



UNPROTECTED/NON PROTÉGÉ

ORIGINAL/ORIGINAL

CMD: 21-M32

Date signed/Signé le : 26 AUGUST, 2021

Annual Program Report

Rapport annuel sur les programmes

## Canadian Nuclear Laboratories

## Laboratoires Nucléaires Canadiens

### Regulatory Oversight Report for Canadian Nuclear Laboratories Sites: 2020

### Rapport de surveillance réglementaire pour les sites des Laboratoires Nucléaires Canadiens: 2020

Public Meeting

Réunion publique

Scheduled for:  
November 24-25, 2021

Prévue pour :  
Les 24 et 25 novembre 2021

Submitted by:  
CNSC Staff

Soumis par :  
Le personnel de la CCSN

**Summary**

This Commission member document (CMD) concerns the regulatory oversight report for sites operated by Canadian Nuclear Laboratories (CNL) for the 2020 calendar year. CNL is the licensee for each of these sites.

No actions are required of the Commission. This CMD is for information only.

**Résumé**

Le présent document à l'intention des commissaires (CMD) porte sur le Rapport de surveillance réglementaire pour les sites exploités par les Laboratoires Nucléaires Canadiens (LNC) durant l'année civile 2020. Les LNC sont le titulaire de permis pour chacun de ces sites.

Aucune mesure n'est requise de la part de la Commission. Ce CMD est fourni à titre d'information seulement.

**Signed/signé le**  
26 August, 2021

---

Kavita Murthy

**Director General**  
Directorate of Nuclear Cycle and Facilities Regulation

**Directrice générale**  
Direction de la réglementation du cycle et des installations nucléaires

This page was intentionally left blank.

## TABLE OF CONTENTS

<b>CHANGES TO 2020 REGULATORY OVERSIGHT REPORT .....</b>	<b>1</b>
<b>PLAIN LANGUAGE SUMMARY .....</b>	<b>2</b>
<b>1 INTRODUCTION .....</b>	<b>4</b>
<b>2 CANADIAN NUCLEAR LABORATORIES .....</b>	<b>5</b>
2.1 Chalk River Laboratories.....	6
2.1.1 Major Activities at CRL .....	6
2.2 Whiteshell Laboratories.....	7
2.2.1 Major Activities at WL .....	8
2.3 Port Hope Area Initiative .....	8
2.3.1 Major Activities at PHAI .....	9
2.4 Prototype Power Reactors .....	10
2.4.1 Douglas Point Waste Facility .....	10
2.4.2 Gentilly-1 Waste Facility .....	11
2.4.3 Nuclear Power Demonstration Waste Facility.....	12
<b>3 THE CNSC'S REGULATORY OVERSIGHT OF CNL.....</b>	<b>13</b>
3.1 Regulatory Activities.....	14
3.2 Performance Ratings .....	15
<b>4 THE CNSC'S ASSESSMENT OF SAFETY AT CNL SITES.....</b>	<b>15</b>
4.1 Management System .....	16
4.2 Human Performance Management .....	16
4.3 Operating Performance.....	16
4.4 Safety Analysis.....	17
4.5 Physical Design.....	17
4.6 Fitness for Service .....	17
4.7 Radiation Protection.....	17
4.7.1 Application of ALARA .....	18
4.7.2 Worker Dose Control .....	18
4.7.3 Radiation Protection Program Performance .....	19
4.7.4 Radiological Hazard Control .....	19
4.8 Conventional Health and Safety.....	20
4.8.1 Performance .....	20
4.8.2 Practices.....	21
4.8.3 Awareness.....	21
4.9 Environmental Protection .....	21
4.9.1 Effluent and Emissions Control.....	22
4.9.2 Environmental Management System .....	22
4.9.3 Assessment and Monitoring.....	22
4.9.4 Independent Environmental Monitoring Program.....	23
4.9.5 Environmental Risk Assessment .....	23
4.9.6 Protection of the Public.....	24

4.9.7	Estimated Dose to the Public.....	24
4.10	Emergency Management and Fire Protection .....	24
4.11	Waste Management .....	25
4.12	Security .....	27
4.13	Safeguards and Non-Proliferation .....	28
4.14	Packaging and Transport .....	29
<b>5</b>	<b>EVENTS AND OTHER MATTERS OF REGULATORY INTEREST .....</b>	<b>29</b>
5.1	Reportable Events.....	29
5.2	Public Engagement.....	30
5.2.1	CNSC .....	30
5.2.2	Canadian Nuclear Laboratories .....	30
5.3	Indigenous Consultation and Engagement .....	32
5.3.1	CNSC .....	32
5.3.2	Canadian Nuclear Laboratories .....	33
5.4	Nuclear Liability Insurance .....	34
5.5	COVID-19 Response .....	35
5.5.1	CNSC .....	35
5.5.2	Canadian Nuclear Laboratories .....	36
5.6	Overall Conclusions .....	37
	<b>REFERENCES .....</b>	<b>38</b>
	<b>GLOSSARY AND ACRONYMS .....</b>	<b>40</b>
	<b>A. INDIGENOUS COMMUNITIES AND GROUPS WHOSE TRADITIONAL AND/OR TREATY TERRITORIES ARE IN PROXIMITY TO CNL SITES.....</b>	<b>42</b>
	<b>B. ROR DASHBOARD .....</b>	<b>44</b>
	<b>C. LICENCES AND LICENSING ACTIVITIES .....</b>	<b>45</b>
	<b>D. REGULATORY DOCUMENT IMPLEMENTATION .....</b>	<b>47</b>
	<b>E. LIST OF INSPECTIONS AT CNL SITES .....</b>	<b>50</b>
	<b>F. REPORTABLE EVENTS.....</b>	<b>55</b>
	<b>G. REGULATORY EFFORT.....</b>	<b>59</b>
	<b>H. SAFETY AND CONTROL AREA RATINGS.....</b>	<b>60</b>
	<b>I. DOSES TO NUCLEAR ENERGY WORKERS AND NON-NUCLEAR ENERGY WORKERS AT CNL SITES .....</b>	<b>67</b>
	<b>J. LOST-TIME INJURY INFORMATION .....</b>	<b>78</b>
	<b>K. TOTAL ANNUAL RELEASE OF RADIONUCLIDES.....</b>	<b>81</b>
	<b>L. ESTIMATED DOSE TO THE PUBLIC .....</b>	<b>86</b>

**M. PARTICIPANT FUNDING AWARDED FOR THE 2020 CNL REGULATORY  
OVERSIGHT REPORT.....89**

**N. SELECTED WEBSITES .....90**

This page was intentionally left blank.



## CHANGES TO 2020 REGULATORY OVERSIGHT REPORT

As a result of recommendations from the Commission, feedback from intervenors, commitments made by Canadian Nuclear Safety Commission (CNSC) staff as well as continuous improvement from previous years' regulatory oversight reports, the following changes have been made to the *Regulatory Oversight Report for Canadian Nuclear Laboratories Sites: 2020*:

- Indigenous groups and their traditional and/or treaty territories have been acknowledged at the beginning of the regulatory oversight report (ROR) and presentation.
- The executive summary has been replaced with a plain language summary.
- Further details on all Safety and Control Areas (SCAs) have been added.
- A binary rating system consisting of either “satisfactory” (SA) or “below expectations” (BE) has been used to assign licensee performance.
- An update has been added on nuclear liability as it relates to Canadian Nuclear Laboratories (CNL) sites.
- Greater use of hyperlinks have been made when content is readily available online (e.g. CNSC external website, past RORs, etc.).
- Where applicable, data provided includes:
  - error bars on charts and graphs;
  - an explanation on sampling and analytical techniques; and
  - sources of equations used for calculations and analyses.
- A pilot version of an ROR dashboard containing key and publicly digestible information and data has been developed to complement engagement activities.

## PLAIN LANGUAGE SUMMARY

The *Regulatory Oversight Report for Canadian Nuclear Laboratories Sites: 2020* is a report on the safety performance of sites that are licensed to Canadian Nuclear Laboratories (CNL) by the Canadian Nuclear Safety Commission (CNSC) and about CNSC staff's work to ensure the safety and protection of the people and the environment around the sites.

This report provides information on the following CNL licensed sites:

- Chalk River Laboratories – an operating nuclear research laboratory
- Whiteshell Laboratories – a nuclear research laboratory currently being decommissioned
- Port Hope Area Initiative
  - Port Hope Project – a low-level radioactive waste remediation project
  - Port Granby Project – a low-level radioactive waste remediation project
  - Port Hope Pine Street Extension Temporary Storage Site – a temporary storage site for low-level radioactive waste
  - Port Hope Radioactive Waste Management Facility – a temporary storage facility for low-level radioactive waste
- Douglas Point Waste Facility – a shut down prototype power reactor
- Gentilly-1 Waste Facility – a shut down prototype power reactor
- Nuclear Power Demonstration Waste Facility – a shutdown prototype power reactor

These sites continued to operate safely in 2020, and monitoring shows that the food grown nearby is safe to eat and that the water is safe to drink. There were no releases that could have harmed human health or the environment.

Each year, CNSC inspectors complete safety inspections at CNL sites. The number of inspections and their focus depend on the individual site and how it has been performing. The CNSC uses a risk-informed approach when planning inspections. In 2020, CNSC staff performed a total of 15 inspections across the CNL sites. While remote inspections were leveraged to the extent possible, the number of inspections was lower than in previous years due to the COVID-19 related restrictions put in place to protect the health and safety of people. These inspections resulted in the issuance of 30 notices of non-compliance (NNC), which were all related to issues identified as low risk. CNSC staff have determined that all of the NNCs have been closed or have an appropriate corrective action plan that has been put in place.

The CNSC evaluates licensees across 14 safety and control areas. However, this report focuses on the following 3 areas, as these provide a good overview of safety performance at CNL sites:

- **Radiation protection:** In 2020, the maximum individual radiation dose to a worker at any of the CNL sites occurred at Chalk River Laboratories and was 7.97 mSv (16% of the annual regulatory limit). The maximum estimated dose to the public from a CNL site was from the Port Hope Project, and was 0.033 mSv/year (3.3% of the 1 mSv/year dose limit).
- **Conventional health and safety:** All CNL sites must report any workplace-related lost-time injuries to the CNSC and provincial agencies. In 2020, there were 5 lost-time injuries reported, the same number as reported in the previous year and well below comparable industry values.
- **Environmental protection:** CNSC licensees are required to report to the CNSC and other regulatory authorities any unauthorized releases of hazardous substances or nuclear materials to the environment. In 2020, there were no unauthorized airborne or waterborne releases reported. All water used at CNL sites must be treated before being discharged back into the environment. All released water met the federal or provincial discharge requirements, ensuring the safety of people near the facility. Airborne releases are controlled through methods such as filtration to ensure that provincial and federal requirements are met.

### **Indigenous and community engagement**

The CNSC recognizes and understands the importance of building relationships with Indigenous peoples in Canada. The CNSC's goal is to build partnerships and trust with Indigenous peoples through cooperative engagement activities. The CNL sites discussed in this report lie within the traditional and/or treaty territories of many Indigenous communities and groups.

In 2020, the activities undertaken by CNSC staff supported their ongoing commitment to meeting consultation and accommodation obligations, and to continuing to build relationships with Indigenous peoples in proximity to CNL sites.

Additionally, CNSC staff took the initiative to meet with Indigenous groups from communities near CNL sites prior to the public consultation period for this regulatory oversight report. This was carried out in order to provide information and to seek opportunities for improvement.

#### **In summary:**

- The health and safety of Indigenous communities and the public near the CNL sites, and the surrounding environment continue to be protected.
- Workers at each CNL site were safe and properly protected.
- There were no releases that could have harmed the environment or health and safety of people.

Referenced documents in this Commission member document are available to the public upon request.

# 1 INTRODUCTION

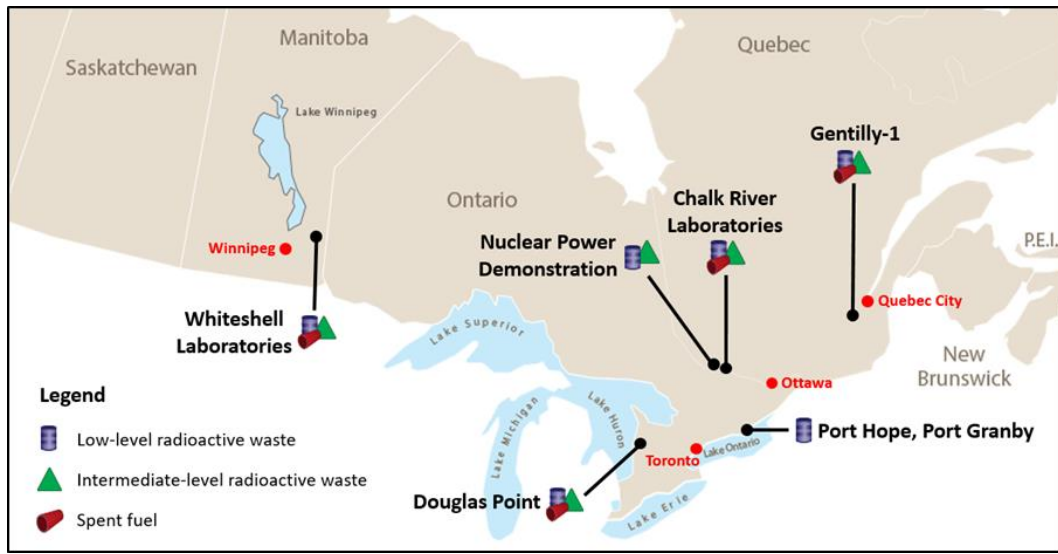
For the purposes of the [Nuclear Safety and Control Act](#) [1], and its associated regulations, the CNSC regulates Canada's nuclear industry to protect the health, safety, security and the environment; to implement Canada's international commitments on the peaceful use of nuclear energy; and to disseminate objective scientific, technical and regulatory information to the public. Licensees are responsible for operating their facilities safely, and are required to implement programs that make adequate provision for meeting legislative and regulatory requirements.

The Commission has directed CNSC staff to report to the Commission annually on the safety performance of sites operated by CNL in the form of an ROR. This ROR provides an overview of CNSC regulatory effort and staff's assessment of licensee performance at sites operated by CNL for the 2020 calendar year.

The CNL sites covered by this report are located in many different parts of the country ([Figure 1](#)). CNSC staff would like to acknowledge the Indigenous communities and groups ([Appendix A](#)) whose traditional and/or treaty territories are in proximity to the CNL sites covered by this report.

These include:

- Chalk River Laboratories (CRL)
- Whiteshell Laboratories (WL)
- Port Hope Area Initiative (PHAI)
  - Port Hope Project (PHP)
  - Port Granby Project (PGP)
  - Port Hope Pine Street Extension Temporary Storage Site
  - Port Hope Radioactive Waste Management Facility
- Douglas Point (DP) Waste Facility
- Gentilly-1 (G-1) Waste Facility
- Nuclear Power Demonstration (NPD) Waste Facility

**Figure 1: Sites covered by this report**

Any proposed activities that are not currently licensed by the CNSC will be the subject of separate Commission decisions, and are not specifically discussed in further detail in this ROR.

