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Cameco Fuel Manufacturing Inc.

One-Part Public Hearing

Scheduled for:

November 23 and 24, 2022

Request for a Licensing Decision:

Regarding:

Renewal of Operating Licence FFL-3641.0/2023 for Cameco Fuel Manufacturing

Submitted by:

Cameco Fuel

Manufacturing Inc.

Land Acknowledgement

We respectfully acknowledge that Cameco's facilities in Cobourg and Port Hope, Ontario are in the traditional territory of the Michi Saagiig and Chippewa Nations, collectively known as the Williams Treaties First Nations, which include: Curve Lake, Hiawatha, Alderville, Scugog Island, Rama, Beausoleil, and Georgina Island First Nations.

Cameco respectfully acknowledges that the Williams Treaties First Nations are the stewards and caretakers of these beautiful lands and waters in perpetuity, and we are grateful that they continue to maintain this responsibility to ensure the health and integrity for generations to come.

We offer this acknowledgement to reaffirm our commitment and responsibility in building meaningful relationships and to improving our own understanding of local Indigenous peoples and their cultures.

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Executive Summary

Cameco Fuel Manufacturing Inc. (CFM), is a wholly owned subsidiary of Cameco Corporation (Cameco). CFM was granted renewal of the Canadian Nuclear Safety Commission (CNSC) licence for its Port Hope facility for a period of one year following a hearing in writing in December 2021. The current licence is valid from March 1, 2022 to February 28, 2023. This Commission Member Document (CMD) provides a summary of the licensing basis in support of CFM's request for a renewal of its operating licence for a 20-year term.

CFM operates a fuel fabrication facility located in Port Hope, Ontario that handles nuclear material to provide CANDU fuel primarily for the domestic market and is the subject of this licence application. CFM also operates a specialty metals fabrication facility in Cobourg, Ontario to support CANDU fuel production.

CFM is committed to the safe operation of its facilities and strives to continually improve safety and environmental performance and processes to ensure the safety of our employees, members of the public as well as protection of the environment. In support of continual improvement, CFM maintains strong programs, plans and procedures for health, safety, radiation protection, environment, emergency response, fire safety, waste management and operations quality assurance.

As a result, CFM's operations have maintained radiation exposures well below dose limits for workers and below established limits for members of the public and controlled environmental emissions to levels to a fraction of release limits. Performance of the facility between 2012 and 2021 demonstrates that CFM continues to be qualified to carry out the activities permitted under the licence.

The following are some of the highlights of CFM's performance over the review period:

- Safety Culture initiatives that have seen safety performance steadily improve to top quartile performance with no lost time injuries at the site since 2015.
- No reportable uranium releases during the review period.
- Stable employee dose rates while continually improving measurement methods.
- Improved Human Performance and reduced employee Repetitive Strain Injuries through implementation of an industrial automation strategy.
- Continued safe operations during the COVID-19 pandemic including the provision of vaccination clinics at the site.

As part of Cameco's Fuel Services Division (FSD), CFM continues to build understanding and support through communications and engagement activities described in the Fuel Services Division Public Information Program. Residents of the town of Port Hope, the Mississaugas of Scugog Island, Hiawatha, Alderville and Curve Lake First Nations are the primary target audiences for CFM. Other interested groups and members of the general public are identified to be part of the secondary target audience. Recognizing the importance of Indigenous engagement, Cameco has and will continue to provide information and respond to inquiries from Indigenous communities and other interested parties.

Engagement activities during the review period focused on providing the public and Indigenous communities with ongoing updates on operations through presentations, updates to council, mailing of Cameco's "Energize" newsletter, posting of information on camecofilm.com and social media channels, and participating in community events, such as the Port Hope Fall Fair. Following expressions of interest from Curve Lake First Nation and the Mississaugas of Scugog Island First Nation, representatives from FSD began monthly meetings with these First Nations to discuss areas of interest, such as licensing activities, environmental monitoring and public disclosure.

CFM has demonstrated strong performance in the 2012-2021 review period, with continuous improvements implemented throughout. Based on this performance, CFM is qualified to carry on the requested licensed activities planned for the proposed 20-year licence term and will, in doing so, continue to make the necessary provisions for protecting the health and safety of workers and the public as well as the environment.

1.0 INTRODUCTION

1.1 *Background*

Cameco Fuel Manufacturing Inc. (CFM), a wholly owned subsidiary of Cameco Corporation (Cameco), operates a Class IB nuclear fuel manufacturing facility in Port Hope, Ontario under Canadian Nuclear Safety Commission (CNSC) operating licence FFL-3641.0/2023 (the Licence), valid until February 28, 2023.

CFM operates a fuel fabrication facility located in Port Hope, Ontario that handles nuclear material to provide CANDU fuel primarily for the domestic market and is the subject of this licence application. CFM also operates a specialty metals fabrication facility in Cobourg, Ontario to facilitate complete CANDU fuel supply; however, this facility does not process nuclear material and is not subject to licensing by the CNSC.

Cameco is a major supplier of uranium processing services required to produce fuel for the generation of safe, clean and reliable electricity around the world. Cameco's Fuel Services Division (FSD) supplies the world's reactor fleet with fuel to generate one of the cleanest sources of electricity available today. FSD comprises the Blind River Refinery (BRR), the Port Hope Conversion Facility (PHCF) and CFM and a divisional head office located in Port Hope. Cameco and FSD carry out aspects of licensed activities on behalf of CFM under a services agreement between CFM and Cameco.

CFM is located at 200 Dorset Street East, Port Hope, Ontario, adjacent to Peter Street (formally Highway #2), which links the Municipality of Port Hope (MPH) and the Town of Cobourg. The facility is located on approximately 16 hectares, of which approximately 2.3 hectares, located on the southernmost portion of the property, is operated under a Fuel Facility Operating Licence from the CNSC and approximately 14 hectares is undeveloped. An aerial photograph of the site is shown in Figure 1.

Figure 1 – Cameco Fuel Manufacturing



The facility receives uranium dioxide powder (UO_2 powder) that it conditions and presses into pellets that are then sintered into a durable ceramic in a hydrogen atmosphere furnace. Pellets are ground to meet specification and inspected. Pellets may be packed into shipping containers for shipment to customers or used in the assembly of fuel bundles. Uranium pellet production and bundle fabrication operations are controlled by CFM, as will be described in each safety and control area (SCA) detailed below.

1.2 *Highlights of the Application*

CFM's current operating licence was granted by the CNSC on February 16, 2022, for a one-year period and the licence is set to expire on February 28, 2023. Previously, a ten-year licence was approved by the CNSC on February 28, 2012 and expired on February 28, 2022. The one-year licence was requested to separate the licence renewal periods of BRR and CFM. Performance from March 1, 2012 to December 31, 2021 (the Review Period) is used throughout this CMD to demonstrate CFM is qualified to carry out the licensed activities.

For the renewal of FFL-3641.0/2023, CFM makes the following licensing requests of the Commission:

- Renewal for a 20-year licence term for the continued authorization to possess, transfer, use, process, import, manage, store and dispose of the nuclear substances that are required for, associated with, or arise from the production of uranium dioxide pellets; and,
- Increase the annual production limit to 1650 tonnes of uranium (tU) as UO_2 pellets to align with the current production capacity of the facility.

On October 4, 2021, CFM submitted an application to the CNSC for the renewal of the CFM Licence for a period of 20 years and included a justification for the longer licence term and requested production increase. Additional information was provided in subsequent months to respond to CNSC staff requests regarding the application, the supporting studies and programs that comprise the licensing basis. A revised set of documents to incorporate this additional information was submitted December 14, 2021.

Other changes to the licensing basis described in the application, supporting studies and programs were made as part of the one-year licence renewal submissions:

- CFM developed and implemented Exposure Based Release Limits (EBRLs), which are based on attaining federal or provincial environmental quality criteria at the end of an appropriate mixing zone, following the Commission approval of these limits in the December 2021 hearing in writing.
- CFM revised its Preliminary Decommissioning Plan (PDP) and associated cost estimate. An updated financial guarantee of \$10.8 million is now in place for CFM to reflect the updated PDP, following the Commission approval of these limits in the December 2021 hearing in writing.
- CFM updated its Safety Analysis Report (SAR) in 2021, to incorporate information from other supporting studies and to align with International Atomic Energy Agency (IAEA) standard SSR-4, *Safety of Nuclear Fuel Cycle Facilities*.

- CFM revised/updated its Derived Release Limits (DRL) in accordance with N288.1, *Guidelines for Calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities.*

Since 2012, CFM completed significant upgrades to automate both the handling of UO₂ powder and pellets within the facility as well as to the fuel bundle assembly process. These upgrades have provided improved ergonomics, lower employee dose rates and improved product conformance to customer specifications.

CFM is committed to maintaining a secure supply of nuclear fuel to energize a clean-air world while continually improving safety performance and operations to ensure the safety of workers and the public and to protect the environment. CFM maintains the required programs, plans and procedures in all SCA areas as detailed below to support this commitment.

The application for licence renewal and the justification for production increase submitted on December 14, 2021 serves as the licensing basis for consideration in the renewal of the Licence for a period of 20 years.

The performance of this facility over the review period demonstrates that CFM is qualified to carry out the activities permitted under the Licence. The application and supporting documents reaffirm CFM's commitment to protect the environment, the health and safety of employees and the public, and to maintain security and safeguards obligations. These documents describe key improvements made in the review period, such as emissions reduction activities, enhancement of the environmental protection program, training program improvements, management of legacy waste, operational reliability improvements, and the implementation of new and updated CSA standards and REGDOCs.

Within the requested licence period of 20 years, CFM expects to continue with current licensed operations of manufacturing uranium pellets and assembling fuel bundles within the requested change to production limits.

2.0 BUSINESS PLAN

CFM is committed to maintaining a secure supply of nuclear fuel to energize a clean-air world while continually improving safety performance and operations to ensure the safety of workers, the public and to protect the environment. Objectives and targets for the facility are set and reviewed regularly to measure progress and performance.

CFM's production commitments for the coming licence period are expected to remain consistent with current output. However, in preparation for potential growth of nuclear fuel demand both domestically and internationally, CFM is requesting a change to the licensed production limit from 125 Megagrams (Mg) of UO₂ as pellets during any calendar month (equivalent to 1,500 tonnes of UO₂ pellets per year) to 1,650 tU as UO₂ as pellets per year (equivalent to 155 Mg UO₂ as pellets per month). This represents an annual uranium processing limit increase of 24 % and aligns the licensed production limit with the capacity of the current plant equipment. In the event of an increase in customer demand, CFM would be able to fulfil this demand by increasing both staffing levels and the number of operating days. This would not require the installation of new equipment and environmental releases would remain within the current limits and action levels.

FSD operations will continue to provide vital services for the nuclear industry and ultimately the energy-consuming public. Although there are no defined projects within FSD at this time, CFM and Cameco are assessing the potential for growth in the nuclear energy industry including Small Modular Reactors (SMRs) and other future increases in demand.

CFM will continue to identify and pursue opportunities to improve operational efficiency while continuing to maintain the safety of workers and the public as well as protection of the environment.

3.0 SAFETY AND CONTROL AREAS (SCAs)

CFM's annual compliance reports submitted to the CNSC provide a synopsis of annual performance, annual monitoring data and a five-year trend review (radiation protection and environmental protection) under each SCA. Recent reports are available on Cameco's community website.

3.1 *Management System*

A management system is the framework that establishes the process and programs required to ensure an organization achieves its safety objectives, continuously monitors its performance against these objectives and fosters a healthy safety culture. Cameco's corporate policies and programs provide guidance and direction for the site-based programs that support the CFM Management System Program Manual (CFM-MS). The CFM-MS describes the overall facility management system as part of the licensing basis. The program addresses the requirements of Cameco's Safety, Health, Environment and Quality (SHEQ Policy) as well as providing guidance to the management system aspects of the SCAs established by the CNSC.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Management System SCA.

3.1.1 Relevance and Management

CFM-MS has been developed to meet CSA N286-12 (R2017), *Management system requirements for nuclear facilities* and REGDOC 2.1.1, *Management System*. The management system establishes the processes and programs required to ensure CFM operates safely; continuously monitors its performance; and fosters a healthy safety culture. The management system describes how licensed activities are controlled and references the supporting program documents required to maintain a secure and reliable supply of nuclear fuel.

The Cameco Management System focuses on governance, promoting quality and a strong safety culture. Corporate policies, programs and guidance influence site management systems and programs to ensure accountability, consistency and oversight at all operations. Divisional oversight and collaboration enhance FSD safety culture through consistency, management system enhancements and/or divisional program development, to improve safety and environmental performance.

3.1.2 Past Performance

CFM is committed to maintaining a secure supply of nuclear fuel and continually strives to improve safety performance and processes to ensure the safety of both our workers and the public while protecting the environment. The management system is the framework that guides the processes and programs required to ensure objectives are achieved, performance is monitored, and a healthy safety culture is maintained during production, maintenance, materials handling, waste management and other onsite activities. This includes, but is not limited to, requirements for work planning, change control, corrective action processes, document control, audits, and management review. The application of requirements under the management system is scaled according to the complexity and risk potential of a particular activity.

During the review period, CFM replaced its Integrated Management System with the CFM-MS. The CFM-MS meets the requirements of CSA N286-12 and REGDOC 2.1.1 for a quality management program. The requirements of REGDOC 2.1.2, *Safety Culture* were implemented by Cameco, including CFM during the review period.

All inspections, audits, incidents and events are documented in Cameco's Incident Reporting System (CIRS) from the start through to the verification of completion of corrective actions. CIRS is also used for ranking of events, ensuring significant events are reviewed at appropriate levels of the organization and sharing use of experience throughout Cameco.

Cameco uses audits to evaluate various aspects of site operations related to the licensed activities. The program requires an audit of compliance with all applicable federal and provincial environmental legislation at least once every three years. Results of all audits are reported in CIRS to ensure findings, identified opportunities for improvement, and areas of concern are reviewed by site management and processed accordingly. There were no significant issues identified in audits completed during the review period.

Routine inspections by CNSC staff continue to confirm that CFM remains in compliance with these requirements. Findings made by CNSC inspectors and specialists are reviewed by CFM and are used to strengthen existing programs and controls to ensure safety, security and the environment are not compromised. They are also entered into CIRS and tracked to completion.

CFM conducts annual management reviews of the site management system and all associated programs and performance to evaluate the effectiveness of the system and to identify opportunities for improvement.

CFM has a mature change control process that ensures proposed changes are assessed consistently and will provide an equivalent or greater level of safety and are subjected to the same level of review and approval as was originally obtained to ensure the safety case for the facility is maintained. CFM's change control process covers several areas: process layout(s); material design; regulatory; personnel; training and document change.

Cameco conducts safety culture assessments approximately every five years at all FSD sites. These assessments evaluate the perception of employees in relation to safety in a qualitative and quantitative manner. The most recent assessment for CFM was carried out in 2021 and indicated that workers are engaged in working safely as well as continually improving all aspects of positive safety culture. The 2021 assessment did indicate a marked improvement over previous assessments. The CFM and FSD leadership teams are committed to continuing to enhance safety culture and will continue to prioritize and execute activities that engage all employees in safe work and improvements to safety.

Improvements in the review period that have enhanced aspects of CFM's management system include:

- Development and implementation of a Cameco Laboratory Information Management System (LIMS);
- Development and implementation of a Cameco Management Document System (MDS);
- Development and implementation of a Cameco radiation protection database (CAMRAD);
- Development and implementation of a Cameco management of change electronic workflow/database (MOC); and
- Adopting a corporate annual management review template for the annual review meeting.

3.1.3 Future Plans

Looking ahead to the next licensing period, CFM will continue to apply improvements to the management system as opportunities are identified. Existing processes such as auditing and management review, will ensure that enhancements to the site systems are realized.

3.1.4 Challenges

As the regulatory framework continues to develop, changes in existing standards and regulatory documents as well as new standards and documents require assessment, planning and implementation for any gaps identified. A challenge for all licensees is the coordination and prioritization of new

requirements to be implemented. CFM will continue to work closely with CNSC staff to implement the standardized requirements under the regulatory framework in a manner that ensures operations remain safe, clean and reliable during any applicable implementation phase.

3.1.5 Requests

CFM has no requests at this time.

3.2 Human Performance Management

Human performance management addresses the activities that enable effective human performance through the development and implementation of processes that ensure there are sufficient workers in relevant areas who have the necessary knowledge, skills, procedures and tools in place to safely perform their duties.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Human Performance Management SCA.

3.2.1 Relevance and Management

The regulatory requirements for this SCA in the review period have primarily been focused on training. CFM's Systematic Approach to Training (SAT) applies a robust, risk-informed system to analyze and track training requirements and to develop and deliver appropriate training. This process covers initial training, routine re-qualification and re-qualification after an employee's extended absence.

CFM maintains processes to support human performance in its operations. Aspects of human performance 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.

3.2.2 Past Performance

The worker training and qualification program is well established using a SAT, which is described in the site training plan and supporting documents. The CFM training plan meets the requirements of REGDOC 2.2.2, *Personnel Training, Version 2*. Operation of CFM requires on-the-job training for employees. CFM continues to enhance the training plan by addressing opportunities identified through routine audits and inspections. Compliance to training requirements is tracked by Cameco's Learning Management System (LMS).

Summary statistics for the training plan during the review period are provided in Table 1. Yearly fluctuations are the result of changes to personnel (e.g., new hires, job transfers, return to work) or training program requirements (e.g., requalification periods, new qualifications).

Table 1 Training Statistics for the Review Period

Year	Total Training Hours	Number of Qualifications Granted	% Qualifications Held
2012	2,263	3,460	91.8%
2013	2,020	3,188	88.1%
2014	1,378	3,086	85.1%
2015	2,850	4,384	85.5%
2016	3,745	5,761	91.7%
2017	6,658	10,243	89.0%
2018	4,329	4,968	97.5%
2019	5,199	5,650	95.6%
2020	2,635	5,866	95.8%
2021	5,305	7,931	97.9%

CFM operates on a three-shift, 5 days per week rotation, which is periodically augmented by weekend overtime to meet production requirements. In accordance with the requirements of Part III of the *Canada Labour Code*, CFM has defined maximum hours of work in a shift cycle for all employees on-site.

