Cameco

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August 16, 2018

Mr. Mike Jones
Senior Project Officer
Nuclear Processing Facilities Division
Canadian Nuclear Safety Commission
280 Slater Street
Ottawa, ON K1P 5S9

Dear Mr. Jones,

Quarterly Compliance Report – Port Hope Conversion Facility

Please find enclosed the Port Hope Conversion Facility's second quarter 2018 Quarterly Compliance Monitoring & Operational Performance Report. The report has been written to comply with the requirements in the CNSC document, "Annual Compliance Monitoring and Operational Performance Reporting Requirements for Class 1A and B Nuclear Facilities", dated March 2011.

If you have any questions or concerns regarding this matter, please contact me.

Sincerely,

Suzanne Frankcom-Wright
Coordinator, Regulatory Compliance

c: Ms. Caroline Ducros, Canadian Nuclear Safety Commission
Mr. David Bradley, Ministry of the Environment and Climate Change
Mr. John Crouter, Ministry of the Environment and Climate Change
Mr. D. Kim, Environment Canada
Ms. A. Rappl, Municipality of Port Hope (arappl@porthope.ca)
Ms. T. Wilson, Municipality of Port Hope (twilson@porthope.ca)
Port Hope Library

2018 Second Quarter Compliance Monitoring
&
Operational Performance Report

Reporting Period April 1 – June 30, 2018

Port Hope Conversion Facility
Operating Licence
FFOL-3631.00/2027

One Eldorado Place
Port Hope, Ontario
L1A 3A1

Submitted to:
The Canadian Nuclear Safety Commission
P.O. Box 1046, Station B
280 Slater Street
Ottawa, Ontario
K1P 5S9

Submitted on: August 16, 2018

I Executive Summary

Cameco Corporation (Cameco) is a major supplier of uranium processing services required to produce nuclear fuel for the generation of clean electricity around the world. Cameco's Fuel Services Division is comprised of the Blind River Refinery, the Port Hope Conversion Facility (PHCF), Cameco Fuel Manufacturing Inc. and a divisional head office located in Port Hope, Ontario.

Cameco operates a Class IB nuclear facility in Port Hope, Ontario and employs approximately 325 workers. In the second quarter of 2018, the facility operated under operating licence FFOL-3631.00/2027, which is valid until February 28, 2027.

Cameco is committed to the safe, clean and reliable operation of all of its facilities and continually strives to improve its performance and processes to ensure the safety of both its employees and local residents. PHCF maintains the required programs, plans and procedures in the areas of health and safety, radiation protection, environment, emergency response, fire protection, waste management, and training.

As a result of these programs, plans and procedures, PHCF's operations have maintained radiation exposures to workers and the public well below the regulatory dose limits. Environmental emissions are also being controlled to levels that are a fraction of the regulatory limits.

There were four reportable events that occurred in the second quarter.

On April 18, 2018 anhydrous hydrogen fluoride (AHF) was detected during unloading at the connection of the liquid unloading line and the ISO container. Prior to unloading, all vacuum and leak checks had passed inspection. In accordance with the applicable procedure, Cameco activated the emergency response team, the ISO container was depressurized and the threaded hose fitting was tightened. Fumes were directed to the scrubber and environmental monitoring determined that there was no environmental impact as a result of the event, nor was there any impact to personnel.

The Ontario Spills Action Centre (SAC) was contacted and the CNSC was notified (reference # 8800-AXRLZB) to report an ambient station high volume air sampler exceedance of total suspended particulate (TSP) of 169 µg/m^3 on April 10, 2018, which is above the ECCC and MOECP 120 µg/m^3 TSP dust criteria for visibility. The investigation indicated that the particulate was due to dusty post-winter conditions and site traffic adjacent to the monitoring location, located next to the cylinder storage area. The ground surface in the cylinder storage area has since been cleaned up and no further exceedances have occurred.

In 2016 and early 2017, as part of the relicensing process, a daily sanitary sewer discharge action level of 100 µg/L and a monthly mean release limit of 275 µg/L were developed and accepted. Between April 16 to April 19 and May 29 to May 30, 2018, the sanitary sewer discharge action level was reached or exceeded due to groundwater infiltration. An exceedance of an action level does not pose a risk to people or the environment.

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1.0 INTRODUCTION

1.1 General Introduction

Cameco Corporation (Cameco) is a major supplier of uranium processing services required to produce fuel for the generation of clean electricity around the world.

Cameco's Fuel Services Division (FSD) is comprised of the Blind River Refinery (BRR), the Port Hope Conversion Facility (PHCF), Cameco Fuel Manufacturing Inc. (CFM) and a divisional head office located in Port Hope, Ontario.

Cameco operates a Class IB nuclear conversion facility in Port Hope, Ontario and employs approximately 325 workers. The facility operated under a Canadian Nuclear Safety Commission (CNSC) ten-year operating licence (the Licence), FFOL-3631.00/2027, which is valid until February 28, 2027.

Cameco is committed to the safe, clean and reliable operation of all of its facilities and continually strives to improve safety performance and processes to ensure the safety of both its employees and local residents.

PHCF maintains the required programs, plans and procedures in the areas of health and safety, radiation protection, environment, emergency response, fire protection, waste management, and training.

In addition to the CNSC, the PHCF is regulated by other federal and provincial regulators, such as the Ontario Ministry of Environment, Conservation and Parks (MOECP), Environment and Climate Change Canada (ECCC), Employment and Social Development Canada (ESDC), and Transport Canada (TC).

The acronyms in the following table may appear in this report.

Table 1

Acronyms Used Within This Report	
Acronym	**Description**
AAQC	Ambient Air Quality Criteria
AHF	Anhydrous Hydrogen Fluoride
ALARA	As Low As Reasonably Achievable
BRR	Blind River Refinery

Bq/cm^2	Becquerel per Square Centimeter
Cameco	Cameco Corporation
CaO	Calcium Oxide
CBT	Computer Based Training
CCC	Criticality Control Committee
CCM	Contaminated Combustible Material
CCME	Canadian Council of Ministers of the Environment
CFM	Cameco Fuel Manufacturing
Charter	The Safety Charter
CIRS	Cameco Incident Reporting System
CNC	Contaminated Non-Combustible Material
CNL	Canadian Nuclear Laboratories
CNSC	Canadian Nuclear Safety Commission
COC	Contaminants of Concern
CSSC	Conversion Safety Steering Committee
CUP	Clean Up Program Operations Group
DU	Depleted Uranium
EC	Environment and Climate Change Canada
ECA	Environmental Compliance Approval
EHS	Environmental Health and Safety
EMP	Environmental Monitoring Plan
ERP	Emergency Response Plan
ERT	Emergency Response Team

FHA	Fire Hazard Assessment
FBW	Filter Backwash
FFI	Facility Fire Inspections
FMEA	Failure Mode and Effects Analysis
FPP	Fire Protection Program
FSD	Fuel Services Division
gU/h	Grams of Uranium per Hour
HAZOP	Hazard and Operability Analysis
HF	Hydrogen Fluoride
HIRAC	Hazard Identification, Risk Assessment and Control
HRSDC	Human Resources and Skills Development Canada
IAEA	International Atomic Energy Agency
ICAM	Intelligent Alpha/Beta Continuous Air Monitor
IMS	Incident Management System
ISO	International Standards Organization
ITM	Inspection, Testing and Maintenance
JHA	Job Hazard Analysis
LCH	Licence Conditions Handbook
Licence	Licence FFOL-3631.00/2027
LIMS	Laboratory Information Management System
LOPC	Loss of Primary Containment
LTWMF	Long Term Waste Management Facility
MEWS	Ministry of the Environment Wastewater System

MISA	Municipal/Industrial Strategy for Abatement
MOECP	Ontario Ministry of the Environment, Conservation and Parks
MPH	Municipality of Port Hope
mSv	Millisievert
NDR	National Dose Registry
NEW	Nuclear Energy Worker
NFPA	National Fire Protection Association
NO_x	Nitrogen Oxides
NO_2	Nitrogen Dioxide
NO_3	Nitrate
NSCA	Nuclear Safety Control Act
NUO_2	North UO_2 Plant
OH&S	Occupational Health and Safety
ORL	Operating Release Level
OSL	Optically Stimulated Luminescence
PDP	Preliminary Decommissioning Plan
PHCF	Port Hope Conversion Facility
PHFES	Port Hope Fire and Emergency Services
PTTW	Permit to Take Water
Q1	First Quarter
Q2	Second Quarter
Q3	Third Quarter
Q4	Fourth Quarter

QA	Quality Assurance
QMI-SAI	Quality Management Institute – Standards Australia International
RE	Reliability Engineering
SAT	Systematic Approach to Training
SCBA	Self-Contained Breathing Apparatus
SCI	South Cooling Water Intake
SEU	Slightly Enriched Uranium
SHEQ	Safety Health Environment and Quality
SPOC	Single Point of Contact
SSC	Systems Structures and Components
SuperCUP	Clean Up Program to remove historic equipment and structures
SWCS	Storm Water Control Study
TC	Transport Canada
TRIR	Total Recordable Injury Rate
UF_6	Uranium Hexafluoride
µgU/L	Micrograms of Uranium per Litre
ULN	Upper Limit of Normal
UO_2	Uranium Dioxide
UO_2N	UF_6 plant/Building 2 Cooling Water Return
UO_2S	UO_2 Plant Cooling Water Return
UO_3	Uranium Trioxide
µSv/h	Microsievert per Hour

µSv	Microsievert
WSIB	Workplace Safety and Insurance Board

* Not all acronyms listed above appear in every quarterly.

1.2 Facility Operation

Cameco continues to strive for operational excellence at all of its facilities through consistent application of management systems to ensure that they operate in a safe, clean and reliable manner. Corporate policies and programs, including that for Safety, Health, Environment and Quality (SHEQ) provide guidance and direction for all site-based programs and procedures that define the PHCF Quality Management System.

In addition to Cameco requirements regarding management systems, the facility's quality program has been designed to meet section 3(d) of the *Class I Nuclear Facilities Regulations*. This program provides the controls to ensure all processes are conducted in a safe manner and that processes applying to licensed activities are conducted in accordance with applicable CNSC quality requirements and other regulatory requirements. The application of the quality requirements is scaled according to the safety significance (complexity and hazard potential) of a particular activity.

Changes to the physical design of equipment, processes and the facility with the potential to impact safety are evaluated from project planning through to the 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 is in-place which ensures that any equipment changes or modifications will not have an adverse effect on the environment or on the health and safety of employees or members of the public.

There were no significant changes to the physical design of equipment, processes and the facility in the second quarter 2018.

There were four reportable events that occurred in the second quarter.

On April 18, 2018 anhydrous hydrogen fluoride (AHF) was detected during unloading at the connection of the liquid unloading line and the ISO container. Prior to unloading, all vacuum and leak checks had passed inspection. In accordance with the applicable procedure, Cameco activated the emergency response team, the ISO container was depressurized and the threaded hose fitting was tightened. Fumes were directed to the scrubber and environmental monitoring determined that there was no environmental impact as a result of the event, nor was there any impact to personnel.

The UF_6 plant ran continuously up to the scheduled maintenance shutdown beginning in May 18, 2018.

The UO_2 plant ran continuously throughout the quarter.

1.3 Production or Utilization

The maximum daily production rate for the UF_6 plant did not exceed the licensed limit of 45 tonnes uranium as UF_6 per day during the second quarter.

Detailed plant production information is considered “Protected Proprietary” and is submitted to the CNSC on an annual basis under a separate cover.

1.4 Facility Modification

There were no modifications affecting the safety analysis of the licensed facility made in the quarter that required written approval of the Commission or a person authorized by the Commission.

The following PHCF documents referenced in the Licence Conditions Handbook (LCH) were updated and submitted for CNSC staff review in the second quarter:

- Pressure and Safety Significant Piping and Vessel Control Procedure;
- CQP 1201 Fire Safety Plan for Port Hope Conversion Facility;
- CQP 942 UF_6 Plant Operations Training Procedure for Port Hope Conversion Facility;
- Fuel Services Division Waste Management Program; and,
- Waste Management Plan for the Port Hope Conversion Facility.

2.0 SAFETY AND CONTROL AREAS

2.1 Management

2.1.1 Management System

This safety and control area covers the framework which establishes the processes and programs required to ensure that the organization achieves its safety objectives and continually monitors its performance against these objectives, as well as fostering a healthy safety culture.

The PHCF's management systems program identifies the controls required to ensure all processes are conducted in a safe manner and that processes applying to licensed activities are conducted in accordance with applicable CNSC management systems requirements and other regulatory requirements. The application of the management systems requirements is scaled according to the complexity and hazard potential of a particular activity.

The 2018 internal audits have been scheduled for the year and are in progress.

One external customer audit was completed during the second quarter of 2018. Once the final audit report has been received, the results of the audit will be entered into Cameco's Incident Reporting System and will be tracked to completion.

There were no significant changes to PHCF's Management Systems Program in the second quarter of 2018.

There were no CNSC inspections conducted at the PHCF during the second quarter.

The PHCF received the following inspection reports from the CNSC in the second quarter:

- CNSC Compliance Inspection CAMECO-PHCF-2018-01 Report; and,
- CNSC Compliance Inspection CAMECO-PHCF-2018-02 Report.

Cameco strives for continual improvement and is committed to ensuring the safety of employees, the public and the environment. The corrective actions related to inspection reports are assigned as appropriate.

2.1.2 Human Performance Management

This safety and control area covers activities that enable effective human performance through the development and implementation of processes that ensure that licensee staff members are sufficient in numbers in all relevant job areas and have the necessary knowledge, skills and tools in place, in order to safely carry out their duties.

UF_6 training activities included formalized continuous learning leading up to production shut down activities, which commenced in May. Training activities to maintain the area qualifications of UF_6 operators and training for operators new to UF_6 continued.

UO_2 training activities involved transferred staff from the UF_6 plant, to UO_2, to support ongoing production requirements. A technical writer for UO_2 became fully trained and is working on updating work instructions. Maintenance of area qualifications continues for qualified operators.

During the second quarter, the PHCF maintained a sufficient number of production personnel and emergency response team members to ensure that operating production areas and the site were adequately staffed to run safely.

2.1.3 Operating Performance

This safety and control area includes an overall review of the conduct of the licensed activities and the activities that enable effective facility performance.

In the second quarter of 2018, the PHCF continued to operate in a manner that supports safe, clean and reliable production and in compliance with applicable acts and regulations.

The UF_6 plant ran continuously up to the scheduled maintenance shutdown beginning in May.

The UO_2 plant ran continuously throughout the quarter.

The PHCF operated in accordance with site programs and procedures and did not exceed any CNSC regulatory limits during the quarter.

2.2 Facility and Equipment

2.2.1 Safety Analysis

This safety and control area covers the maintenance of the safety analysis which supports the overall safety case for the facility. This 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.