This report discusses all Safety and Control Areas (SCAs), but focuses on radiation protection, conventional health and safety, and environmental protection, as they provide a good overview of safety performance at CNL sites. The report also provides an overview of licensee operations, licence changes, major developments at licensed facilities and sites, and reportable events. In addition, the report includes information on the CNSC's and CNL's engagement with Indigenous groups and communities, and the public, and COVID-19 response. The information in this document is complemented by the information provided in the PowerPoint presentation *CMD 21-M32.A, Regulatory Oversight Report for Canadian Nuclear Laboratories Sites: 2020* [2] and a dashboard containing key ROR information and data ([Appendix B](#)).

## 2 CANADIAN NUCLEAR LABORATORIES

CNL is responsible for the operation and management of nuclear sites owned by Atomic Energy of Canada Limited under a Government-Owned, Contractor-Operated model.

A brief overview of each CNL site is provided below, with a link to the CNSC web page that contains more details such as facility information, announcements, regulatory reporting and other key topics.

## 2.1 Chalk River Laboratories

CRL is located in the province of Ontario, 160 kilometers northwest of Ottawa ([Figure 2](#)). CRL operates under a single licence that includes Class I and Class II nuclear facilities, waste management areas, radioisotope laboratories, support facilities and offices. CNL safely manages low-level waste, intermediate-level waste and high-level radioactive waste at the site. The CRL site continues to undergo a period of change. Where permitted by the current licensing basis, CNL is shutting down and decommissioning legacy facilities, and constructing and commissioning replacement facilities throughout the site. Further information on CRL is available on the CNSC's Website at:

<http://nuclearsafety.gc.ca/eng/reactors/research-reactors/nuclear-facilities/chalk-river/index.cfm>.

**Figure 2: A view of the CRL built-up area** (*Source: CNL*)



### 2.1.1 Major Activities at CRL

After the National Research Universal (NRU) reactor ceased operating on March 31, 2018, CNL began conducting activities to permanently shut down the NRU reactor and its associated systems. These activities were ongoing in 2020 and will continue until the NRU reactor and facility can be placed in a state of storage-with-surveillance.

Under the joint regulatory oversight of the CNSC and the United States Nuclear Regulatory Commission, CNL has been safely returning materials which contain highly enriched uranium (HEU) to the United States. The HEU originates from materials imported to Canada for research and medical isotope production at CRL. The transfer of spent HEU fuel was completed in 2019, and in 2020 CNL completed the transfer of the HEU-bearing liquid generated during the medical isotope production process.

In July 2020, CNL began site preparation work, including site clean-up, grading, and soil studies, at the Advanced Nuclear Materials Research Centre (ANMRC) construction site. The ANMRC will consolidate existing laboratories and hot cells located at CRL and is anticipated to be one of the largest active research laboratories in Canada.

CNL continues work on the proposal to construct and operate a Near Surface Disposal Facility (NSDF) at the CRL site. This project is currently under review by CNSC staff, is subject to an environmental assessment pursuant to the [Canadian Environmental Assessment Act, 2012](#) [3], and will require authorizations from the Commission. Additionally, Global First Power is proposing a small modular reactor at the CRL site. This project is also undergoing an environmental assessment pursuant to the [Canadian Environmental Assessment Act, 2012](#) [3], with Global First Power as the proponent. Because these are not currently CNSC licensed facilities and will be the subject of separate Commission decisions, these projects are not specifically discussed in further detail in this ROR.

## 2.2 Whiteshell Laboratories

WL is a former nuclear research and test facility located near Pinawa, Manitoba that was established in the early 1960s ([Figure 3](#)). The site hosts the 60 megawatt thermal (MWth) Whiteshell Reactor No. 1 (WR-1), a SLOWPOKE demonstration reactor, other research and support facilities, and a waste management area that contains low-level waste, intermediate-level waste and high-level radioactive waste. The WR-1 and SLOWPOKE reactors were permanently shut down in 1985 and 1990 respectively. Decommissioning activities at WL commenced in 2003. Further information on WL is available on the CNSC's Website at: <http://nuclearsafety.gc.ca/eng/reactors/research-reactors/other-reactor-facilities/whiteshell-laboratories.cfm>.

**Figure 3: WL main campus** (Source: CNL)



### 2.2.1 Major Activities at WL

Demolition of the Active Liquid Waste Treatment Centre has begun. All waste has been removed from Shielded Modular Above Ground Storage and has been moved to CRL for storage in preparation for the conversion of the building into a Cask Loading Facility. The Cask Loading Facility will be used to handle, stage, and load waste into appropriate shipping packages for transportation offsite. Operational cleanout of the Health and Safety Facilities started in preparation for decommissioning and demolition of the buildings.

CNL continues to work on the proposal to change the decommissioning approach for WR-1 from full dismantlement to in situ decommissioning. This proposed approach is currently under review by CNSC staff, is subject to an environmental assessment pursuant to the [Canadian Environmental Assessment Act, 2012](#) [3], and will require authorization from the Commission. As these are not currently CNSC licensed activities and will be the subject of separate Commission decisions on this project, it is not specifically discussed further in this ROR.

### 2.3 Port Hope Area Initiative

The PHAI consists of 2 projects, the PHP ([Figure 4](#)) and PGP ([Figure 5](#)), under 2 separate licences. The scope of the PHAI is defined by a legal agreement between the Municipalities of Port Hope and Clarington and the Government of Canada, originally signed in 2001. These projects involve the clean-up of historic low-level radioactive waste contamination found in Port Hope and Port Granby, and its emplacement in new long-term waste management facilities (LTWMFs) located in each community.



The Port Hope Pine Street Extension Temporary Storage Site and the Port Hope Radioactive Waste Management Facility are small temporary storage sites for low-level waste that are being remediated as part of the PHP. As such, they are included under the PHP in this report.

Further information on the PHAI is available on the CNSC's Website at: <http://nuclearsafety.gc.ca/eng/waste/historic-nuclear-waste/port-hope-area-initiative/index.cfm>.

**Figure 4: Work in PHP on the Port Hope Harbour** (Source: CNL)



**Figure 5: Construction work at PGP** (Source: CNL)



### 2.3.1 Major Activities at PHAI

In 2020, many remediation activities at the PHP were delayed or had slow progression due to COVID-19 restrictions that limited the number of workers at the various sites. The baseliner of cell 2B at the LTWMF was completed in 2020 and the cell began accepting waste. The waste water treatment plant continued to operate safely in 2020 with no reportable events.

In 2020, CNL safely completed the transfer of historic low-level radioactive waste from the Port Granby Waste Management Facility into the engineered above-ground LTWMF. In total 1,315,061 metric tonnes of low-level radioactive waste was safely transported to the LTWMF since the remediation started in late 2016.

Progress continues on capping the LTWMF, final grading, erosion control measures and the construction of the groundwater collection system at the Port Granby Waste Management Facility. These activities are expected to be finalized in the spring of 2022 and will permit CNL to progress into phase 3 of its project plan. Phase 3 entails the long-term maintenance and monitoring of the site and operation of the Waste Water Treatment Plant. By removing the source of contamination from the site, groundwater improvements are expected over time which will reduce the environmental impact on Lake Ontario. CNSC staff will continue its regulatory oversight of the PGP for the foreseeable future to ensure the protection of the public and environment. Further details on the completion of this work can be found in CNSC staff's CMD 21-H102 with respect to an application for a 1-year renewal of the licence for the Port Granby Long-Term Low-Level Radioactive Waste Management Project [4].

## 2.4 Prototype Power Reactors

The DP, G-1, and NPD waste facilities are 3 prototype power reactors that are currently safely shut down and undergoing decommissioning activities including hazard reduction and waste characterization, in line with plans reviewed and accepted by CNSC staff. For these prototype reactors, CNL is required to implement and maintain programs such as radiation protection, occupational health and safety, security and fire protection.

### 2.4.1 Douglas Point Waste Facility

DP, located in Tiverton, Ontario on the Bruce nuclear site is a partially decommissioned prototype power reactor ([Figure 6](#)). The 200-megawatt electric (MWe) prototype Canada deuterium uranium (CANDU) power reactor was put into service in 1968 and permanently shut down in 1984. CNL safely manages low- and intermediate-level radioactive wastes, as well as used nuclear fuel stored in concrete dry storage canisters at the site. CNL is also undertaking decommissioning planning activities. Further information on DP is available on the CNSC's Website at: <http://nuclearsafety.gc.ca/eng/reactors/research-reactors/other-reactor-facilities/douglas-point-waste-facility.cfm>.

**Figure 6: DP waste facility** (Source: CNL)



In July of 2019, CNL submitted to the CNSC an application for a licence amendment to allow CNL to begin dismantlement work at DP. A public hearing on this matter was held on November 25-26, 2020. In its Record of Decision DEC 20-H4, [Application to amend the Waste Facility Decommissioning Licence for the Douglas Point Waste Facility to include phase 3 decommissioning activities](#) [5], the Commission granted the licence amendment effective March 12, 2021.

#### **2.4.2 Gentilly-1 Waste Facility**

G-1, located in Bécancour, Québec within Hydro-Québec's Gentilly-2 site, is a partially decommissioned prototype power reactor ([Figure 7](#)). The 250 MWe boiling water reactor was put into service in 1972 and shut down in 1984. At G-1, CNL safely manages low- and intermediate-level radioactive wastes, as well as used nuclear fuel in concrete dry storage canisters. Additionally, CNL is undertaking decommissioning planning activities. Further information on G-1 is available on the CNSC's Website at:

<http://nuclearsafety.gc.ca/eng/reactors/research-reactors/other-reactor-facilities/gentilly-1-facility.cfm>.

**Figure 7: G-1 waste facility, outlined in yellow** (Source: CNL)



### 2.4.3 Nuclear Power Demonstration Waste Facility

NPD, located in Rolphton, Ontario, is a partially decommissioned prototype power reactor (Figure 8). The 20 MWe prototype CANDU power reactor was placed into service in 1962 and operated until 1987. At NPD, CNL safely manages low- and intermediate-level radioactive wastes. Additionally, CNL is undertaking decommissioning planning activities. Further information on NPD is available on the CNSC's Website at:

<http://nuclearsafety.gc.ca/eng/reactors/research-reactors/other-reactor-facilities/nuclear-power-demonstration.cfm>.

**Figure 8: NPD waste facility** (Source: CNL)



CNL continues to work on the proposal to modify the decommissioning approach for NPD from full dismantling to in situ decommissioning. This application is under review by CNSC staff, is subject to an environmental assessment pursuant to the [Canadian Environmental Assessment Act, 2012](#) [3], and will require authorization from the Commission. As these are not currently CNSC licensed activities and will be the subject of separate Commission decisions on this project, it is not specifically discussed further in this ROR.

### 3 THE CNSC'S REGULATORY OVERSIGHT OF CNL

The CNSC performs regulatory oversight of licensed facilities to verify compliance with the requirements of the [Nuclear Safety and Control Act](#) [1] and associated regulations made under the [Nuclear Safety and Control Act](#) [1], each site's licence and licence conditions handbook (LCH), and any other applicable standards and regulatory documents.

CNSC staff use the SCA framework to assess, evaluate, review, verify and report on licensee performance. The SCA framework includes 14 SCAs, which are subdivided into specific areas that define its key components. Further information on the CNSC's SCA framework can be found on the CNSC's Website at:

<http://www.nuclearsafety.gc.ca/eng/resources/publications/reports/powerindustry/safety-and-control-areas.cfm>.

<http://www.nuclearsafety.gc.ca/eng/resources/news-room/feature-articles/safety-and-control-areas.cfm>.

### 3.1 Regulatory Activities

CNSC staff spent over 36,300 hours in 2020 working on licensing and compliance activities with respect to CNL sites. This included effort from CNSC staff spread over 9 directorates. While overall regulatory effort at CNL sites remained similar to previous years, there was an increase in the licensing work offset by a reduction in compliance work. The additional licensing work was due to an increased focus on the review of updated and new CNL programmatic documents, assessing the licence amendment for DP, and updating the CRL LCH. While remote compliance verification activities were leveraged to the extent possible, the reduction in compliance effort can be directly attributed to the lower number of on-site compliance activities because of health and safety related restrictions implemented in response to the COVID-19 pandemic, discussed further in [Section 5.5](#) of this report.

#### *Licensing*

In 2020, CNSC staff spent roughly 23,000 hours on licensing activities, which includes drafting new licences, preparing Commission member documents, and drafting or revising LCHs. [Appendix C](#) provides a summary of licensing activities.

As CNSC regulatory documents are published, CNSC staff update the LCHs as applicable for each site, taking into consideration the licensee's implementation plans. CNSC staff verify the implementation as part of ongoing compliance verification activities. [Appendix D](#) provides a list of CNSC regulatory documents implemented at CNL sites and used by CNSC staff for compliance verification.

#### *Compliance*

The CNSC ensures licensee compliance through verification, enforcement and reporting activities. CNSC staff implement compliance plans for each site by conducting regulatory activities including inspections, desktop reviews and technical assessments of licensee programs, processes and reports.

In 2020, CNSC staff spent over 13,300 hours on compliance activities. [Appendix E](#) contains a list of CNSC inspections carried out at each CNL site in 2020. All NNCs resulting from non-compliance with legislation, regulations and licensing basis requirements noted during these inspections were considered low-risk and did not have an impact on safety at CNL sites. CNSC staff determined that all NNCs were adequately addressed either through closure or an appropriate corrective action plan. [Appendix F](#) contains a list of reportable events at each CNL site in 2020. For these events, CNSC staff were satisfied with CNL's corrective actions.

[Appendix G](#) provides a summary of regulatory effort in 2020, including hours spent by CNSC staff participating in inspections from the International Atomic Energy Agency (IAEA).

### 3.2 Performance Ratings

CNSC staff assign performance ratings to licensees based on the results from regulatory oversight activities. For 2020, the ratings that were used for CNL sites were either “satisfactory” (SA) or “below expectations” (BE). The “fully satisfactory” (FS) rating was not used. It is important to recognize that a rating of SA in the current ROR instead of FS used in a previous ROR does not indicate a reduction in performance. Use of binary ratings is consistent with a neutral and fair approach that the CNSC strives to implement in its regulatory oversight. In 2020, the Commission agreed, in the Commission Meeting Minutes, [\*Minutes of the Canadian Nuclear Safety Commission \(CNSC\) Meeting held on December 8, 9 and 10, 2020\*](#) [6], with the use of a binary approach for RORs, using only SA or BE ratings.