As part of Cameco's FSD, CFM has a range of corporate programs and procedures in place to address human resource matters and to ensure employees are fit for duty. These include programs or procedures addressing alcohol and substance abuse, violence in the workplace, respectful workplace, medical surveillance and radiation protection monitoring.

3.2.3 Future Plans

In the upcoming licence period, the development and implementation of human performance management tools will continue as CNSC staff develop and publish additional guidance through applicable REGDOCs and Cameco establishes its corporate framework to meet these requirements. CFM will review and incorporate the applicable aspects of a human performance management program as part of the CNSC regulatory framework improvements.

3.2.4 Challenges

CFM will continue to improve human performance management across its operations and does not see any additional challenges in the implementation of this SCA.

3.2.5 Requests

CFM has no requests at this time.

3.3 **Operating Performance**

This SCA sets out the requirements for overall conduct of licensed activities and reporting on the performance. The Facility Licensing Manual (FLM) defines the programs and plans in place at CFM to ensure ongoing performance is maintained, monitored and reported. This provides an overview of how licensed activities are performed and how supporting activities enable effective performance.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Operating Performance SCA.

3.3.1 **Relevance and Management**

Operating performance at CFM tracks how the licensed activities are conducted to inform effective performance of the facility. CFM has developed and implemented programs to mitigate potential risks, maintain integrity of facilities and apply managed processes for operations and control. CFM reports operational performance to the CNSC staff annually using the SCA framework. CFM submits quarterly reports summarizing radiation and environmental monitoring data, the public information program activities, and other operational highlights. The annual and quarterly reports are made available to the public via camecofuel.com. CFM also provides notification to the CNSC staff of any significant event that occurs outside of normal operations as required by the *Nuclear Safety and Control Act* (NSCA).

In accordance with Cameco's Public Disclosure Protocol for FSD, the following events are also posted to the FSD community website:

- Unusual operational events that may have off-site consequences or that would be of interest to our target audiences;
- Environmental events that trigger a notification to the CNSC under Section 29 of the *General Nuclear Safety and Control Regulations (GNSCR)*; and,
- Summaries of non-routine environmental incidents that are required to be reported to the Ontario Spills Action Centre

Operating limits for the site are specified in the FLM. CFM has robust systems in place to ensure both the ongoing performance is maintained and continuous improvement is achieved as described within the FLM, management system and associated programs and plans.

The FLM and associated programs establish safe, uniform and efficient operating practices and processes within the facility to ensure safety of the public, the environment, as well as the safety of the plant personnel and plant equipment. Ongoing operational performance and continual improvement is achieved using the “plan, do, check, act” model. Finally, operational reviews are held at all levels of the organization through production, leadership and management review meetings.

3.3.2 Past Performance

Throughout the review period, CFM continues to operate in a manner that supports maintaining a secure supply of nuclear fuel in compliance with applicable legislation and the facility's licensing basis.

The management system and other program level documents have parameters that are monitored, measured and tracked to ensure the facility is operated as intended. The performance of these programs is regularly assessed to assure the site management that these programs are implemented, adequate and effective. Corporate personnel audit the site management programs on a regular basis to verify that site performance meets both corporate requirements and complies with all applicable regulatory requirements. The CNSC and other regulatory agencies have conducted inspections of the facility during the review period, verifying compliance with applicable acts and regulations.

CFM reports unplanned events in accordance with the NSCA and its regulations, REGDOC 3.1.2, *Reporting Requirements, Volume 1: Non-Power Reactor Class 1 Nuclear Facilities and Uranium Mines and Mills* and the licence conditions. During the review period, CFM reported 24 incidents related to transportation, plant operations, health and safety, radiation protection and environmental performance as summarized in Table 2.

Table 2 Reportable Incidents in the Review Period

Year	Transportation	Action Levels	Environmental Releases	Other	Total
2012	0	1	0	1	2*
2013	1	2	0	1	4
2014	0	3	0	0	3
2015	0	2**	0	2	4
2016	1	1	0	0	2
2017	0	2	0	2	4
2018	0	1	0	0	1
2019	0	1	0	1	2
2020	0	0	1	0	1
2021	0	1	0	0	1

*Two notifications were provided for a single event. An RP incident resulted in an environmental action level exceedance.

** CFM reported an extremity action level exceedance in 2015; however it was determined during the investigation that due to calculation error, the extremity action level was not exceeded and the dose record for the employee was changed with NDR. An internal dose was assigned from urinalysis in a separate event.

CFM investigated each incident in accordance with Cameco's corrective action process with corrective actions identified, implemented and tracked as appropriate.

3.3.3 Future Plans

In line with Cameco's focus on continual improvement, CFM will continue to improve the performance of its operations. To achieve this, CFM develops budget plans based on the FSD strategic plan. The strategic plan and budget set the priorities and direction for the division and site for the coming years ensuring the operations achieve production and safety objectives.

3.3.4 Challenges

CFM does not have any specific challenges associated with this SCA.

3.3.5 Requests

Operating limits are defined in the licensing basis upon which the Commission rendered their decision to renew CFM's operating licence in 2012. The current licensed production limit is 125 Mg of UO₂ as pellets during any calendar month.

CFM is requesting a change in the licensed limit to 1650 tU as UO₂ pellets annually. This change aligns the nomenclature used in setting operating limits across the FSD facilities (i.e., tonnes uranium per year). The proposed limit reflects the production capacity of the equipment installed at CFM under a seven-day operating week.

To compare the nomenclature of the requested production limit in terms of the current production limit, the following equivalencies apply:

- 1650 tonnes uranium/year is 137.5 tonnes uranium/month
- 1 tonne uranium as UO₂ is equivalent to 1.13 tonnes of UO₂
- 1 megagram of UO₂ is equivalent to 1 tonne of UO₂

The requested 1650 tU/yr divided equally by month would be equivalent to 155 Mg UO₂/month, a 24% increase in the production limit.

3.4 Safety Analysis

Safety analysis is a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or facility and considers the effectiveness of preventative measures and strategies in reducing the effects of such hazards.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Safety Analysis SCA.

3.4.1 Relevance and Management

CFM has a SAR that summarizes the systematic review of site operations to identify and assess hazards and potential risks to the public and environment from the facility. A "What-If?" methodology was utilized to systematically determine the potentially hazardous scenarios. The SAR demonstrates that adequate safety systems are in place to prevent an unreasonable risk to persons and the environment, across an array of potential representative scenarios. The 2021 version of the SAR incorporated information from other supporting studies of the facility to better align with the guidance provided in the IAEA standard SSR-4 *Safety of Nuclear Fuel Cycle Facilities*.

Additional risk analyses maintained for the facility under federal or provincial regulatory requirements include:

- An environmental aspects registry to meet the requirements of ISO 14001:2015 *Environmental Management System Standard*;
- A Fire Hazard Analysis (FHA) that meets the requirements of CSA N393-13, *Fire protection for facilities that process, handle or store nuclear substances*;
- An Environmental Risk Assessment (ERA) completed in accordance with CSA N288.6-12, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills*. The ERA is used to ensure the adequacy of the monitoring program; and
- A DRL assessment completed in accordance with CSA N288.1-14, *Derived Release Limit*.

These assessments provide additional analysis specific to the respective SCAs and support the conclusions of the SAR that the facility is operated in a manner that is protective of people and the environment.

3.4.2 Past Performance

Safety analyses for the facility are regularly reviewed to ensure changes to the facility, recommendations from CNSC staff, industry best practices, new scientific literature, recent operating experience and/or new or updated regulatory documents and standards are incorporated to enhance the robustness of the analysis. During the review period, CFM updated and submitted the SAR to CNSC staff in 2014 and 2021. Other risk assessments are periodically reviewed and updated on the frequency prescribed in their respective standards or REGDOCs.

3.4.3 Future Plans

REGDOC 2.4.4, *Safety Analysis for Class 1B Facilities* is expected to be published in the next licence period. There is an established process for review of new standards and REGDOCs and their incorporation as Compliance Verification Criteria (CVC) or as guidance in the Licence Conditions Handbook (LCH). In accordance with the process, CFM will identify and address any gaps in the facility safety analysis on a schedule accepted by CNSC staff.

3.4.4 Challenges

CFM does not have any specific challenges associated with this SCA.

3.4.5 Requests

CFM is not requesting any changes at this time.

3.5 Physical Design

Physical design relates to activities that impact the ability of systems, components and structures to meet and maintain their design basis given new information arising over time and taking changes in the external environment into account.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Physical Design SCA.

3.5.1 Relevance and Management

Changes to the physical design of equipment, processes and the facility with the potential to impact safety are evaluated through a design control process from initial planning through to completion of the project. This review identifies impacts and potential impacts to the environment, radiation protection, health and safety and fire protection. A site design control procedure ensures that any facility changes, or modifications will not have an adverse effect on the environment, on the health and safety of employees or to members of the public.

The aspects of the site design program are as follows:

- Facility and process changes – All changes to the physical design of equipment, processes and the facility are evaluated from project planning to the completion of the project through the design control procedure described in the management system. The design control process identifies impacts and potential impacts to the environment and health and safety. It also triggers review by appropriate subject matter experts and process or area owners to ensure all applicable codes and legal requirements are observed. For some changes, third-party review (TPR) and/or CNSC notification is also required.
- 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 TPR in accordance with CSA N393-13 (R2018). All TPRs are conducted by qualified personnel from organizations whose management and financial operations are independent of the design organization.
- Pressure boundary program – This program meets the requirements of CSA B51-19, *Boiler, pressure vessel and pressure piping code*. It establishes the infrastructure and defines the activities necessary to maintain a sustainable process that allows CFM to perform activities associated with repairs, replacements, modifications and alterations to pressure retaining items, components, and systems, including installation of new systems. As required by the Licence, CFM maintains an agreement with an Authorized Inspection Agency (AIA) with the Technical Standards and Safety Authority (TSSA) for the registration, inspection and other activities related to pressure systems. This agreement ensures oversight of pressure retaining components and systems continues to be carried out by a third-party expert.

As part of CFM's financial and resource planning process, plant improvements related to physical design are identified and prioritized for inclusion in the budget.

3.5.2 Past Performance

During the review period, CFM made improvements to the process and design change control procedure through the implementation of Cameco's electronic MOC workflow. This electronic process improves documentation and traceability of design changes and enhances review by additional subject matter experts.

CFM maintained its AIA agreement with TSSA during the review period. The agreement is renewed periodically and was last renewed in 2022 for a three-year period.

In the review period, CFM implemented a new CSA standard N393-13 (R2018), *Fire protection for facilities that process, handle, or store nuclear substance* and the most updated version of the standard, CSA B51-19, *Boiler, pressure vessel and pressure piping code*.

3.5.3 Future Plans

CFM will continue to enhance the electronic MOC process based on feedback received during development and implementation. In line with Cameco's focus on continual improvement, CFM will continue to improve the performance of its operations in this SCA.

3.5.4 Challenges

CFM does not have any specific challenges associated with this SCA.

3.5.5 Requests

CFM has no requests at this time.

3.6 *Fitness for Service*

Fitness for service covers the activities that impact on the physical condition of systems, components and structures to ensure that they remain effective over time. This includes programs that ensure all equipment is available to perform its intended design function when called upon to do so.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Fitness for Service SCA.

3.6.1 Relevance and Management

CFM has programs, plans and procedures that ensure the facility is operated in a safe, clean and reliable manner. These documents address the following areas that comprise this SCA: a preventative maintenance program (PM), an in-service inspection program, an operational reliability program and other testing and review systems.

CFM has an established PM program as described in its Preventative Maintenance Execution Management document, AP-18. All PM tasks are initiated and documented through the work notification functions of the corporate-wide enterprise application software for asset management, maintenance management, accounting and purchasing functions. PM plans are issued, reviewed and updated periodically to ensure the PM routines continue to be effective and adequate. Key performance indicators (KPI) are in place to monitor the effectiveness of the program.

Fire protection systems are tested according to an established schedule developed using the National Building Code and the National Fire Code. Reviews of aspects of the fire protection systems are completed as required by CSA N393-13 (R2018).

3.6.2 Past Performance

CFM uses KPIs to monitor the effectiveness of these programs. Overall, the KPIs reflect strong performance with improvements to the site uptime availability and overall equipment effectiveness, improvements in preventive maintenance schedule compliance and a decrease in the amount of reactive maintenance work. Detailed information on KPIs is considered proprietary and are not made publicly available.

CFM conducted in-house and third-party testing for fire protection systems, as required, in the review period. All fire inspection reports are entered into CIRS so that corrective actions can be identified and tracked to completion.

3.6.3 Future Plans

CFM plans to make improvements to this SCA through the Operational Reliability Program and recommendations developed during management review of KPIs.

3.6.4 Challenges

No additional challenges for this SCA.

3.6.5 Requests

CFM has no requests at this time.

3.7 Radiation Protection

The SCA of Radiation Protection covers the implementation of a Radiation Protection Program (RPP) in accordance with the *Radiation Protection Regulations*. This program must ensure both contamination and radiation doses received are monitored and controlled.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Radiation Protection SCA.

3.7.1 Relevance and Management

CFM has a mature and robust RPP detailed in the Radiation Protection Manual (CFM-RP) designed to meet the requirements of the *Radiation Protection Regulations*. CFM-RP describes the controls implemented to ensure the facility operates safely and is protective of employee and public health. It also keeps radiation exposures as low as reasonably achievable with social and economic factors taken into account (ALARA).

The CFM-RP documents the radiological hazards found at the facility and the controls in place to not only manage these hazards, but also to ensure dose to workers and the public remains ALARA. Under this program at CFM, the controls and programs for worker and public protection include:

- External dosimetry – personal monitoring;
- Internal dosimetry – urine analysis and lung counting programs;
- Contamination control;
- Radioactive waste handling;
- Radioisotope control;
- ALARA program;
- Radiation protection training;
- Respiratory protection program; and
- Radiation exposure control and monitoring.

Performance of the CFM-RP is assessed through annual target setting, the corporate SHEQ audit program and during the facility's annual management review.

3.7.2 Past Performance

During the review period, CFM has not exceeded any regulatory limits with respect to radiation protection. Over the licensing period CFM has also made improvements to aspects of the program as part of its continual improvement program:

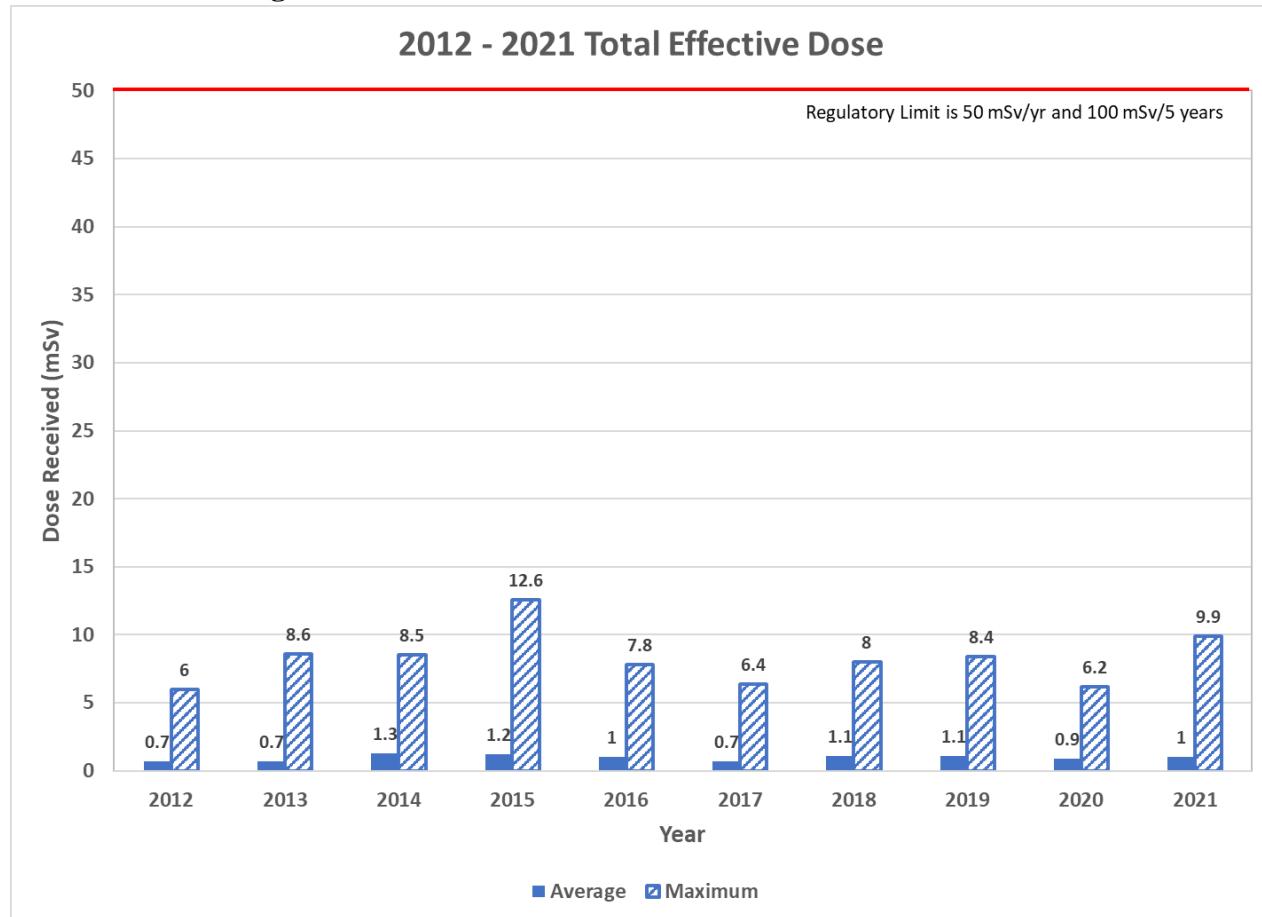
- An enterprise-wide database (CAMRAD) to house all health physics data was fully implemented across Cameco sites;
- CFM transitioned from assigning internal dose from urine analysis to lung counting dosimetry in 2014;
- CFM updated the DRL for the facility, which was subsequently accepted by CNSC staff;
- The requirements of the amended *Radiation Protection Regulations* were implemented; and
- Improvements to the CFM-RP and associated procedures were made throughout the licensing term to address changes at the facility as well as audit and inspection findings and other identified opportunities for improvement.