The PHCF has a safety report that documents the detailed safety analysis carried out for the facility. The safety report summarizes the systematic review of site operations to identify and assess hazards and potential risks to the public and environment. Cameco uses a hazards and operability (HAZOP) approach to assess new processes or equipment. This focuses on equipment, instrumentation, human actions and other factors that impact on the process. HAZOPs are conducted prior to making any plant modifications that may affect the safety case for the facility, with the site safety report updated at least every five years to include the findings from any HAZOP's completed since the last revision to the report. The safety report was most recently updated in the fourth quarter of 2015 and was accepted by CNSC staff on April 22, 2016.

There were no modifications made in the quarter that affected the safety case for the PHCF. The safety-significant systems at the facility have been identified and a preventive maintenance program is in place to ensure that the equipment associated with these systems is properly maintained.

2.2.2 Physical Design

This safety and control area relates to activities that impact on the ability of systems, structures and components (SSCs) to meet and maintain their design basis, given new information arising over time and taking into account changes in the external environment.

As part of Cameco's budgeting process for capital expenditures, plant improvements related to physical design are identified and prioritized. A Stage Gate process is used at PHCF to review capital projects at up to four points in the design process. This process includes sign-off by site management (or designate), to ensure that these requirements are addressed in every capital project.

Changes to the physical design of equipment, processes and the facility with the potential to impact safety are evaluated from initial planning through to the 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 is in place which ensures that any equipment changes or modifications will not have an adverse effect on the environment, on the health and safety of employees or on members of the public.

There were no significant changes to the physical design of equipment, processes and the facility in the second quarter 2018.

2.2.3 Fitness for Service

This safety and control area covers activities that impact on the physical condition of SSCs, 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.

In the second quarter of 2018, work was conducted in all four areas of Operational Reliability. Highlights included:

- Work Management (WM): Continued working on aspects of work management opportunities through the implementation of a maintenance communication plan, sharing maintenance best practices across Cameco through workshops, and continuation of the Plan-Do-Check-Act process for maintenance key performance indicators.
- Materials Management (MM): Kitting improvement project has been the focus to ensure successful implementation.
- Reliability Engineering (RE): Predictive maintenance activities continue in four key categories: thermal, ultrasonic testing, lubrication and vibration.
- Operations Improvement (OI): Continue implementation of a 5S program for maintenance shops.

The effectiveness of the program, as it pertains to reliability of equipment and systems, continues to be measured through a number of leading and lagging metrics. Program effectiveness is defined by upward trends of these indicators to reach world class standards for chemical manufacturing facilities.

Testing and verification activities are integrated into the preventive maintenance strategy for any SSCs. Compliance to the activities is measured on a weekly basis.

The asset management program accounts for aging through a number of processes designed to detect early warning signs and to prescribe rehabilitation programs or pro-active replacement strategies. The effectiveness of the program is measured by the same means as the overall maintenance program.

2.3 Core Control Processes

2.3.1 Radiation Protection

This safety and control area covers the implementation of a radiation protection program, in accordance with the *Radiation Protection Regulations*. This program must ensure that contamination and radiation doses are monitored and controlled.

PHCF has an extensive Radiation Safety Program in place to meet the requirements of the *Nuclear and Safety Control Act* and the *Radiation Protection Regulations* and ensure exposures are kept to levels as low as reasonably achievable (ALARA). The program includes the following aspects:

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

The CNSC regulatory limits for effective dose for nuclear energy workers (NEWs) are 50 millisievert (mSv) per year and no more than 100 mSv over a specified five year period.

For various radiological parameters, Cameco has established action levels, accepted by the CNSC, which may be indicative of a potential loss of control for that specific parameter. These action levels serve as an early warning of a condition that warrants further investigation. In addition, as a continual improvement tool, Cameco has established lower-tier internal administrative levels and ALARA targets, which are set below the action levels and provide very early warning of a potential concern. A result above an internal administrative level is also investigated and remedial actions taken, if necessary.

Audits and inspections are performed in accordance with the Management Systems Program Manual. Refer to the Management Systems section of this report for further details.

The radiation protection and ALARA programs have been demonstrated to be effective.

The PHCF did not implement any significant changes in the second quarter.

Cameco uses in-house licensed dosimetry services for assigning internal doses to individuals utilizing urine analysis and lung counting programs. In 2014, Cameco received the renewed dosimetry services licence (11010-16-24.0) which is due to expire on November 30, 2024.

The PHCF uses a licensed dosimetry service provider that is accredited by the CNSC for external dosimetry. The dosimetry service provides optically stimulated luminescence (OSL) dosimeters to the PHCF for use by employees, contractors, and visitors. An OSL dosimeter is used to monitor whole body and skin dose. Dosimeters are changed monthly for production, maintenance and support services and quarterly for all other employees. The provider reports the OSL dosimeters' results to the National Dose Registry (NDR) as well as provides a copy to the PHCF.

The radiation protection program at the PHCF is well established, with detailed procedures outlining the processes under each element of the program. Review of the quarterly dose data indicates that the program is effective in the prevention of unreasonable risk to the health and safety of workers. Cameco follows a "top five" approach whereby the work practices of the five employees with the highest year-to-date doses are reviewed.

The following tables and graphs summarize employee external exposure results. Note that in figures with ranges on the horizontal axis, a range of one to two, for example, means all results are greater than one and less than or equal to two.

Whole Body Dose

Table 2 shows the whole body dose summary results from the second quarter of 2018 for six work groups: UF_6 Plant; UO_2 Plant, Maintenance; Technical Support (including NEW contractors), Major Projects; and Administration. The highest exposures were from the UF_6 group.

There were no results above the monthly action level of 2 mSv during the quarter.

Table 2

Second Quarter 2018 Whole Body Dose Results				
Work Group	**Number of Individuals**	**Average Dose (mSv)**	**Minimum Dose (mSv)**	**Maximum Dose (mSv)**
UF_6 Plant	84	0.21	0.00	1.59
UO_2 Plant	23	0.18	0.01	0.37
Maintenance	68	0.18	0.00	0.88
Technical Support [1]	363	0.04	0.00	0.98
Major Projects	46	0.02	0.00	0.09
Administration	84	0.01	0.00	0.07
Total (Max)	**668**	**0.08**	**0.00**	**1.59**
[1]Includes contractors (NEWs)				

Distributions of the quarterly external whole body exposures are shown in Figure 1. 99.6% of whole body exposures were below 1 mSv.

Figure 1

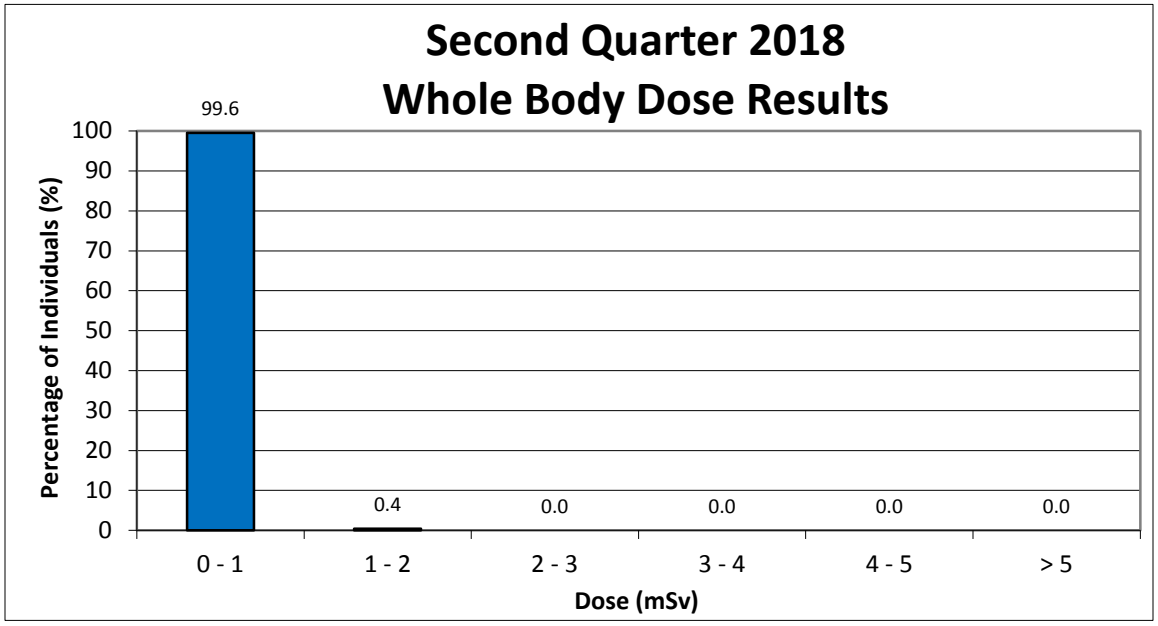
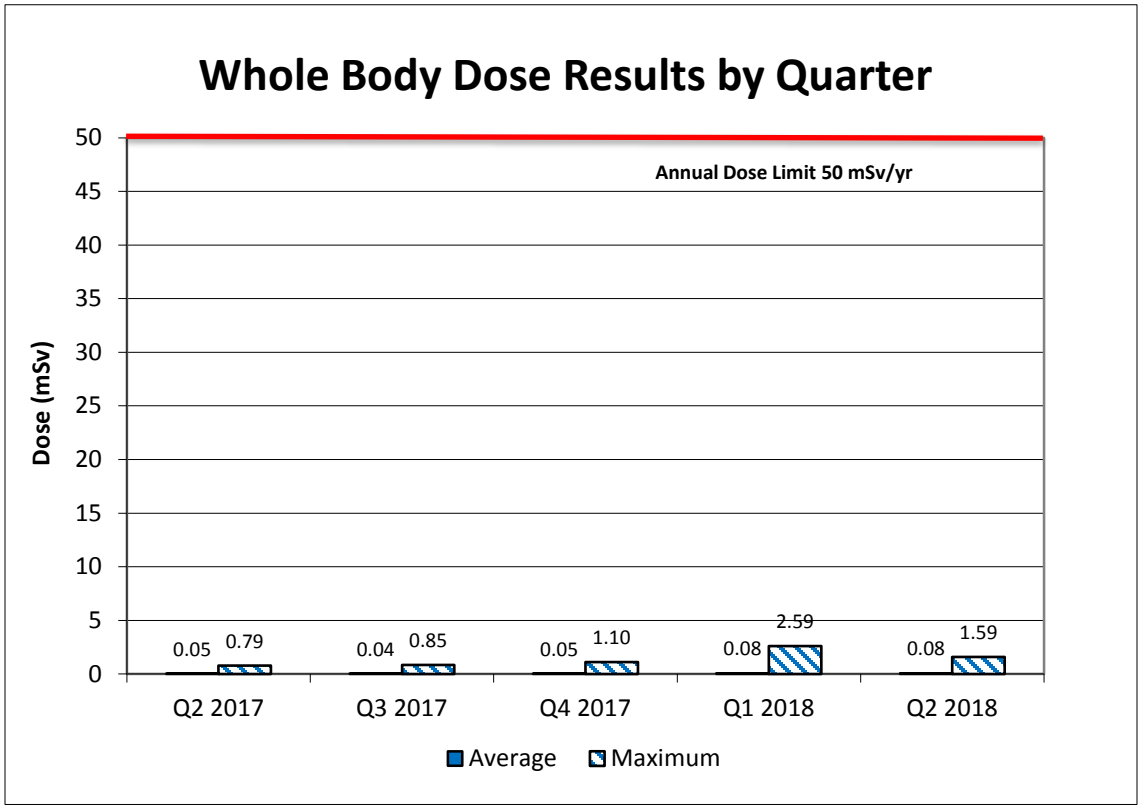


Table 3 and Figure 2 show the employee average, minimum and maximum quarterly individual external whole body exposures for the second quarter of 2017 through to the second quarter of 2018. The average whole body dose is consistent with previous quarters when production is operational. The maximum whole body dose received by a UF_6 employee was related to work in the flame reactor areas.

Table 3

Whole Body Dose Results by Quarter				
Monitoring Period	**Number of Individuals**	**Average Dose (mSv)**	**Minimum Dose (mSv)**	**Maximum Dose (mSv)**
Q2 2017	524	0.05	0.00	0.79
Q3 2017	574	0.04	0.00	0.85
Q4 2017	547	0.05	0.00	1.10
Q1 2018	560	0.08	0.00	2.59
Q2 2018	668	0.08	0.00	1.59

Figure 2



Skin Dose

Table 4 shows the quarterly skin dose summary results for six work groups: UF_6 Plant; UO_2 Plant; Maintenance; Technical Support (including NEW contractors), Major Projects; and Administration. The highest exposures are from the UF_6 group related to work in the flame reactor area.

Table 4

Second Quarter 2018 Skin Dose Results				
Work Group	**Number of Individuals**	**Average Dose (mSv)**	**Minimum Dose (mSv)**	**Maximum Dose (mSv)**
UF_6 Plant	84	1.01	0.00	5.99
UO_2 Plant	23	0.78	0.06	1.93
Maintenance	68	0.94	0.00	4.51
Technical[1]	363	0.09	0.00	1.55
Major Projects	46	0.04	0.00	0.27
Administration	84	0.01	0.00	0.23
Total (Max)	**668**	**0.30**	**0.00**	**5.99**
[1]Includes contractors (NEWs)				

Distributions of the quarterly external skin exposures are shown in Figure 3. All of the external skin exposures were below 10 mSv.