For 2020, CNSC staff have rated CNL’s performance in each SCA as SA. [Appendix H](#) provides SCA ratings for each site from 2016 to 2020.

## 4 THE CNSC’S ASSESSMENT OF SAFETY AT CNL SITES

The CNSC regulates all aspects of safety at nuclear sites in Canada, including risks to workers, the public and the environment. Assessments are carried out across 14 SCAs. CNSC staff assess performance in all SCAs by verifying compliance of licensee documents and programs through desktop reviews and through compliance verification inspections that are planned or reactive. Although all 14 SCAs are covered generally in the following sections, this report focuses on radiation protection, conventional health and safety, and environmental protection since these 3 SCAs are considered the most representative of CNL’s overall safety performance. In particular, the SCAs of radiation protection, and conventional health and safety are a good measure of the safety of workers at CNL sites, while the SCA of environmental protection is a good measure of the safety of the public and the environment.

CNSC staff have determined that all NNCs from inspections were adequately addressed either through closure or an appropriate corrective action plan, and that the NNCs did not impact safety at CNL sites. CNSC staff conclude that CNL has met regulatory requirements and for 2020 have rated all SCAs at all CNL licensed sites as “satisfactory”.

For both the radiation protection and environmental protection SCAs, the concept of action levels (ALs) is used. ALs are a specific dose of radiation or other parameter that serve as an early warning to safeguard against exceedances of radiation dose limits and environmental release limits. AL exceedances are reportable to the CNSC. Further information on ALs is available on the CNSC’s Website at: <http://www.nuclearsafety.gc.ca/eng/resources/news-room/feature-articles/radiation-dose-limits-release-limits-and-action-levels.cfm>.

## 4.1 Management System

The management system SCA covers the framework that establishes the processes and programs required to ensure an organization achieves its safety objectives, continuously monitors its performance against these objectives, and fosters a healthy safety culture.

CNSC staff assess CNL's performance in the management system SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)). In 2020, this included the assessment of specific areas such as organizational changes to the CNL leadership team, changes to improve alignment to grading and risk management requirements, updates to CNL's corporate corrective action program, and changes implemented as a result of CNL's 2019 safety culture self-assessment. CNSC staff's assessment concluded that CNL's corporate management system program continues to meet regulatory requirements.

## 4.2 Human Performance Management

The human performance management SCA covers activities that enable effective human performance through the development and implementation of processes that ensure a sufficient number of licensee personnel are in all relevant job areas and have the necessary knowledge, skills, procedures and tools in place to safely carry out their duties.

CNSC staff assess CNL's performance in the human performance management SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)). In March 2020, in compliance with REGDOC-2.2.2, [Personnel Training, Version 2](#) [7], CNL implemented a list of positions and roles requiring a Systematic Approach to Training. CNL is currently assessing any gaps in the associated training programs and identifying corrective actions. These will be further assessed by CNSC staff in an upcoming inspection planned for FY21/22.

## 4.3 Operating Performance

The operating performance SCA includes an overall review of the conduct of the licensed activities and the activities that enable effective performance.

CNSC staff assess CNL's performance for the operating performance SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)). CNL continued to meet its reporting requirements including those associated with annual reports and reportable events, and demonstrated that facilities were operated and maintained according to the licensing basis.



## 4.4 Safety Analysis

The safety analysis SCA covers maintenance of the safety analysis that supports the overall safety case for the facility. 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.

CNSC staff assess CNL's performance in the safety analysis SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)). In 2020, this included the review of new and revised Criticality Safety Documents and Safety Analysis Reports, which confirmed that facilities and activities were operated according to the licensing basis.

## 4.5 Physical Design

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

CNSC staff assess CNL's performance in the physical design SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)).

## 4.6 Fitness for Service

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

CNSC staff assess CNL's performance in the fitness for service SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)). In 2020, this included CNSC staff verifying that safety systems were being properly maintained and through the review of new or revised CNL documentation. These compliance activities demonstrated that facilities were operated and maintained according to the licensing basis.

## 4.7 Radiation Protection

The radiation protection SCA covers the implementation of a radiation protection program in accordance with the [Radiation Protection Regulations](#) [8]. CNL sites are required to implement and maintain a radiation protection program to ensure that contamination levels and radiation doses received by individuals are monitored, controlled and maintained as low as reasonably achievable (ALARA).

CNSC staff assess CNL's performance in the radiation protection SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)). [Appendix I](#) contains data on dose to workers for each CNL site from 2016 to 2020.

#### 4.7.1 Application of ALARA

CNL's application of ALARA within the radiation protection program includes management commitment and oversight, personnel qualification and training, design analyses of facilities and systems, provision of protective equipment and ALARA assessments/reviews of radiological activities.

In 2020, CNL continued to effectively implement the ALARA program at its sites. This program integrates ALARA into design, planning, management and control of radiological activities, and is based on current industry best practices and operating experience.

In 2020, WL staff provided additional information on the assumptions and calculations used to derive the collective dose estimates associated with the accelerated decommissioning approach. CNSC staff reported on this additional information in CMD 20-M22, [Regulatory Oversight Report for Canadian Nuclear Laboratories Sites: 2019](#) [9]. CNSC staff believe that this CMD, which will be complemented by a more detailed future memo to the Commission, will satisfy the request in item 260 of the Record of Decision DEC 19-H4, [Application for the Renewal of the Nuclear Research and Test Establishment Decommissioning Licence for Whiteshell Laboratories](#) [10]:

*“To better understand the effects of the accelerated decommissioning, the Commission requests that CNSC staff provide a systematic assessment of the potential effects on the collective occupational dose of the proposed accelerated decommissioning compared to the deferred decommissioning assessed in the original Comprehensive Study Report. The assessment could be provided during a future ROR or other means.”*

CNSC staff note that decommissioning alternatives should not be compared, judged and/or selected based on radiation dose estimates alone as the end states and benefits associated with each alternative will vary. Based on the dose estimates and the radiation protection program currently being implemented, CNSC staff conclude that either decommissioning strategy can be performed within regulatory dose limits and in accordance with the ALARA principle.

#### 4.7.2 Worker Dose Control

Workers, including employees and contractors, conducting work activities which present a reasonable probability that the worker may receive an occupational dose greater than 1 mSv/y, are identified as Nuclear Energy Workers (NEWs).

Workers, whose job functions do not present a reasonable probability of receiving an occupational dose greater than 1 mSv/y are considered non-NEWs.

In 2020, no worker received a radiation dose in excess of the CNSC's regulatory dose limits. The maximum individual effective dose received by a NEW across CNL sites was at CRL, with a dose of 7.97 mSv, which is approximately 16 percent of the CNSC's regulatory limit for effective dose of 50 mSv in a one-year dosimetry period. The maximum individual effective dose received by a NEW for the five-year dosimetry period (January 1, 2016 to December 31, 2020) was also at the CRL site, and was 44.95 mSv. This dose is approximately 45 percent of the regulatory limit for effective dose of 100 mSv in a five-year dosimetry period.

#### 4.7.3 Radiation Protection Program Performance

In 2020, CNL implemented corrective actions to address areas requiring improvement at CRL, such as finalizing the implementation of a revised rule for setting dose and dose rate alarms for all radiological activities, updating radiological signage at some locations, and reviewing their ALs for radiological exposures in order to validate their continued effectiveness. The review resulted in CNL's revision of its ALs for all CNL sites to assure consistency with regulatory guidance. CNSC staff reviewed the revised ALs and found that CNL demonstrated that the ALs are appropriate for the purposes of section 6 of the [Radiation Protection Regulations](#) [8]. In 2020, no ALs were exceeded at CNL sites.

Since 2017, there has been an increasing trend in worker doses as WL decommissioning activities began to focus on buildings and facilities with increased radiological hazards. Nevertheless, worker exposures remain well controlled and at a small fraction of regulatory dose limits.

#### 4.7.4 Radiological Hazard Control

Radiation and contamination monitoring programs continued to be implemented at CNL sites in 2020, to control and minimize radiological hazards and the spread of radioactive contamination. Dose rate measurements, surface contamination monitoring and, where appropriate, in-plant air monitoring are routinely performed to confirm that radiation exposures are kept ALARA.

The radiological hazard surveys conducted in 2020 by CNL staff did not identify any adverse trends, and were consistent with expected radiological conditions.

In January 2020, CNL reported to CNSC staff that 2 registered sealed sources exceeded their required leak test frequencies as set out in the [Nuclear Substances and Radiation Devices Regulations](#) [11]. CNL staff later reported an additional missed leak test while determining the extent of condition of this event. In response to this event, CNL staff have completed a review of all registered sources, and implemented a new system of reminders for leak tests to be sent to the Responsible Users of Registered Sources. These actions were accepted by CNSC staff in July 2020.

## 4.8 Conventional Health and Safety

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

CNSC staff assess CNL's performance in the conventional health and safety SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)). Overall, the compliance verification activities conducted by CNSC staff at CNL sites confirmed that CNL continues to maintain a high-level of staff safety.

### 4.8.1 Performance

The key performance indicators for conventional health and safety are the number of recordable lost-time injuries (RLTI) that occur per year, and the RLTI severity and frequency. An RLTI is defined as a workplace injury that results in the worker being unable to return to work for a period of time. RLTI severity and frequency provide context to the number of RLTIs. Severity quantifies the number of lost work days experienced per 100 employees, while frequency quantifies the number of lost-time injuries relative to the number of hours worked.

Data on RLTI, and RLTI frequency and severity from 2016 to 2020 are included in [Appendix J](#) for all sites covered by this ROR.

In 2020, there were 4 RLTIs at CRL and 1 RLTI at WL, for a total of 5 RLTIs, the same number as reported in the previous year for all CNL sites. These events led to a combined 80 working days lost, with 1 CRL injury that resulted from an employee slipping on ice and sustaining a head injury, accounting for more than 60 of the days away from work. For CRL and WL, the RLTI frequency was 0.15 and 0.34, and the RLTI severity was 2.92 and 0.68 respectively. There were no RLTIs at PHP, PGP, DP, G-1 or NPD.

For comparison, CNL's reported RLTI frequency is lower than 2019 lost-time injury rates for comparable industries in Ontario like construction (1.12) and manufacturing (0.67), as per Ontario Workplace Safety and Insurance Board data in the [2019 WSIB Statistical Report](#) [12]. CNSC staff consider this to be a conservative comparison because Ontario lost-time injury data includes only injuries for which compensation claims were allowed, rather than all reportable injuries, as is included in CNL data. The RLTI rate of 0.34 at WL in Manitoba is significantly lower than local lost-time injury rates for construction (3.7) and manufacturing (2.4), as per the data from the Workers Compensation Board of Manitoba found in [The Manitoba Workplace Injury and Illness Statistics Report 2010-2019](#) [13].

### 4.8.2 Practices

CNL's occupational safety and health program applies to all work performed by both CNL employees and contractors. When evaluating safety practices at a site, CNSC staff do not distinguish between the licensee's own staff and those of contractors, considering all to be 'workers' and equally subject to CNSC requirements and licensee policies. This is notable for CNL, as many CNL sites employ contractors to perform a wide variety of tasks.

CNL's Improvement Action system is used by CNL to record all events, including injuries, at CNL sites. CNL's Improvement Action data is available to CNSC staff.

### 4.8.3 Awareness

On September 1, 2020, in response to changing work conditions due to COVID-19, CNL conducted a mandatory safety pause across all sites in order to refocus and prioritize safety in the workplace.

Additionally, at the WL site, CNL initiated a ten-week fieldwork pause commencing November 16, 2020 in response to an adverse trend in human performance during fieldwork activities and heightened COVID-19 risk. This pause allowed time for a review of processes, procedures and training at WL. This did not impact the routine maintenance or monitoring activities at the site.

## 4.9 Environmental Protection

Protection of the environment and the public are both assessed in the SCA of environmental protection. This SCA covers programs that identify, control and monitor all releases of radioactive and hazardous substances, and the effects on people and the environment from facilities or as a result of licensed activities.

CNSC staff assess CNL's performance in the environmental protection SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)). [Appendix K](#) provides the total annual releases of radionuclides for each CNL site from 2016 to 2020. [Appendix L](#) contains data on dose to the public for each CNL site from 2016 to 2020. CNSC staff have determined that the environmental protection programs currently in place at all CNL sites covered by this report are protective of the public and the environment.

#### 4.9.1 Effluent and Emissions Control

In compliance with CSA standard N288.5-11, [Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills](#) [14], CNL has implemented and maintains an effluent verification monitoring program at all sites covered by this report. At all CNL sites, airborne and waterborne releases of radioactive and hazardous substances remained below their respective regulatory limits in 2020. There were zero AL exceedances for radiological or non-radiological releases (effluents or emissions) at CNL sites in 2020. CNSC staff conclude that the effluent verification monitoring programs in place for CNL facilities protect the environment and the health and safety of the public.

#### 4.9.2 Environmental Management System

The CNSC requires that licensees develop and maintain an environmental management system in order to provide a documented framework for integrated activities related to environmental protection. CNL has established a corporate level environmental management system that is part of the overall CNL management system. CNL's corporate environmental management system conforms to International Standards Organization (ISO) Standard 14001:2015, [Environmental Management Systems](#) [15], and the environmental management systems for CRL and WL are registered to ISO 14001:2015.

#### 4.9.3 Assessment and Monitoring

In compliance with CSA standard N288.4, [Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills](#) [16], CNL has implemented an integrated environmental monitoring program at CRL, WL, PHP and PGP. As none of the criteria of CSA standard N288.4 are met, an environmental monitoring program is not required at the DP, G-1 and NPD sites. The N288.4 criteria include things such as the likelihood that a contaminant may exceed a benchmark value, an estimated dose to the public may exceed 0.05 mSv during normal operations, an offsite dose may exceed 1 mSv in the event of an accident, or another identified source of uncertainty that would warrant an environmental monitoring program.

Through compliance activities conducted during 2020, CNSC staff concluded that all the releases to the environment in 2020 remained a small fraction of their respective derived release limits (DRLs) at all CNL sites and met the regulatory requirements. The environmental monitoring programs currently in place for CRL, WL, PHP and PGP are protective of the environment. The monitoring results for 2020 at the PHP indicate that there were no exceedances of the [Ambient Air Quality Criteria](#) [17]; however, levels of arsenic, uranium, fluoride, and cobalt in surface water exceeded the [Provincial Water Quality Objectives](#) [18] or [Canadian Water Quality Guidelines for the Protection of Aquatic Life](#) [19] in certain locations along Brand Creek, Highland Drive South Creek and Alexander Creek due to historical releases of untreated contaminated water from sites or contaminated sediment. These releases predate the Port Hope Area Initiative and are expected to be remediated as part of the project.

Arsenic in sediment in Highland Drive South Creek exceeded the [Provincial Sediment Quality Guidelines](#) [20] and CCME [Interim Sediment Quality Guideline](#) [21] due to historical releases. However, water and sediment quality are expected to improve once remediation is complete.