During the review period, there were nine reported radiation protection action levels exceedances: Two extremity, one whole body exposure, five related to elevated uranium in urine results, and one from annual lung counting. In accordance with the corrective action process, investigations were conducted for all events and corrective actions were identified and implemented as appropriate. The extremity doses were determined to be incorrect and doses were corrected in the National Dose Registry (NDR). The whole-body exposure was determined to be non-occupational from a medical procedure. Internal dose was assigned from the urine analysis and lung counting events.

Figures 2 through 7 summarize exposure results over the review period, through to the end of 2021. These results demonstrate that CFM-RP and associated procedures are effective at controlling the dose to workers.

The total effective dose can consist of three components: external whole-body dose; internal dose to the lung (beginning in 2014); and internal dose to the kidney (only on an exception basis after 2014). The annual effective dose to Nuclear Energy Workers (NEWs) remains well below the regulatory limit. The highest annual individual effective dose to an NEW over the review period from 2012 – 2021 was 12.6 mSv, which is 25% of the annual regulatory limit as shown in Figure 2.

Figure 2 – Annual Effective Dose to Workers for the Review Period

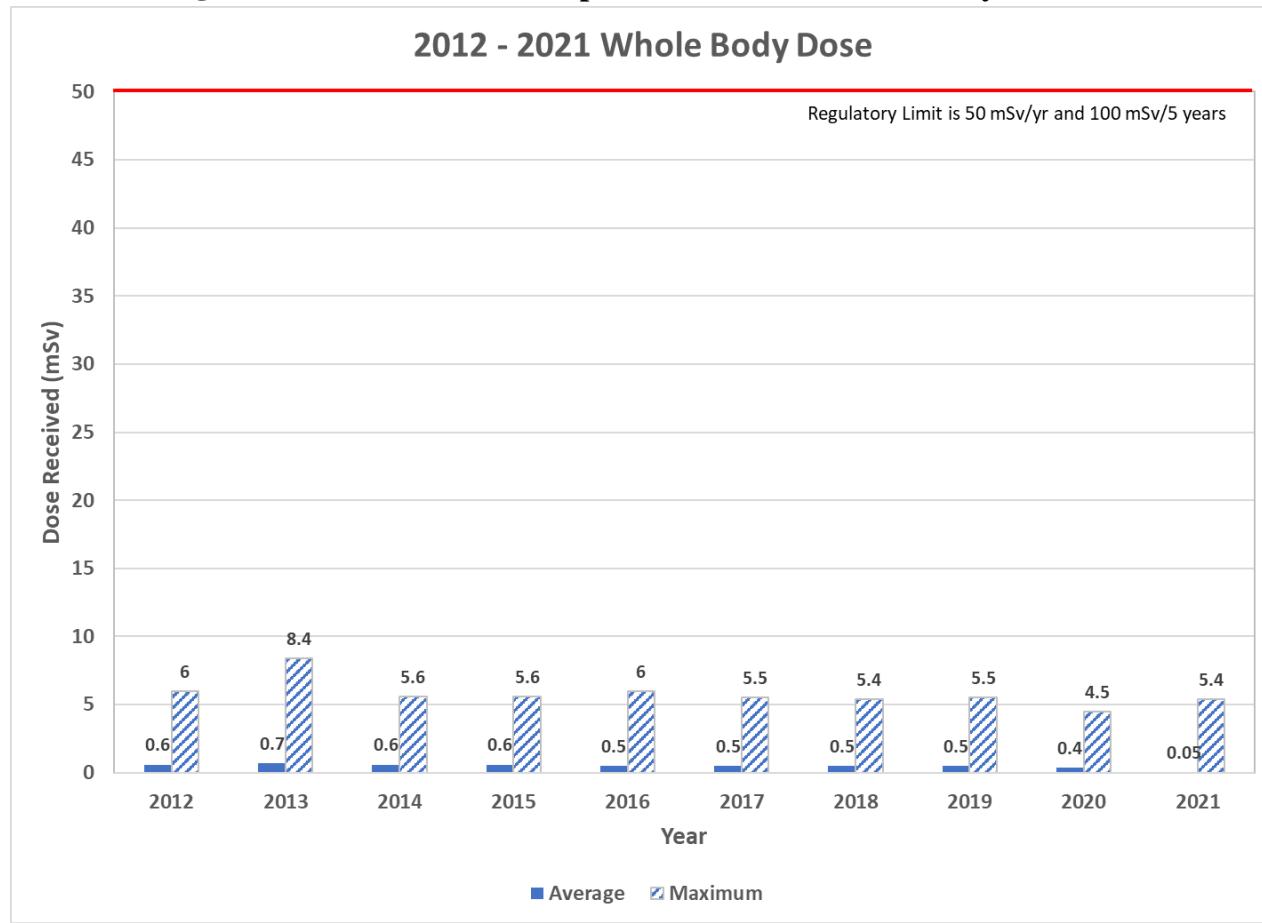


The *Radiation Protection Regulations* also establishes a five-year regulatory limit of 100 mSv, which applies to specified five-year periods. The periods relevant to the review period are from January 1, 2011 to December 31, 2015, from January 1, 2016 to December 31, 2020, and from

January 1, 2021 to December 31, 2025. For the first five-year period, the maximum total effective dose for an individual was 41.0 mSv. For the second five-year period, the maximum total effective dose was 31.7 mSv. The maximum total effective dose information for 2021, which is the first year of the next five-year period was 9.9 mSv.

As shown in Figure 3, the average annual whole-body dose for NEWs did not exceed 1.0 mSv at any time during the review period. As external dose is a larger component of effective dose by managing external exposures ensures that the total effective dose for workers remains a small fraction of the CNSC annual limit of 50 mSv.

Figure 3 – Effective Dose Component – External Whole-Body Dose to Workers



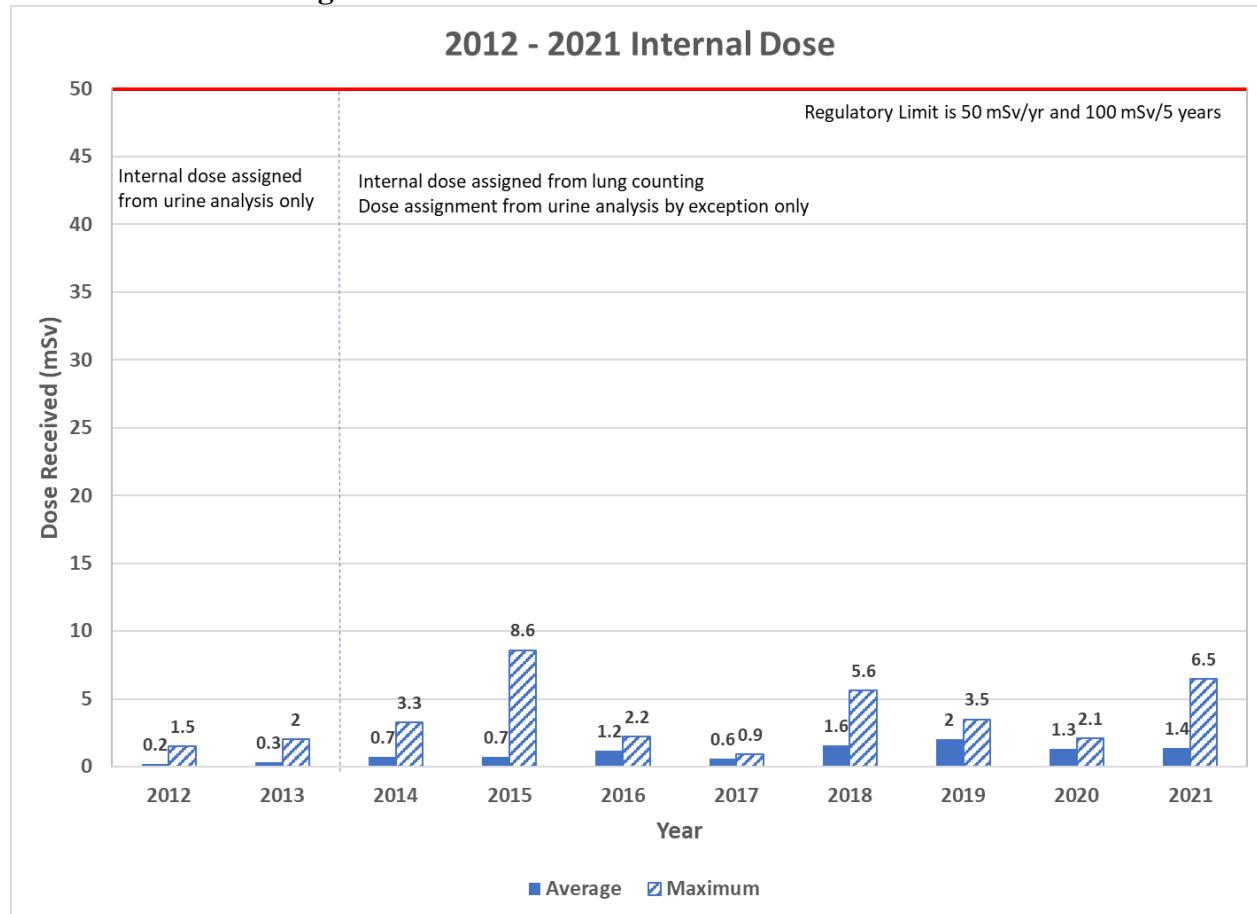
During the review period, as part of the licensed internal dosimetry program, CFM began using a lung counter to monitor and assess uranium exposure in the lungs of NEWs working at CFM. Based its solubility, UO₂ will move slowly through the body and the majority will settle in the lungs, a small amount would be processed by the kidney and excreted in urine. Lung counting provides a more accurate assessment of worker dose than urine analysis at CFM. Beginning in 2014, internal dose has been assigned using the lung counting program; however, urine analysis is still in place and is used as an early screening process for worker internal exposure and can be used to assign dose as part of an official investigation into a potential uranium uptake.

The average annual internal dose based on lung counting remained at or below 2.0 mSv throughout the licensing period as shown in Figure 4. Managing the internal dose component from lung

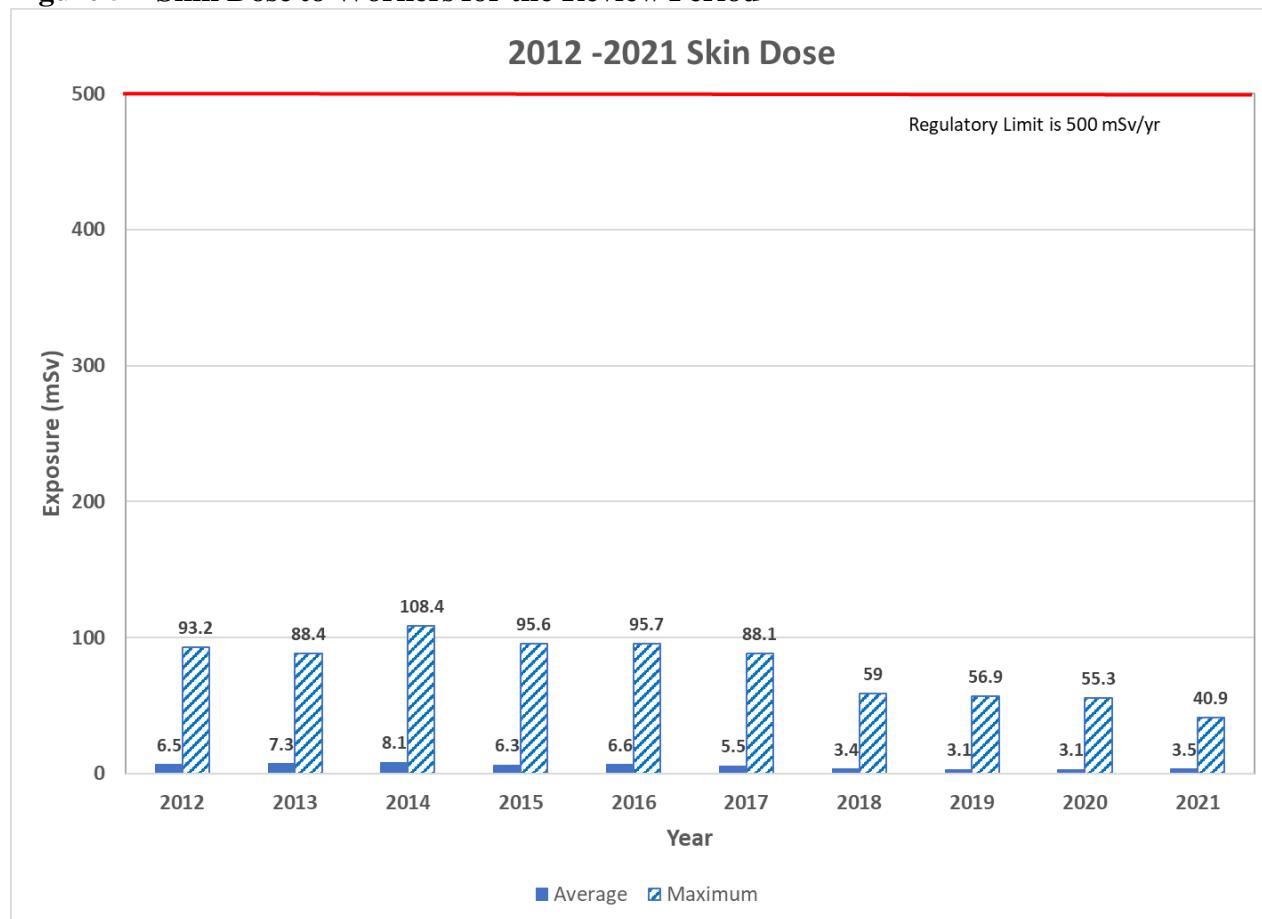
counting at these levels ensures that total effective dose for workers remains a small fraction of the CNSC annual limit of 50 mSv.

The maximum internal dose to an NEW of 8.6 mSv was measured in 2015. This result included internal dose assigned from lung counting and urine analysis. An investigation was completed into the elevated urinalysis result and corrective actions identified and implemented.

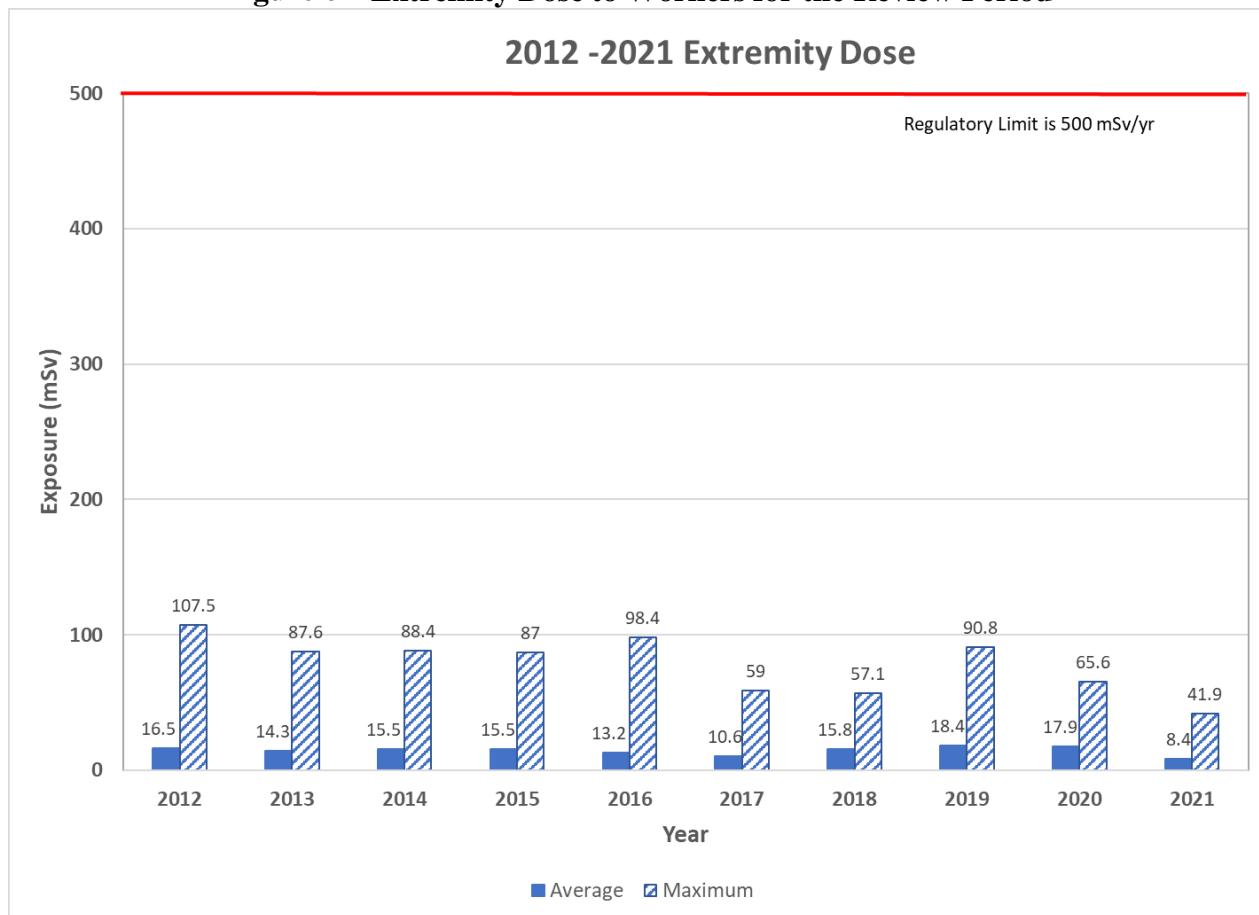
Figure 4 – Internal Dose to Workers for the Review Period



