12.1 SCA – Waste Management

Legislative Requirement: The *General Nuclear Safety and Control Regulations* requires that a licence application contain information related to the in-plant management of radioactive waste or hazardous waste resulting from the licensed activities. The *Class I Nuclear Facilities Regulations* requires that a licence application contain the proposed procedures for handling, storing, loading and transporting nuclear substances and hazardous substances.

Table 20: PHCF Documents Relevant to Waste Management

Document Title	Site/Division/Corporate
Waste Management Plan (WMP-01)	Site
FSD Waste Management Program (FSD-PGR-WM-01)	Divisional
Clean-Up Program (WMP-02)	Site
Preliminary Decommissioning Plan (PDP)	Site

The divisional and site waste management documents define the wastes generated as part of licensed activities, how it is managed onsite and removed from the facility to a separate waste management facility.

12.1.1 Waste Management

The waste management activities are conducted with the following objectives:

- To manage and dispose of wastes in accordance with applicable laws and generally accepted industry practices so as to minimize the potential adverse impact to personnel and to the environment;
- To minimize and reduce the quantity of stored onsite waste through recycle, re-use and recovery to the extent possible;
- To segregate radioactively contaminated and non-contaminated waste materials;
- To maintain an inventory of waste materials produced, received, disposed of and stored, including quantities and location on site;
- To store waste materials only when re-use, recycle or recovery is not possible and then to do so with proper management systems and controls in place; until an acceptable method has been identified for their eventual disposal; and
- To continually evaluate disposal alternatives and new technologies for waste reductions.

12.1.2 Clean-Up Program

The Clean-Up Program (CUP) has been established to remove obsolete buildings, equipment and materials for the purpose of reducing environmental liabilities, creating useable space and improving the appearance of the PHCF. CUP may undertake these activities at any of the properties that make up the PHCF:

Site 1 – main site operations and storage (1 Eldorado Place)
Site 2 – Dorset Street storage (158 Dorset Street East)

12.1.3 Preliminary Decommissioning Plan

Cameco maintains a Preliminary Decommissioning Plan (PDP) and financial guarantee for the PHCF. The PDP is reviewed and approved as appropriate every five years. The financial guarantee is updated as required after every PDP update has been reviewed and accepted by the CNSC.

13.1 SCA – Security

Legislative Requirement: The *General Nuclear Safety and Control Regulations* require that a licence application contain information including the proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information. The *Class I Nuclear Facilities Regulations* require that a licence application contain information including the proposed measures to prevent acts of sabotage or attempted sabotage at the nuclear facility, including measures to alert the licensee to such acts. In addition, Part 2 of the *Nuclear Security Regulations* apply to PHCF.

Table 21: PHCF Documents Relevant to Security

Document Title	Site/Division/Corporate
Security Plan (SecurityPlan001)	Site

The security plan outlines how the security requirements stipulated in the regulations and the licence are met.

Cameco maintains a security program to comply with the requirements of the *General Nuclear Safety and Control Regulations*, the *Nuclear Security Regulations* and any additional requirements such as designated officer orders.

Cameco's Security Plan presents an overview of the security operations at the PHCF and identifies the systems and processes in place to meet security program objectives. Accordingly, this document is considered prescribed information.

14.1 SCA – Safeguards

Legislative Requirement: The *General Nuclear Safety and Control Regulations* require the licensee to take all necessary measures to facilitate Canada's compliance with any applicable safeguards agreement, and defines reporting requirements for safeguards events. The *Class I Nuclear Facilities Regulations* require that a licence application contain information on the licensee's proposed measures to facilitate Canada's compliance with any applicable safeguards agreement.

Table 22: PHCF Documents Relevant to Safeguards

Document Title	Site/Division/Corporate
FSD Safeguards Program (FSD-PGR-SG-01)	Divisional

PHCF complies with the obligations arising from the Canada/International Atomic Energy Agency (IAEA) safeguards agreements, as well as all other measures arising from the *Treaty on the Non-Proliferation of Nuclear Weapons.* Cameco complies with REGDOC 2.13.1 *Safeguards and Nuclear Material Accountancy.*

The site maintains separate inventories for natural, depleted and enriched uranium where receipts and shipments are recorded. Monthly inventory reports are distributed to the CNSC that include safeguarded natural, depleted and enriched uranium as well as the inventory of non-safeguarded material.

Periodic audits of the inventory system are conducted by the IAEA, the CNSC and by Cameco internal auditors. Uranium accountability controls and practices are in place through the accountability system in order to comply with the applicable requirement for nuclear materials safeguards of the CNSC.

15.1 SCA – Packaging and Transport

Legislative Requirement: The *Class I Nuclear Facilities Regulations* require that a licence application contain information on the proposed procedures for handling, storing, loading and transporting nuclear substances.

Table 23: PHCF Documents Relevant to Packaging and Transport

Document Title	Site/Division/Corporate
FSD Packaging and Transportation (FSD-PGR-TRN-01)	Divisional

Cameco maintains corporate standards and site procedures that cover the safe packaging and transport of nuclear substances to and from the licensed facility.

Radioactive materials are packaged and transported on public roadways in accordance with Transport Canada regulations and specifically, the CNSC *Packaging and Transport of Nuclear Substances Regulations*. Employees are trained in the safe handling, packaging and shipping of dangerous goods commensurate with their responsibilities.