#### 4.9.4 Independent Environmental Monitoring Program

In addition to licensees carrying out required monitoring of their operations, the CNSC carries out its Independent Environmental Monitoring Program (IEMP) to verify and confirm that licensees' environmental protection and monitoring programs are effective. Further information on the CNSC's IEMP, including sampling results and associated standards, can be found on the CNSC's Website at: <http://www.nuclearsafety.gc.ca/eng/resources/maps-of-nuclear-facilities/iemp/index-iemp.cfm>.

In 2020, CNSC staff did not conduct independent environmental monitoring around CNL sites as no activities were scheduled in 2020 as part of the IEMP plan. In 2019, CNSC staff conducted independent environmental monitoring around the CRL, PHP, PGP and DP sites. IEMP results for the areas surrounding these sites indicate that the public and the environment in the vicinity of these sites are protected.

#### 4.9.5 Environmental Risk Assessment

The environmental risk assessment (ERA) conducted by licensees is a systematic process used to identify, quantify and characterize the risk posed by contaminants and physical stressors in the environment to human and non-human (biological) receptors. As per the criteria of CSA Standard N288.6-12, [Environmental risk assessments at class I nuclear facilities and uranium mines and mills](#) [22], only the CRL, WL and DP sites are required to have ERAs.

In 2019, CNL submitted an updated ERA for CRL. CNSC staff determined that the ERA is compliant with the CSA standard N288.6-12. The findings of this ERA continue to apply to CRL during the 2020 operating year.

As part of licensing requirements, CNL is updating their site-wide ERA for the WL site in accordance with the CSA standard N288.6-12 taking into account current site conditions. CNSC staff received the ERA for the lagoon and landfill areas in 2021 and are expecting to receive a site-wide ERA in 2022.

In March 2019, CNL submitted an updated ERA and associated environmental effects review for the DP site in support of the licence amendment hearing in 2020. The ERA included an ecological risk assessment and a human health risk assessment for radiological and non-radiological (hazardous) contaminants and physical stressors resulting from releases from the Bruce nuclear site, including those from authorized discharges in the DP site's current storage-with-surveillance state. CNSC staff reviewed CNL's 2019 ERA and found it to be in accordance with CSA standard N288.6-12.

While the PHP and PGP sites do not require an ERA as per CSA standard N288.6-12, CNL submitted the environmental and biophysical monitoring plans for the PHP and PGP sites in March 2018, revisions to which were reviewed and accepted by CNSC staff in 2018 and 2019. These plans continue to apply in the 2020 operating year.

CNSC staff have concluded that CNL continued to maintain and implement an effective ERA at applicable CNL sites in accordance with regulatory requirements. There were no NNCs related to environmental risk. Additionally, CNSC staff have concluded that CNL has comprehensive groundwater monitoring programs at applicable CNL sites consistent with licensing requirements.

#### **4.9.6 Protection of the Public**

CNL is required to demonstrate that the health and safety of the public are protected from exposures to hazardous and nuclear substances released from its licensed operations. The effluent and environmental monitoring programs are used to verify that releases of hazardous substances do not result in environmental concentrations that may affect public health.

The CNSC receives reports of discharges to the environment through the reporting requirements outlined in CNL's licences and LCHs. Based on an assessment of the results in CNL's 2020 environmental monitoring program reports for non-radiological (hazardous) substances, CNSC staff conclude that CNL met regulatory requirements.

#### **4.9.7 Estimated Dose to the Public**

As part of annual reporting to the CNSC, CNL provides data on dose to a hypothetical member of the public that is representative of someone who spends considerable time in proximity to the licensed site.

In all cases, CNL's data indicates that doses to the public resulting from CNL's operations are well below the 1 mSv limit prescribed in the [Radiation Protection Regulations](#) [8]. At no point during 2020 did the emissions from the CRL site exceed the constraint for dose to the public of 0.30 mSv/year (y) indicated in the CRL LCH. The maximum estimated dose to the public from a CNL site was estimated to be from PHP, at 0.033 mSv/y (3.3% of the 1 mSv/y dose limit).

#### **4.10 Emergency Management and Fire Protection**

The emergency management and fire protection SCA covers emergency plans and emergency preparedness programs that exist in case of emergencies and for non-routine conditions. This area also includes any results of participation in exercises.



Staff assess CNL's performance in the emergency management and fire protection SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)). In 2020, this included a review of the NRU fire incident at the CRL site, discussed below.

On January 25, 2020, a fire occurred in the NRU reactor building. CNL made a [public notification](#) regarding this event, and it was reported to the Commission via a memo from CNSC staff in June 2020. The investigation revealed that the most probable cause of the fire was a failure of a metal halide bulb in a light fixture. The hot pieces from the bulb melted and ignited some plastic sheathing on top of storage cabinets, which in turn resulted in damage to parts of the contents of the storage cabinets. An operating experience bulletin regarding this event was subsequently shared CNL-wide and with the CANDU Owner's Group. CNL completed a review of light fixtures at all CNL sites and replaced older-style metal halide bulbs with new bulbs rated for open fixtures, and CNL revised supervisor responsibilities to include periodic checks of storage areas for excess combustible material throughout the CRL site. CNSC staff reviewed CNL's response and found it satisfactory.

An annual emergency preparedness exercise is a licence condition for CRL. As a result of COVID-19, this exercise did not take place in 2020 and has been postponed to August 2021.

#### 4.11 Waste Management

The SCA of waste management covers internal waste-related programs that 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. This area also covers the planning for decommissioning.

CNSC staff assess CNL's performance in the waste management SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)). CNL's activities at each of the sites covered by this report involve the management of radioactive wastes, from generation to storage. Radioactive and hazardous wastes have been previously generated from reactor operations and radioisotope production, and waste continues to be generated from on-going site operations, research and development, decommissioning, and environmental remediation activities at CNL. CNSC staff maintain oversight of CNL's current and future management of radioactive wastes through compliance activities, including inspections and desktop reviews.

Radioactive wastes stored on the sites covered by this report consist of high-, intermediate- and low-level radioactive wastes. The inventory of wastes stored at CNL sites is included in the seventh [Canadian National Report for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management \(October 2020\)](#) [23].

During 2020, CNL maintained a waste management program to safely manage radioactive and hazardous wastes as a result of CNL's licensed activities, including the decommissioning of its facilities. The waste management program ensured the safe management, processing, and storage of low- and intermediate-level radioactive wastes, and hazardous wastes (in solid, liquid, or gaseous states). The waste management program also ensured that the decommissioning of buildings and structures was documented and conducted in a manner that met the requirements of the SCA as defined in the relevant site-specific LCH. CNSC staff determined that CNL's waste management programs for minimizing radioactive waste continued to meet the applicable regulatory requirements.

Waste from institutions, including hospitals and universities from across Canada, is received at CRL on a commercial basis for safe long-term storage. This service ensures that wastes are managed in a safe, secure, and environmentally-sound manner. CNL received a total of 255.8 m<sup>3</sup> of radioactive waste from external organizations in 2020. This includes 87.6 m<sup>3</sup> of commercial waste and 168.2 m<sup>3</sup> of waste returned from off-site waste processors (i.e., secondary waste from the off-site treatment of CNL waste, such as ash from incineration of waste).

Throughout 2020, CNL continued to execute decommissioning and remediation activities to reduce the legacy liabilities at all of its sites. These activities included:

- CNL's land use program was launched in 2020 to ensure a consistent approach, and to establish and achieve appropriate next land uses and end states for sites being decommissioned and remediated.
- At CRL, decommissioning and environmental remediation activities to support the transformation of the site to a modern campus ([CNL's Vision 2030](#)).
- At WL, activities underway to complete the orderly decommissioning of the site, including hazard reduction activities, waste retrievals and building demolitions.
- At PHP, remediation of residential and industrial sites within the Municipality of Port Hope continues. Construction of the last cell within the LTWMF is expected to be complete in the summer of 2021.
- At PGP, completion of excavation and transfer of historic low-level radioactive waste away from the Lake Ontario shoreline, to a safe engineered containment mound. Final landscaping of the project is scheduled for the summer of 2022.
- At DP, G-1 and NPD, removal of clean waste and hazard reduction work under the respective storage with surveillance plans, significantly reducing the hazards and associated liabilities at these sites.

CNSC staff maintain oversight of CNL's current and future management of radioactive wastes via inspections, desktop reviews, and technical assessments. During 2020, CNL employed effective programs to safely manage radioactive and hazardous wastes from CNL's licensed activities and decommissioning of its facilities as authorized by the Commission.

#### 4.12 Security

The security SCA covers the programs required to implement and support the security requirements stipulated in the regulations, the licence, orders, or expectations for the facility or activity.

CNSC staff assess CNL's performance in the security SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)).

In 2018, CNSC staff raised concerns regarding CNL's security program at WL. These concerns led to the CNSC issuing an order to CNL to implement changes to CNL's security posture at the site. In September of 2019, CNL submitted a corrective action plan to the CNSC to address identified deficiencies and implemented interim compensatory measures at WL that were reviewed and accepted by CNSC staff.

In November 2019, WL demonstrated, by way of a force-on-force security exercise subject to the requirements of subsection 36(2) of the [Nuclear Security Regulations](#) [24], that it was adequately training its personnel and had the necessary procedures and equipment to deploy a tiered response force capable of providing an effective intervention against an adversary characterized by the design basis threat, thereby validating its Tiered Response Force tactical deployment plans. Based on information provided by CNL, following the November 2019 force-on-force security exercise, inclusive of the period from January 1 to April 30, 2020, WL maintained compensatory measures as it worked towards full operational implementation of its tiered response force security program by May 1, 2020, based on an implementation plan approved by CNSC staff. As such, a tiered response force equivalent to what was demonstrated during the November 2019 force-on-force security exercise, was not fully deployed by WL on a full-time operational basis until May 1, 2020, which is the date required by licence condition 12.2.

As of June 2020, WL had to revert back to compensatory measures as a result of the May 2020 Order in Council amending the [Regulations Prescribing Certain Firearms and Other Weapons, Components and Parts of Weapons, Accessories, Cartridge Magazines, Ammunition and Projectiles as Prohibited or Restricted](#) [25] under the [Criminal Code of Canada](#) [26]. The Order in Council required several administrative and regulatory changes related to the possession and use of prohibited and restricted firearms and special equipment. WL undertook the necessary steps to meet the new requirements imposed by the Order in Council, including undertaking additional training and procurement of supplementary special equipment in order to meet additional regulatory requirements and CNSC staff expectations. The order was closed on November 26, 2020, after CNSC staff confirmed that WL had met all the terms and conditions of the order.

#### 4.13 Safeguards and Non-Proliferation

The safeguards and non-proliferation SCA covers the programs and activities required for the successful implementation of the obligations arising from the Canada/IAEA safeguards agreements, as well as other measures arising from the [Treaty on the Non-Proliferation of Nuclear Weapons](#) [27].

CNSC staff assess CNL's performance in the safeguards and non-proliferation SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)). These compliance activities demonstrated that facilities were operated and maintained according to the licensing basis.

Under the terms of the Canada-IAEA safeguards agreements, the IAEA has the right to perform independent verification activities at various types of sites in Canada. IAEA activities are not CNSC compliance inspections, however CNSC staff accompanied the IAEA on 4 of their activities in 2020. Due to the ongoing COVID-19 pandemic, CNSC staff accompaniment was reduced from previous years.

In 2020, the IAEA carried out activities at CRL, WL, PHP, DP, G-1, and NPD to verify nuclear material inventories and assure the absence of undeclared nuclear material and activities. No significant issues were identified. [Appendix E](#) contains a list of IAEA lead inspections carried out at each CNL site in 2020.

In order to comply with COVID-19 restrictions, IAEA inspectors arriving to Canada from international destinations quarantined for 2 weeks before entering CNL sites to perform inspections. The CNSC, IAEA, and CNL worked together to manage the response to the COVID-19 pandemic, and ensure that Canada's requirements under the [Treaty on the Non-Proliferation of Nuclear Weapons](#) [27] were fulfilled.

CNL requires a licence, separate from the licensing of their operations, for the import and export of controlled nuclear substances, equipment and information identified in the [Nuclear Non-proliferation Import and Export Control Regulations](#) [28].

## 4.14 Packaging and Transport

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

CNSC staff assess CNL's performance in the packaging and transport SCA through desktop reviews of documents and reportable events ([Appendix F](#)) and also through the course of inspections ([Appendix E](#)). CNL has developed and implemented a packaging and transport program to ensure compliance with the [Packaging and Transport of Nuclear Substances Regulations, 2015](#) [29] and [Transportation of Dangerous Goods Regulations](#) [30]. This program covers elements of package design, package maintenance, and the registration for use of certified packages as required by the regulations. These compliance activities demonstrated that facilities and activities were operated and maintained according to the licensing basis.

## 5 EVENTS AND OTHER MATTERS OF REGULATORY INTEREST

This section of the ROR provides information on other matters of regulatory interest, including reportable events and nuclear liability insurance at CNL sites, as well as the separate efforts of CNSC staff and CNL regarding public engagement, Indigenous consultation and engagement, and the response to the COVID-19 pandemic. In particular, CNSC staff carried out independent public and Indigenous engagement activities as part of the organization's commitment to building trust and long-term relationships, and continued to ensure regulatory oversight in regards to safety and protection of people and the environment while also managing employee health during the pandemic.

### 5.1 Reportable Events

Detailed requirements for reporting unplanned situations or events at CNL licensed sites to the CNSC are referenced in the applicable LCH. CNSC REGDOC- 3.1.2, [Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills](#) [31] was implemented for applicable CNL sites in January 2019. Over the period covered by this report, CNL has complied with the requirements for submission of these reports.

[Appendix F](#) provides a list and a brief description of the reportable events which occurred in 2020. For these events, CNSC staff are satisfied with CNL's corrective actions.

No "Event Initial Reports" were submitted by CNSC staff to the Commission in 2020. One event, a fire in the NRU reactor building was communicated to the Commission by CNSC staff in a memo. This event is discussed in [Section 4.10](#) of this report.

## 5.2 Public Engagement

### 5.2.1 CNSC

The [Nuclear Safety and Control Act](#) [1] mandates the CNSC to disseminate objective scientific, technical and regulatory information to the public concerning its activities and the activities it regulates. CNSC staff fulfill this mandate in a variety of ways, including hosting in-person and virtual information sessions and through annual regulatory reports. CNSC staff also participate in local community events as well as CNL led public meetings. CNSC staff also seek out other opportunities to engage with the public and Indigenous groups, often participating in meetings or events in communities with interest in nuclear sites. These allow CNSC staff to answer questions about the CNSC's mandate and role in regulating the nuclear industry, including CNL's sites.