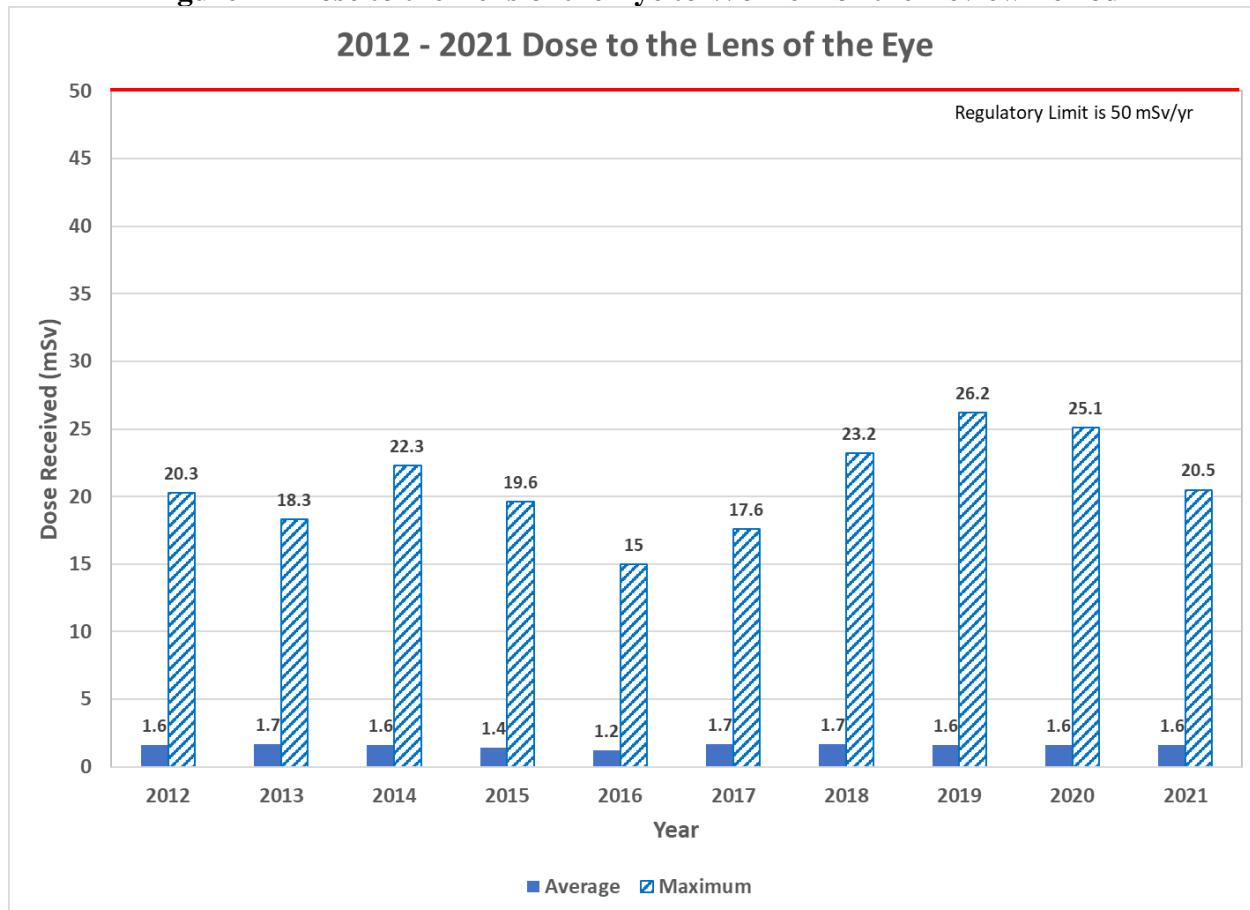
As can be seen in Figure 5, the average annual skin dose for NEWs ranged from 3.1 mSv to 8.1 mSv in this period. The maximum skin dose in this period was 108.4 mSv in 2014. CFM has implemented automations throughout the licensing period which has helped lower skin dose to levels that remain a small fraction of the CNSC annual limit of 500 mSv.

Figure 5 – Skin Dose to Workers for the Review Period


At CFM, the average extremity dose for NEWs ranged from 8.4 mSv to 18.4 mSv in this period as shown in Figure 6. The maximum extremity dose in this period was 107.5 mSv in 2012. CFM has implemented automations throughout the licensing period which has helped lower extremity dose to workers.

Figure 6 – Extremity Dose to Workers for the Review Period


Between 2012 and 2017, the average annual eye dose for NEWs at CFM was measured and calculated to be within a range of 1.2 mSv to 1.7 mSv. As measured and calculated, the maximum eye dose in this period was 22.3 mSv in 2014. A review of eye doses calculated using the optically stimulated luminescence dosimeter (OSLD) badges from 2018-2021 indicates the average annual dose as calculated was 1.6 mSv/year and the maximum annual dose was 26.2 mSv. The calculated eye dose for the review period is shown in Figure 7.

Figure 7 – Dose to the Lens of the Eye to Worker for the Review Period


Cameco's corporate SHEQ audit program includes audits of the CFM-RP at least once every three years. An independent third-party also conducts annual audits of the FSD internal dosimetry program. In the review period, no significant issues were identified during these audits, and opportunities for improvement and minor findings were investigated with appropriate action taken and documented in CIRS.

3.7.3 Future Plans

The sites RPP is mature and enables CFM to keep radiation exposures ALARA. Dose statistics at CFM have shown a slight decreasing trend over time. The current dose levels are at the point where it becomes increasingly difficult to achieve further reductions in a cost-effective, ALARA manner.

The proposed production increase would not require any changes to the content of the CFM-RP. The existing programs set out in CFM-RP for dosimetry, monitoring and contamination control would continue to apply, no additional work groups would be required, and no new equipment would be installed. CFM will need to increase the number of operators and supervisory staff in the production work group, which will increase the number of workers monitored under the existing program. This increase in workers will ensure that all workers remain within current constraints for individual hours of work and maintain doses ALARA while increasing the production hours for the facility.

CFM will continue to enhance the program through physical, procedural and monitoring improvements as identified by the ALARA Committee, the audit and corrective action processes, and new regulatory requirements.

3.7.4 Challenges

The implementation of the updated *Radiation Protection Regulations* has been challenging for the assessment of dose to the lens of the eye. At the time of implementation of the regulations, there was not an available licensed dosimetry provider for this service. Cameco has worked with its external dosimetry service provider to estimate the dose to the lens of the eye based upon OSLD. However, initial validation work indicates that the OSLD eye dose value methodology can overestimate the dose received up to 70%. Additional site-specific studies are in progress to develop a more accurate estimation factor for the FSD facilities. Until this is complete, an interim action level has been established and accepted by CNSC staff.

3.7.5 Requests

CFM has no requests at this time.

3.8 Conventional Health and Safety

The conventional health and safety SCA covers the implementation of a program to manage workplace safety hazards and to protect personnel and equipment.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Conventional Health and Safety SCA.

3.8.1 Relevance and Management

CFM has a comprehensive and well-established worker protection program, which meets the specific health and safety requirements prescribed by the NSCA and more specifically, Part II of the *Canada Labour Code*. In addition, Cameco's SHEQ policy and corporate health and safety program provide direction for site programs and procedures. Cameco has five key principles that form the framework of how safety is managed at all facilities. These are set out below:

- 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; and
- We are a learning organization.

The health and safety of workers at CFM is assured through a site-specific safety and health management program. Key components of the program include:

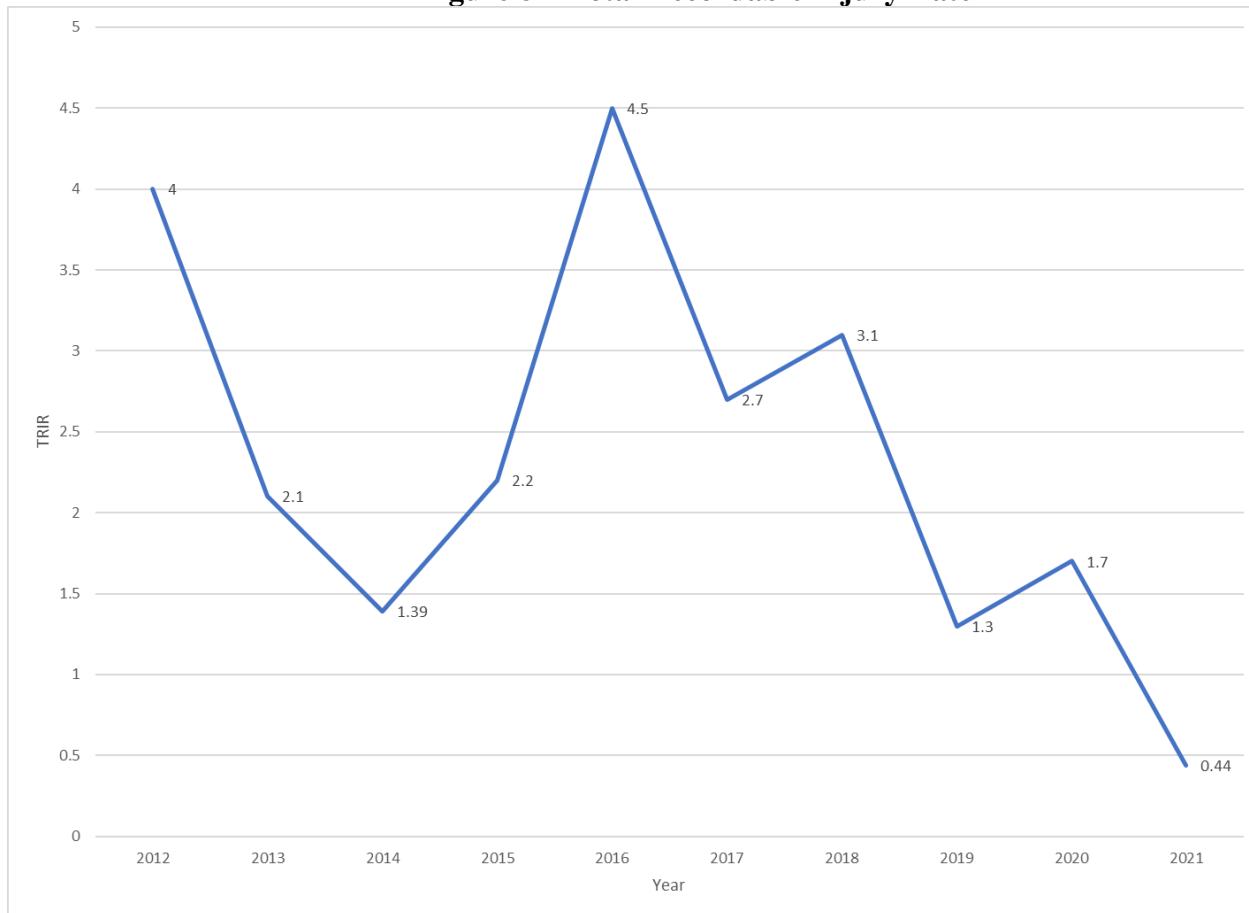
- Compliance with all safety and health-related legal and regulatory requirements;
- Setting site safety and health objectives;
- Implementation of corporate safety standards;
- Development and maintenance of a formal hazard recognition, a risk assessment and a change control process; and
- Documenting health and safety significant incidents in CIRS from reporting the initial event through to the verification of corrective actions.

The requirements to have both a policy and workplace health and safety committee under Part II of the *Canada Labour Code* are met by the Joint Health and Safety Committee (JHSC). The intent of the JHSC is to provide a forum whereby worker and management representatives can not only come together on a regular basis to identify and resolve health and safety concerns, but also work together on proactive and preventative-type actions that will reduce risks related to health and safety in the workplace.

3.8.2 Past Performance

CFM experienced one lost time injury during the review period. The incident occurred in January of 2015; the Port Hope site has now achieved over seven years without a lost time accident.

Total recordable injury rate (TRIR) is a standardized safety metric created by the U.S. Occupational Safety and Health Administration (OSHA) to measure the frequency of injuries in the workplace – more specifically, the number of injuries requiring medical treatment or restricted work per 100 employees per year. This metric can compare safety performance year over year – the lower the TRIR, the better the safety performance. Figure 8 summarizes the site TRIR in the review period. CFM's TRIR does show some variance from year-to-year but has been trending down over the last six years.

Figure 8 – Total Recordable Injury Rate


CFM undertook a number of activities to support improved safety performance in the review period, including the below:

- Prompt investigation into all safety-related incidents, documenting all investigations and corrective actions in CIRS;
- Implementation of various corporate safety standards, which includes self-assessment and documentation of corrective actions in CIRS. Corporate safety standards implemented include: control of hazardous energy (lock-out/tag-out), confined space, hoisting and rigging, safeguarding of machines, tire and rim safety and fall protection;
- Development of a COVID-19 hazard prevention response procedure;
- Improvements to ergonomics and occupational monitoring for heat stress and noise; and,
- Corporate safety culture assessments in 2016 and 2021, which reaffirmed the facility's commitment to safety, documented positive trends in safety culture metrics and assurance that managements' overall direction at improving safety culture is progressing effectively.

Cameco's corporate SHEQ audit program includes audits of the CFM health and safety program at least once every three years. In the review period, no significant issues were identified during these audits, opportunities for improvement and minor findings were investigated with appropriate action taken and documented in CIRS.

The COVID-19 pandemic occurred within the review period. Throughout the pandemic, CFM utilized guidelines from local, provincial and federal regulators, the company physician and recommendations from the World Health Organization, the US Centers for Disease Control and Prevention and OSHA to develop and maintain the COVID-19 hazard prevention response procedure. As of November 2021, all onsite personnel, including visitors and contractors must provide proof of COVID vaccination. To support employees during the pandemic, CFM held three vaccine clinics (including one expanded to friends and family) and provided onsite volunteer rapid COVID testing. In November 2020, a COVID outbreak was declared at CFM after confirmation of two cases of workplace transmission. Normal weekly start-up activities were delayed allowing CFM to perform necessary testing and tracing activities to confirm that there was no additional transmission.

3.8.3 Future Plans

CFM will continue to implement new corporate safety standards as well as maintain and enhance its safety program where opportunities are identified during the upcoming licence period. We continue to strive for zero injuries throughout our operation.

3.8.4 Challenges

This SCA is a challenging area that requires continual oversight because legislation, best practices, and safety technology are evolving and improving. Maintaining high safety standards and a high degree of worker awareness of safety is always a challenge at any industrial operation. Until there are no injuries to any worker on the job, there will always be a need to strive for improvement. CFM is committed to maintaining a high level of safety performance and is always looking at ways to continually improve all aspects of our operation, including health and safety.

3.8.5 Requests

CFM has no requests at this time.

3.9 *Environmental Protection*

The environmental protection SCA covers programs that identify, control and monitor all releases of radioactive and hazardous substances and effects on the environment from facilities or as a result of licensed activities.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Environmental Protection SCA.

3.9.1 Relevance and Management

CFM maintains an environmental protection program (CFM-EP) that satisfies the requirements of the ISO14001 standard as well as Cameco's corporate requirements.

Environmental protection is regulated by both federal and provincial regulatory authorities at CFM. Requisite provincial approvals are in place for the various discharges from the facility. CFM monitors emissions to air and liquid discharges to the sanitary sewer to ensure they meet applicable provincial and federal requirements. The documents that comprise the CFM-EP identify all emissions to the air, water and land along with the programs that are in place to monitor the emissions, identify what is measured, and list the regulatory and reporting requirements.

CFM's facility is designed with discrete discharge points along the production line and from building ventilation. The airborne effluent monitoring program therefore is designed so that each stack in the production line is monitored when that area of the plant is operating. Air emissions are also regulated by the provincial Ministry of the Environment, Conservation and Parks (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 Emission Summary and Dispersion Modelling (ESDM). The ESDM predicts contaminant concentrations from the facility at the facility fenceline 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 ambient air program has been established to measure the quality of the air surrounding the facility using high volume samplers with a focus on uranium. This is used to support CFM operations in the event of an upset condition, to support validation of existing air dispersion models and for periodic review of the ERA.

The waterborne effluent includes sanitary facilities, laundry and respiratory cleaning facilities, cooling water, and sintered pellet manual wash water. This is discharged to the Municipality of Port Hope sanitary sewer system and is monitored in accordance with operating licence requirements and sewer use by-law. Automatic, composite sampling based on an equal volume/time sampling methodology is used to collect representative samples of the combined discharges to the sanitary sewer from the uranium processing portion of the facility and the groundwater treatment system. An additional output to the sanitary sewer from non-production areas exits on the west side of the facility.

Groundwater collection is also regulated under a Permit to Take Water (PTTW) from the MECP. Groundwater sampling and groundwater level monitoring is completed semi-annually at numerous monitoring wells and pumping wells within the licensed and unlicensed portions of the CFM property. Semi-annual groundwater sampling and groundwater level monitoring is also completed at monitoring wells on adjacent properties bordering Peter Street. The groundwater treatment system inlet and outlet are also sampled twice annually for uranium and volatile organic compounds (VOC).

The aquatic environmental monitoring program is intended to collect data to monitor stormwater discharges to municipal infrastructure and the Gages Creek tributary, in addition to monitoring surface water quality within the Gages Creek tributary.

3.9.2 Past Performance

Uranium Loadings

As detailed Table 3, CFM's total uranium loadings to the environment have remained low and well below the applicable limits throughout the review period. Emissions to air represent a combination of uranium loadings from the process stacks as determined from the routine stack sampling program, and uranium loadings from the various process area ventilation exhaust systems, as determined by in-plant air sampling data and exhaust discharge rates.