Figure 3

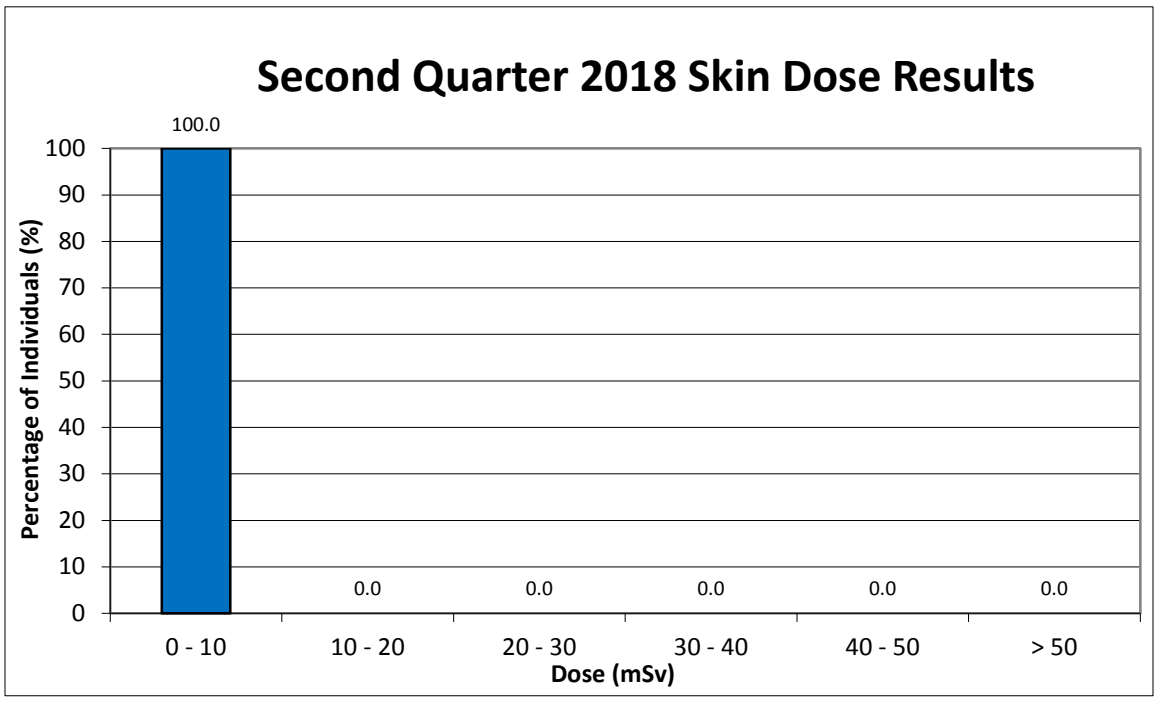
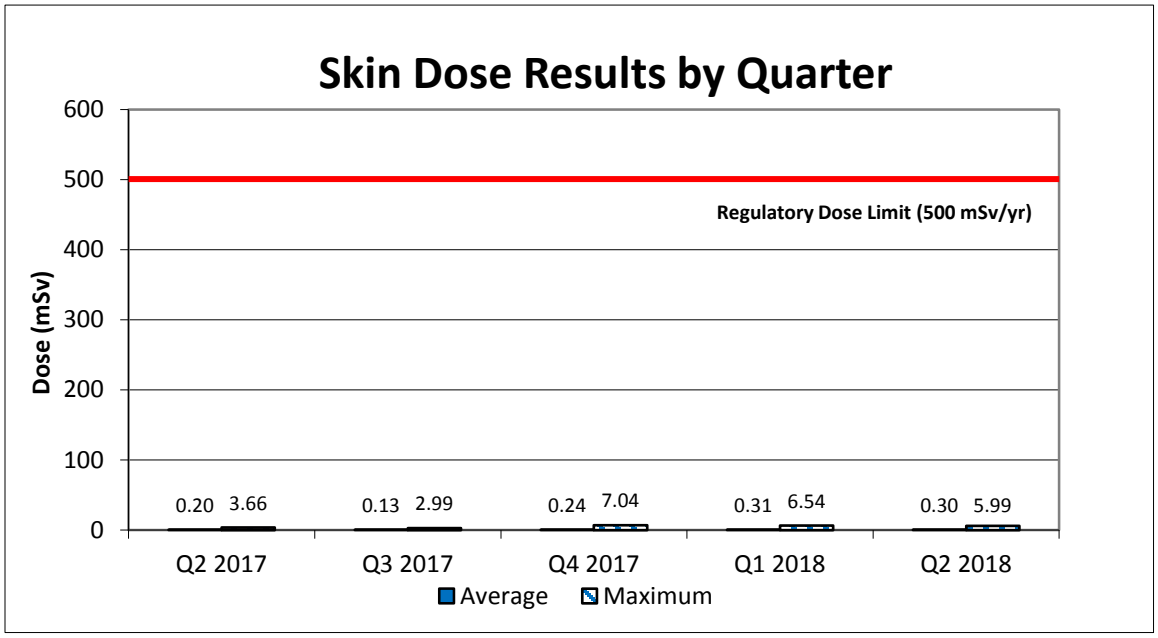


Table 5 and Figure 4 show the employee average and maximum quarterly individual skin exposure for the second quarter of 2017 through to the second quarter of 2018. The average skin dose is consistent with previous quarters in which production and maintenance activities were occurring. The maximum skin dose received by a UF_6 operator was related to flame reactor work activities.

Table 5

Skin Dose Results by Quarter				
Monitoring Period	**Number of Individuals**	**Average Dose (mSv)**	**Minimum Dose (mSv)**	**Maximum Dose (mSv)**
Q2 2017	524	0.20	0.00	3.66
Q3 2017	574	0.13	0.00	2.99
Q4 2017	547	0.24	0.00	7.04
Q1 2018	560	0.31	0.00	6.54
Q2 2018	668	0.30	0.00	5.99

Figure 4



Urine Analysis

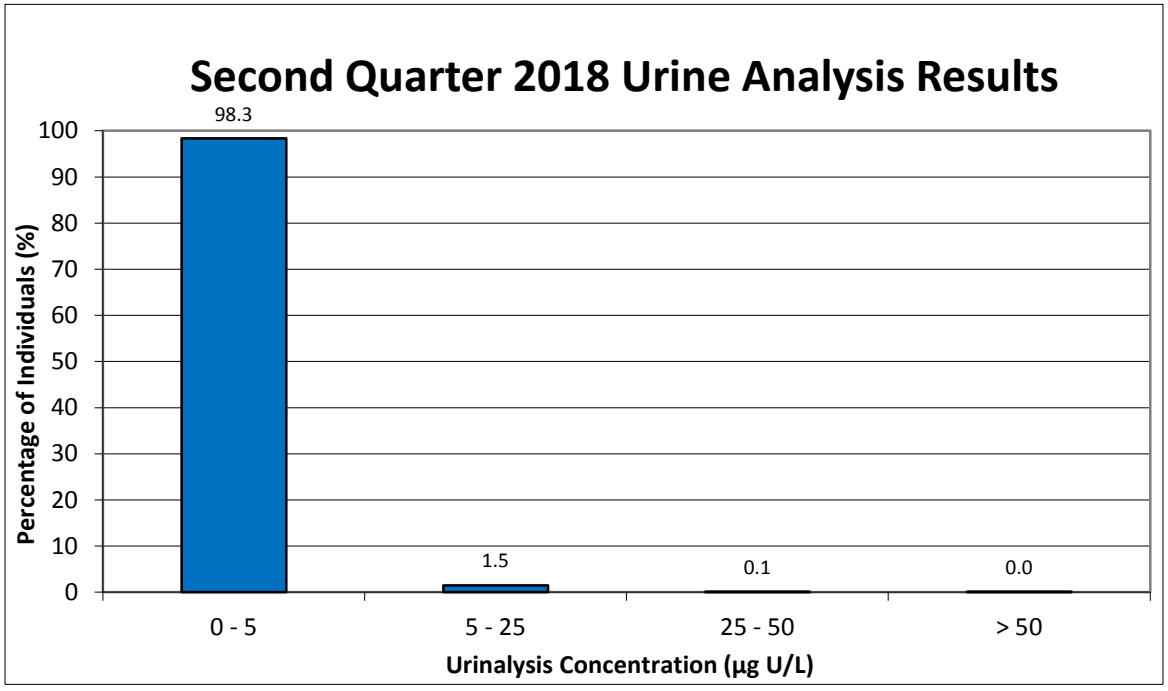
Table 6 and Figure 5 show the distribution of urine results for the second quarter. A total of 10,274 urine samples were collected and analyzed for uranium during the second quarter of 2018. The majority of routine urine analysis results (99.8.0%) were less than 5 µg U/L in the quarter.

All results above 13 µg U/L were screened by radiation protection staff. There were no official investigations for urine analysis during the second quarter of 2018.

Table 6

Second Quarter 2018 Routine Urine Analysis Results	
Distribution of Results	**Q2 2018**
Number of Samples < 5 µg U/L	10,103
Number of Samples > 5 to < 25 µg U/L	155
Number of Samples > 25 to < 50 µg U/L	12
Number of Samples > 50 µg U/L	4
Number of Samples Analyzed (Uranium)	10,274

Figure 5



The distribution of the quarterly internal urine dose for employees is shown in Figure 6. All individual assigned doses were at or below 0.2 mSv.

Figure 6

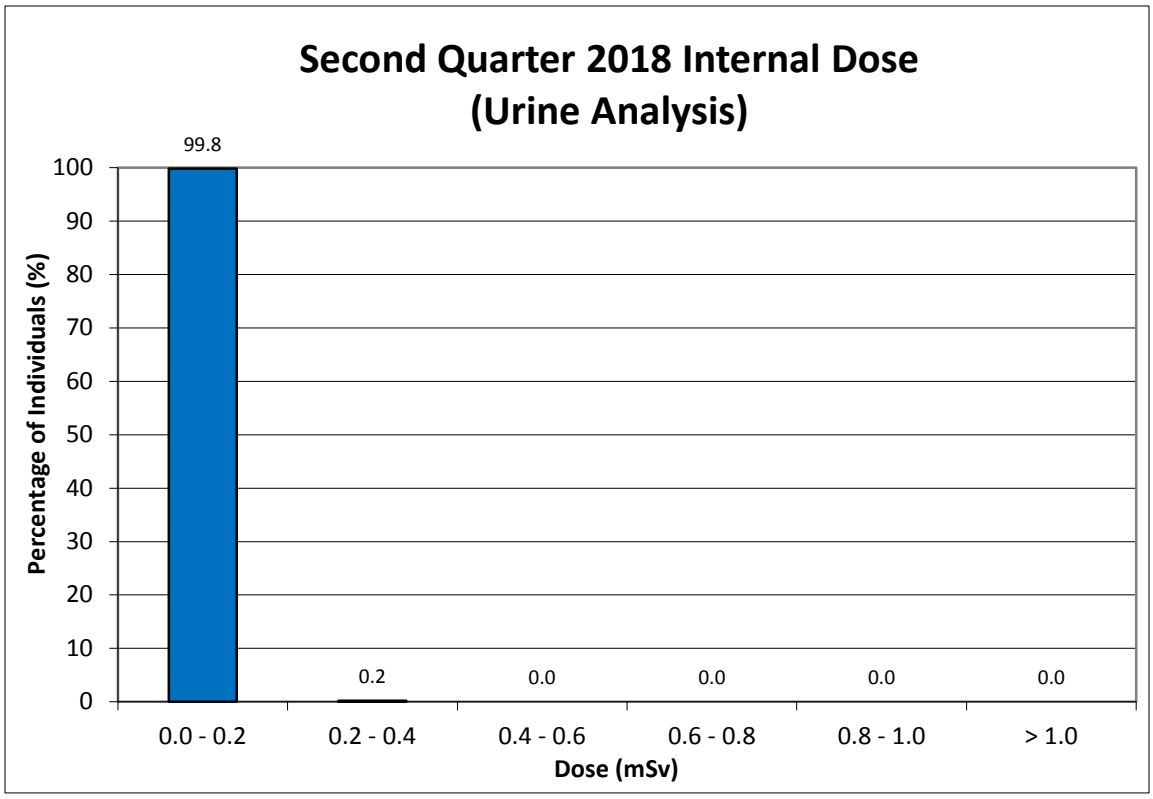
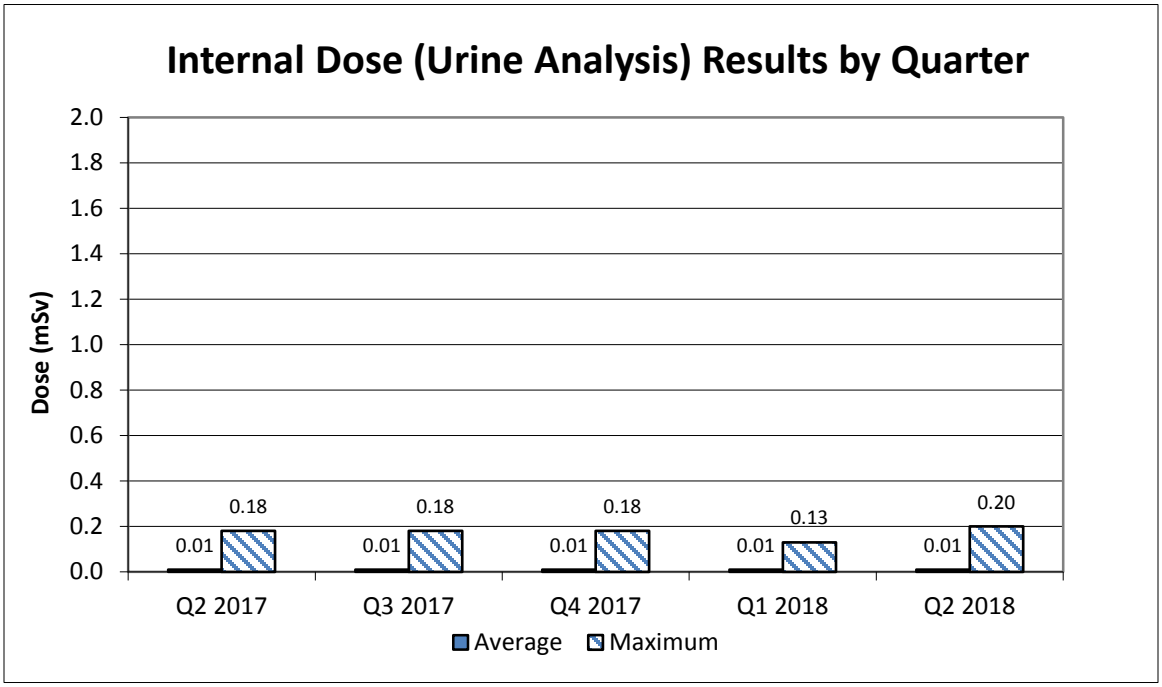


Table 7 and Figure 7 present the internal urine analysis doses for the last five quarters. A total of 579 employees and contractors (NEW) were monitored by the urine analysis program during the second quarter. The average and maximum internal urine analysis doses in the quarter were 0.01 mSv and 0.20 mSv, respectively, which were comparable to previous quarters.

Table 7

Internal Dose (Urine) by Quarter				
Quarter	**Number of Individuals**	**Minimum Dose (mSv)**	**Maximum Dose (mSv)**	**Average Dose (mSv)**
Q2 2017	456	0.00	0.18	0.01
Q3 2017	489	0.00	0.18	0.01
Q4 2017	476	0.00	0.18	0.01
Q1 2018	465	0.00	0.13	0.01
Q2 2018	579	0.00	0.20	0.01

Figure 7



Fluoride in Urine

A total of 5,284 urine samples were analyzed for fluoride during the second quarter, with summary results provided in Table 8. There were no samples above the internal administrative investigation level of 4 mg F/L during the second quarter.