CNSC staff carried out several outreach activities in 2020, which were targeted at, or otherwise relevant to, CNL sites. Some of these activities were targeted to specific regulatory review processes underway, including the DP licence amendment, NSDF, and NPD in situ decommissioning project. Other activities were more generic in nature including the outreach related to the CNL ROR. Outreach related to the ROR also focused on Indigenous groups from communities near CNL sites and webinars that targeted the public were discontinued. Due to the ongoing COVID-19 pandemic, CNSC outreach in 2020 was reduced from previous years and was limited to virtual events.

Outreach included hosting and participating in webinars, and attending environmental stewardship meetings such as:

- CNSC DP licence amendment webinars (English and French sessions)
- CNSC ROR webinars (English and French sessions)
- CNSC NSDF and NPD joint webinars (English and French sessions)
- CNL Environmental Stewardship Council meetings

These outreach activities are separate from CNSC staff's Indigenous engagement activities which are discussed further in [Section 5.3](#).

CNSC awarded approximately \$100,000 in participant funding to assist Indigenous peoples, members of the public and stakeholders in reviewing this ROR and submitting comments to the Commission, as detailed in [Appendix M](#).

### 5.2.2 Canadian Nuclear Laboratories

The CNSC requires licensees to maintain and implement public information and disclosure programs. These programs are supported by disclosure protocols that outline the type of facility information to be shared with the public as well as details on how that information is to be shared. This ensures that timely information about the health, safety and security of persons and the environment, and other issues associated with the lifecycle of nuclear facilities, is effectively communicated to the public.

CNSC staff monitor CNL's implementation of its public information and disclosure program to verify that it communicates regularly with its audiences in a way that is meaningful to them. CNSC staff also review yearly program updates to verify CNL is taking audience feedback into consideration and taking steps to implement program adjustments to meet the evolving needs of its audiences.

In 2020, all licensees faced many challenges due to the COVID-19 pandemic, and had to adapt their public information programs accordingly. This included moving away from traditional in-person meetings and events, and offering webinars and increased digital communications whenever possible.

Communications activities by CNL included:

- Holding virtual webinars and open houses related to hearings or hot topics, including DP, NSDF and NPD;
- Providing web updates on the pandemic and other items of interest;
- Engaging on social media extensively with hundreds of posts and updates throughout the year;
- Participating in dozens of virtual events/presentations and numerous in-person events (pre-pandemic);
- Engaging with local/national media to provide operational and facility updates;
- Deploying a number of methods to gain feedback from, and create discussion with, interested parties including: feedback forms being made available online and at external events, technical meetings and focus groups being held and responses to inquiries being answered.

In response to feedback from intervenors for increased transparency and earlier availability of environmental data to inform their reviews, for this ROR, CNL produced and posted summaries of each of the major sites' annual compliance monitoring reports on their website and disseminated the full reports to interested stakeholders and Indigenous groups (e.g., CRL Environmental Stewardship Council, local municipalities, other regulatory bodies, etc.) in summer 2021.

In 2020, CNL demonstrated a strong commitment to disseminating appropriate and timely health and safety information to the public and community members through the use of their website, social media, virtual events, engagement activities and newsletters. As such, CNSC staff found that all of its sites and facilities were in compliance with their applicable public information program requirements for the year 2020.

## 5.3 Indigenous Consultation and Engagement

### 5.3.1 CNSC

CNSC staff are committed to building long-term relationships with Indigenous groups who have interest in CNSC-regulated facilities within their traditional and/or treaty territories. The CNSC's Indigenous engagement practices include sharing information, discussing topics of interest, seeking feedback and input on CNSC processes, and providing opportunities to participate in environmental monitoring. The CNSC also provides funding support (through the CNSC's Participant Funding Program) for Indigenous peoples to meaningfully participate in Commission proceedings and ongoing regulatory activities.

CNL sites fall within the traditional and treaty territories of many Indigenous communities and nations, as listed in [Appendix A](#). CNSC staff have formalized long-term engagement relationships with 4 of these Indigenous groups through terms of reference co-developed with each group. The terms of these agreements may include regular meetings (monthly, quarterly, biannual, etc.), a governance structure, specific collaborative activities, topics of interest to the group, etc. CNSC staff remain open to developing such agreements with other interested groups.

In 2020, CNSC staff efforts were largely focused on consultation activities for the ongoing environmental assessments and licensing processes for WR-1, NPD, and NSDF, as well as the DP licence amendment, which are outside the scope of this ROR. Respecting the priorities of the Indigenous groups involved in these projects, engagement regarding ongoing licensed activities within the scope of this ROR was interwoven into the project-specific consultation activities where possible. Indigenous groups were also notified of additional informational opportunities such as public webinars outlining the relevant environmental assessment and licensing processes and providing updates on specific projects (NPD, NSDF, and DP).

CNSC staff provided an update to interested groups on the status of the PHP and PGP, including information on the licence amendment for the PHP and the 2021 PGP licence renewal. No specific engagement activities were requested by Indigenous groups with respect to G-1 in 2020. However, CNSC staff ensured that all Indigenous groups with a potential interest in CNL's sites, facilities and activities, were aware of last year's CNL ROR process and how they could get involved. Three interested Indigenous groups participated in the Commission meeting as intervenors, supported by the Participant Funding Program. CNSC staff continue to keep Indigenous groups informed on regulatory oversight and encourage their participation in the RORs and other Commission proceedings.



As environmental monitoring is often a topic of interest, CNSC staff have increasingly involved Indigenous groups in the IEMP. Although there were no sampling campaigns at CNL sites in 2020, CNSC staff shared with interested Indigenous groups the results of the 2019 sampling campaigns around the CRL site as well as the Bruce Nuclear Generating Station site, which encompasses DP. CNSC staff received positive feedback from the groups involved and plan to continue expanding this type of engagement moving forward.

The vast majority of engagement and consultation with Indigenous groups in 2020 occurred via remote means due to public health recommendations related to COVID-19, although a few meetings were held in person prior to the introduction of travel restrictions in March 2020. CNSC staff welcomed the opportunity to discuss and address topics of interest and concern to the Indigenous communities through these various engagement activities. In 2021, engagement related to the ROR focused on Indigenous groups from communities near CNL in order to provide information on CNSC staff regulatory oversight and to continue to encourage Indigenous groups to participate in RORs. In particular, CNSC staff have offered a focused engagement session with all Indigenous groups and communities in proximity to CNL sites during the public consultation period to provide information on, and seek opportunity for improvement of, the regulatory oversight report. This session is planned for September 2021.

Further information on the CNSC's Indigenous consultation and engagement activities can be found on the CNSC's Website at:

<http://www.nuclearsafety.gc.ca/eng/resources/aboriginal-consultation/index.cfm>

### **5.3.2 Canadian Nuclear Laboratories**

CNSC staff note that CNL has a dedicated Indigenous engagement program that covers CNL's operations and activities. CNL met and shared information with interested Indigenous communities and organizations throughout 2020. CNL staff also participated in cultural awareness activities, provided capacity funding to support engagement activities, and invited Indigenous community members to CNL events.

CNL engagement with respect to CRL, WL, DP and NPD generally revolved around project-specific environmental assessment and licensing processes. However, discussions and activities have also addressed concerns and interest in the broader sites and ongoing licensing activities.

For CRL, CNL has noted that Indigenous groups expressed interest in environmental protection, economic development, and heritage resource protection. CNL continued to work on long-term relationship agreements and invited groups to participate in archaeological assessment field studies. Some Indigenous groups in this area are also invited observers of CNL's public Environmental Stewardship Council.

CNL has noted that topics of interest to Indigenous groups in the vicinity of WL included environmental protection, economic opportunities, and future plans for WL. In 2020, CNL invited Indigenous groups to observe on-site activities such as waste shipments and environmental monitoring, established Indigenous liaison positions with several communities, began development of an Indigenous advisory committee, initiated negotiation of long-term relationship agreements, and developed work plans to guide future engagement.

With respect to the PHAI, identified topics of interest include environmental protection, economic development and heritage resource protection. CNL's engagement activities included information sharing, site tours, virtual engagements, and invitations to economic opportunity events.

For DP, CNL has noted that interest from Indigenous groups includes archaeological work, environmental protection and monitoring, site restoration, end-state land use, and the incorporation of Indigenous values throughout the project. CNL engagement activities included in-person and virtual meetings, site tours, and information sharing.

No engagement activities with Indigenous groups were carried out for G-1 in 2020. However, CNL has indicated its intention to share information with and seek feedback from Indigenous communities with respect to G-1 and has noted that planning activities for Indigenous engagement were initiated in 2020.

CNSC staff continue to be satisfied with the level and quality of Indigenous engagement conducted by CNL with regards to its operations and proposed projects at its different sites. CNSC staff encourages CNL to continue to remain flexible and responsive to the requests and needs of the Indigenous communities and groups that have an interest in its sites, facilities and proposed projects.

## 5.4 Nuclear Liability Insurance

Pursuant to section 7 of the [Nuclear Liability and Compensation Act](#) [32], which came into force on January 1, 2017, and previously under the [Nuclear Liability Act](#) [33], CNL is required to maintain nuclear liability insurance for designated nuclear installations. The 5 nuclear installations operated by CNL that require nuclear liability insurance, as designated in the Schedule (Section 2) of the [Nuclear Liability and Compensation Regulations](#) [34], are: Chalk River Laboratories, Whiteshell Nuclear Research Establishment, Douglas Point Waste Storage Facility, Gentilly 1 – Waste Storage Facility, and Nuclear Power Demonstration Waste Management Facility.

The insured facilities at CRL are a single-unit reactor of over 7 megawatts, nuclear fuel waste processing facilities, retired nuclear reactor structures, facilities for nuclear fuel production and nuclear substance processing, and radioactive waste processing and storage facilities. CNL's prescribed limit of liability for this installation is \$180 million, in accordance with paragraph 5(a) of the [Nuclear Liability and Compensation Regulations](#) [34]. The insured facilities at WL are nuclear fuel waste management facilities, and retired nuclear reactor structures. CNL's prescribed limit of liability for this installation is \$13 million. The insured facilities at DP are a nuclear fuel waste management facility, and a retired prototype nuclear power station placed in storage-with-surveillance. CNL's prescribed limit of liability for this installation is \$13 million. The insured facilities at G-1 are a nuclear fuel waste management facility, and a retired power reactor placed in storage-with-surveillance. CNL's prescribed limit of liability for this installation is \$13 million. The insured facility at the NPD is a radioactive waste management facility. CNL's prescribed limit of liability for this installation is \$1 million.

Natural Resources Canada, which is the federal department responsible for the administration of the [Nuclear Liability and Compensation Act](#) [32], confirms that CNL is in compliance with its obligation under the [Nuclear Liability and Compensation Act](#) [32] for nuclear liability insurance for all 5 designated nuclear installations.

## 5.5 COVID-19 Response

### 5.5.1 CNSC

On March 15, 2020, the CNSC activated the business continuity plan in response to the COVID-19 pandemic. Effective March 16, all CNSC staff in Ottawa and at regional and site offices were directed to work from home. CNSC management immediately suspended all travel to sites and identified activities that were considered critical in order to support continued safe operation of licensed facilities and delivery of the CNSC mission and mandate. Files scheduled to be presented to the Commission and the associated timelines for submission to the Secretariat were reviewed to confirm any impact and plan any mitigation measures.

In April of 2020, CNSC staff reviewed all planned on-site compliance activities on a risk-informed basis to determine an appropriate path forward. CNSC staff identified planned compliance activities well suited to be delivered by other means (remote inspections and verification methods, desktop review of documents and licensee submissions, etc.) and adjusted planned activities accordingly. CNSC staff oversight activities were modified as per changes to activities by CNL, as described in [Section 5.5.2](#).

The CNSC nuclear fuel cycle program developed a pandemic-related protocol that included measures to be taken by inspectors in adherence with federal and provincial health guidelines, licensee COVID-19 protocols as well as additional precautionary measures to further mitigate risks. This included a pre-job briefing which had instructions to be delivered by CNSC directors and supervisors to inspectors prior to performing any on-site oversight activities. Inspectors were provided with personal protective equipment by the CNSC prior to any on-site activity. The pre-job briefing clearly outlines the right of individual employees to not attend an in-person inspection if they do not feel it is safe to do so.

Compliance activities of nuclear fuel cycle facilities continued remotely and on-site oversight activities have since resumed on a risk-informed basis in observance of relevant COVID-19 health protocols. CNSC staff continue to conduct oversight activities during the COVID-19 pandemic to ensure the protection of the environment, and the health and safety of people. Specific oversight activities completed in 2020 during the pandemic are outlined in [Appendix E](#) of this report.

### **5.5.2 Canadian Nuclear Laboratories**

In response to the COVID-19 pandemic, CNL reduced operations at all their sites beginning March 18, 2020. CNL activated their business continuity plans, and had all non-essential staff work remotely. The state of reduced operations included only work to ensure CNL sites, facilities, equipment, and grounds were maintained and kept safe and compliant with regulatory requirements. For CNL activities that were not put on hold, the licensee worked to follow all public health guidelines and additional safety protocols. All CNL sites maintained appropriate security measures throughout this period.

On April 9, 2020, CNL submitted a formal request to the CNSC for regulatory flexibility due to the evolving COVID-19 pandemic, and associated challenges. This request included a temporary amendment to timelines for certain inspections, licence renewals, licence requirements, and upcoming reports, in order for CNL to focus on essential operations and worker health and safety during the pandemic. CNSC reviewed each request on a case-by-case basis and worked with CNL to establish acceptable amended timelines under specific conditions. Delays ranged from days to up to 6 months, where warranted.

CNL's crisis management team developed a plan for a phased return to full operation from the reduced operations state. This plan involves 5 phases, from planning to post-pandemic, and does not have a defined time period. Transition between phases is dependent on the meeting of defined criteria in this plan. CNL continues to adjust protocols and guidance at each of its sites based on provincial and municipal guidance.

CNL implemented several safety precautions at sites to ensure the safety of staff and visitors. These included:

- Limiting on-site staff based on health authority advice, and transitioning staff to remote work where possible. Specific protocols were put in place to ensure minimum shift complements were met for groups such as security and fire brigade so that safety and security of CNL sites were not impacted. CNL sites have had sufficient number of qualified and trained persons in the radiation protection pool, and COVID-19 measures have not had any impact on their ability to manage the activities related to radiation protection.
- Creating mandatory face covering protocols for all CNL sites to identify conditions and exemptions for face coverings.
- Daily screening for COVID-19 for all CNL staff and contractors, and later, voluntary COVID-19 testing at certain sites.
- Updating work planning processes to include an assessment of COVID-19 precautions including physical distancing and personal protective equipment.
- CNL expanded its virtual psychologically safe workplace and mental health services to assist employees.

CNL's crisis management team is continuing to evaluate new information and risk related to COVID-19 at their sites and local communities. CNSC staff are informed of any changes made by the CNL crisis management team.