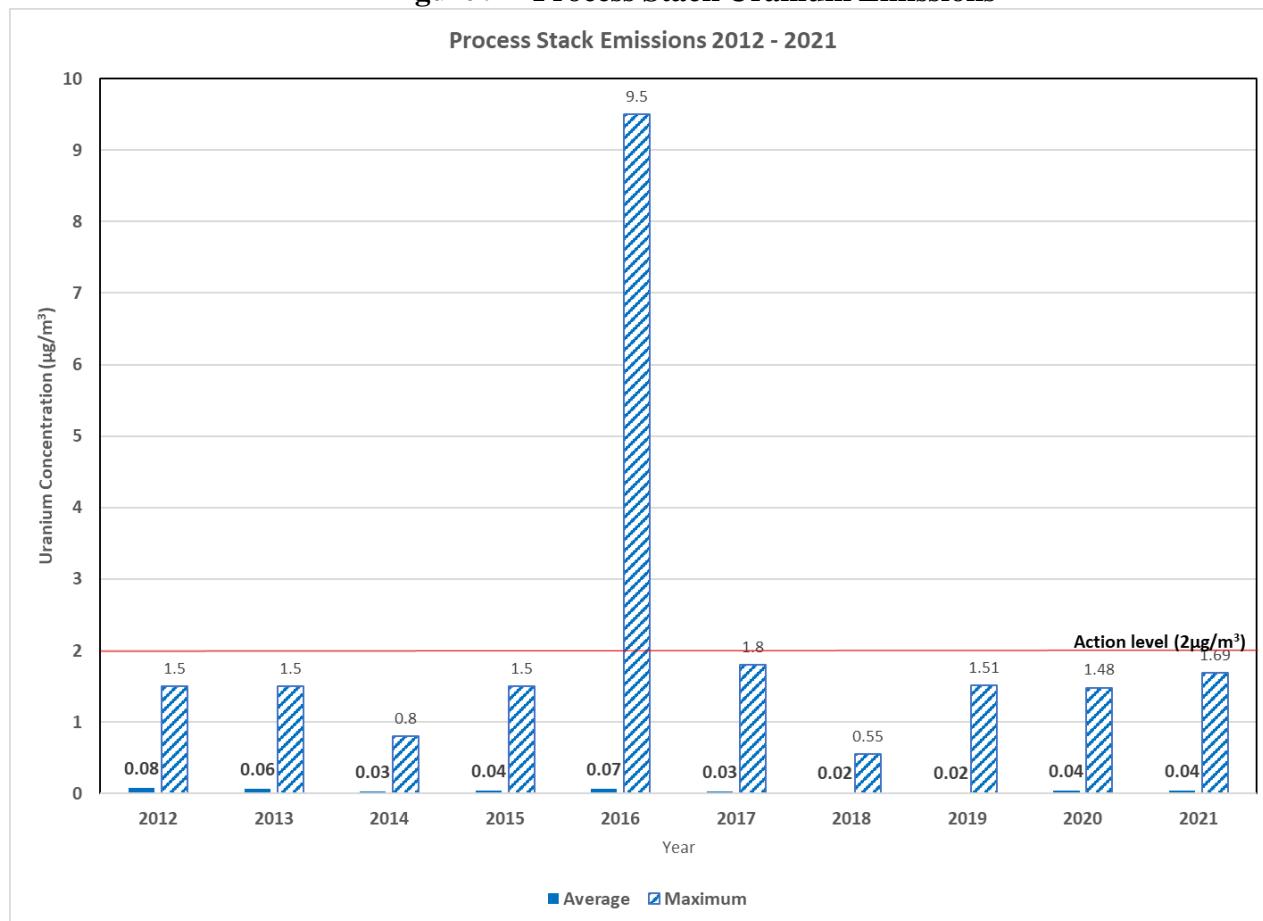
Again, while low and well below the applicable limits, the variation in uranium loadings to water from year-to-year is attributable to both changes in annual production levels and to the volume of wastewater discharged in a given year.

Table 3 Total Uranium Loadings to the Environment

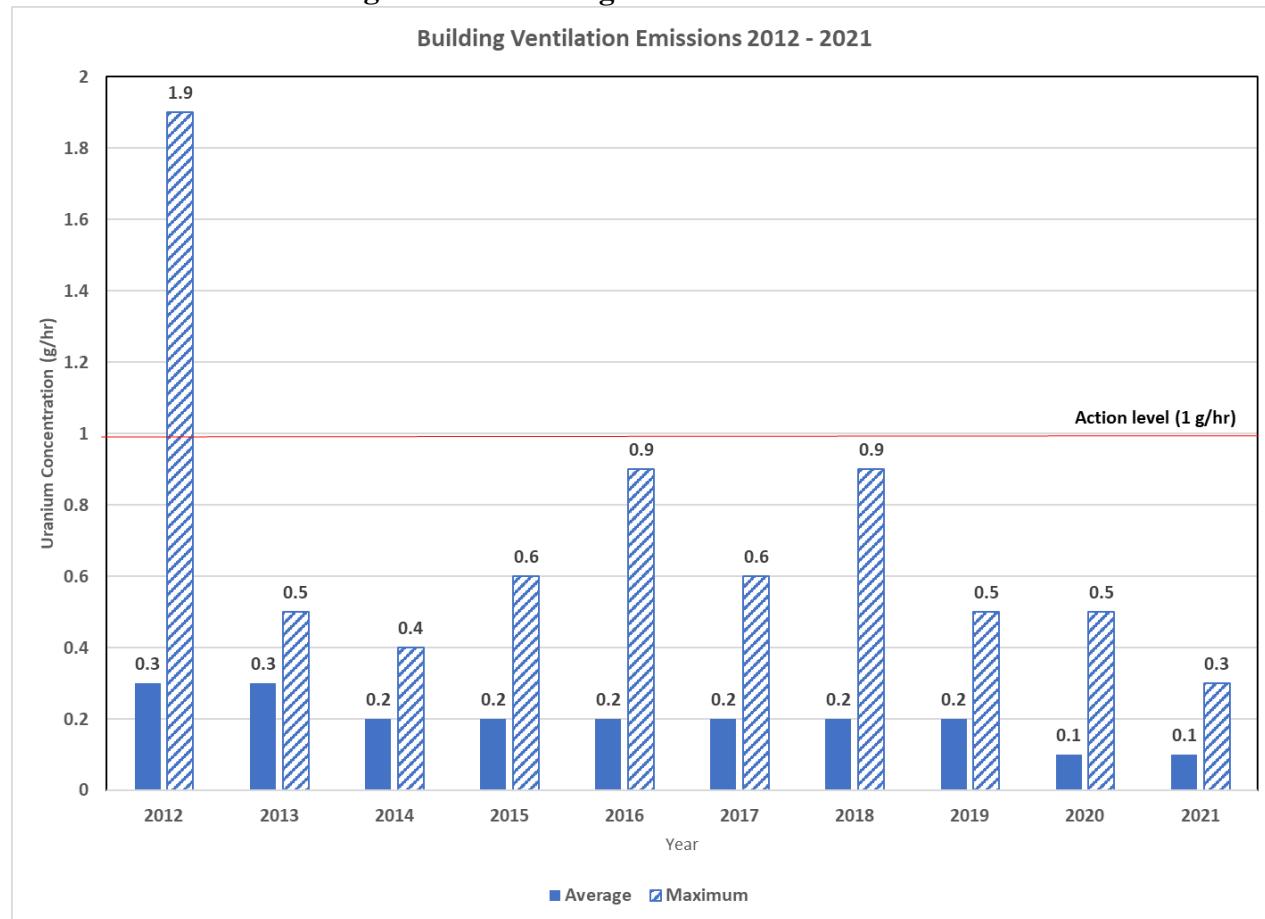
Emission	Limit (kg/y)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Air (kg/year)	10.5	0.59	0.51	0.41	0.46	0.73	0.67	1.26	1.09	0.93	0.90
Water (kg/year)	62	0.95	0.83	1.58	1.24	0.85	0.64	0.84	0.39	0.34	0.29
Total (kg/year)		1.54	1.34	1.99	1.70	1.58	1.31	2.10	1.48	1.27	1.19

Source Monitoring

The results from the air emissions monitoring are set out in Figures 9 through 11. The current action level is shown in each figure. The limit for air emissions applies to the combined discharge from process stacks and building ventilation and is not shown on the graph. The data shows that air emission discharges from CFM continue to be well below the emissions limits.

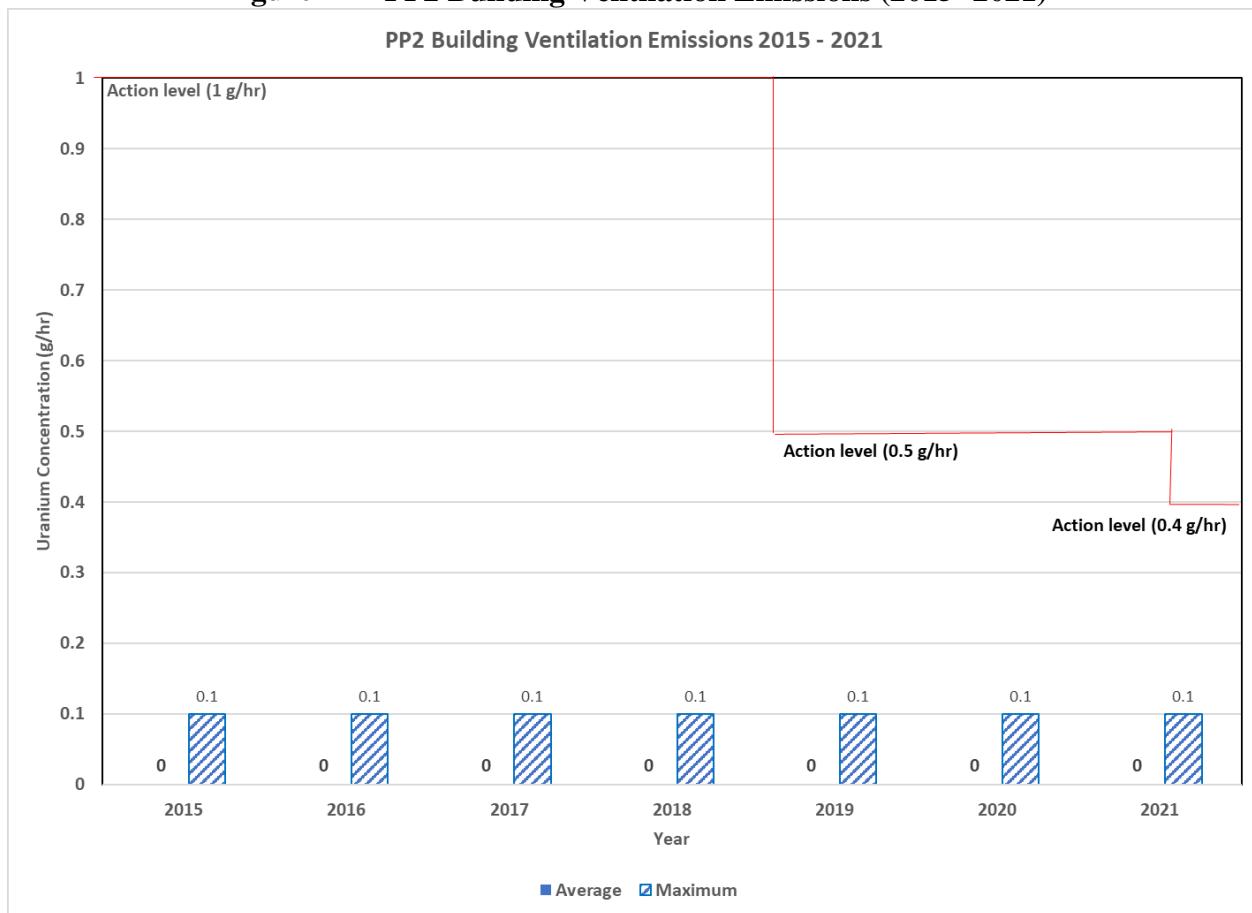
Figure 9 – Process Stack Uranium Emissions


The action level was exceeded once during the licence term in 2016. This event was the result of a HEPA filter not being properly clamped down during installation. The filter shifted in the housing and increased uranium emissions that were detected via routine daily monitoring. An investigation was completed, and corrective actions were implemented.

Figure 10 – Building Ventilation Uranium Emissions


There was one exceedance of the building ventilation action level in the review period. This took place in 2012 and was the result of a spill of UO₂ powder due to an equipment failure when transferring powder between areas in the plant. There was no measurable exposure to workers. An investigation was completed and corrective actions were implemented.

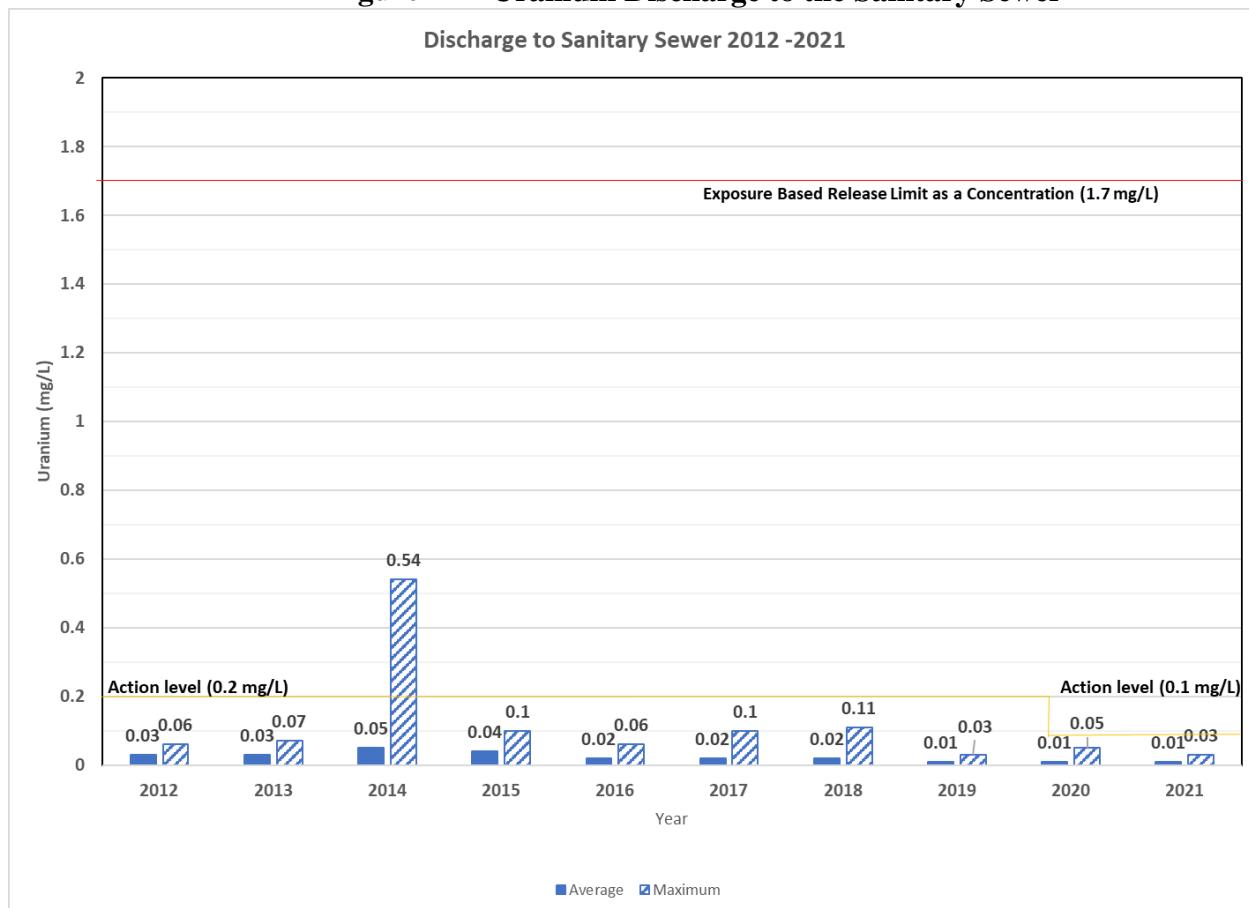
In 2015, the upgraded powder preparation and pressing equipment (known as PP2) was brought online and building ventilation emissions for this area were calculated with CAMHEAD data and exhaust discharge rates, accounting also for the HEPA filtration on these discharges. A separate action level of 0.5 g/hr for the PP2 building ventilation was implemented in 2018. This action level was reviewed again in 2021 and has been reduced to 0.4 g/hr effective July 2021. In Figure 11, this change is shown along with the performance of the relevant area of the plant.

Figure 11 – PP2 Building Ventilation Emissions (2015 -2021)


Water Monitoring

The results from CFM's liquid effluent emissions monitoring are set out in Figure 12. The current licence limit is 1.7 mg/L, which was approved by the Commission in the 2021 licence renewal, which aligns the action level and licence limit in terms of units. In the review period, CFM has had an action level in place for the uranium concentration in the sanitary sewer discharge. CFM decreased this action level to 0.1 mg U/L during the review period. As detailed below, there were two exceedances of the applicable action level during the review period:

- 2014 (one exceedance) - maintenance work on the furnace sanitary sewer lines dislodged historic material to the sanitary sewer. CFM reported the incident and it was investigated in accordance with the corrective action process and corrective actions identified were implemented.
- 2018 (one exceedance) - as of January 2018, the action level was lowered from 0.2 mg U/L to 0.1 mg U/L. That same month during the commissioning of a new grinder system, the discharge to sanitary sewer was measured at 0.11 mg U/L. After investigation and with concurrence from CNSC staff, the previous action level was reinstated until the grinder project was completed to allow for some variability during commissioning of the grinder. The lower action level of 0.1 mg U/L was implemented in January 2020 with no further exceedances.