Table 8

Second Quarter 2018 Fluoride in Urine Analysis Results			
Type of Fluoride Samples	**Number of Samples**	**Minimum Concentration (mg F/L)**	**Maximum Concentration (mg F/L)**
All fluoride samples	5,284	0.1	3.9
Routine post-shift fluoride samples >= 7 mg F/L	0	-	-
Routine pre-shift fluoride samples >= 4 mg F/L	0	-	-
Non-routine fluoride samples	538	0.1	3.9
Samples analyzed for U, insufficient volume (< 30mL) for F analysis	80	-	-

Lung Counting

As part of the licensed internal dosimetry program, Cameco employs the use of a lung counter to monitor and assess internal exposure to uranium of its employees at the PHCF. This equipment is capable of measuring low levels of exposure to the point where an employee's further exposure can be prevented well before it exceeds a regulatory action level or dose limit. The lung counting program runs in parallel with the urinalysis program.

A total of 72 PHCF lung count measurements were completed in the second quarter for PHCF. There were no PHCF investigations triggered by the lung counting program during the quarter and no regulatory action level was exceeded for PHCF lung count measurements.

Contamination Control

The PHCF is divided into three zones for contamination control purposes. Zone 1 areas (clean areas - no radioactive sources other than monitoring equipment) are clearly delineated. Whole body monitors are located at the Zone 1 boundary in the main lobby, men's and women's change rooms and gate 12 vehicle port. In Zone 2 areas and the yard Zone 3 areas (transition areas – may contain limited amounts of uranium compounds), no visible contamination should exist and, when detected, loose contamination is promptly isolated, monitored, cleaned and monitored again to ensure the contamination has been removed. Zone 3 production areas are production areas where uranium compounds are expected. Designated Zone 1 and 2 areas are monitored on a weekly schedule (lunchrooms and change houses) and rotating monthly schedule (offices) as defined in the RPPM so that each office area is monitored at least annually. Additional monitoring is done on an as-needed basis (i.e. during an investigation, when requested or where contamination is suspected).

Table 9

Second Quarter 2018 Alpha Contamination Monitoring Results			
Area	**Number of Samples Taken**	**Zone Contamination Criteria (Bq/cm²)**	**Number of Samples Above Criteria**
Zone 1	1,051	0.4	0
Zone 2	10,474	0.4	44

The contamination in Zone 2 areas was primarily detected in the office areas and lunch rooms of production buildings. Contamination measurements are taken upon request in

Zone 3 areas when contamination is suspected and only documented when above the applicable levels.

Vehicle contamination check verification forms are used to record contamination checks on vehicles leaving the site. The tires, seats, floors and pedals are checked for contamination on all vehicles. If contamination above the unrestricted release criteria is detected in these areas, vehicles are directed to the site truck wash booth to be decontaminated prior to leaving the site. In addition, Class 7 transport vehicles are monitored to comply with transport regulations.

In-Plant Air

Routine air sampling is performed by collecting airborne particulate on air sampling filters and quantifying the airborne concentration of uranium.

The site administrative level and derived air concentration (DAC), based on slow moving (low solubility) material, is 100 µg U/m^3 but protective measures, such as investigation and respiratory protection, are normally required as a precaution at lower DAC levels. Continuous air monitoring equipment (iCAMs) in the UF_6 and UO_2 plants are also used to provide early warning and to prompt response to elevated airborne uranium concentrations. Local alarms and direct communication with the control rooms provide early warning to plant personnel.

Elevated airborne uranium concentrations have occurred following process upsets or maintenance activities. The release of uranium as an aerosol during an upset condition prompts additional air sampling and non-routine personnel monitoring such as urine analysis and lung counting where applicable.

Table 10

Second Quarter 2018 In-Plant Air Uranium Concentration by Operations Group				
Operations Group	**Number of Samples Taken**	**Average (µg U/m^3)**	**Maximum (µg U/m^3)**	**Number of Samples Taken Above Administrative Level**
UF_6 Plant	4,948	6	543	28
UO_2 Plant	1,597	2	22	0
Waste Recovery	761	3	157	2
CUP	476	2	22	0

The maximum in-plant air sample of 543 µg U/m^3 was recorded on May 4, 2018. This result was due to an issue with a flame reactor. The area was posted as respirator required.

The average in-plant air concentrations were in line with the previous quarters in which the production plants were operational.

Gamma Surveys

Plant gamma surveys using hand-held meters are conducted on a routine basis throughout the site. The frequency of the readings and the number of readings taken in each area varies based on the area and the historical results from that area.

2.3.2 Conventional Health and Safety

This safety and control area covers the implementation of a program to manage non-radiological workplace safety hazards and to protect personnel and equipment.

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

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

The health and safety of workers at the PHCF is assured through site-specific safety and health management programs. These programs set out the requirements for management of health and safety aspects of the operation consistent with Cameco's corporate safety, health, environment and quality (SHEQ) policy, which is modeled on the OHSAS 18001 standard. Key components of the program include:

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

Several Occupational Health and Safety initiatives progressed in the second quarter including the following:

- Communications: New Safety announcements continue to be added bi-weekly to TV monitors and to the morning call minutes;
- Hazard Assessments: The committee reviewed all HIRAC's proposed by employees and developed a list. The committee will now be devoting one day a month to complete HIRAC's;
- Ergonomics: The sub-committee continues to review actions from previous assessments and complete new ones as required;
- Education and Training: New Incident investigation training has been deployed;
- Safety Awareness Activities: The CSSC initiated a safety word search activity in the second quarter;

- Sub-committees: The sub-committees continue to work on their short term targets;
- CSSC team efficiencies: The CSSC continues to work on team efficiencies and recently voted on the restructuring of the meeting days. One day will be inspections, minutes and action review. Another day will be in the field completing HIRAC assessments, and the third day will be the regulatory compliance meeting; and,
- Total Recordable Injury Rate (TRIR) YTD is 3.04.

Table 11

2018 Safety Statistics					
Quarter / Parameter	**Q1 2018**	**Q2 2018**	**Q3 2018**	**Q4 2018**	**YTD**
First Aid Injuries	15	20			35
Medical Diagnostic Procedures	1	3			4
Medical Treatment Injuries	2	3			5
Lost Time Injuries	0	1			1
Lost Time Injury Frequency	0.00	0.94			0.51
Lost Time Injury Severity	0.00	10.33			5.57

There was one lost time incident that occurred in the second quarter.

On May 15, 2018 during confined space training, offsite at the Eastern Ontario Emergency Training Academy, an emergency response team (ERT) member was crawling through a confined space tunnel prop. The ERT member failed to stop at the tunnel transition and fell into the next tunnel approximately 4 feet below. The individual was wearing all required PPE at the time of the incident.

The ERT member was transported to site to be evaluated by the site nurse and was put on restricted duties. The employee continued to work under the restrictions, however has since been instructed by their doctor to cease work. The lost-time began June 19, 2018 and the individual continues to remain off work.

2.3.3 Environmental Protection

This safety and control area covers the programs that monitor and control all releases of nuclear and hazardous substances into the environment, as well as their effects on the environment, as the result of licensed activities.

There are federal, provincial and municipal regulatory authorities that have legislative jurisdiction over environmental protection at the facility. PHCF's Environmental Monitoring Plan (EMP) is comprised of monitoring the following components:

- water and air emissions;
- gamma levels;
- soil and vegetation; and
- groundwater.

The key characteristics of the operation and activities that can have a significant environmental impact are monitored and measured and are described in the EMP and associated procedures. These documents identify all of the emissions to the air, water and land, the programs that are in place to monitor them, what is measured, the legal requirements and the reporting requirements.

Audits and inspections were performed in accordance with the Management Systems Program Manual.

Though the environmental program has been demonstrated to be effective, the PHCF has also implemented changes during the quarter as part of its continual improvement program, including:

Program Update:

- The PHCF has received comments from CNSC staff regarding environmental program documents that were revised to meet CSA standards N288.4 Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills and N288.5 Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills. PHCF intends to revise the site environmental protection program based on comments received and resubmit the program for CNSC concurrence in the third quarter 2018.
- The Environmental Emergency (E2) Plan was updated in the second quarter 2018.

Cameco has established action levels, which have been accepted by the CNSC, for key environmental parameters. These action levels serve as an early warning of a condition that warrants further investigation. An exceedance of an action level does not pose a risk to people or the environment. A result above an action level is investigated and remedial actions taken, if necessary.

Public Dose

The Operating Release Level (ORL) is based on the releases of uranium and external gamma radiation to the environment that ensures the dose to the public from the PHCF is below 0.3 mSv/year with the air and water components each being less than 0.05 mSv/year and gamma component being less than 0.3 mSv/year to ensure the dose to the public remains well below the annual regulatory dose limit for a member of the public of 1.0 mSv.

An ORL equation has been developed to account for all public dose exposure pathways – gamma, air and water. In accordance with the requirements of the CNSC, the ORL for the PHCF was updated in 2016 and subsequently accepted by the CNSC. The 2016 report resulted in changes to dose calculations related to releases to water and the fenceline gamma locations used for reporting the dose to the public. These changes included calculating dose to the public from facility discharges to the sanitary sewer, as well as including a fenceline monitoring location closer to the operating facility than previously used in the dose to the public calculations and calculating two doses to a member of the public, one for a resident near Site 1 and the other for a resident near Site 2. Changes to the ORL are incorporated into PHCF reporting effective the first quarter of 2017 and represent a more conservative estimate of dose to the public that can be used throughout the Vision in Motion project.

ORL equations for Site 1 and Site 2 have been derived and are expressed in the form shown below.

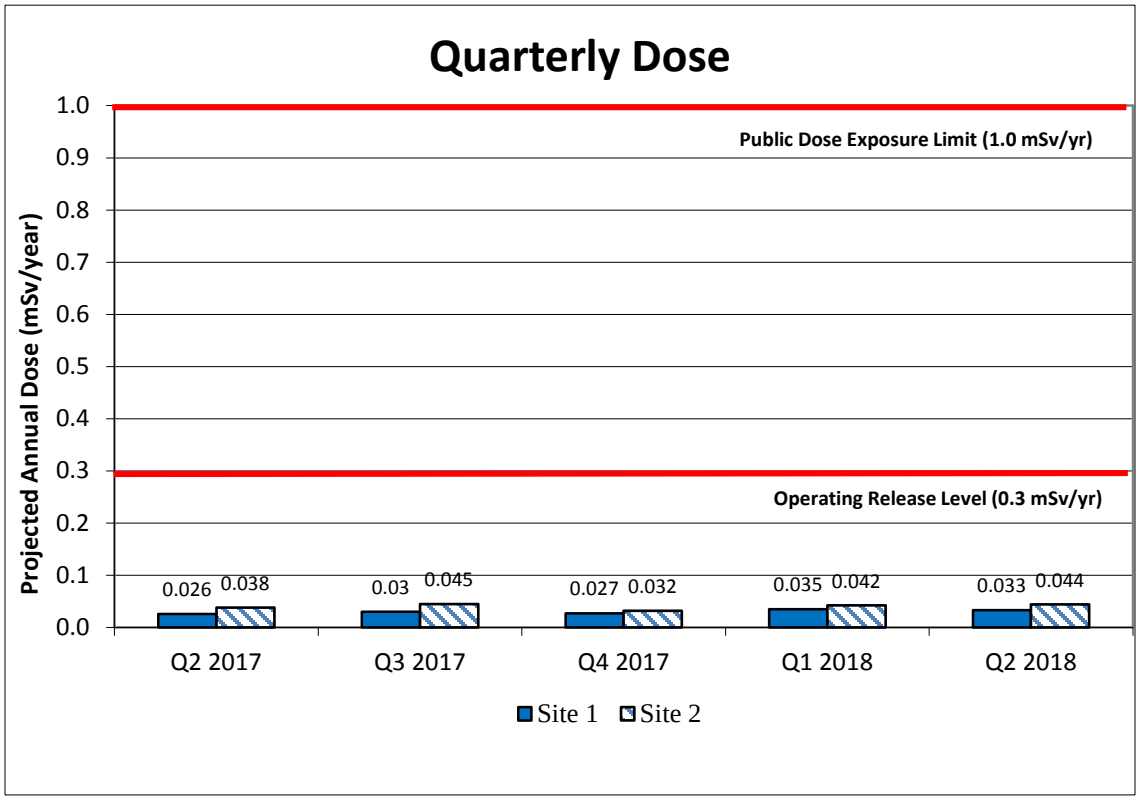
$$\text{Public Dose} = \text{Dose}_{\text{Air}} + \text{Dose}_{\text{Water}} + \text{Dose}_{\text{Gamma}} < 0.3 \text{ mSv/y}$$

The monthly dose from Site 1 and Site 2 are based on monitoring results for each dose component as shown in Table 12. This table illustrates the individual contributions from air, water and gamma as well as the total public dose from each site.

Table 12

Quarterly Dose (mSv/quarter)					
ORL Component	**Q1 2018**	**Q2 2018**	**Q3 2018**	**Q4 2018**	**YTD 2018**
Air	<0.001	<0.001			<0.001
Water	<0.001	<0.001			<0.001
Gamma – Site 1	0.034	0.033			0.067
Gamma – Site 2	0.042	0.043			0.085
Quarterly Dose – Site 1	0.035	0.033			0.068
Quarterly Dose – Site 2	0.042	0.044			0.086

Figure 8



Gamma Monitoring

In order to ensure that doses to local residents/critical receptors are ALARA and do not exceed the annual public dose limit of 1 mSv as defined in the Radiation Protection Regulations, environmental OSL dosimeters are strategically placed (at chest height) around the exterior perimeter of the licensed facility. The OSL dosimeters are deployed on a monthly basis. Gamma dose is measured in mSv which is converted into a dose rate in µSv/h. Eighteen locations at Site 1 (including main site and Centre Pier) and six locations at Site 2 have been selected around the fenced perimeter to cover all potential receptors in the public.

As per the 2016 ORL, dose to the public is calculated for both sites 1 and 2 using specific gamma fenceline monitoring locations. The results at stations 2 and 13 are used for Site 1 public dose calculations and the results at stations 2 and 21 are used for Site 2 public dose calculations. The results at these locations for this quarter are summarized and compared with regulatory action levels in Table 13.

No monthly gamma radiation action levels were exceeded during the second quarter at any fenceline monitoring locations.

Table 13

Second Quarter 2018 Public Dose Gamma Monitoring Results					
Station Number	**April**	**May**	**June**	**Action Level (µSv/h)**	**Licence Limit (µSv/h)**
2	0.22	0.26	0.20	0.400	0.570
13	0.02	0.03	0.02	0.100	0.400
21	0.05	0.07	0.03	0.250	0.260

Air Emissions

A stack monitoring program is used to determine the airborne uranium emission rates on a daily basis from the main stacks of the UF_6 and UO_2 plants.

Source emission action levels and maximum limits are indicated in the appropriate tables and figures throughout this report.