## 5.6 Overall Conclusions

CNSC staff conclude that the CRL, WL, PHAI, DP, G-1 and NPD sites operated safely in 2020. This conclusion is based on CNSC staff's assessments of licensee activities that included site inspections, reviews of reports submitted by licensees, and event and incident reviews, supported by follow-up and general communication with the licensee.

For 2020, the performance in all 14 SCAs was rated as "satisfactory".

CNSC staff's compliance activities confirmed that:

- Radiation protection programs at all CNL sites adequately controlled radiation exposures, keeping doses ALARA
- Conventional health and safety programs at all CNL sites continue to protect workers; and
- Environmental protection programs at all CNL sites were effective in protecting people and the environment.

CNSC staff will continue to provide regulatory oversight at all CNL sites, to ensure that CNL continues to make adequate provision to protect the health, safety and security of workers, Canadians and the environment, and continues to implement Canada's international obligations on the peaceful use of nuclear energy.

## REFERENCES

1. [Nuclear Safety and Control Act](#), S.C. 1997, c. 9
2. CMD 21-M32.A, Presentation, *Regulatory Oversight Report for Canadian Nuclear Laboratories Sites: 2020*
3. [Canadian Environmental Assessment Act, 2012](#), S.C. 2012, c. 19, s. 52
4. CMD 21-H102, Licence Renewal, *Application to renew licence for the Port Granby Long-Term Low-Level Radioactive Waste Management Project*
5. DEC 20-H4, Record of Decision, [Application to amend the Waste Facility Decommissioning Licence for the Douglas Point Waste Facility to include phase 3 decommissioning activities](#)
6. Commission Meeting Minutes, [Minutes of the Canadian Nuclear Safety Commission \(CNSC\) Meeting held on December 8, 9 and 10, 2020](#)
7. REGDOC-2.2.2, [Personnel Training, Version 2](#)
8. [Radiation Protection Regulations](#), SOR/2000-203
9. CMD 20-M22, Annual Program Report, [Regulatory Oversight Report for Canadian Nuclear Laboratories Sites: 2019](#)
10. DEC 19-H4, Record of Decision, [Application for the Renewal of the Nuclear Research and Test Establishment Decommissioning Licence for Whiteshell Laboratories](#)
11. [Nuclear Substances and Radiation Devices Regulations](#), SOR/2000-207
12. Ontario Workplace Safety and Insurance Board, [2019 WSIB Statistical Report, Industry Sector Claims and LTI Rate](#)
13. Safe Work Manitoba, [The Manitoba Workplace Injury and Illness Statistics Report 2010-2019](#)
14. CSA Standard N288.5-11, [Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills](#)
15. ISO Standard 14001:2015, [Environmental Management Systems](#)
16. CSA Standard N288.4, [Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills](#)
17. Ontario Ministry of Environment, Conservation and Parks, [Ambient Air Quality Criteria](#)
18. Ontario Ministry of Environment, Conservation and Parks, [Provincial Water Quality Objectives](#)
19. Canadian Council of Ministers of the Environment, [Canadian Water Quality Guidelines for the Protection of Aquatic Life](#)

20. Ontario Ministry of Environment Conservation and Parks, [Provincial Sediment Quality Guidelines](#)
21. Canadian Council of Ministers of the Environment, [Interim Sediment Quality Guideline](#)
22. CSA Standard N288.6-12, [Environmental risk assessments at class I nuclear facilities and uranium mines and mills](#)
23. [Canadian National Report for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management \(October 2020\)](#)
24. [Nuclear Security Regulations](#), SOR/2000-209
25. [Regulations Prescribing Certain Firearms and Other Weapons, Components and Parts of Weapons, Accessories, Cartridge Magazines, Ammunition and Projectiles as Prohibited or Restricted](#), SOR/98-462
26. [Criminal Code](#), R.S.C., 1985, c. C-46
27. United Nations, [Treaty on the Non-Proliferation of Nuclear Weapons](#)
28. [Nuclear Non-proliferation Import and Export Control Regulations](#), SOR/2000-210
29. [Packaging and Transport of Nuclear Substances Regulations](#), 2015, SOR/2015-145
30. [Transportation of Dangerous Goods Regulations](#), SOR/2001-286
31. REGDOC-3.1.2, [Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills](#)
32. [Nuclear Liability and Compensation Act](#), S.C. 2015, c. 4, s. 120
33. [Nuclear Liability Act](#), R.S.C. 1985, c. N-28
34. [Nuclear Liability and Compensation Regulations](#), SOR/2016-88
35. REGDOC-3.6, [Glossary of CNSC Terminology](#)
36. CMD 21-M35, Annual Program Report, *Regulatory Oversight Report on the Use of Nuclear Substances in Canada: 2020*
37. [General Nuclear Safety and Control Regulations](#), SOR/2000-202
38. CSA Standard N288.1-14, [Guidelines for calculating derived release limits for radioactive materials in airborne and liquid effluents for normal operation of nuclear facilities](#)

## GLOSSARY AND ACRONYMS

For definitions of terms and acronyms used in this document, except for those listed below, see REGDOC-3.6, [Glossary of CNSC Terminology](#) [35].

<b>ALARA</b>	As Low As Reasonably Achievable
<b>AL</b>	Action Level
<b>ANMRC</b>	Advanced Nuclear Materials Research Centre
<b>BE</b>	Below Expectation
<b>Bq</b>	Becquerel
<b>CANDU</b>	Canada Deuterium Uranium
<b>CNL</b>	Canadian Nuclear Laboratories
<b>CNSC</b>	Canadian Nuclear Safety Commission
<b>CMD</b>	Commission Member Document
<b>CRL</b>	Chalk River Laboratories
<b>DRL</b>	Derived Release Limits
<b>DP</b>	Douglas Point
<b>ERA</b>	Environmental Risk Assessment
<b>FS</b>	Fully Satisfactory
<b>G-1</b>	Gentilly-1
<b>HEU</b>	Highly Enriched Uranium
<b>HRS</b>	Hours
<b>IAEA</b>	International Atomic Energy Agency
<b>IEMP</b>	Independent Environmental Monitoring Program
<b>KG</b>	Kilogram
<b>LCH</b>	Licence Conditions Handbook
<b>LTWMF</b>	Long-Term Waste Management Facility
<b>M</b>	Meter
<b>MBq</b>	Megabecquerel
<b>mSv</b>	Millisievert
<b>MWe</b>	Megawatt Electric
<b>MWth</b>	Megawatt Thermal



<b>NEWs</b>	Nuclear Energy Workers
<b>NNC</b>	Notice of Non-compliance
<b>NPD</b>	Nuclear Power Demonstration
<b>NRTEOL</b>	Nuclear Research and Test Establishment Operating Licence
<b>NRTEDL</b>	Nuclear Research and Test Establishment Decommissioning Licence
<b>NSDF</b>	Near Surface Disposal Facility
<b>NRU</b>	National Research Universal
<b>PGP</b>	Port Granby Project
<b>PHAI</b>	Port Hope Area Initiative
<b>PHP</b>	Port Hope Project
<b>REGDOC</b>	Regulatory Document
<b>RLTI</b>	Recordable Lost-Time Injuries
<b>ROR</b>	Regulatory Oversight Report
<b>SA</b>	Satisfactory
<b>SCA</b>	Safety and Control Areas
<b>WFDL</b>	Waste Facility Decommissioning Licence
<b>WL</b>	Whiteshell Laboratories
<b>WNSL</b>	Waste Nuclear Substance Licence
<b>WR-1</b>	Whiteshell Reactor No. 1
<b>Y</b>	Year

## **A. INDIGENOUS COMMUNITIES AND GROUPS WHOSE TRADITIONAL AND/OR TREATY TERRITORIES ARE IN PROXIMITY TO CNL SITES**

### **Chalk River Laboratories and Nuclear Power Demonstration**

- Algonquins of Ontario
- Algonquins of Pikwàkanagàn
- Métis Nation of Ontario
- Algonquin Anishinabeg Nation Tribal Council
  - Conseil de la Première Nation Abitibiwinini
  - Kebaowek First Nation
  - Kitcisakik
  - Kitigan Zibi Anishinabeg First Nation
  - Lac Simon
  - Long Point First Nation
  - Wahgoshig
- Williams Treaties First Nations:
  - Alderville First Nation
  - Beausoleil First Nation
  - the Chippewas of Georgina Island First Nation
  - Chippewas of Rama First Nation
  - Curve Lake First Nation
  - Hiawatha First Nation
  - Mississaugas of Scugog Island First Nation

### **Whiteshell Laboratories**

- Sagkeeng First Nation
- Manitoba Metis Federation
- Brokenhead Ojibway Nation
- Black River First Nation
- Hollow Water First Nation
- Northwest Angle #33
- Shoal Lake #40 First Nation
- Wabaseemoong Independent Nations

- Iskatewizaagegan #39 Independent First Nation
- Grand Council of Treaty 3

### **Port Hope Project and Port Granby Project**

- Mohawks of the Bay of Quinte
- Métis Nation of Ontario
- Williams Treaty First Nations:
  - Alderville First Nation
  - Beausoleil First Nation
  - the Chippewas of Georgina Island First Nation
  - Chippewas of Rama First Nation
  - Curve Lake First Nation
  - Hiawatha First Nation
  - Mississaugas of Scugog Island First Nation

### **Douglas Point**

- Saugeen Ojibway Nation:
  - Chippewas of Nawash Unceded First Nation
  - Saugeen First Nation
- Métis Nation of Ontario
- Historic Saugeen Métis

### **Gentilly-1**

- Abénakis of Wôlinak and Odanak, represented by the Grand Conseil de la Nation Waban-Aki
- Nation huronne-wendat

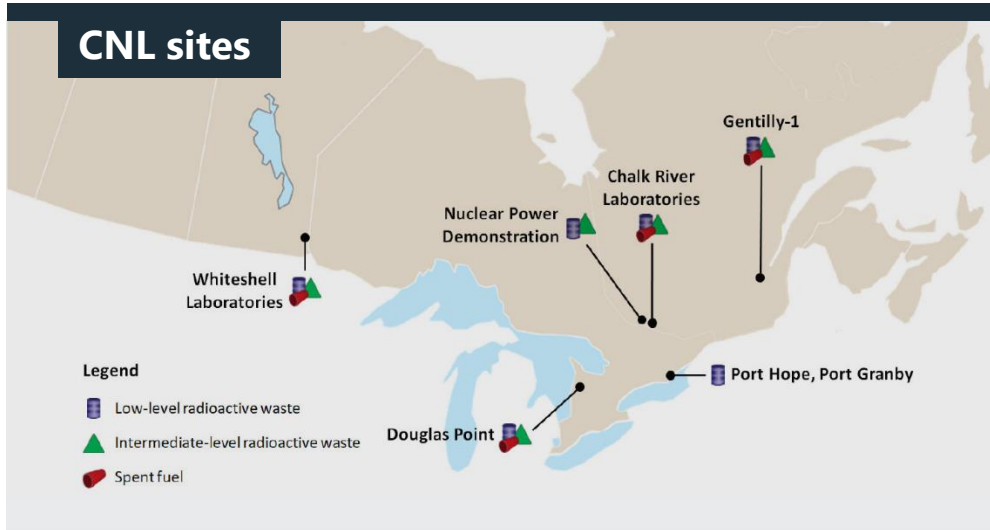
## **B. ROR DASHBOARD**

eDoc 6628071 (Word)

eDoc 6629086 (PDF)

# Regulatory Oversight Report (ROR) Dashboard of Canadian Nuclear Laboratories Sites: 2020

This dashboard reports on the safety performance of Canadian Nuclear Laboratories (CNL) sites and the efforts of the Canadian Nuclear Safety Commission (CNSC) to ensure the safety and protection of the people and the environment around the sites in 2020. For the full ROR, please refer to CMD 21-M32.



**10** Inspectors dedicated to CNL sites

**30-40** CNSC staff with regulatory effort at CNL sites

**4** CNSC employees working at Chalk River Laboratories (CRL) site

## Safety and control areas (SCAs)

3 SCAs covered in all inspections

**100%** Satisfactory rating for all 14 SCAs across all CNL sites



CNSC staff conclude that all CNL sites operated safely in 2020

## Activities

**65** International Atomic Energy Agency (IAEA) led safeguards inspections

**15** CNSC inspections

**30** CNSC Notices of non-compliance (NNCs)

13,361 hours Compliance work



22,942 hours Licensing work

## Events



**37** Reportable events

**1** Event reported to the Commission

All NNCs were considered low-risk and did not have an impact on safety at CNL sites

## Maximum doses

- Regulatory limit
- Estimated dose
- Effective dose

### The public

0.033 mSv/y **MAX 1 mSv/y**

The maximum estimated dose to the public from any CNL site in 2020 was at the Port Hope Project

### Nuclear energy workers (NEWs)

7.97 mSv/y **MAX 50 mSv/y**

The maximum effective dose received by a NEW in 2020 across CNL sites was at CRL

## Public outreach



CNSC staff conducted and participated in > 10 virtual public sessions, including webinars, with respect to CNL sites

## Individual Environmental Monitoring Program (IEMP)



Although there were no IEMP sampling campaigns conducted at CNL sites in 2020, CNSC staff shared with interested Indigenous groups the results of the 2019 sampling campaigns around the Chalk River Laboratories site as well as the Bruce Nuclear Generating Station site, which encompasses the Douglas Point site

## Licensing actions



**1 Licensing Change:** Whiteshell Laboratories Licence and Licence Conditions Handbook issued in January 2020

### C. LICENCES AND LICENSING ACTIVITIES

Site/ Facility/ Project	Licence Number	Previous Commission Hearing	Licensing Changes in 2020
Chalk River Laboratories	NRTEOL-01.00/2028	CMD 18-H2, January 24-25, 2018	None
Whiteshell Laboratories	NRTEDL-W5-8.00/2024	CMD 19-H4, October 2-3, 2019	Licence and LCH issued in January 2020
Port Hope Project	WNSL-W1-2310.02/2022	CMD 12-H10, October 24, 2012	None
Port Granby Project	WNSL-W1-2311.02/2021	CMD 19-H101, March 2019	
Douglas Point Waste Facility	WFDL-W4-332.02/2034	CMD 20-H4, November 25-26, 2020	
Gentilly-1 Waste Facility	WFDL-W4-331.00/2034	CMD 18-H107, December 12, 2018	
Nuclear Power Demonstration Waste Facility	WFDL-W4-342.00/2034		
Port Hope Pine Street Extension Temporary Storage Site	WNSL-W1-182.1/2021	N/A (Licence Date October 31, 2014)	
Port Hope Radioactive Waste Management Facility	WNSL-W1-344-1.8/ind*	N/A (Licence Date September 26, 2016)	
Waste Nuclear Substance Licence (WNSL) for Unspecified Locations	WNSL-W2-2202.0/2026	WDD-DOD-16-004, November 28, 2016	
Canadian Nuclear Laboratories Import Licence	IL-01.00/2021	NLRRD-DOD-16-001, April 26, 2016	
Canadian Nuclear Laboratories Export Licence	EL-01.00/2021		
La Prade Nuclear Substances and Radiation Devices Licence**	15193-4-21.2	N/A	