Figure 12 – Uranium Discharge to the Sanitary Sewer


Dose to the Public

Within the regulatory framework, radiation doses to the public are considered in the environmental protection SCA. The annual dose limit for a member of the public is 1.0 mSv. The annual dose to the public from CFM operations is determined using a critical receptor who, given their proximity to the facility and the theoretical length of time that could be spent at this location, would be expected to receive the highest possible radiation dose that any member of the public could receive as a result of CFM's operations. Based on previous DRL reports, for the majority of the review period, CFM identified the residents living immediately to the west of the facility as the critical receptor, as these residences were closest to the facility. The dose to the public was calculated from the emissions to air and the gamma dose as measured on the west fenceline of the facility. This approach was accepted by CNSC staff.

In 2021, CFM updated the Derived Release Limit Report to incorporate assessments of:

- a worker at the Port Hope Sewage Treatment Plant (STP),
- a palliative care facility constructed in 2014 to the northwest of CFM,
- changes to fuel storage practices,
- a shield berm installed on the north side of the fuel storage building,
- the current version of N288.1 *Establishing and implementing action levels for releases to the environment from nuclear facilities*.

This update resulted in significant changes to how the dose to the public is calculated. Most significantly, the critical receptor changed from the residents to the west of the facility to the residents of the palliative care facility to the northwest of the facility. The gamma dose as measured on the north fenceline was determined to be most appropriate for calculation of dose at this receptor location. Additionally, the assessment of the STP worker indicated that although small, dose from water discharges needed to be included in the calculation of the dose to the public.

Based on the 2021 DRL, the dose to the public from CFM operations is now calculated using three components: dose to the public from air emissions, dose from water discharges and dose from gamma radiation. The dose to the public from air and water emissions is a small fraction of the public dose limit. Therefore, the gamma component represents virtually all the estimated public dose.

Similar to the changes to the calculations for dose to the public at PHCF in 2016 following the update to the DRL, the updated dose calculations for CFM related to the releases to water and fenceline gamma location are more conservative than those previously used. The reported dose for 2021 appears higher than previous years, but there has not been an actual increase in the emission/dose from the facility. The results represent a much more conservative estimate of dose to the public because the gamma monitoring location at the facility fenceline is now closer to the operating facility than the previous location, resulting in the increase shown in Table 4. For this reason, the results beginning in 2021 should not be compared with previous years' results.

Due to the previous identification of the critical receptor as being directly west of the facility, CFM has focused considerable effort on ensuring adequate shielding to the west side of the fuel storage area. Following the updated DRL and the first year of calculating dose based on a different critical receptor, CFM has identified an opportunity to improve the gamma shielding on the north side of the Fuel Storage Building and will be implementing projects to reduce the dose measured at the fenceline beginning in 2023.

Table 4 – Dose to the Public

Parameter	2012 – 2021 Dose to the Public (mSv/yr)									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Air (combined)	0.002	0.002	0.001	0.002	0.003	0.002	0.004	0.004	0.003	0.021
Liquid	Not included	Not included	Not included	Not included	Not included	Not included	Not included	Not included	Not included	0.004
Gamma (Location 12)	-	-	-	-	-	-	-	-	-	0.281
Gamma (Location 1)	0.029	0.011	0.017	0.023	0.02	0.02	0.026	0.023	0.017	0.002*
Total dose to Previous Critical Receptor (Location #1)	0.031	0.013	0.018	0.025	0.023	0.022	0.03	0.027	0.02	0.027*
Total Dose to Critical Receptor (Location #12)	-	-	-	-	-	-	-	-	-	0.306 ⁺

* Data calculated using location #1 gamma dose as well as revised DRL's and including liquid dose

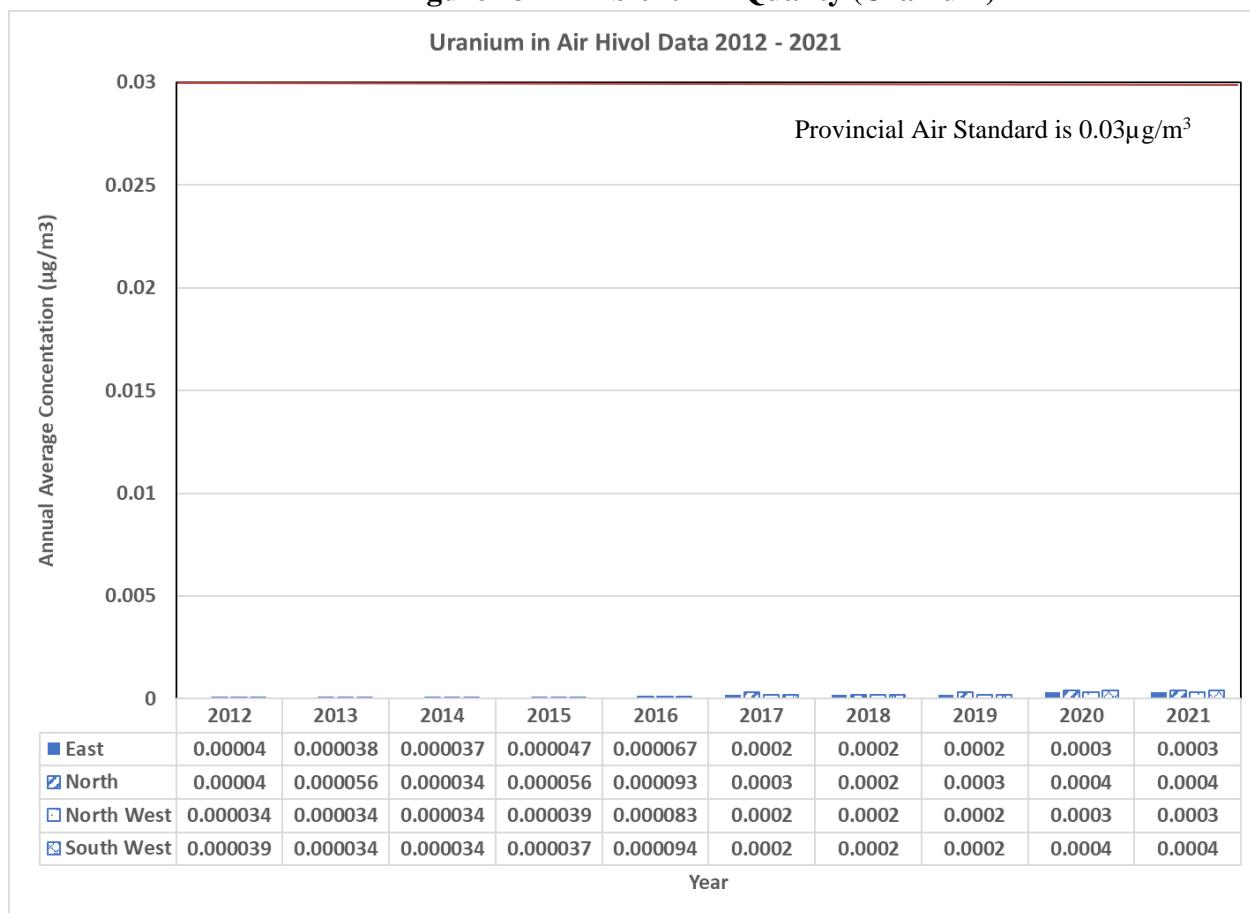
+ Data calculated using location #12 gamma dose as well as revised DRL's and including liquid dose

- Not calculated in specified time period

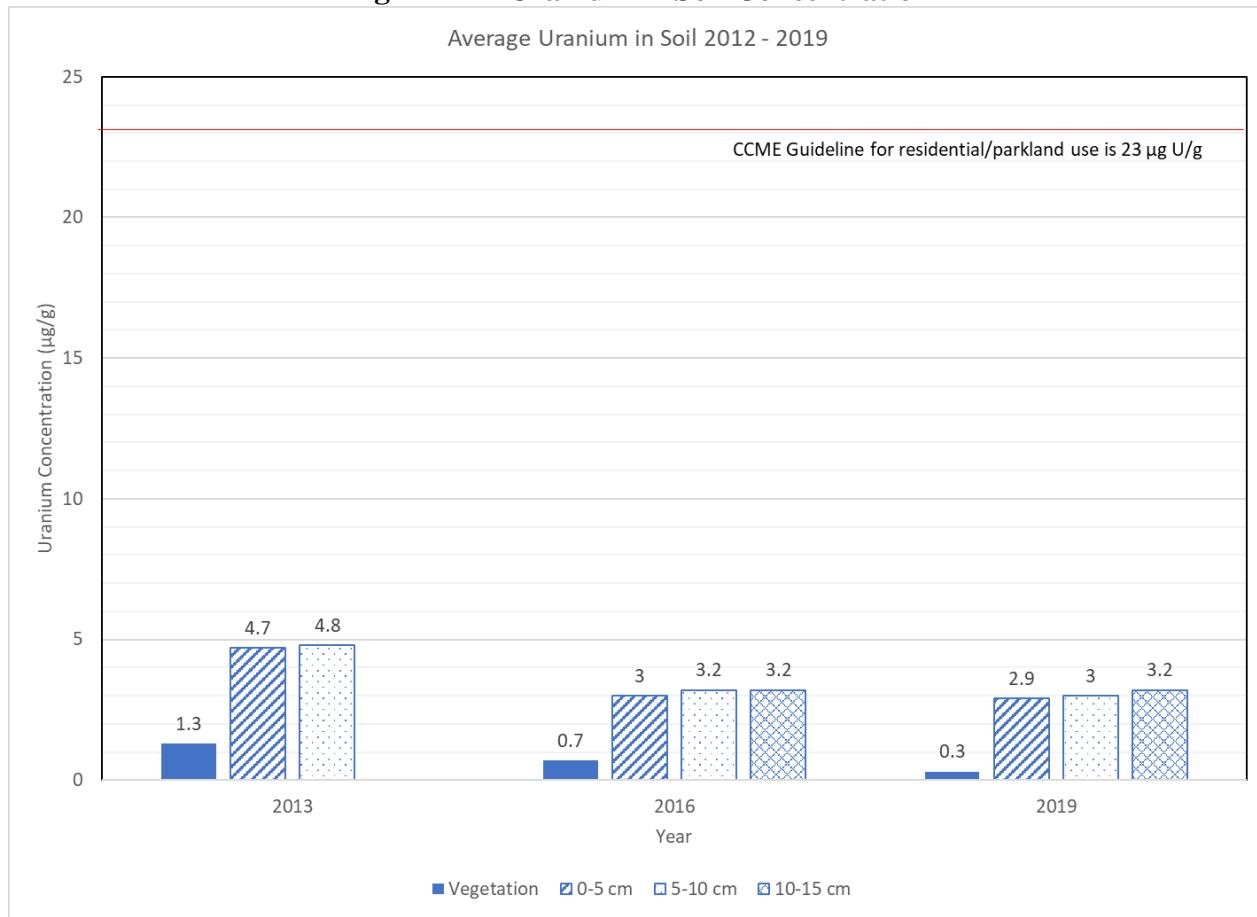
Ambient Monitoring

CFM's ambient air monitoring and terrestrial monitoring programs supported the stack monitoring program with results being a small fraction of the applicable federal and/or provincial objectives, guidelines and criteria as illustrated in Figures 13 and 14.

The hi-vol monitoring data from the review period are shown in Figure 13. As part of the investigation into the 2016 process stack action level exceedance discussed previously, an opportunity was identified to improve data reporting for hi-vols. An assessment was completed in 2017 to compare analysis techniques, and CFM switched to hi-vol analysis by ICP-MS in 2018, which is the same analysis technique used by Cameco at the PHCF and BRR.

Figure 13 – Ambient Air Quality (Uranium)


At least every three years, vegetation and core samples are each separately collected at 23 locations surrounding the CFM facility. A summary of soil samples collected during the review period are shown in Figure 14. All samples were well below the Canadian Council of Ministers of the Environment (CCME) soil guideline for residential/parkland property use ($23\ \mu\text{g U/g}$) that is shown on the figure.

Figure 14 – Uranium in Soil Concentration


Groundwater

CFM has an extensive groundwater monitoring program in place. Groundwater sampling is completed at up to 70 monitoring wells, up to 12 pumping wells, up to three sumps associated with the groundwater treatment system, as well as groundwater treatment system influent and effluent. Groundwater monitoring locations are sampled semi-annually in the spring and fall of each year. Fifty-six wells are located within the fenceline, which defines the licensed site. CFM submits annual groundwater reports to CNSC staff and MECP. A groundwater protection program is in place that meets the CSA standard, N288.7-17, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills*.

Uranium in groundwater on the CFM site meets the MECP Table 3 Standard of 420 µg/L, except for a localized area in the north-east corner of the licensed site. This is attributed to historic contamination of the soil in this area. During the review period, CFM conducted additional subsurface investigation in this area to determine the extent of the uranium contamination in soil. This area is planned for remediation in the next licence period.

Cameco's corporate SHEQ audit program includes audits of the CFM EP at least once every three years. In the review period, no significant issues were identified during these audits, opportunities

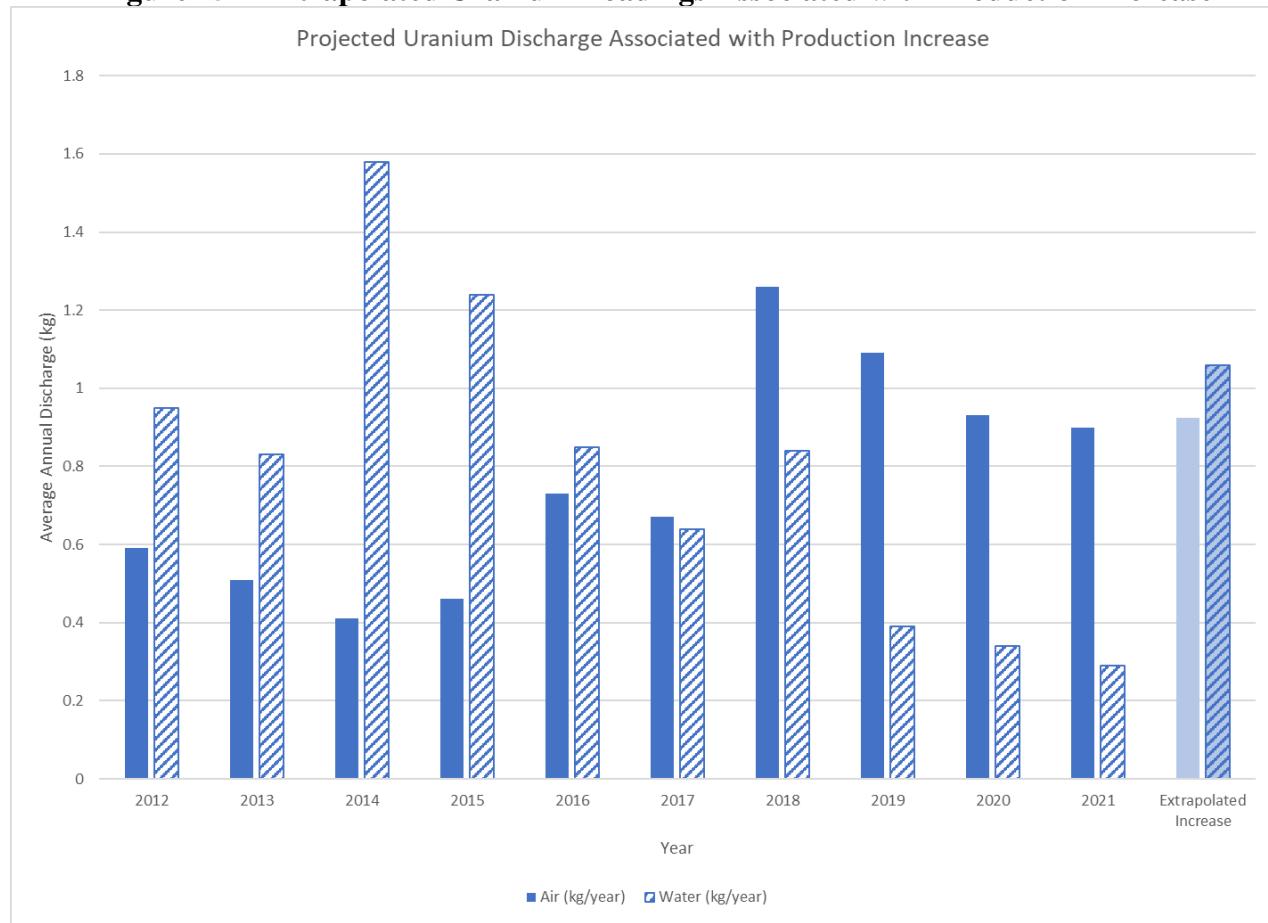
for improvement and minor findings were investigated with appropriate action taken and documented in CIRS.

Throughout the licensing period, the EPP has been demonstrated to be effective and environmental releases from the CFM in general continue to be very low compared to regulatory limits and guidelines. CFM will continue to look for ways to improve the performance of the operation using the corrective action process to document all inspections, audits, incidents and events from reporting to verification of completeness of corrective actions.

3.9.3 Future Plans

REGDOC 2.9.2, *Environmental Protection: Controlling Releases to the Environment* is expected to be published in the next licence period. There is an established process for review of new standards and REGDOCs and their incorporation as CVC or guidance in the LCH. In accordance with this process, CFM will identify and address any gaps in the CFM-EP on a schedule accepted by CNSC staff. As a follow-up to the 2021 DRL, CFM will also be investing in gamma dose mitigation to reduce the calculated dose to the public beginning in 2023.

The proposed production increase would not necessitate changes to the CFM-EP or an update to the ESDM, DRL, ERA, or EBRLs. Even with extrapolating a 25% increase in uranium loadings to air and water, CFM would retain its current limits and action levels. Further, the average extrapolated increase in air and sanitary sewer emissions is within the actual range of the review period as shown in Figure 15 and would not impact the conclusions of either the 2016 ERA or the 2021 ERA review. CFM completed a review of its ERA which showed that the production limit change poses no undue risk to people or the environment.

Figure 15 – Extrapolated Uranium Loadings Associated with Production Increase


3.9.4 Challenges

The regulatory framework for environmental protection is expected to be further developed over the next licence period. CFM will continue to work closely with CNSC staff to determine the appropriate priority of implementing new standardized requirements across all SCA's.