The quarterly average and maximum stack emissions from the UF_6 plant main stack and the UO_2 plant main stack are presented in Table 14 and Figures 9 through to Figure 12.

No licensed action levels were exceeded for uranium emissions from the UF_6 plant main stack in the quarter. The UF_6 main stack average uranium emission rate is comparable to previous quarters. The UF_6 plant shut down on May 18, 2018 for summer maintenance.

No licensed action levels were exceeded for uranium emissions from the UO_2 plant main stack in the quarter. The UO_2 main stack average uranium emission rate is comparable to previous quarters.

Fluoride emissions from the UF_6 main stack are sampled and analyzed on a continuous basis using an on-line analyzer and the data is collected on the plant computer system.

No licensed action levels were exceeded for fluoride emissions from the UF_6 plant main stack in the quarter. The maximum value of 109 g HF/h on April 20, 2018 was caused by elevated tailgas emissions due to operational issues and investigated under CIRS # PHCF-2018-000667.

The UO_2 main stack is also continuously sampled for ammonia. No licensed action levels were exceeded for ammonia emissions from the UO_2 plant main stack in the quarter. The UO_2 main stack average ammonia emission rate is comparable to previous quarters.

The depleted circuit was non-operational in the second quarter 2018.

All other stacks are sampled on an occasional or as requested basis.

Table 14

Daily Main Stack Emissions by Quarter									
Plant	**Parameter**	**Licence Limit**	**Action Level**	**Value**	**Q2 2017**	**Q3 2017**	**Q4 2017**	**Q1 2018**	**Q2 2018**
UF_6	Uranium g U/h	280	40	Avg	1.4	< 0.1	1.7	2.4	1.3
				Max	5.3	0.7	15.3	8.7	4.0
	Hydrogen Fluoride g HF/h	650	230	Avg	29	7	28	47	28
				Max	89	23	209	224	109
UO_2	Uranium g U/h	240	7	Avg	0.4	0.3	0.5	0.6	0.7
				Max	0.9	0.8	1.1	1.4	1.3
	Ammonia kg NH_3/h	58	13	Avg	1.6	1.2	1.4	1.5	1.7
				Max	3.7	3.7	2.8	3.4	3.2

Figure 9

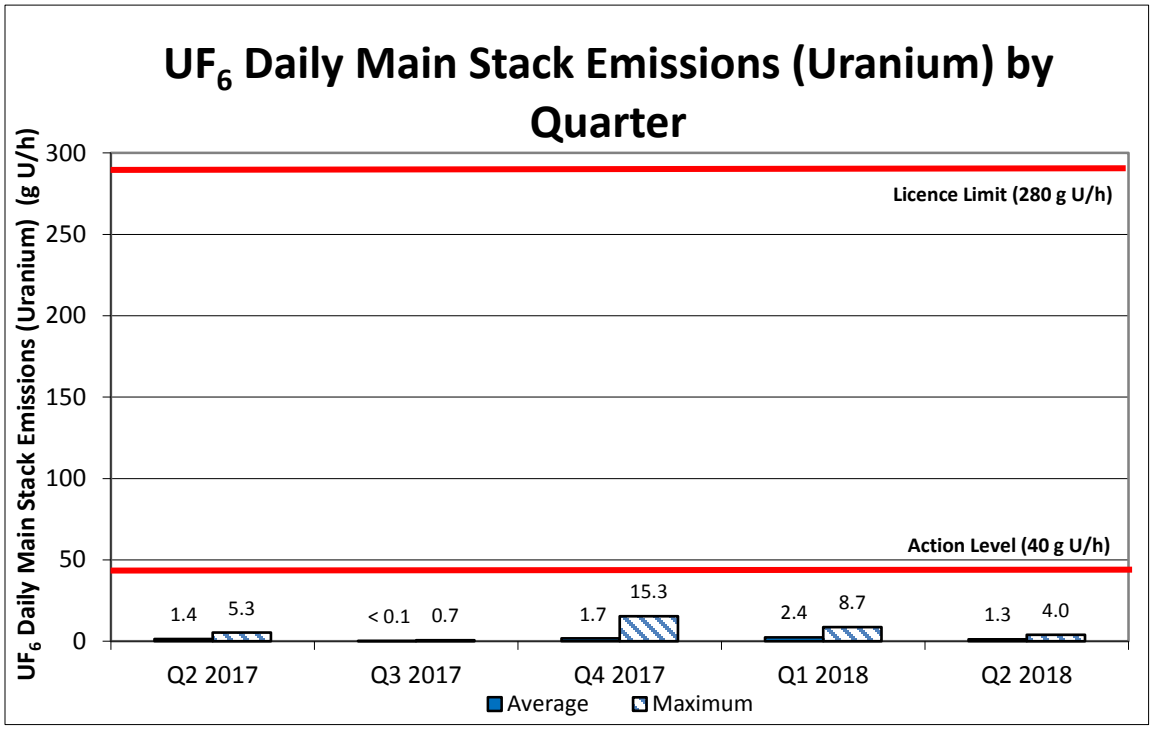


Figure 10

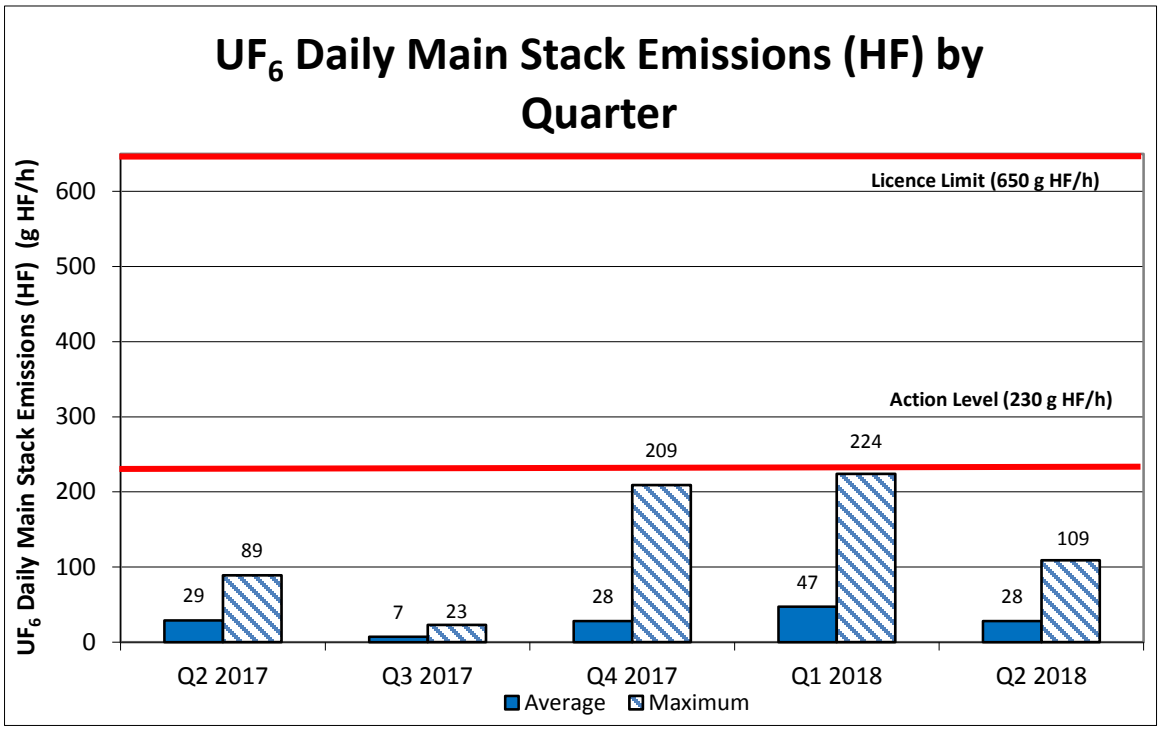


Figure 11

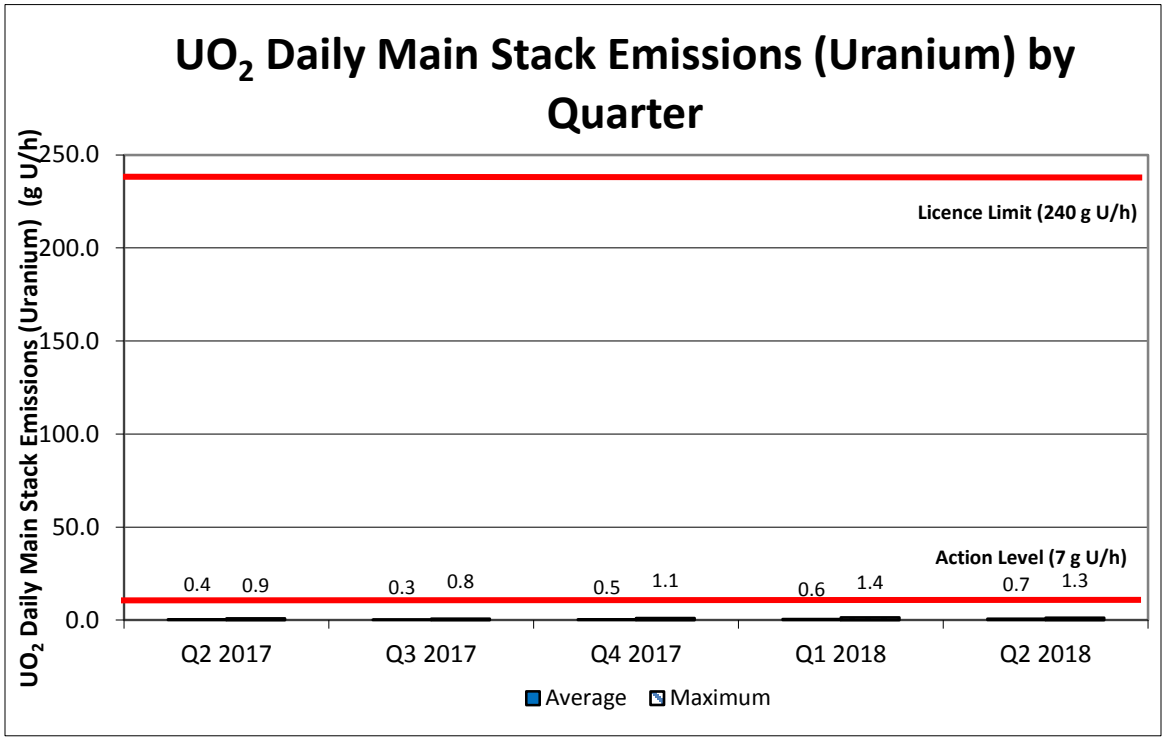
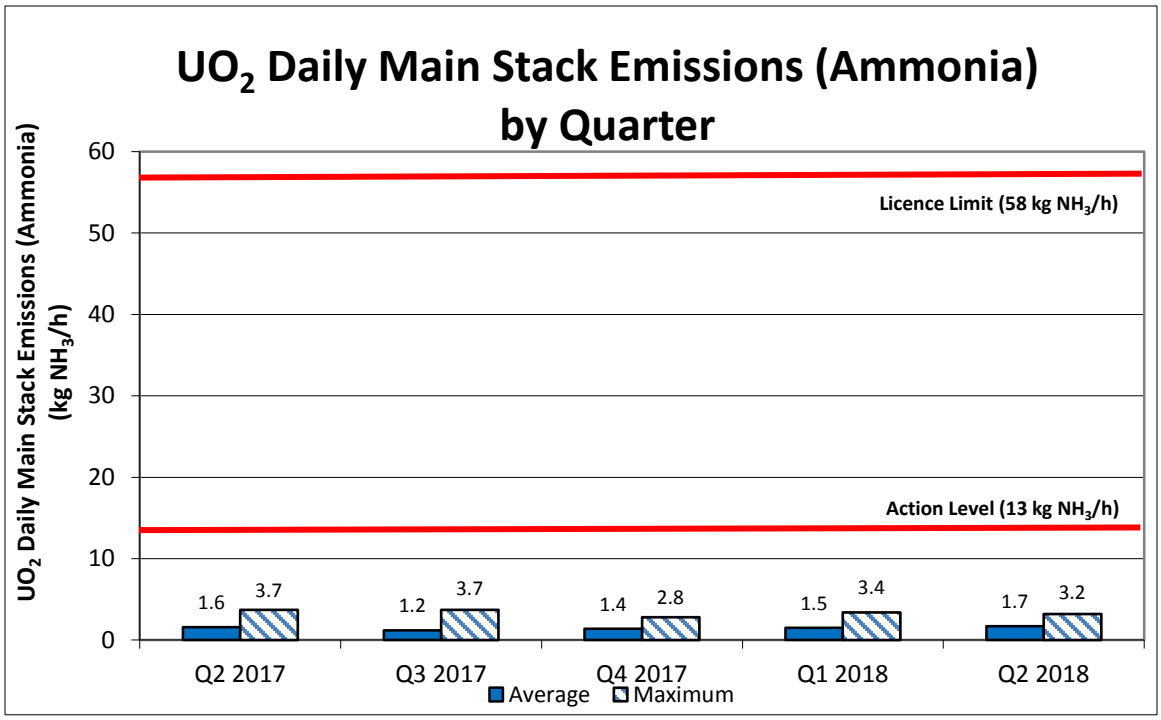


Figure 12



Liquid Discharges

This section summarizes the PHCF liquid discharges and associated monitoring programs.

There are currently three types of liquid point source discharges from the PHCF operations that are routinely monitored: cooling water returns; the combined sanitary sewage discharge; and the combined cooling water pump house backwash (FBW) stream. Facility storm water discharge data is not summarized herein.

The FBW stream receives contributions from pump house travelling screen operations and downstream equipment associated with the facility cooling water intake mechanical pre-treatment operations.

Most of the PHCF cooling water requirements are met by the facility cooling water intake, located at the entrance to the Port Hope harbour, and the remaining cooling water requirements are met by municipal potable water. A once-through non-contact cooling water system is used.

The PHCF cooling water works operations are regulated by the Ontario MOECP under a Permit to Take Water (PTTW), an Environmental Compliance Approval (ECA) and Ontario Regulation 560/94. ECA 4998-9CKL7F requires specific sampling of the cooling water works discharge points UO_2N and UO_2S, among other items. Moreover, the ECA

stipulates added monitoring requirements beyond baseline Municipal/Industrial Strategy for Abatement (MISA) cooling water sampling and flow monitoring requirements in some cases.

Cooling water discharge quality data is summarized in Table 15 and Table 16. The UF_6 Plant/Building 2 (UO_2N) and UO_2 Plant (UO_2S) cooling water returns have general displayed reasonably consistent parameter results over the previous five quarters. Note however that a replacement analytical instrument associated with ammonia+ ammonium, nitrate and fluoride analyses was put into service as of early June. Improved (lowered) method detection limits are now in place for the noted parameters and in the case of ammonia + ammonium, significant reductions in reported concentrations were recorded for the balance of June. A decrease in ammonia trending is anticipated to more visible in summary statistic data for the next quarterly reporting period, the first full quarterly reporting period under the revised detection limits.