Low-Level Waste Programs Nuclear Substances and Radiation Devices Licence**	15193-5-21.2	
<p><i>*This licence is valid indefinitely unless otherwise suspended, amended, revoked, replaced, or transferred.</i></p> <p><i>**These Nuclear Substances and Radiation Devices Licences are discussed in CMD 21-M35, Regulatory Oversight Report on the Use of Nuclear Substances in Canada: 2020 [36] and are not included as part of the content of this ROR.</i></p>		

## D. REGULATORY DOCUMENT IMPLEMENTATION

**Table D-1: Regulatory Documents - CRL**

Document Number	Document Title	Version	Status
REGDOC-2.4.3	Nuclear Criticality Safety, Version 1.1	2020	Implemented in 2020
REGDOC-2.9.1	Environmental Principles, Assessments and Protection Measures, Version 1.1	2017	Implemented in 2020
REGDOC-2.12.3	Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material, Version 2.1	2020	Implemented in 2020
REGDOC-3.2.1	Public Information and Disclosure	2018	Implemented in 2020

**Table D-2: Regulatory Documents - WL**

Document Number	Document Title	Version	Status
REGDOC-2.2.2	Personnel Training, Version 2	2016	Implemented in 2020
REGDOC-2.2.4	Fitness for Duty: Managing Worker Fatigue	2017	Implemented in 2020
REGDOC-2.2.4	Fitness for Duty, Volume III: Nuclear Security Officer Medical, Physical, and Psychological Fitness	2018	Implemented in 2020
REGDOC-2.4.3	Nuclear Criticality Safety	2018	Implemented in 2020
REGDOC-2.4.3	Nuclear Criticality Safety, Version 1.1	2020	Gap analysis received June 2021
REGDOC-2.9.1	Environmental Principles, Assessments and Protection Measures, Version 1.1	2017	Effective September 30, 2022
REGDOC-2.10.1	Nuclear Emergency Preparedness and Response, Version 2	2016	Implemented in 2020
REGDOC-2.12.1	High-Security Facilities, Volume I: Nuclear Response Force, Version 2	2018	Implemented in 2020



REGDOC-2.12.1	High-Security Facilities, Volume II: Criteria for Nuclear Security Systems and Devices	2018	Implemented in 2020
REGDOC-2.12.2	Site Access Security Clearance	2013	Implemented in 2020
REGDOC-2.12.3	Security of Nuclear Substances: Sealed Sources	2013	Implemented in 2020
REGDOC-2.12.3	Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material, Version 2.1	2020	Gap analysis received June 2021
REGDOC-2.13.1	Safeguards and Nuclear Material Accountancy	2018	Implemented in 2020
REGDOC-3.2.1	Public Information and Disclosure	2018	Implemented in 2020

**Table D-3: Regulatory Documents - PHP and PGP**

<b>Document Number</b>	<b>Document Title</b>	<b>Version</b>	<b>Status</b>
REGDOC-2.2.2	Personnel Training, version 2	2016	Effective October 2021
REGDOC-2.9.1	Environmental Principles, Assessments and Protection Measures, Version 1.1	2017	Implemented in 2020

**Table D-4: Regulatory Documents - DP, G-1 and NPD**

<b>Document Number</b>	<b>Document Title</b>	<b>Version</b>	<b>Status</b>
REGDOC-2.2.2	Personnel Training, Version 2	2016	Implemented in 2020
REGDOC-2.4.3	Nuclear Criticality Safety, Version 1.1	2020	Gap analysis received June 2021
REGDOC-2.9.1	Environmental Principles, Assessments and Protection Measures, Version 1.1	2017	Effective December 2021
REGDOC-2.10.1	Nuclear Emergency Preparedness and Response, Version 2	2016	Implemented in 2020
REGDOC-2.12.3	Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material, Version 2.1	2020	Gap analysis received June 2021
REGDOC-3.2.1	Public Information and Disclosure	2018	Implemented in 2020

## E. LIST OF INSPECTIONS AT CNL SITES

**Table E-1: List of CNSC led inspections at CRL**

Inspection	Dates	SCAs Covered	Number of Enforcement Actions and Recommendations
CNL-CRL-2020-01: Compliance Inspection of the Multipurpose Applied Physics Lattice Experimental (MAPLE) Reactor Facilities and New Processing Facility	January 20, 2020	<ul style="list-style-type: none"> <li>• Operating Performance</li> <li>• Fitness for Service</li> <li>• Radiation Protection</li> <li>• Conventional Health and Safety</li> <li>• Emergency Management and Fire Protection</li> <li>• Waste Management</li> <li>• Security</li> </ul>	1 NNC 3 Rec.
CNL-CRL-2020-02: Compliance Inspection of the Recycle Fuel Fabrication Laboratory at Chalk River Laboratories	January 29, 2020	<ul style="list-style-type: none"> <li>• Operating Performance</li> <li>• Radiation Protection</li> <li>• Conventional Health and Safety</li> <li>• Environmental Protection</li> <li>• Emergency Management and Fire Protection</li> <li>• Security</li> <li>• Safeguards and Non-Proliferation</li> </ul>	1 NNC 1 Rec.
CNL-CRL-2020-03: Compliance Inspection of the Target Residue Material Retrieval and Transfer Operations	February 20-29, 2020	<ul style="list-style-type: none"> <li>• Operating Performance</li> <li>• Fitness for Service</li> <li>• Radiation Protection</li> <li>• Conventional Health and Safety</li> <li>• Security</li> <li>• Packaging and Transport</li> </ul>	2 NNC 1 Rec.
CNL-CRL-2020-04: Compliance Inspection of the Targeted Alpha Therapy Radioisotope Laboratories at Chalk River Laboratories	February 28, 2020	<ul style="list-style-type: none"> <li>• Fitness for Service</li> <li>• Radiation Protection</li> <li>• Conventional Health and Safety</li> <li>• Emergency Management and Fire Protection</li> <li>• Waste Management</li> </ul>	2 NNC 4 Rec.

CNL-CRL-2020-05: Fire Protection Inspection at Chalk River Laboratories	March 3-4, 2020	<ul style="list-style-type: none"> <li>• Human Performance Management</li> <li>• Operating Performance</li> <li>• Radiation Protection</li> <li>• Conventional Health and Safety</li> <li>• Emergency Management and Fire Protection</li> </ul>	9 NNC 4 Rec.
CNL-CRL-2020-06: Focused Management System Inspection at Chalk River Laboratories	July 30-31, 2020	<ul style="list-style-type: none"> <li>• Management System</li> <li>• Human Performance Management</li> </ul>	4 NNC 2 Rec.
CNL-CRL-2020-08: Focused Inspection of the Nuclear Criticality Safety Program at Chalk River Laboratories	November 23-24, 2020	<ul style="list-style-type: none"> <li>• Safety Analysis</li> </ul>	2 NNC 5 Rec.

**Table E-2: List of CNSC led inspections at WL**

<b>Inspection</b>	<b>Dates</b>	<b>SCAs Covered</b>	<b>Number of Enforcement Actions and Recommendations</b>
<i>No inspections were performed at WL in 2020.</i>			

**Table E-3: List of CNSC led inspections at PHP**

<b>Inspection</b>	<b>Dates</b>	<b>SCAs Covered</b>	<b>Number of Enforcement Actions and Recommendations</b>
CNL-PHAI-PHP-2020-01: Port Hope Area Initiative: Port Hope Site and Port Granby Site Waste Water Treatment Plants	February 24-26, 2020	<ul style="list-style-type: none"> <li>• Management System</li> <li>• Radiation Protection</li> <li>• Conventional Health and Safety</li> <li>• Environmental Protection</li> </ul>	1 NNC* 2 Rec.
CNL-PHAI-PHP-2020-02: Long-Term Waste Management Facility Cell 2B Integrity	September 28-October 30, 2020	<ul style="list-style-type: none"> <li>• Physical Design</li> </ul>	1 Rec.
<i>* This NNC was issued once, but applied to both PHP and PGP.</i>			

**Table E-4: List of CNSC led inspections at PGP**

<b>Inspection</b>	<b>Dates</b>	<b>SCAs Covered</b>	<b>Number of Enforcement Actions and Recommendations</b>
CNL-PHAI-PGP-2020-01: Port Hope Area Initiative: Port Hope Site and Port Granby Site Waste Water Treatment Plants	February 24-26, 2020	<ul style="list-style-type: none"> <li>• Management System</li> <li>• Radiation Protection</li> <li>• Conventional Health and Safety</li> <li>• Environmental Protection</li> </ul>	1 NNC* 2 Rec.
CNL-PHAI-PGP-2020-02: Soil Remediation Activities	September 28-October 30, 2020	<ul style="list-style-type: none"> <li>• Environmental Protection</li> </ul>	0 NNC/Rec.
CNL-PHAI-PGP-2020-03: Long-Term Waste Management Facility Cell Cover	September 28-October 30, 2020	<ul style="list-style-type: none"> <li>• Physical Design</li> </ul>	1 Rec.
CNL-PHAI-PGP-2020-04: Geotechnical	September 28-October 30, 2020	<ul style="list-style-type: none"> <li>• Physical Design</li> </ul>	0 NNC/Rec.
<i>* This NNC was issued once, but applied to both PHP and PGP.</i>			

**Table E-5: List of CNSC led inspections at DP, G-1\* and NPD**

Inspection	Dates	SCAs Covered	Number of Enforcement Actions and Recommendations
CNL-NPD-2020-01: Annual Baseline Compliance Inspection of NPD Waste Facility with a Focus on Fire Protection and Radiation Protection	March 2, 2020	<ul style="list-style-type: none"> <li>• Management System</li> <li>• Fitness for Service</li> <li>• Radiation Protection</li> <li>• Conventional Health and Safety</li> <li>• Environmental Protection</li> <li>• Emergency Management and Fire Protection</li> <li>• Waste Management</li> <li>• Security</li> </ul>	2 NNC 7 Rec.
CNL-DP-2020-01: Douglas Point Waste Facility General Inspection	March 10, 2020	<ul style="list-style-type: none"> <li>• Human Performance Management</li> <li>• Operating Performance</li> <li>• Fitness for Service</li> <li>• Radiation Protection</li> <li>• Environmental Protection</li> <li>• Emergency Management and Fire Protection</li> <li>• Waste Management</li> <li>• Security</li> </ul>	5 NNC
<i>*No inspections were performed at G-1 in 2020.</i>			

**Table E-6: List of IAEA led inspections at CNL Sites**

<b>SITE/ Facility/ Project</b>	<b>IAEA inspections (CNSC Escort)</b>
CRL	55 (4)
WL	2
PHP	3
PGP	0
DP	2
G-1	2
NPD	1
<b>TOTAL</b>	<b>65</b>

## F. REPORTABLE EVENTS

This appendix contains information on the number of reportable events at the CNL sites covered by this ROR, in the 2020 calendar year. Under the conditions of its licences, CNL is required to report events as per the [General Nuclear Safety and Control Regulations](#) [37], and, if applicable to site, the criteria outlined in REGDOC-3.1.2, [Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills](#) [31]. A total of 37 events were reported to and assessed by CNSC staff in 2020, and it was determined that there was no risk to the environment or the public.

**Table F-1: Number of reportable events at each CNL site in 2020**

Site/Facility/Project	Number of events
CRL	27
WL	4
PHP	0
PGP	3
DP	1
G-1	1
NPD	1
<b>TOTAL</b>	<b>37</b>

**Table F-2: Reportable events at CRL in 2020**

Event Number	Title	SCA	Facility (if applicable)
1	Security Deficiency at Van de Graaff Facility	Security	Van de Graaff Facility
2	Fire in Metal Cabinet within NRU Reactor Building	Emergency Management and Fire Protection	NRU
3	Missed Leak Test on Registered Sources	Radiation Protection	Various Facilities
4	Unlabeled Double-bagged Contaminated Tube of Vacuum Grease Found in Zone 3 Tool Box	Radiation Protection	Recycle Fuel Fabrication Laboratories



5	Activation of Crisis Management Team Due to COVID-19	Emergency Management and Fire Protection	N/A
6	Delayed Replacement of IAEA Electronic Seal	Safeguards and Non-Proliferation	Molybdenum-99 Processing Facility
7	Import of Controlled Item Without Updating Import Licence	Packaging and Transport	N/A
8	Two Radiation Monitors in the Fuel and Materials Cells Past Calibration Period	Radiation Protection	Fuel and Materials Cells
9	Non-Compliance with Fire Protection Impairment, Notification and Compensatory Measures Procedure	Emergency Management and Fire Protection	N/A
10	Loose Contamination Found During Unpackaging of a Radioactive Shipment	Packaging and Transport	N/A
11	Radiation Survey Instrument Used while Being Out of Calibration	Radiation Protection	Facilities Decommissioning
12	Security Protocol Non-Compliance	Security	N/A
13	Dissolution Activities in the Recycle Fuel Fabrication Laboratories Not Adequately Described and Analyzed in the Criticality Safety Document	Safety Analysis	Recycle Fuel Fabrication Laboratories
14	Security Event	Security	N/A
15	Roadrunner Flask 'A' Side Shield Plug was Missing a Bearing Pad and Caused Higher Than Normal Radiation Fields During Unload	Packaging and Transport	Universal Cells
16	Independent Third Party Review Not Submitted to Regulator as Per Licence Conditions Handbook	Emergency Management and Fire Protection	N/A
17	Transport of Dangerous Goods Radioactive Consignment Classification Error	Packaging and Transport	N/A
18	Security Reportable Event	Security	N/A
19	Small Fire in Hot Cell B375 Fuel and Materials Cell 11	Emergency Management and Fire Protection	Fuel and Materials Cells
20	Half-height Sealand Containers Leaking Water	N/A	Facilities Decommissioning

21	Fire Response to Suspicious Package at Building 1565	Emergency Management and Fire Protection	N/A
22	CNL Visitor Unescorted Within the CRL Protected Area	Security	N/A
23	Pre-existing Sanitary Leak Discovered During Excavation	Environmental Protection	Site of ANMRC
24	Unplanned Sprinkler Impairment in B375 Due to Pipe Freeze	Emergency Management and Fire Protection	Recycle Fuel Fabrication Laboratories
25	Security Event	Security	N/A
26	Activity Not Identified in Recycle Fuel Fabrication Laboratories Time Limited Amendment to Criticality Safety Document	Safety Analysis	Recycle Fuel Fabrication Laboratories
27	Fire System Impairment in B250 Due to Pipe Freeze	Emergency Management and Fire Protection	Chemical Engineering Laboratories