3.9.5 Requests

CFM has no requests at this time.

3.10 Emergency Management and Fire Protection

Emergency management and fire protection covers emergency management plans and fire protection plans that exist for emergencies and for non-routine conditions. This also includes any results of participation in emergency response exercises.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Emergency Management and Fire Protection SCA.

3.10.1 Relevance and Management

Emergency planning for nuclear facilities is a requirement of the NSCA, the *Class I Nuclear Facilities Regulations* and the Licence. During the review period, REGDOC 2.10.1, *Nuclear Emergency Preparedness and Response* and CSA N393-13 (R2018) were published and incorporated into the licence conditions handbook.

CFM has well-established measures to prevent or mitigate the effects of accidental releases of nuclear and other hazardous substances. The measures and response actions are documented in the current versions of the facility's Emergency Response Plan and supporting documents. This plan and its procedures outline the actions to be taken to minimize the worker and public health hazards and environmental hazards, which may result from fires, explosions, or the release of hazardous materials. Interaction with off- site authorities is also addressed in the plan.

Emergency preparedness and response training is provided on an ongoing basis to ensure immediate responders have the knowledge and skills necessary to provide for an effective emergency response. Full emergency response support for CFM is provided by the Port Hope Fire and Emergency Services organization as set out in a Memorandum of Understanding.

The Fire Protection Plan establishes provisions to prevent, mitigate and respond to fires such that fire risk to workers, the public, the environment and CFM property is acceptably low and controlled. It meets internal Cameco requirements as well as the *National Fire Code of Canada*, 2015, the *National Building Code of Canada*, 2015 and CSA 393-13 (R2018). The purpose of this plan is to define management responsibilities, objectives, elements and controls required to achieve the fire safety objectives. It applies to all existing buildings at the CFM facility as well as to the design and construction of new buildings and facilities, to the modification of existing facilities, and through their different operational stages, including shutdown and decommissioning.

The emergency response organization includes the immediate responders at CFM, the local emergency response team, which deals with the event at the site level, and the divisional Local Crisis Management Team, which is supported – as necessary - by the Cameco Corporate Crisis Management Team. These multiple layers of support ensure any emergencies within the organization are dealt with appropriately.

3.10.2 Past Performance

Each year, CFM conducts a number of internal drills and training exercises to test the effectiveness of the site and the emergency response organization. This includes full-scale emergency response exercises, including participation from local emergency services and hospital every 3 years. An exercise is planned for fall 2022.

Facility fire inspections are carried out for every area of the facility in accordance with the applicable CSA standards and REGDOCs. Any areas for improvement are documented and tracked in CIRS to ensure the corrective actions are taken.

3.10.3 Future Plans

It is expected that CFM will continue to maintain and enhance, if necessary, its Emergency Management and Fire Protection plans to address new regulatory requirements and opportunities for improvement identified during drills/exercises and other assessments during the next licence period.

3.10.4 Challenges

CFM has not identified any challenges associated with this SCA.

3.10.5 Requests

CFM has no requests at this time.

3.11 Waste Management

The waste management SCA covers the internal waste-related programs, which form part of the facility's operations up to the point where the waste is removed from the facility to a separate waste management facility. It also covers the planning for decommissioning.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Waste Management SCA.

3.11.1 Relevance and Management

CFM's Waste Management Plan for management of radioactive waste in solid, liquid or gaseous states satisfies CSA N292.3-14, *Management of low and intermediate level radioactive waste* and CSA N292.0-14, *General principles for the management of radioactive waste and irradiated fuel* and for hazardous waste as defined by O. Reg. 347 *General – Waste Management*.

This plan describes the waste-related processes and work instructions that form part of CFM's operations and describes how waste is managed throughout its lifecycle to the point of disposal. It includes waste generation, storage, processing, recycling and removal/transfer to an appropriate waste management or other facility. A summary of waste management is available on the community website.

CFM's Waste Management Plan has 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 the waste material produced, received, disposed of and stored, including quantities and locations 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.

Preliminary Decommissioning Plan (PDP)

CFM maintains a PDP and financial guarantee for decommissioning. These documents are developed in accordance with CSA N294-19, *Decommissioning of facilities containing nuclear substances* and the CNSC's G-206 (*Financial Guarantees*). The PDP is reviewed and revised as appropriate every five years and will be reviewed and updated at least four times in the proposed licence period. The last update completed in 2021 and the revised financial guarantee of \$10.8 million was approved by the Commission in the December 2021 hearing in writing. A summary of the PDP is available on the community website.

3.11.2 Past Performance

Solid wastes contaminated by uranium are reprocessed, recycled and re-used to the extent possible. Waste materials that cannot be reprocessed, recycled or re-used are safely stored onsite until appropriate disposal options are available.

In the review period, several activities were undertaken to address the accumulated legacy radioactive waste that has been stored at CFM. In 2014, CFM began routine shipments of contaminated combustible material to BRR for incineration. Also in 2014, two significant campaigns were undertaken to transfer approximately 900 m³ of contaminated non-combustible materials to an appropriately permitted facility in the United States. In 2019, CFM implemented a small-scale project model for routine shipments of contaminated non-combustible waste to an appropriately permitted facility in the US. Routine disposal of this material began in 2019. Between 2019 and 2021, approximately 500 m³ of this legacy waste was safely disposed of. CFM is currently sorting and characterizing the remaining inventory of legacy packaged waste in order to determine appropriate handling, processing and/or disposal plans.

During the review period, CFM incorporated the CSA standard N292.3-14 and CSA standard N292.0-14 into its Waste Management Plan.

3.11.3 Future Plans

CFM is currently developing the gap analysis for REGDOC 2.11.1, *Waste Management, Volume 1: Management of Radioactive Waste* and REGDOC 2.11.2, *Decommissioning*. CFM will then revise the applicable documents on a proposed schedule that will have to be accepted by CNSC staff. CFM will continue to characterize the remaining packaged legacy waste and determine the appropriate disposition for this material.

3.11.4 Challenges

CFM has not been able to find any commercially viable low-level radioactive waste management facility in Canada for disposal of waste. Cameco intends to meet this challenge through continued recycling initiatives and by using international disposal opportunities to reduce the waste inventory at CFM when appropriate.

3.11.5 Requests

CFM has no requests at this time.

3.12 Security

This SCA covers the programs required to implement and support the security requirements stipulated in the GNSCR, the *Nuclear Security Regulations* and other CNSC documents, such as those prescribed in REGDOC 2.12.3, *Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material, Version 2*.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Security SCA.

3.12.1 Relevance and Management

CFM's Security Plan presents an overview of the security operations at CFM and identifies the systems and processes in place to meet security program objectives. Accordingly, this document is considered prescribed information and is subject to the requirements of the GNSCR. The objective of the Security Plan is to ensure safe and secure operation of the facility, by maintaining protection through use of equipment, personnel, and procedures. The CFM Security Plan has continued to evolve to meet all regulatory requirements and commitments over the review period.

3.12.2 Past Performance

During the review period, the CNSC's Nuclear Security Division reviewed CFM's security plan. CFM used the findings and recommendations of CNSC staff to improve the overall security plan.

3.12.3 Future Plans

CFM will continue to maintain and enhance, if necessary, its Security Plan during the upcoming licence period.

3.12.4 Challenges

At this time, CFM foresees no challenges with respect to maintaining an effective security program during the next licence period.

3.12.5 Requests

CFM has no requests at this time.

3.13 Safeguards

Safeguards cover the programs required for the successful implementation of the obligations arising from the Canada/International Atomic Energy Agency (IAEA) Safeguards Agreement, as well as all other measures arising from the *Treaty on the Non-Proliferation of Nuclear Weapons*.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Safeguards SCA.

3.13.1 Relevance and Management

CFM reports in accordance with REGDOC 2.13.1, *Safeguards and Nuclear Material Accounting*. The facility maintains a natural uranium inventory system in which receipts and shipments are recorded. Monthly inventory reports are provided to the CNSC that include safeguarded natural uranium as well as the inventory of non-safeguarded material.

CFM completes an annual Physical Inventory Taking (PIT) as part of the Safeguards Program, which is followed by a Physical Inventory Verification (PIV) with the IAEA or a Physical Inventory Taking Evaluation with the CNSC. Design Information Verification (DIV) may occur during a PIV or as a separate activity. Short Notice Random Inspections (SNRIs) of the facility are conducted by the IAEA periodically throughout the year to verify compliance to safeguard obligations.

3.13.2 Past Performance

During the review period, a total of fifteen SNRIs, ten PIVs, eight DIVs and one special assessment have been carried out by the IAEA and/or CNSC as part of safeguards activities at CFM.

3.13.3 Future Plans

CFM will continue to maintain and enhance, if necessary, the Safeguards Program during the upcoming licensing period.

3.13.4 Challenges

Over the review period, the scope of IAEA inspections and demands made during these inspections have continued to increase. The resource requirements for Cameco to meet the demands of the IAEA have grown without clear linkage to a safety or security benefit. CFM will continue to comply with the safeguards requirements within Canada and will continue to work to ensure future inspections, verifications and new requirements proceed in a manner that brings value and efficiency to all organizations involved.

3.13.5 Requests

CFM has no requests at this time.

3.14 Packaging and Transport

The packaging and transport SCA addresses the programs that cover the safe packaging and transport of nuclear substances and radiation devices to and from the licensed facility.

Throughout the review period, CNSC staff rated CFM as satisfactory in the Packaging and Transport SCA.

3.14.1 Relevance and Management

The site has procedures related to the handling, storing, loading, transporting and receipt of nuclear substances and other dangerous goods.

Nuclear substances are packaged and transported on public roadways, railways and marine transport around the world in accordance with the *Transportation of Dangerous Goods Act* and its regulations (TDGR) and the *Packaging and Transport of Nuclear Substances Regulations, 2015* (PTNSR). As described in the Packaging and Transportation Program, Cameco maintains corporate standards and CFM maintains site procedures that cover the safe packaging and transport of nuclear substances to and from licensed facilities.

Workers are trained in the safe handling, packaging, marking, labelling, shipping (placard and documentation) and receipt of dangerous and/or radioactive goods commensurate with their responsibilities. Detailed work instructions are documented, and workers are trained in the safe handling of nuclear substances and dangerous goods, as required by the TDGR, PTNSR and the *Canada Labour Code*, Part II.

If required by the *Nuclear Non-proliferation Import and Export Control Regulations*, then an import or export licence is obtained from the CNSC prior to shipment and corresponding import or export permits are also obtained from Global Affairs Canada.

3.14.2 Past Performance

UO₂ powder is transported by road from the PHCF to CFM. Finished fuel bundles are transported to customer locations in shipping containers that meet the package requirements as specified in the PTNSR.

During the review period, two minor transportation events were reported by CFM related to material shipped from PHCF to CFM. These were investigated, corrective actions put into place, and no environmental impacts occurred as a result.

3.14.3 Future Plans

CFM will continue to comply with all existing and new regulatory requirements in this SCA in the next licensing period.

3.14.4 Challenges

CFM does not foresee any challenges with respect to this SCA during the next licence period.

3.14.5 Requests

CFM has no requests at this time.

4.0 OTHER MATTERS OF REGULATORY INTEREST

4.1 *Environmental Assessment*

CFM does not have any active projects in the environmental assessment (EA) process under the *Canadian Environmental Assessment Act, 2012* or the federal *Impact Assessment Act*.

4.2 *Aboriginal Engagement*

FSD is committed to provide opportunities to engage with First Nation and Métis communities regarding CFM's ongoing operations.

There are no First Nations communities located within the Municipality of Port Hope. However, Mississaugas of Scugog Island First Nation, Hiawatha First Nation, Alderville First Nation and Curve Lake First Nation are included in the Port Hope primary target audience of the PIP. Efforts to engage this audience include:

- Issuing an annual letter/email to Indigenous communities to determine interest in further engagement and preferences for engagement such as meetings and/or facility tours.
- Emailing the Energize newsletter.
- Emailing a copy of the Annual Reports.
- Mailing/emailing a copy of the Quarterly Compliance Monitoring and Operational Performance Report.
- Inviting First Nations to any FSD-led activities such as information sessions or community barbeques.
- Informing of any licensing activities through letters/email.

The Chippewas of Beausoleil First Nation, Chippewas of Georgina Island First Nation, Chippewas of Rama First Nation, Mohawks of the Bay of Quinte, and the Métis Nation of Ontario Region 6 are part of the Port Hope secondary target audience identified in the PIP. Efforts to engage with these groups include:

- Issuing an annual letter/email to determine interest in further engagement including meetings and/or facility tours.
- Informing of any licensing activities.

As with any interested party, FSD will review and respond accordingly to any request from an interested Indigenous community. FSD now meets regularly with Curve Lake First Nation and Mississaugas of Scugog Island First Nation to discuss areas of interest, such as licensing activities, environmental monitoring, and public disclosure.

FSD will continue outreach to the local First Nations and Métis communities throughout the licensing process and subsequent licence period. CFM's preliminary assessment of the licence renewal,

including the proposed production limit change, is that it would not result in any new or additional adverse impacts on the Indigenous or treaty rights of Indigenous target audiences for CFM as described in the PIP and identified in section 5. Our preliminary assessment is based on a number of factors, including that: (i) the potential effects of CFM's operations on the environment and the health and safety of people are localized to the vicinity of CFM's operations; (ii) CFM is located within the Municipality of Port Hope on property owned by CFM; and (iii) there are no Indigenous communities located either within Port Hope or the vicinity of CFM. CFM completed a review of its ERA which showed that the production limit change poses no undue risk to people or the environment. However, despite our preliminary assessment, supportive communities is one of Cameco's four measures of success, and in consideration of the guidance provided in the REGDOC 3.2.2, CFM submitted an Indigenous Engagement Report in support of the changes requested in its 20-year licence application.

An updated Indigenous Engagement Report is found in Appendix A

4.3 Other Engagement

The COVID-19 pandemic presented unprecedented challenges to our organization and our communities. As we navigated through these trying times, our top priority continued to be the health and safety of our employees, community and environment.

As the pandemic unfolded in March 2020, Cameco swiftly implemented a large complement of protective measures including:

- activation of Local Business Continuity Plans;
- increased sanitization and cleaning frequency;
- site access and health screening;
- suspension of non-essential work by visitors and contractors to reduce the number of people coming into the facilities;
- changes to lunch/break schedules to assist with social distancing;
- suspension of all in-person meetings and training;
- suspension of all business travel unless approved by the CEO; and
- working from home where possible.

Cameco takes its leadership role in Northumberland County very seriously and we strive to provide leadership, assistance and support to the community in many forms that range from donations of PPE, knowledge sharing, funding and time.

In April 2020, Cameco announced a \$250,000 COVID-19 Relief Fund for Northumberland County and the Blind River area. Twenty-three organizations in Northumberland County were awarded grants of up to \$20,000 to assist in their efforts to overcome the effects COVID-19 was having on their ability to serve their communities and support people in need.

Over the course of the pandemic Cameco also donated PPE to local organizations to assist with their COVID-19 response. Cameco donated 3M half face respirators and cartridges, N95 masks, respirator wipes, goggles and goggle style safety glasses to Northumberland Hills Hospital and

safety glasses to the Port Hope Police Services. Over 100,000 masks were also donated to other organizations across Northumberland County.

4.4 Cost Recovery

CFM is current on its cost recovery payments.

4.5 Financial Guarantees

CFM maintains a PDP, which is prepared based on guidance provided in CSA N294-19, G-219 (*Decommissioning Planning*) and G-206. The current financial guarantee, maintained in the form of an irrevocable letter of credit totaling \$10.8 million reflects the PDP accepted by the Commission during the December 2021 Hearing in Writing.

4.6 Other Regulatory Approvals

During the review period, the CFM received amendments to the following approvals from the MECP:

- Environmental Compliance Approval (ECA) for air emissions
- Permit to Take Water (PTTW) for its well water system

During the review period, CFM renewed the following with the TSSA:

- Authorized inspection agency agreement with the TSSA as required by the Licence and LCH.

4.7 Licensee's Public Information Program

FSD maintains a Public Information Program (PIP) that was designed in accordance with REGDOC 3.2.1, *Public Information and Disclosure*. FSD works to build and sustain the trust of local communities by operating safely and acting as a good corporate citizen in its local communities. A key element of building and sustaining that trust is a commitment to provide those in the community with accurate and transparent reporting of environmental practices and performance. These are central values for FSD and it is these values that drive the PIP.

Cameco remains committed to ensuring that information is made available to the communities in which we operate and to other interested stakeholders. The following information is made available to all members of the public through Cameco's corporate and/or community websites:

- Technical reports or summaries (e.g., environmental risk assessment, derived release limit assessment, safety analysis and preliminary decommissioning plan) are available on the dedicated community website, as are documents supporting licensing activities.
- CNSC Quarterly Monitoring and Operational Performance Reports and Annual Compliance Reports are also posted on the community website. These reports are also

sent to Curve Lake, Scugog Island, Alderville, Hiawatha and Rama First Nations and the Mohawks of the Bay of Quinte.

- Cameco may choose to develop and deploy videos to help highlight various aspects of its operations and/or community activities. These videos may be utilized on its website and/or social media or used at off-site events.
- Print material is available for all visitors to Cameco facilities and made available at off-site information sessions. Other information products are made available through the community website, which is promoted through online, social media, print and/or radio advertisements.
- Cameco may choose to use information boards to help highlight various aspects of its operations and community investment activities. These boards may be deployed at community or Cameco-led events.

For many years FSD has retained outside expertise to measure public opinion in Port Hope to help determine the effectiveness of the PIP. The most recent survey of more than 325 residents of Port Hope was completed by Fast Consulting in 2021. The final report is available on FSD's community website.

The survey results indicate that residents of Port Hope continue to show strong support for local FSD operations. 91% of local residents support FSD's continued operations in Port Hope. The results of the survey remain consistent with other significant findings including:

- The large majority of respondents (85%) agree Cameco does everything possible to protect people and environment.
- Nearly all (93%) agree Port Hope is a safe, healthy place to live, including 74% who 'strongly agree'.