Flow data is summarized and discussed in the Annual Compliance Monitoring and Operational Performance Report.

An overview of ECA monitoring results with comparison to effluent objectives and limits, among other items, is compiled in a separate annual performance report to fulfill additional ECA reporting requirements. Annual performance reports are submitted to the MOECP within 90 days of the end of each calendar year.

The municipal sewage treatment plant processes the sanitary sewer discharges from the PHCF. The principal sources contributing to the combined PHCF sanitary sewer discharge are standard domestic stream contributions from throughout the facility, liquid discharges from the Powerhouse (such as boiler blowdown) and contributions from showering facilities. All sanitary sewer sources merge into a common sanitary sewer line within the PHCF prior to discharging to the municipal sanitary sewer system. It should be noted that a portion of the sanitary sewer discharge from PHCF originates upstream of the facility, primarily from the municipal water treatment facility.

The combined PHCF sanitary sewer discharge is sampled on a daily basis for uranium and pH. Table 17 summarizes and Figure 13 illustrates summary uranium concentrations and pH values observed during the second quarter.

In 2016 and early 2017, as part of the relicensing process, a daily sanitary sewer discharge action level of 100 µg/L and a monthly mean release limit of 275 µg/L were developed and accepted. Between April 16 to April 19 and May 29 to May 30, 2018, the sanitary sewer discharge action level was reached or exceeded due to groundwater infiltration. An exceedance of an action level does not pose a risk to people or the environment.

Table 15

UO_2N Water Quality Data by Quarter							
Parameter	**Units of Measure**	**Value**	**Q2 2017**	**Q3 2017**	**Q4 2017**	**Q1 2018**	**Q2 2018**
Uranium	µg U/L	Average	3.2	3.1	2.9	3.7	3.1
		Maximum	8.6	7.4	4.8	6.2	7.8
Fluoride	mg F/L	Average	0.21	0.18	0.21	0.23	0.18
		Maximum	0.33	0.22	0.31	0.30	0.28
Ammonia & Ammonium	mg N/L	Average	0.075	0.094	0.25	0.31	0.18
		Maximum	0.13	0.30	0.44	0.67	0.38
Nitrate	mg N/L	Average	0.93	0.66	0.98	1.3	0.90
		Maximum	1.6	1.0	1.3	1.5	1.5
pH	-	Minimum	7.59	7.48	7.31	7.20	7.60
		Maximum	8.39	8.43	8.20	8.32	8.56

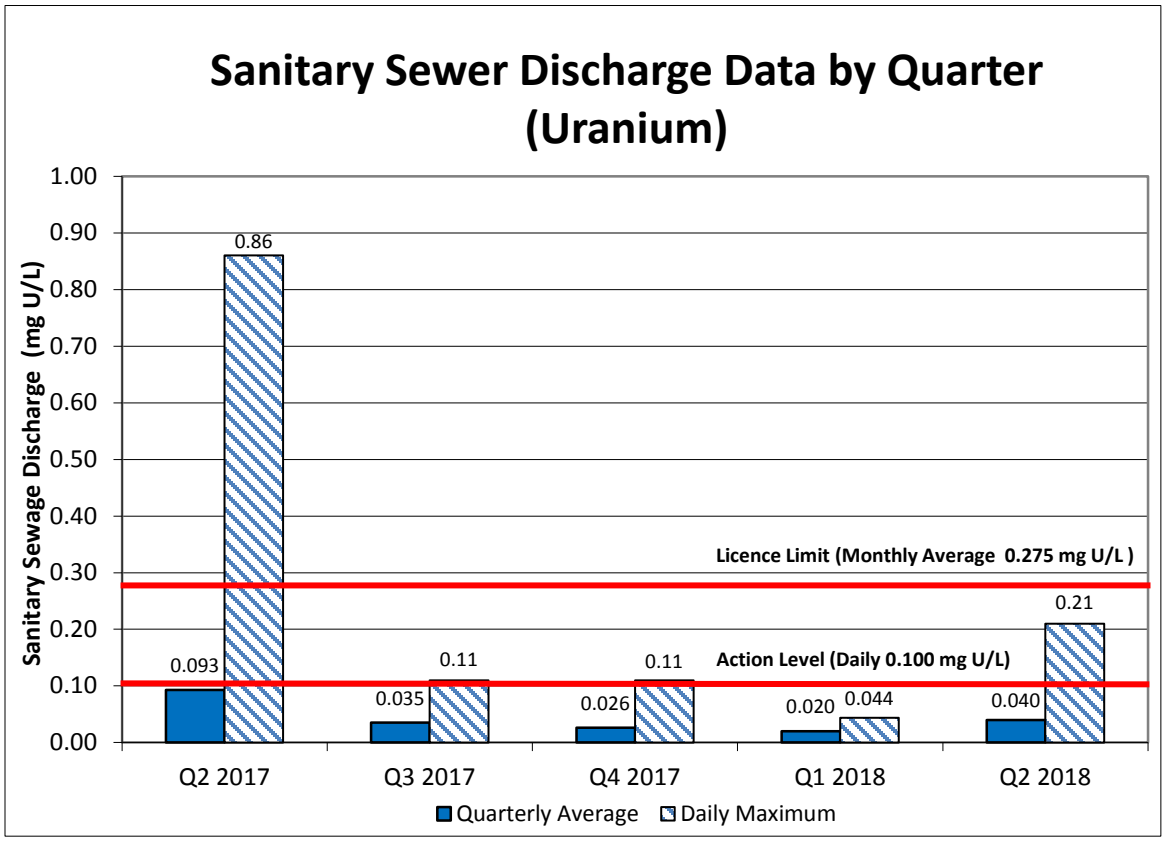
Table 16

UO_2S Water Quality Data by Quarter							
Parameter	**Units of Measure**	**Value**	**Q2 2017**	**Q3 2017**	**Q4 2017**	**Q1 2018**	**Q2 2018**
Uranium	µg U/L	Average	3.3	3.1	3.0	3.9	3.1
		Maximum	8.5	7.4	6.0	6.6	8.5
Ammonia & Ammonium	mg N/L	Average	0.082	0.12	0.23	0.29	0.17
		Maximum	0.12	0.36	0.42	0.50	0.36
Nitrate	mg N/L	Average	0.98	0.67	1.0	1.4	0.92
		Maximum	1.6	1.1	1.3	1.6	1.6
pH	-	Minimum	7.63	7.53	7.37	7.31	7.69
		Maximum	8.43	8.47	8.20	8.36	8.63

Table 17

Sanitary Sewer Discharge Data by Quarter							
Parameter	**Units of Measure**	**Value**	**Q2 2017**	**Q3 2017**	**Q4 2017**	**Q1 2018**	**Q2 2018**
Uranium	mg U/L	Average	0.093	0.035	0.026	0.020	0.040
		Maximum	0.86	0.11	0.11	0.044	0.21
pH	-	Minimum	7.23	7.17	6.84	7.16	7.11
		Maximum	8.92	8.33	7.92	8.91	8.30

Figure 13



Ambient Air Monitoring

In support of the source sampling program, an ambient air program has been established to measure air quality near the PHCF. Samples from the site and the community are collected and analyzed for a variety of parameters. The facility's fluoride and uranium emissions have the greatest potential environmental impact and therefore, are the major focus of the ambient air monitoring program.

Cameco monitors ambient uranium concentrations in the field using dustfall jars, high volume air samplers (hi-vols) and soil samples. The results from dustfall jars and hi-vol programs are provided below. Soil sampling is currently conducted on an annual basis and the results are discussed in the Annual Compliance Monitoring and Operational Performance Report.

Dustfall monitoring is a measurement of deposition rate and is obtained by collecting particulate matter in a container, termed a dustfall jar. The particulate matter is collected over a one-month period, and analyzed to determine the uranium deposition rate. There is no regulated standard for uranium content in dustfall. Cameco has established an internal

administrative screening level of 10 mg U/m^2/30 days that would be indicative of abnormal conditions.

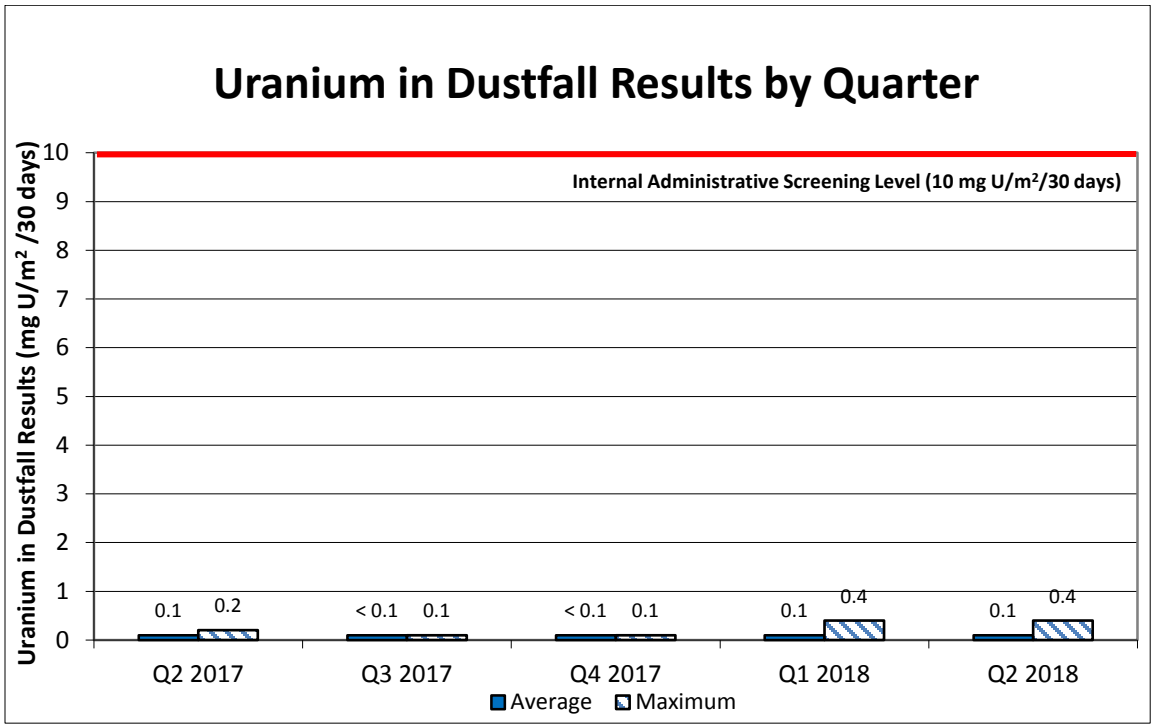
No uranium dustfall results exceeded the internal administrative screening level in the second quarter. The average uranium in dustfall results in the second quarter of 2018 were consistent with the uranium in dustfall averages during the previous four quarters.

Table 18 and Figure 14 show the quarterly all-station average and maximum uranium dustfall results from the first quarter of 2017 through to the second quarter of 2018.

Table 18

Uranium in Dustfall Results by Quarter (mg U/m^2/30 days)					
Value	**Q2 2017**	**Q3 2017**	**Q4 2017**	**Q1 2018**	**Q2 2018**
Average	0.1	< 0.1	< 0.1	0.1	0.1
Maximum	0.2	0.1	0.1	0.4	0.4
Internal Administrative Screening Level = 10 mg U/m^2/30 days					

Figure 14



The hi-vol air-sampling program monitors the concentration of uranium suspended in the air near the facility. There are four monitoring stations located at Marsh Street at the fence

line just south of the UF_6 plant, east of the Port Hope Waterworks, Hayward Street and Shuter Street.

Approximately 40 cubic feet per minute of air is passed through the hi-vol sampler and collected on a filter in a 24 hour period.

The regulatory criteria for uranium content in ambient air varies by period and particulate size. Cameco uses TSP (total suspended particulates) hivols at the PHCF. The Ambient Air Quality Criteria (AAQC) for U in TSP are 0.3 µg U TSP/m^3 (24 hr) and 0.06 µg U in TSP/m^3 (annual). These TSP criteria are compared against the maximum and average PHCF hivol results, respectively.

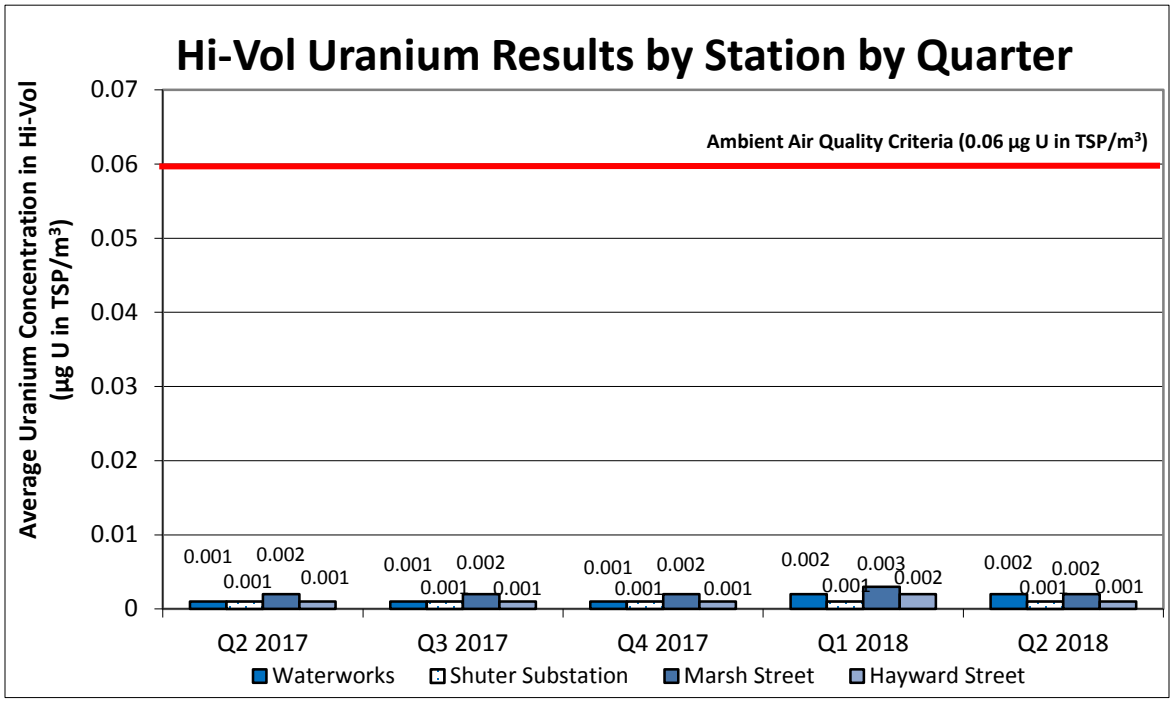
Table 19 summarizes the average and maximum uranium hi-vol results from the second quarter of 2017 through to the second quarter of 2018.