Monitoring of packages being sent off-site is covered in various site procedures.

3.0 NUCLEAR FACILITY SPECIFIC CONDITIONS

16.1 Clean-Up Program

PHCF maintains a site program for the purposes of reducing environmental liabilities, addressing health and safety hazards in underutilized buildings, creating useable space and improving the appearance of the facility.

Table 24: PHCF Documents Relevant to the Clean-Up Program

Document Title	Site/Division/Corporate
Clean-Up Program (WMP-02)	Site
Supplementary Environmental Monitoring Plan for Vision in Motion and other Clean-Up Program Projects (EMP-VIM)	Site
Environmental Protection Program (EPP)	Site
Supplemental VIM Submission (VIM description)	Site

Routine operations under CUP are described in 1.2.7. CUP projects include activities such as the removal of out of service equipment, dismantling of process systems, removal of structures, demolition of buildings and decontamination of items for operating plants.

CNSC staff will receive prior notification of large-scale projects during the planning stage of the project. Each project scope will define the activities, supervision/oversite responsibilities, potential hazards and how they will be managed. Hazards may be managed through existing site monitoring and control processes for health, safety, radiation protection, fire protection, environment, and quality, or may require additional project-specific monitoring and controls.

16.2 Quantity of Fissionable Material

The operating licence limits the PHCF to possession of a small quantity of fissionable material. PHCF maintains an appropriate level of nuclear liability insurance as required by the *Nuclear Liability and Compensation Act*.

16.3 Nuclear Criticality Program

The facility maintains a nuclear criticality program as described in 8.1.8.

APPENDIX A: DESCRIPTION OF SITES 1 AND 2 – FACILITY LEGAL DESCRIPTION

Cameco Port Hope Conversion Facility includes three separate properties licensed under fuel facility operating licence (FFOL-3631.00/2017). Site 1 consists of the main site property for operations and storage located at 1 Eldorado Place (designated as "Site 1 – main site operations and storage") and Site 2 consists of a single property for storage facilities located at 158 Dorset Street East.

Site 1 – Main Site Operations and Storage – 1 Eldorado Place

Engineering Drawing:
General Plant Layout – Site 1 – Main Site Operations and Storage; drawing No. 99101, Sheet 71, Current Version

Legal Description of Site 1- Main Site – 1 Eldorado Place
Lands in the Municipality of Port Hope registered and deposited with the Land Registrar as Parts 6, 7, 8, 9, 16, 17, 19, 20 on Plan 9R-1273; Parts 1 and 2 on Plan 39R-12643; Parts 1 on Plan 39R-12642; Parts 1 and 2 on Plan 39R-12867; Parts 1, 2, 3, 4, 5, 6, 7, 8, 11, 12 on Plan 9R-2236 save an except Part 1 on Plan 39R-12641 and Parts 1, 3, 4, 5 and 10 on Plan 39R-12674; and Parts 1 and 3 on Plan 39R-12377 save and except the portion of Part 3 on Plan 39R-12377 that is east of the chain link security fence and approximately 6.68 metres in width.

SITE 2 – Dorset Street Warehouse – 158 Dorset Street East

Engineering Drawing:
General Plant Layout – Site 2 – Dorset Street Storage; drawing No. 99101, Sheet 73, Current Version.

Legal Description of Dorset Street Warehouses and Property
Schedule "A"
ALL AND SINGULAR that certain parcel or tract of land and premises situate, lying and being in the Town of Port Hope, in the County of Northumberland (formerly the County of Durham), Province of Ontario, being composed of part of Lot 3, Concession 1, Township of Hope, now being part of the Town of Port Hope, the boundaries of the said parcel being described as follows:
COMMENCING at an iron bar planted at the south-westerly angle of said Lot 3;
THENCE North 71 degrees 27 minutes east along the southerly limit of said Lot 3 a distance of four hundred and eleven feet (411.0') to an iron bar;
THENCE North 18 degrees 43 minutes west parallel to the westerly limit of said Lot 3 a distance of six hundred and seventy-nine and fifty-six one hundredths feet (679.56') to an iron bar planted in the southerly limit of the right-of-way of the Campbellford, Lake Ontario and Western Railway (Canadian Pacific Railway);

THENCE South 35 degrees 19 minutes in and along the said southerly limit a distance of five hundred and seven and eight tenths feet (507.80') to an iron bar planted in the westerly limit of said Lot 3;
THENCE south 18 degrees 43 minutes east in and along the said westerly limit a distance of three hundred and eighty and twelve one hundredths feed (380.12') more or less to the point of commencement.
THE HEREINABOVE described lands containing by admeasurement 5.0 acres be the same more or less and shown outlined in red on a map or plan made by J.L. Sylvester, Ontario Land Surveyor, dated August 9th, 1963, which said map or plan may be found in Instrument No. N12702 in the said Registry Office.

Schedule "B"
ALL AND SINGULAR that certain parcel or tract of land and premises situate, lying and being in the Town of Port Hope, in the County of Northumberland, and being that part of Nelson Street bounded on the south by the Road Allowance between Concessions One and the Broken Front that are now in the Town of Port Hope and on the north by the southerly limit of the Canadian Pacific Railway Right-of-way.