The results of this public opinion research confirm that FSD's PIP is seen as effective and appropriate by the vast majority of Port Hope residents. FSD will continue to explore opportunities to enhance the Public Information Program for target audiences.

4.8 Nuclear Liability Insurance

CFM maintains the required nuclear liability insurance as required under the *Nuclear Liability Act* (NLA).

4.9 Additional/Other Matters

CFM has nothing to add at this time.

REFERENCES

The following documents have been posted on Cameco's community website to provide information in support of the licence renewal.

1. Cameco Corporation. 2022. *Cameco Fuel Manufacturing Licence Renewal Handbook*.
2. Cameco Fuel Manufacturing. 2021. *Justification for Licence Term and Production Increase for Cameco Fuel Manufacturing Revision 1*
3. Cameco Fuel Manufacturing. 2021. *Cameco Fuel Manufacturing Renewal of Licence FFOL-3641.0/2023 for a 20-year term Revision 1*.
4. Cameco Corporation. 2022. *CFM Public Summary – Preliminary Decommissioning Plan*.
5. Cameco Corporation. 2021. *Review of the Environmental Risk Assessment for Cameco Fuel Manufacturing*. May 11, 2021.
6. Cameco Corporation. 2020. *Facility Licensing Manual Cameco Fuel Manufacturing*. July 28, 2020.
7. Cameco Corporation. 2018. *Environmental Risk Assessment for Cameco Fuel Manufacturing Refinery (Redacted)*. November 9, 2018.
8. Cameco Corporation. 2018. *Cameco Fuel Manufacturing - ERA Public Summary*. November 5, 2018.
9. Cameco Corporation. 2022. *Cameco Fuel Manufacturing – Public Summary – Safety Report*. August 2022
10. Cameco Corporation. 2017. *Fuel Services Division – Waste Management Overview*. November 7, 2017.

The following CNSC REGDOCs and CSA standards are applicable to this licence renewal.

1. Canadian Standards Association (CSA). 2019. B51-19 *Boiler, pressure vessel, and pressure piping code*
2. Canadian Standards Association (CSA). 2012 (R2017). N286-12 *Management system requirements for nuclear facilities*
3. Canadian Standards Association (CSA). 2021. N286.0.1-21 *Commentary on N286-12, Management system requirements for nuclear facilities*
4. Canadian Standards Association (CSA). 2014 (R2019). N288.1-14 *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities*
5. Canadian Standards Association (CSA). 2010 (R2015). CSA N288.4-10, *Environmental monitoring programs at class I nuclear facilities and uranium mines and mills*
6. Canadian Standards Association (CSA). 2011 (R2016). CSA N288.5-11, *Effluent monitoring programs at class I nuclear facilities and uranium mines and mills*
7. Canadian Standards Association (CSA). 2012 (R2017). CSA N288.6-12 *Environmental risk assessment at class I nuclear facilities and uranium mines and mills*

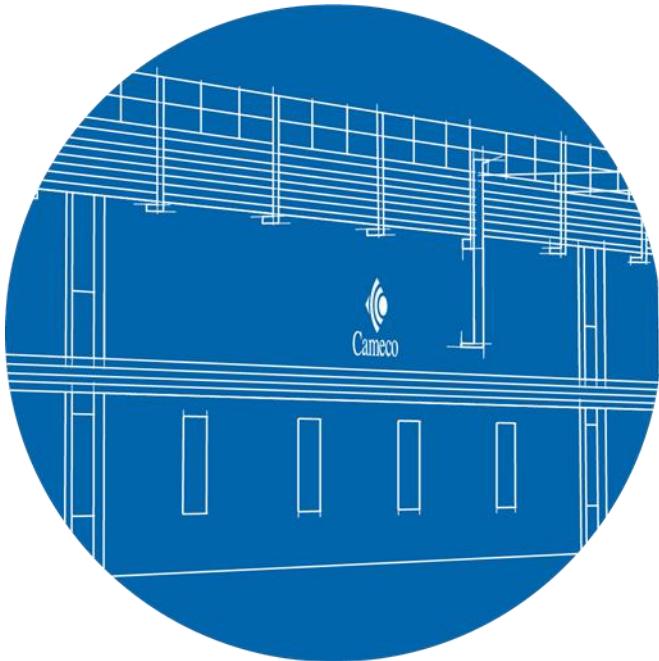
8. Canadian Standards Association (CSA). 2015. CSA N288.7-15 *Groundwater protection programs at class I nuclear facilities and uranium mines and mills*
9. Canadian Standards Association (CSA). 2017. CSA N288.8 *Establishing and implementing environmental action levels to control emissions from nuclear facilities*
10. Canadian Standards Association (CSA). 2013 (R2018). CSA N393-13, *Fire protection for facilities that process, handle, or store nuclear substances*
11. Canadian Standards Association (CSA). 2014. CSA N292.3-14 *Management of low- and intermediate-level radioactive waste*
12. Canadian Standards Association (CSA). 2014. CSA N292.0-14 *General principles for the management of radioactive waste and irradiated fuel*
13. Canadian Standards Association (CSA). 2019. CSA N294-19 *Decommissioning of facilities containing nuclear substances*
14. Canadian Standards Association (CSA). 2018. Z94.4-18 *Selection, use and care of respirators*
15. Canadian Nuclear Safety Commission (CNSC). 2000. G-206: *Financial guarantees guide for the decommissioning of licensed activities*
16. Canadian Nuclear Safety Commission (CNSC). 2018. REGDOC 2.1.2 – *Safety Culture*
17. Canadian Nuclear Safety Commission (CNSC). 2016. REGDOC 2.2.2 – *Personnel Training, Version 2*
18. Canadian Nuclear Safety Commission (CNSC). 2019. REGDOC 2.4.3 – *Nuclear Criticality Safety*
19. Canadian Nuclear Safety Commission (CNSC). 2020. REGDOC 2.9.1 – *Environmental Protection: Environmental Principles, Assessments and Protection Measures, version 1.2*
20. Canadian Nuclear Safety Commission (CNSC). 2016. REGDOC 2.10.1 – *Nuclear emergency preparedness and response*
21. Canadian Nuclear Safety Commission (CNSC). 2020. REGDOC 2.12.3 – *Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material Accountancy v2.1*
22. Canadian Nuclear Safety Commission (CNSC). 2018. REGDOC 2.13.1 – *Safeguards and Nuclear Material Accountancy*
23. Canadian Nuclear Safety Commission (CNSC). 2018. REGDOC 3.1.2 – *Reporting Requirements, Volume 1: Non-Power Reactor Class 1 Nuclear Facilities and Uranium Mines and Mills*
24. Canadian Nuclear Safety Commission (CNSC). 2018. REGDOC 3.2.1 – *Public Information and Disclosure*

GLOSSARY

AIA	Authorized Inspection Agency
ALARA	As Low As Reasonably Achievable
BRR	Blind River Refinery
Cameco	Cameco Corporation
CANDU	Canada Deuterium – Uranium
CCME	Canadian Council of Ministers of the Environment
CFM	Cameco Fuel Manufacturing Inc.
CFM-EP	CFM Environmental Protection Program Manual
CFM-MS	CFM Management System Program Manual
CFM-RP	CFM Radiation Program Manual
CIRS	Cameco Incident Reporting System
CMD	Commission Member Document
CNSC	Canadian Nuclear Safety Commission
CSA	Canadian Standards Association
CVC	Compliance Verification Criteria
DRL	Derived Release Limit
EA	Environmental Assessment
EBRL	Exposure Based Release Limit
EPP	Environmental Protection Program
ERA	Environmental Risk Assessment
ESDM	Emission Summary Dispersion Model
FFL	Fuel Facility Licence
FHA	Fire hazards analysis
FLM	Facility Licensing Manual
FSD	Fuel Services Division
GNSCR	<i>General Nuclear Safety and Control Regulations</i>
HEPA	High Efficiency Particulate Arresting
ISO	International Organization for Standardization
IAEA	International Atomic Energy Agency
JHSC	Joint Health and Safety Committee
KPI	Key Performance Indicator

LCH	Licence Conditions Handbook
Licence	FFL-3641.0/2023
LIMS	Laboratory Information Management System
LMS	Learning Management System
MDS	Management Document System
MECP	Ministry of the Environment, Conservation and Parks (Ontario)
Mg	Megagrams
MOC	Management of Change
NDR	National Dose Registry
NEW	Nuclear Energy Worker
NSCA	<i>Nuclear Safety and Control Act</i>
O. Reg.	Ontario Regulation
PDP	Preliminary Decommissioning Plan
PHCF	Port Hope Conversion Facility
PM	Preventative Maintenance
PIP	Public Information Program
PIT	Physical Inventory Taking
PIV	Physical Inventory Verification
PTNSR	<i>Packaging and Transport of Nuclear Substances Regulations, 2015</i>
PTTW	Permit to Take Water
REGDOC	CNSC Regulatory Document
PPP	Radiation protection program
SAR	Safety Analysis Report
SAT	Systematic Approach to Training
SCA	Safety and Control Area
SHEQ	Safety, health, environment and quality
SMR	Small Modular Reactor
SNRI	Short Notice Random Inspection
TDGR	<i>Transport of Dangerous Goods Regulations</i>
TPR	Third Party Review
TRIR	Total Recordable Injury Rate
TSSA	Technical Standards and Safety Authority
tU	Tonnes Uranium
UO₂	Uranium Dioxide
VOC	Volatile Organic Compounds

APPENDIX A



Cameco Fuel Manufacturing Indigenous Engagement Report

August 9, 2022

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Overview

On October 29, 2021, Cameco submitted its Indigenous Engagement Report (IER) to the Canadian Nuclear Safety Commission (CNSC) which was developed in support of Cameco Fuel Manufacturing's (CFM) 20-year licence renewal request to fulfill the requirements of the CNSC's REGDOC 3.2.2 Indigenous Engagement.

Cameco strives to keep Indigenous communities informed and adapts its approach based on the unique interests of and requests from the respective communities. Rama, Alderville, Hiawatha First Nations and the Mohawks of the Bay of Quinte have expressed interest in receiving updates from Cameco and therefore all receive the quarterly and annual compliance reports, the Energize newsletter and other information. In addition to also receiving this email correspondence, Curve Lake and Scugog Island First Nations meet regularly with Cameco.

The information provided in this section describes CFM's activities under the IER.

Indigenous Engagement

In the IER, Cameco committed to sending follow up letters to Indigenous communities three weeks after submitting the licence renewal application to the CNSC. Letters were emailed to all seven Williams Treaty First Nations, Mohawks of the Bay of Quinte and the Métis Nation of Ontario on October 27, 2021. Hiawatha First Nation acknowledged receipt. Scugog Island First Nation requested an introductory meeting which took place on November 5, 2021 and have since established regular meetings. Cameco also continues regular meetings with Curve Lake First Nation which began in March 2021.

The below table details the information emailed to Indigenous communities in 2021 and 2022 (as of the date of this report). Public Disclosures are emailed to Curve Lake First Nation and Scugog Island at their request and further reviewed and discussed in regular meetings.

Email Correspondence			
Topic	Method of Communication	Date	Indigenous Communities Contacted
Q4 2020 Compliance Report and follow up on introductory letter sent in December 2020.	Email	March 3, 2021	Hiawatha, Alderville, Curve Lake, Scugog Island, Rama, Beausoleil, Georgina Island, Mohawks of the Bay of Quinte
CFM 1-year licence renewal	Letter via email	March 10, 2021	Hiawatha, Alderville, Curve Lake, Scugog Island, Rama, Beausoleil, Georgina Island, Mohawks of the Bay of Quinte and Métis Nation of Ontario
2020 Annual Compliance Report	Email	April 14, 2021	Hiawatha, Alderville, Curve Lake, Scugog Island

Energize – Spring	Email	April 14, 2021	Hiawatha, Alderville, Curve Lake, Scugog Island
Q1 2021 Compliance Report	Email	July 27, 2021	Hiawatha, Alderville, Curve Lake, Scugog Island, Rama, Mohawks of the Bay of Quinte
Energize – Summer	Email	July 27, 2021	Hiawatha, Alderville, Curve Lake, Scugog Island, Rama, Mohawks of the Bay of Quinte
CFM – Letter of Intent 20-Year Licence	Letter via email	September 29, 2021	Hiawatha, Alderville, Curve Lake, Scugog Island, Rama, Beausoleil, Georgina Island, Mohawks of the Bay of Quinte and Métis Nation of Ontario
CFM – 20-Year application	Letter via email	October 27, 2021	Hiawatha, Alderville, Curve Lake, Scugog Island, Rama, Beausoleil, Georgina Island, Mohawks of the Bay of Quinte and Métis Nation of Ontario
Q2 2021 Compliance Report	Email	November 4, 2021	Hiawatha, Alderville, Curve Lake, Scugog Island, Rama and Mohawks of the Bay of Quinte
Q3 2021 Compliance Report	Email	December 10, 2021	Hiawatha, Alderville, Curve Lake, Scugog Island, Rama and Mohawks of the Bay of Quinte
Energize – Fall	Email	December 20, 2021	Hiawatha, Alderville, Curve Lake, Scugog Island, Rama and Mohawks of the Bay of Quinte
Q4 2021 and 2021 Annual Compliance Report	Email	April 7, 2022	Hiawatha, Alderville, Curve Lake, Scugog Island, Rama and Mohawks of the Bay of Quinte
Request for meeting	Email	April 21, 2022	Cameco received a request from Métis Nation of Ontario Region 6 for a meeting regarding CFM's licence renewal. Cameco replied on April 26, 2022 with potential dates in May.
Letter with CFM intervention information and CFM Licence Renewal Briefing Guide	Letter via email	May 13, 2022	Hiawatha, Alderville, Curve Lake, Scugog Island, Rama and Mohawks of the Bay of Quinte
Letter with CFM intervention information and CFM Licence Renewal Briefing Guide	Letter via email	May 13, 2022	Métis Nation of Ontario

Q1 2022 Compliance Report	Email	June 29, 2022	Hiawatha, Alderville, Curve Lake, Scugog Island, Rama and Mohawks of the Bay of Quinte
Energize – Fall	Email	June 29, 2022	Hiawatha, Alderville, Curve Lake, Scugog Island, Rama and Mohawks of the Bay of Quinte

Cameco held meetings with Curve Lake, Hiawatha and Scugog Island First Nations in 2021. Cameco established monthly meetings with Curve Lake and most of the 2021 and 2022 discussions focused on CFM due to CFM's licence renewal activities. Topics in which Curve Lake has expressed interest include environmental aspects such as emissions, monitoring and environmental risk assessments (ERAs), as well as identifying opportunities to incorporate Indigenous Knowledge. Cameco consulted with Curve Lake on the development of its land acknowledgement.

Cameco and Scugog Island First Nation met for the first time on November 5, 2021 and agreed to establish regular meetings in 2022 and work towards building a meaningful relationship. Meetings have focused on CFM due to CFM's licence renewal activities. Scugog Island has expressed interest in environmental monitoring and economic development.

Below is a summary of the meetings and topics covered since March 2021:

Meetings		
Indigenous Community	Date of Meeting	Topics
Curve Lake First Nation	March 10, 2021	Introduction to Cameco - CFM & Port Hope Conversion Facility (PHCF)
	April 28, 2021	CFM 1-year
	May 26, 2021	CFM 1-year Environmental Performance
	June 30, 2021	Waste Management
	August 25, 2021	Community Investment, Sustainability and COVID Response
	September 22, 2021	CFM 20-year and production increase
	October 12, 2021	Facility tour – PHCF and CFM
	October 27, 2021	CFM ERA
	December 7, 2021	Preliminary Decommissioning Plans – PHCF and CFM
	January 26, 2022	Review of 2021 – areas covered in meetings, action items/recommendations. Established focus areas for 2022 including CFM licence renewal.

		Established meeting schedule for 2022.
	February 23, 2022	Review of CFM licence renewal process and next steps. Curve Lake was supportive of including the land acknowledgement at the front of the CFM licence briefing book.
	April 1, 2022	CFM 20-year licence - key dates, what Cameco is asking for in the licence (what's different/what is the same) why 20 years, production increase - what that looks like.
	April 27, 2022	20-year CFM licence - environmental data
	July 27, 2022	CFM soil and groundwater monitoring programs
Hiawatha First Nation	March 30, 2021	Introduction to Cameco – CFM & PHCF
Mississaugas of Scugog Island First Nation	November 5, 2021	Introduction to Cameco – CFM & PHCF
	January 10, 2022	Reconnect and establish meeting schedule for 2022
	February 28, 2022	Community Investment, Sustainability and COVID Response
	March 24, 2022	CFM 20-year licence - key dates, what Cameco is asking for in the licence (what's different/what is the same) why 20 years, production increase - what that looks like.
	May 13, 2022	20-year CFM licence - environmental data
	July 26, 2022	CFM soil and groundwater monitoring programs

Additional Opportunities

Cameco's ongoing efforts to provide open communications and share information about its operations with Indigenous communities has resulted in further opportunities to meet with Indigenous communities and provide facility tours.

On March 23, Cameco hosted the Indigenous Advisory Council for the Small Modular Reactor Action Plan. The Council brings together Indigenous leaders from Ontario, Alberta, Nunavut, Saskatchewan, and New Brunswick. Cameco leadership provided tours of PHCF and CFM Port Hope and included overview presentations for each operation and opportunities for questions and dialogue.

Members of Anishinabek Nation toured the PHCF and CFM on May 24, 2022. The guests included the Anishinabek Nation Grand Council Chief, Northern Superior Regional Deputy Grand Council Chief (Biinjitiwaabik Zaaging Anishinaabek), Southeast Regional Deputy Grand Council Chief (Alderville First Nation), Southwest Regional Deputy Grand Council Chief (Chippewas of the Thames First Nation) and Curve Lake First Nation. The tours were provided by Cameco leadership and included overview presentations of each operation, and opportunities for questions and dialogue.