Figure 15 show the average uranium hi-vol results from the second quarter of 2017 through to the second quarter of 2018. Average and maximum results for the quarter are below regulatory criteria and comparable to levels observed in the previous four quarters.

Table 19

Uranium-in-Air Concentration at Hi-Vol Stations by Quarter (µg U in TSP/m^3)					
Quarter	**Result**	**Waterworks**	**Shuter Substation**	**Marsh Street**	**Hayward Street**
Q2 2017	Average	0.001	0.001	0.002	0.001
	Maximum	0.005	0.004	0.009	0.005
Q3 2017	Average	0.001	0.001	0.002	0.001
	Maximum	0.015	0.004	0.008	0.007
Q4 2017	Average	0.001	0.001	0.002	0.001
	Maximum	0.005	0.007	0.008	0.005
Q1 2018	Average	0.002	0.001	0.003	0.002
	Maximum	0.027	0.007	0.012	0.011
Q2 2018	Average	0.002	0.001	0.002	0.001
	Maximum	0.006	0.003	0.012	0.005
Average <0.06 µg U in TSP/m^3 (annual) AAQC Maximum <0.3 µg U in TSP/m^3 (24 hr) AAQC					

Figure 15



The concentration of fluoride in the ambient environment is monitored in the field using dustfall, lime candle and vegetation sampling. The results from the dustfall and lime candle programs are provided below. The results for the vegetation sampling program are provided in the Annual Compliance Monitoring and Operational Performance Report.

In addition to the uranium analysis discussed above, the fluoride content of the collected dust provides information on the amount of fluoride in air near the facility. There is no regulated standard for fluoride content in dustfall. However, Cameco has established an internal administrative screening level of 20 mg F/m^2/30 days that would be indicative of abnormal conditions.

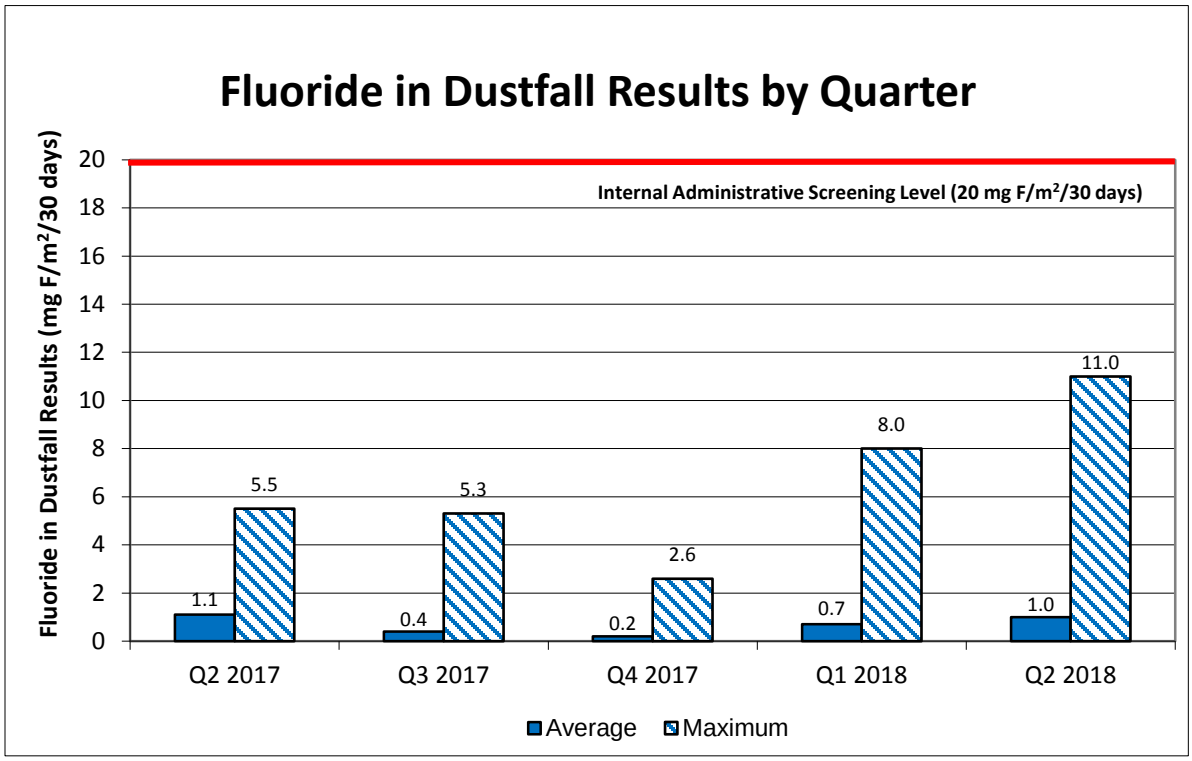
The average fluoride in dustfall results in the second quarter of 2018 is consistent with the fluoride in dustfall results observed in the previous four quarters.

Table 20 and Figure 16 show the quarterly all-station average and maximum fluoride dustfall results from the second quarter of 2017 through to the second quarter of 2018.

Table 20

Fluoride in Dustfall Results by Quarter (mg F/m^2/30 days)					
Value	**Q2 2017**	**Q3 2017**	**Q4 2017**	**Q1 2018**	**Q2 2018**
Average	1.1	0.4	0.2	0.7	1.0
Maximum	5.5	5.3	2.6	8.0	11.0
Internal Administrative Screening Level = 20 mg F/m^2/30 days					

Figure 16



Fluorination rate is an indirect measurement of the gaseous fluoride concentration in the ambient air. An established method for measuring the fluoride concentration in ambient air is to expose lime coated filter papers, commonly called lime candles, for a fixed period of time. The fluoride reacts with the lime and the analysis of the lime candles provides a time-averaged fluoride concentration. Lime candles consist of a 10 cm x 10 cm filter paper that is soaked with a saturated calcium oxide (CaO) solution housed in a louvered shelter sampling station with a hinged top.

The lime candles are prepared, deployed and collected on a specified frequency and are submitted to the analytical group for fluoride analysis. The period of time is normally 30 days; however, weekly periods are also used. These shorter-term results are used to assess impact in a timelier manner. Monthly and weekly lime candles are operated throughout the year. The Ambient Air Quality Criteria (AAQC) for fluoridation are

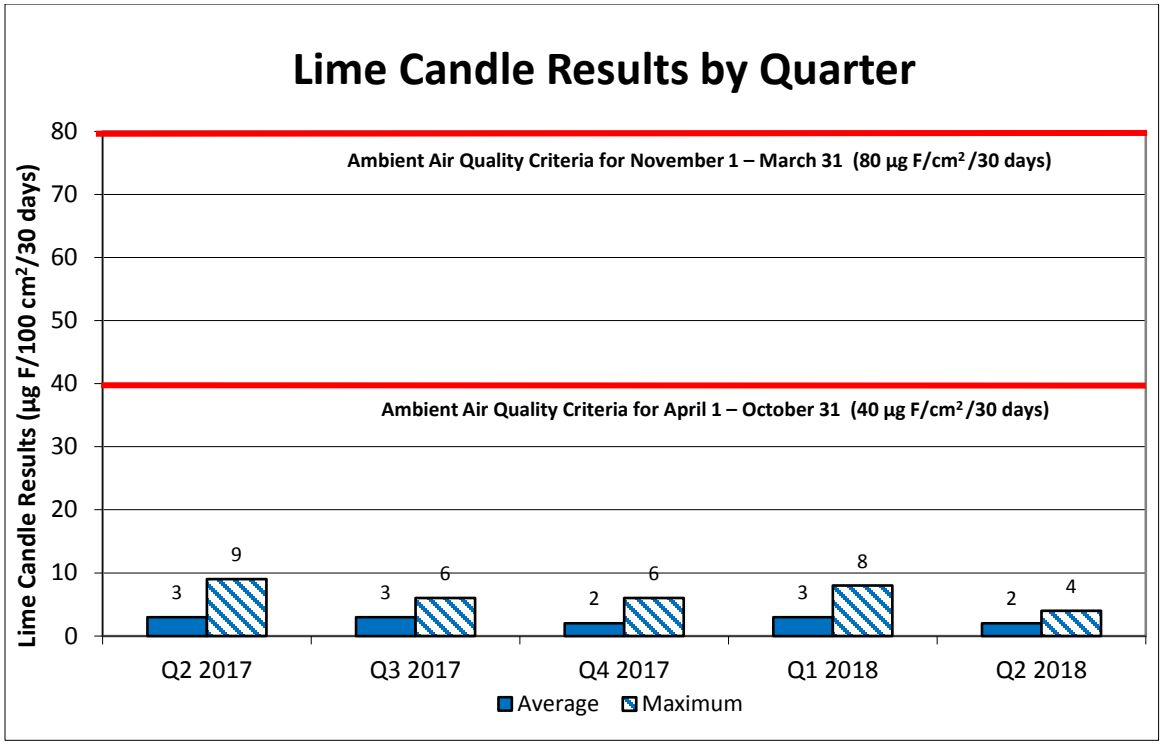
40 µg F/100 cm^2/30 days for April 1 to October 31 and 80 µg F/100 cm^2/30 days for November 1 to March 31. These criteria are based on the protection of foraging animals.

Table 21 and Figure 17 show the average and maximum lime candle results from the second quarter of 2017 through to the second quarter of 2018. Average results are comparable to levels observed in the previous four quarters.

Table 21

Monthly Lime Candle Results by Quarter (µg F/100 cm^2/30 days)					
Value	**Q2 2017**	**Q3 2017**	**Q4 2017**	**Q1 2018**	**Q2 2018**
Average	3	3	2	3	2
Maximum	9	6	6	8	4

Figure 17



Terrestrial Monitoring

The terrestrial monitoring program, including soil and vegetation sampling, is performed at frequencies specified in the individual procedures. The data collected is useful for evaluating the potential effects of the facility operations on the surrounding environment and may be used to supplement results from the air emission monitoring program. Results

from the terrestrial monitoring program are summarized and discussed in the Annual Compliance Monitoring and Operational Performance Report.

Ambient Water Quality Monitoring

The ambient water quality monitoring program is established to monitor and assess potential impacts of PHCF operations on the local watercourse.

Liquid discharges to the Port Hope harbour are from the three source discharge types outlined previously, storm water discharges and groundwater flow through the site.

The surface water monitoring program consists of sampling 13 monitoring locations on a quarterly basis. At each location, samples are obtained just below the water surface and just above the harbour sediment layer. The second quarter 2018 surface water sampling took place on May 9, 2018. Note that sampling locations in the vicinity of the west turning basin harbour wall have been adjusted in response to the installation of a silt curtain by the Municipality of Port Hope.

The PHCF long-term groundwater monitoring program includes groundwater level monitoring and groundwater sampling. Groundwater level monitoring of select wells is completed on a quarterly or annual basis.

Groundwater is sampled under three separate schedules: monthly sampling of the operating pumping wells; quarterly sampling of overburden monitoring wells covering five key areas of the site; and annual sampling of bedrock monitoring wells. The five keys areas of the site include: the refinery wells; the east plume associated with the UF_6 plant; the south plume associated with the UF_6 plant; the former UF_6 plant area; and the UO_2 plant area.

Twelve pumping wells were in operation during the second quarter. Additional groundwater and surface water monitoring program details are provided in the Annual Groundwater and Surface Water Review Report.

As the south cooling water intake (SCI) is located near the harbour's exit point to Lake Ontario, the associated water quality data provides a reasonable indication of the mean water quality in the Port Hope harbour.

A summary of SCI water quality data is presented in Table 22. The SCI has generally displayed reasonably consistent parameter results over the previous five quarters. Note that a replacement analytical instrument associated with ammonia+ ammonium, nitrate and fluoride analyses was put into service as of early June. Improved (lowered) method detection limits are now in place for the noted parameters and in the case of ammonia + ammonium, significant reductions in reported concentrations were recorded for the balance of June, included analytical zero recordings in select cases. A decrease in

ammonia trending is anticipated to more visible in summary statistic data for the next quarterly reporting period, the first full quarterly reporting period under the revised detection limits.

Table 22

SCI Water Quality Data by Quarter							
Parameter	**Units of Measure**	**Value**	**Q2 2017**	**Q3 2017**	**Q4 2017**	**Q1 2018**	**Q2 2018**
Uranium	µg U/L	Average	3.3	3.1	3.0	3.9	3.2
		Maximum	8.6	8.8	5.8	6.4	8.0
Fluoride	mg F/L	Average	0.21	0.18	0.20	0.23	0.18
		Maximum	0.26	0.22	0.29	0.30	0.36
Ammonia & Ammonium	mg N/L	Average	0.17	0.14	0.24	0.27	0.14
		Maximum	0.22	0.32	0.40	0.47	0.34
Nitrate	mg N/L	Average	0.98	0.66	1.0	1.4	0.93
		Maximum	1.6	1.0	1.7	1.5	1.6
pH	-	Minimum	7.68	7.31	7.32	7.19	7.60
		Maximum	8.47	8.56	8.29	8.36	8.69

Effluent and Environmental Monitoring Program Performance

The facility Environmental Protection Program sets out the effluent and environmental monitoring requirements for the facility to ensure adequate environmental protection measures are in place. The performance criteria of these programs is that at least 90% of planned samples are collected and analyzed to meet the data acceptance criteria

- Water samples (i.e. cooling water, sanitary discharge) – 99.0% of planned samples were collected
- Stack samples (i.e. stacks, in-plant air) – 99.0% of planned samples were collected
- Environmental Samples (i.e. surface water, groundwater, hivol, dustfall, lime candle, fenceline gamma, soil, vegetation) – 99.5% of planned samples were collected

In the quarter, all analysis under the environmental program was completed with the quality control set out in the analytical methods. There were 102 instances where samples were flagged for issues with laboratory quality control. Of these, 8 were reviewed and/or repeated and deemed acceptable for use in accordance with the laboratory quality

program; 94 required further investigation into the reason for the issue(s). There were corrective actions taken to address the findings.

In addition, there were 25 ammonia cooling water results flagged for further investigation during the quarter due to lower results than routinely observed. The cause of the lower results was the implementation of a new replacement instrument which decreased the laboratory method detection limit allowing for lower limits to be reported than with the previous instrument. The samples were deemed to be acceptable.

In total, 94 (or 0.60% of) sample analyses were not included in quarterly reporting. There are 15 samples from the quarter that are missing analysis parameters and are waiting finalization, 14 of the 15 are waiting on contract lab analysis results.

2.3.4 Emergency Management and Response

This safety and control area covers the fire protection program, emergency plans and emergency preparedness programs. These procedures must exist for emergencies and for non-routine conditions. This also includes any results of emergency exercise participation.

The PHCF continues to maintain its emergency preparedness and response program while looking for opportunities to further improve. This activity and associated records are subject to various audits and are incorporated into the PHCF annual management review.

There were ten emergency response exercises carried out in the second quarter of 2018:

- On April 3, 10, 17 and 24 the Emergency Response Team (ERT) conducted HAZMAT training for UF_6 cylinder valve replacement, UF_6 release and chemical exposure in building 31.
- On April 18 the ERT conducted an ISO HF training scenario;
- On May 1, 8, 15 and 22 the ERT conducted live fire training at the Eastern Ontario Emergency Training Academy (EOETA) in Norwood, Ontario; and,
- On June 27 the ERT conducted refresher training at the EOETA.

During the second quarter there were 86 hours of training completed consisting of:

- Four 8-hour sessions of NFPA 472 Day Two and Day Three training;
- Five 10-hour sessions of live fire training; and,
- One 4-hour training scenario.

All drills and exercises are documented and deficiencies are tracked to ensure that appropriate corrective actions are taken.

2.3.5 Waste and By-product Management

This safety and control area covers internal waste and by-product-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 and by-product management facility. This also covers the ongoing decontamination and planning for decommissioning activities.

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 on-site until appropriate disposal options are available.

Wastes generated at the facility are segregated at the point of generation into contaminated and non-contaminated. Non-contaminated waste is either recycled or disposed of at an appropriate facility. Contaminated waste is stored in appropriate containers pending assessment of recycling or disposal options.

In the second quarter, 9.0 tonnes of non-contaminated wastes were sent to a local landfill. A total of 9.76 tonnes of non-contaminated materials were sent to appropriate recycling facilities for recovery.

The PHCF produces two by-products at the facility. These include ammonium nitrate, which is sold to a local fertilizer company, and fluoride product, which is sent for uranium recovery at a licensed facility. The amount of ammonium nitrate recycled in the quarter was 493 m^3. A total of 653 drums of fluoride product were generated in the quarter.

PHCF generated 68.4 tonnes of contaminated combustible materials (CCM) in the quarter, of which 25.4 tonnes was shipped to the BRR for incineration and 10.9 tonnes was shipped to the LTWMF for disposal. During the same period, a total of 10.1 tonnes of contaminated non-combustible materials (CNC) were generated and 63.9 tonnes were shipped to appropriately licensed hazardous waste facilities.

PHCF recycled 19.5 tonnes of metal after decontamination to free release criteria in the second quarter.

2.3.6 Nuclear Security

This safety and control area covers the programs required to implement and support the security requirements stipulated in the General Nuclear Safety and Control Regulations, the Nuclear Security Regulations and other CNSC requirements.

PHCF maintains a comprehensive security program which meets the requirements of the General Nuclear Safety and Control Regulations, the Nuclear Security Regulations and other CNSC requirements.

2.3.7 Safeguards and Non-proliferation

This safety and control area covers the programs required for the successful implementation of the obligations arising from the Canada/IAEA Safeguards and Non-proliferation Agreement.

The PHCF participated in two Safeguard inspections/activities in the second quarter:

- A Short Notice Random inspection was held on May 31 and June 1. There have been no findings reported to date.
- A Short Notice Random inspection was held on June 21 and 22. There have been no findings reported to date.

2.3.8 Packaging and Transport of Nuclear Substances

This safety and control area covers the packaging and transport of nuclear substances and other nuclear materials to and from the licensed facility.

UO_2 is produced, packaged in drums and transported by road from the PHCF to Cameco's Fuel Manufacturing Facility in Port Hope and/or other domestic fuel manufacturing facilities. UO_2 is also packaged in drums and transported by road and marine overseas to Japan, Romania and South Korea. There is also a small amount of material transported by air for customer evaluation purposes. The drums used for air transport meet the Type IP-3 packaging requirements; all other drums meet the Type IP-1 packaging requirements as specified in the CNSC Packaging and Transport of Nuclear Substance Regulations.

UF_6 is produced and transported in Type H(M) and H(U) cylinders certified by the CNSC by road or marine from the PHCF to the USA or overseas, including but not limited to, the United Kingdom, France, Germany, Holland and Japan.

In addition to UO_2 and UF_6, uranium scraps and by-products are transported by road from the PHCF to Cameco's Key Lake operation or to the USA for uranium recovery.

There were no reportable transportation events related to the PHCF in the second quarter.

3.0 OTHER MATTERS OF REGULATORY INTEREST

3.1.1 Public Information Program

For the second quarter of 2018, PHCF continued to meet the requirements of CNSC RD/GD 99.3, Public Information and Disclosure programs.

Public Engagement

On June 13, Cameco's Vision in Motion group hosted a community open house at the Carpenter's Union Hall and employees provided information about many key areas involved in the VIM project. Employees hosted several information stations where people could get information and ask questions about key activities occurring during the next 18 months. Attendees were provided details about why this project is taking place and what the local community should expect to see and hear during activities. Staff from the Port Hope Area Initiative also hosted their own information station to answer any questions regarding Centre Pier and the Choate Street extension. Representatives from the Municipality of Port Hope including the Mayor as well as members of council and staff were in attendance to gain information and also answer community questions. Other key attendees included a CNSC representative, local Green Party candidates and members of the Restore the West Beach group. A survey was administered to the community to get a better understanding of what they would like to see communicated in the future and their feedback will be acted on in the coming months. The open house was attended by more than 100 people and received local media attention, including a well-balanced feature that aired on Global news in Peterborough (CHEX TV).

The spring 2018 issue of Energize hit mailboxes of the Port Hope residents (Ward 1 & 2) in early May and was posted on our website and social media on May 9. The headline feature focused on Cameco Fuel Manufacturing being selected by Bruce Power as a supplier to the Major Component Replacement project. Other articles include recognizing the importance of mental health in the workplace, an evening with Karl Subban, Cameco's Charity Golf Tournament, and an update on the Vision in Motion project.

Cameco's public opinion survey started in June once again using Fast Consulting to facilitate. Landlines, mobile phone numbers and online surveys were used to conduct the survey. Results will be disclosed in the third quarter.

Public Disclosure

Cameco's conversion facility did not disclose any unusual events to the public during the second quarter. Social Media

Our social media 'likes/follows' continued to grow in the second quarter and both Twitter and Facebook received an average of 20 new followers. Cameco Ontario posts covered an array of topics including our community investment announcements such as Cameco's monthly community partner, our invitation to the open house that was shared 31 times, and our post announcing 60 years of processing UO_2 in Port Hope.

Leading up to Cameco's Charity Golf Tournament on May 26, many posts were made recruiting golfers and thanking sponsors at the various sponsorship levels.

Member of Parliament for Northumberland—Peterborough South and Parliamentary secretary to the Minister of Natural Resources, Kim Rudd, posted a video on social media congratulating Cameco on their announced contract with Bruce Power. This was shared on the Cameco Ontario Facebook page.

Website

Cameco's 7th Annual Charity Golf Tournament registration and announcement were posted on the community website in the first quarter but the post was updated in the second quarter to include a thank you and pictures of the event.

There were no environmental incidents posted on our website in the second quarter.

Relationship with Municipality of Port Hope

In addition to the regular communications between the municipality and Cameco in relation to the Vision in Motion project, representatives of the municipality were invited to attend the Vision in Motion open house and be available for questions. The Mayor of Port Hope, Bob Sanderson, Deputy Mayor, Terry Hickey and special projects lead, Sue Bernardi attended and spoke with members of the public.

Our relationship remains open and strong with council and key members of the municipality.

Media Analysis

Cameco appeared in the media for various reasons including its community investment and it was positive in nature. On May 16 Cameco was proud to present, 'A night with Karl Subban' and approximately 100 people, including Port Hope Mayor Bob Sanderson, teachers, students and parents, attended. Karl talked about the potential every boy and girl has to make it in life, sports and school.

Cameco's involvement in the Northumberland United Way's Hockey Night in Northumberland, and the Northumberland United Way's upcoming Day of Caring were also among the positive media.

Communication Products

Cameco created a bookmark for the Karl Subban event to hand out to attendees, and also handed it out at Career Day on May 2.

Cameco updated company fact sheets to reflect new contracts and announcements. These fact sheets are handed out at events such as the Career Day, any event where media is present, and also all tours.

Cameco completed extensive work to update Vision in Motion information handouts ahead of its open house. These updated fact sheets detail the projects and activities. An animation was also created to demonstrate the before and after of the VIM project. All of this information is available on our community website at https://www.camecofuel.com/business/port-hope-conversion-facility/vision-in-motion.

Other Initiatives

During the quarter, Cameco and its employees engaged in a number of community outreach activities and events. The Heart and Stroke Big Bike ride was in Port Hope and Cobourg and once again, more than 40 employees participated and raised money for the cause. Cameco employees also participated in Port Hope's Float Your Fanny Down the Ganny and Cameco sponsored the Kid's Zone. A member of Cameco's leadership team presented an award at the Port Hope & District Chamber of Commerce Business Excellence Awards and employees helped out at the 21st Day of Caring for the Northumberland United Way.

Cameco's Career Day occurred on May 2 at the Port Hope High School and Cobourg's Catholic Secondary School. Over 20 employees from various career paths volunteered to share their work experience with students grades nine to twelve, providing them with real stories of what education is needed to do certain jobs.

Cameco donated advertising time on the local radio station (93.3 MyFM) to the following three Cameco Community Partners:

- April – The Children's Foundation Serving Hastings, Northumberland & Prince Edward Counties
- May – Cornerstone Family Violence Prevention Centre
- June – Northumberland YMCA

3.1.2 Site - Specific

The nuclear criticality safety program at the PHCF follows the criticality control principles as described in Radiation Protection Program Manual. In summary, processing of any amount of enriched material at the PHCF is governed by a criticality control committee (CCC) as described in the Nuclear Criticality Safety Program Manual.

The PHCF met all other site-specific reporting requirements.

Vision in Motion (VIM) detailed design activities continued as part of a rolling wave approach with a focus on equipment removal and demolition at the former UF_6 plant and site-wide infrastructure. The storm water system design was in review by the Ganaraska Region Conservation Authority.

Project hi-vol stations per the Supplemental Environmental Monitoring Plan were installed and began operating.

The Ontario Spills Action Centre (SAC) was contacted and the CNSC was notified (reference # 8800-AXRLZB) to report an ambient station high volume air sampler exceedance of total suspended particulate (TSP) of 169 µg/m^3 on April 10, 2018, which is above the ECCC and MOECP 120 µg/m^3 TSP dust criteria for visibility. The investigation indicated that the particulate was due to dusty post-winter conditions and site traffic adjacent to the monitoring location, located next to the cylinder storage area. The ground surface in the cylinder storage area has since been cleaned up and no further exceedances have occurred.

The construction noise Administrative Control criteria states that day-time (07:00-19:00) noise levels attributable to construction activities cannot exceed the higher of 65 dBA or the baseline (pre-construction) noise levels plus 5 dBA at the premises of a residential/institution noise-sensitive receptor. On May 18, 2018, a noise action level exceedance of 66 dBA was recorded at a receptor point (N3), located east of the Centre Pier, as a result of construction equipment working in the vicinity of the receptor.

Temporary construction support facilities at the Centre Pier were established. Main site construction support facility trailers were completed at a vendor's manufacturing facility and a contract for their installation was awarded. Tenders closed and bid evaluations were underway for infrastructure work at the south end of the facility in the area of the new hydrogen station and in the corridor between building 2 and warehouse buildings 6, 7, 12 and 12A.

The Cameco/Canadian Nuclear Laboratories (CNL) working groups continued to coordinate. The Centre Pier work island in support of concurrent Cameco and CNL activities was fully implemented (May 22). Legal agreements with CNL to support the

temporary storage site removal work, and waste acceptance criteria were completed. Legal agreements in support of shared work at the Centre Pier harbour and former waterworks property continue to be in-progress. It is planned that CNL will incorporate all of the demolition activity at the former waterworks property along with other remediation activities at the site; and in support of this plan CNL had a designated substances survey (DSS) completed at the former waterworks buildings.

Preparations for the 2018 accumulated waste processing campaign were in-progress. Contracts for equipment installation and transportation were awarded. Some waste materials were temporarily transferred to the Centre Pier to create space at the main site due to a later than planned start to transfer of wastes to the LTWMF. Setup of work areas and equipment was completed and drum repackaging activities began on June 10. Waste deliveries to the LTWMF began on June 20.

The first phase of activities in the former UF_6 plant involving removal of asbestos and installation of electrical and mechanical support services was completed. Hazardous material removal activities began using Cameco personnel and with ongoing contractor support for asbestos abatement, mechanical and electrical work.

Procurement for Centre Pier building demolition was ongoing and bids for demolition of all remaining buildings on the Centre Pier closed and are being evaluated. It is anticipated that delays to the opening of the LTWMF will impact the start and finish dates for the demolition.

Coordination and communication with The Municipality of Port Hope (MPH) and the community continued. Employee and public open houses about VIM were held, with strong interest and some media coverage of the public event. Website content about VIM was updated. A regular monthly coordination meeting between MPH and Cameco in relation to VIM activities was implemented. A joint meeting was held with CNL, MPH and CNSC to clarify the application of CNL and Cameco licences to the remediation efforts, especially those on MPH property. The MPH received bids for the design and municipal environmental assessment design of the Choate Street extension per the Road Construction Agreement. Cameco and MPH reviewed bids and the municipality awarded and kicked-off the work.

3.1.3 Improvement Plans and Future Outlook

The 2018 improvement plans and future outlook for the PHCF are discussed in section 3.1.3 Improvement Plans and Future Outlook of the 2017 Annual Compliance Monitoring and Operational Performance Report, which was issued on March 29, 2018.

3.1.4 Safety Performance Objectives for Following Year

The 2018 safety performance objectives for the PHCF are discussed in section 3.1.4 Safety Performance Objectives for Following Year of the 2017 Annual Compliance Monitoring and Operational Performance Report, which was issued on March 29, 2018.

4.0 CONCLUDING REMARKS

Cameco is committed to the safe, clean and reliable operations of all of its facilities and continually strives to improve safety performance and processes to ensure the safety of both its employees and the people in neighbouring communities.

In the second quarter of 2018, PHCF did not exceed any CNSC regulatory limits. As a result of the effective programs, plans and procedures in place, the PHCF was able to maintain individual radiation exposures well below all regulatory dose limits. In addition, environmental emissions continued to be controlled to levels that are a fraction of the CNSC regulatory limits, and public radiation exposures are also well below the regulatory limits.

Cameco's relationship with local residents remains strong and we are committed to maintaining the strong support and trust we have developed over the past several years.