**Table F-3: Reportable events at WL in 2020**

Event Number	Title	SCA	Facility (if applicable)
1	Failure to Submit Notification to CNSC of Revised Criticality Safety Document	Operating Performance	Concrete Canister Storage Facility
2	Breach of Security Protocol	Security	N/A
3	Non-Compliance to the WL Waste Management Area Facility Authorization	Operating Performance	Waste Management Area
4	Confirmed COVID-19 Case at WL	N/A	N/A

**Table F-4: Reportable events at PGP in 2020**

Event Number	Title	SCA	Facility (if applicable)
1	Water Release East Gorge	Environmental Protection	Waste Management Facility
2	Waste Water Treatment Plant Bio-Reactor Leak	Environmental Protection	Waste Water Treatment Plant
3	Effluent Toxicity Failure	Environmental Protection	Waste Water Treatment Plant

**Table F-5: Reportable events at DP in 2020**

<b>Event Number</b>	<b>Title</b>	<b>SCA</b>	<b>Facility (if applicable)</b>
1	Diesel Fuel Leak at Douglas Point Waste Facility	Environmental Protection	N/A

**Table F-6: Reportable events at G-1 in 2020**

<b>Event Number</b>	<b>Title</b>	<b>SCA</b>	<b>Facility (if applicable)</b>
1	Gentilly-1 Monthly Fire Alarm System Not Completed	Emergency Management and Fire Protection	N/A

**Table F-7: Reportable events at NPD in 2020**

<b>Event Number</b>	<b>Title</b>	<b>SCA</b>	<b>Facility (if applicable)</b>
1	Remote Monitoring Impairment at Nuclear Power Demonstration Waste Facility	Emergency Management and Fire Protection	N/A

**G. REGULATORY EFFORT**

<b>Site/ Facility/ Project</b>	<b>Inspections</b>	<b>Person Hours of Compliance Work*</b>	<b>Person Hours of Licensing Work*</b>	<b>Total Effort*</b>
CRL**	7	6779	10219	16998
WL	0	1107	4423	5530
PHP***	2	3098	405	3503
PGP	4	1441	82	1523
DP	1	360	3404	3764
G-1	0	67	32	99
NPD	1	509	4377	4886
<b>TOTAL</b>	<b>15</b>	<b>13,361</b>	<b>22,942</b>	<b>36,303</b>
<p><i>*Rounded to the nearest hour. Data for 2020 does not include CNSC staff effort on ongoing environmental assessments and licensing processes for NSDF, NPD and WR-1 in situ decommissioning projects.</i></p> <p><i>**Includes data for CRL, and CNL Import Licence and CNL Export Licence.</i></p> <p><i>***Includes data for PHP, Port Hope Pine Street Extension Temporary Storage Site, Port Hope Radioactive Waste Management Facility, and WNSL for Unspecified Locations.</i></p>				

## H. SAFETY AND CONTROL AREA RATINGS

Note that the following acronyms are used in this appendix:

SA = satisfactory

BE = below expectations

**Table H-1: Safety and control area summary, CRL, 2016-2020**

Safety and control areas	2016	2017	2018	2019	2020
Management system	SA	SA	SA	SA	SA
Human performance management	SA	SA	SA	SA	SA
Operating performance	SA	SA	SA	SA	SA
Safety analysis	SA	SA	SA	SA	SA
Physical design	SA	SA	SA	SA	SA
Fitness for service	BE	SA	SA	SA	SA
Radiation protection	SA	SA	SA	SA	SA
Conventional health and safety	SA	SA	SA	SA	SA
Environmental protection	SA	SA	SA	SA	SA
Emergency management and fire protection	SA	SA	SA	SA	SA
Waste management	SA	SA	SA	SA	SA
Security	SA	SA	SA	SA	SA
Safeguards and non-proliferation	SA	SA	SA	SA	SA
Packaging and transport	SA	SA	SA	SA	SA

**Table H-2: Safety and control area summary, WL, 2016-2020**

<b>Safety and control areas</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
<b>Management system</b>	SA	SA	SA	SA	SA
<b>Human performance management</b>	SA	SA	SA	SA	SA
<b>Operating performance</b>	SA	SA	SA	SA	SA
<b>Safety analysis</b>	SA	SA	SA	SA	SA
<b>Physical design</b>	SA	SA	SA	SA	SA
<b>Fitness for service</b>	SA	SA	SA	SA	SA
<b>Radiation protection</b>	SA	SA	SA	SA	SA
<b>Conventional health and safety</b>	SA	SA	SA	SA	SA
<b>Environmental protection</b>	SA	SA	SA	SA	SA
<b>Emergency management and fire protection</b>	SA	SA	SA	SA	SA
<b>Waste management</b>	SA	SA	SA	SA	SA
<b>Security</b>	SA	SA	BE	BE	SA
<b>Safeguards and non-proliferation</b>	SA	SA	SA	SA	SA
<b>Packaging and transport</b>	SA	SA	SA	SA	SA

**Table H-3: Safety and control area summary, PHP, 2016-2020**

<b>Safety and control areas</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
<b>Management system</b>	SA	SA	SA	SA	SA
<b>Human performance management</b>	SA	SA	SA	SA	SA
<b>Operating performance</b>	SA	SA	SA	SA	SA
<b>Safety analysis*</b>	N/A	N/A	N/A	N/A	N/A
<b>Physical design</b>	SA	SA	SA	SA	SA
<b>Fitness for service*</b>	N/A	N/A	N/A	N/A	N/A
<b>Radiation protection</b>	SA	SA	SA	SA	SA
<b>Conventional health and safety</b>	SA	SA	SA	SA	SA
<b>Environmental protection</b>	SA	SA	SA	SA	SA
<b>Emergency management and fire protection</b>	SA	SA	SA	SA	SA
<b>Waste management</b>	SA	SA	SA	SA	SA
<b>Security</b>	SA	SA	SA	SA	SA
<b>Safeguards and non-proliferation</b>	SA	SA	SA	SA	SA
<b>Packaging and transport</b>	SA	SA	SA	SA	SA

\*As per the LCH for the PHP, due to the scope of work under the licence, the safety analysis and fitness for service SCAs do not apply to the PHP.

**Table H-4: Safety and control area summary, PGP, 2016-2020**

<b>Safety and control areas</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
<b>Management system</b>	SA	SA	SA	SA	SA
<b>Human performance management</b>	SA	SA	SA	SA	SA
<b>Operating performance</b>	SA	SA	SA	SA	SA
<b>Safety analysis*</b>	N/A	N/A	N/A	N/A	N/A
<b>Physical design</b>	SA	SA	SA	SA	SA
<b>Fitness for service*</b>	N/A	N/A	N/A	N/A	N/A
<b>Radiation protection</b>	SA	SA	SA	SA	SA
<b>Conventional health and safety</b>	SA	SA	SA	SA	SA
<b>Environmental protection</b>	SA	SA	SA	SA	SA
<b>Emergency management and fire protection</b>	SA	SA	SA	SA	SA
<b>Waste management</b>	SA	SA	SA	SA	SA
<b>Security</b>	SA	SA	SA	SA	SA
<b>Safeguards and non-proliferation*</b>	N/A	N/A	N/A	N/A	N/A
<b>Packaging and transport</b>	SA	SA	SA	SA	SA

\*As per the LCH for the PGP, due to the scope of work under the licence, the safety analysis, fitness for service, and safeguards and non-proliferation SCAs do not apply to the PGP.



**Table H-5: Safety and control area summary, DP Waste Facility, 2016-2020**

<b>Safety and control areas</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
<b>Management system</b>	SA	SA	SA	SA	SA
<b>Human performance management</b>	SA	SA	SA	SA	SA
<b>Operating performance</b>	SA	SA	SA	SA	SA
<b>Safety analysis</b>	SA	SA	SA	SA	SA
<b>Physical design</b>	SA	SA	SA	SA	SA
<b>Fitness for service</b>	SA	SA	SA	SA	SA
<b>Radiation protection</b>	SA	SA	SA	SA	SA
<b>Conventional health and safety</b>	SA	SA	SA	SA	SA
<b>Environmental protection</b>	SA	SA	SA	SA	SA
<b>Emergency management and fire protection</b>	SA	SA	SA	SA	SA
<b>Waste management</b>	SA	SA	SA	SA	SA
<b>Security</b>	SA	SA	SA	SA	SA
<b>Safeguards and non-proliferation</b>	SA	SA	SA	SA	SA
<b>Packaging and transport</b>	SA	SA	SA	SA	SA

**Table H-6: Safety and control area summary, G-1 Waste Facility, 2016-2020**

<b>Safety and control areas</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
<b>Management system</b>	SA	SA	SA	SA	SA
<b>Human performance management</b>	SA	SA	SA	SA	SA
<b>Operating performance</b>	SA	SA	SA	SA	SA
<b>Safety analysis</b>	SA	SA	SA	SA	SA
<b>Physical design</b>	SA	SA	SA	SA	SA
<b>Fitness for service</b>	SA	SA	SA	SA	SA
<b>Radiation protection</b>	SA	SA	SA	SA	SA
<b>Conventional health and safety</b>	SA	SA	SA	SA	SA
<b>Environmental protection</b>	SA	SA	SA	SA	SA
<b>Emergency management and fire protection</b>	SA	SA	SA	SA	SA
<b>Waste management</b>	SA	SA	SA	SA	SA
<b>Security</b>	SA	SA	SA	SA	SA
<b>Safeguards and non-proliferation</b>	SA	SA	SA	SA	SA
<b>Packaging and transport</b>	SA	SA	SA	SA	SA

**Table H-7: Safety and control area summary, NPD Waste Facility, 2016-2020**

<b>Safety and control areas</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
<b>Management system</b>	SA	SA	SA	SA	SA
<b>Human performance management</b>	SA	SA	SA	SA	SA
<b>Operating performance</b>	SA	SA	SA	SA	SA
<b>Safety analysis</b>	SA	SA	SA	SA	SA
<b>Physical design</b>	SA	SA	SA	SA	SA
<b>Fitness for service</b>	SA	SA	SA	SA	SA
<b>Radiation protection</b>	SA	SA	SA	SA	SA
<b>Conventional health and safety</b>	SA	SA	SA	SA	SA
<b>Environmental protection</b>	SA	SA	SA	SA	SA
<b>Emergency management and fire protection</b>	SA	SA	SA	SA	SA
<b>Waste management</b>	SA	SA	SA	SA	SA
<b>Security</b>	SA	SA	SA	SA	SA
<b>Safeguards and non-proliferation</b>	SA	SA	SA	SA	SA
<b>Packaging and transport</b>	SA	SA	SA	SA	SA

## I. DOSES TO NUCLEAR ENERGY WORKERS AND NON-NUCLEAR ENERGY WORKERS AT CNL SITES

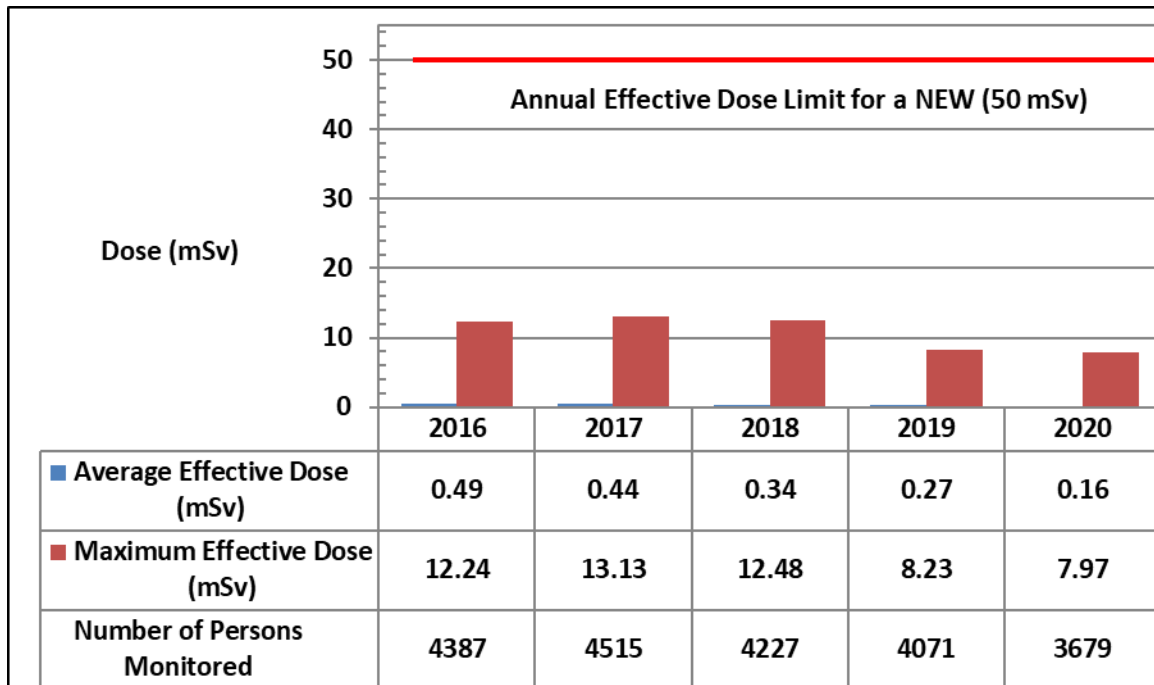
This appendix presents information on doses to NEWs and non-NEWs at CNL sites.

### Chalk River Laboratories

Figure I-1 provides the average effective doses and the maximum effective doses to NEWs at CRL from 2016 to 2020. In 2020, the maximum effective dose received by a NEW at CRL was 7.97 mSv; approximately 16 percent of the regulatory limit for effective dose of 50 mSv in a one-year dosimetry period. The maximum individual effective dose received by a NEW for the five-year dosimetry period (January 1, 2016 to December 31, 2020) was 44.95 mSv, which is approximately 45 percent of the regulatory limit for effective dose of 100 mSv in five-year dosimetry period.

The dose fluctuations from year to year are attributed to the scope and duration of the radiological work conducted, along with the dose rates associated with the work. No adverse trends were identified in 2020.

**Figure I-1: Average and maximum effective doses to NEWs at CRL from 2016 - 2020**



As shown in Tables I-1a and I-1b, equivalent doses (skin and extremity) at the CRL site were below the CNSC regulatory equivalent dose limits for a NEW of 500 mSv/y. The maximum equivalent (skin) dose received by a NEW in 2020 was 9.37 mSv (approximately 2 percent of the regulatory limit for equivalent dose to the skin of 500 mSv in a one-year dosimetry period.) The maximum equivalent (extremity) dose received by a NEW in 2020 was 11.86 mSv; approximately 2 percent of the regulatory limit for equivalent dose to the hands and feet of 500 mSv in a one-year dosimetry period.

**Table I-1a: Equivalent (skin) doses to NEWs at CRL from 2016 - 2020**

<b>Dose Data</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Regulatory Limit</b>
Average skin dose (mSv)	0.60	0.53	0.40	0.29	0.19	n/a
Maximum skin dose (mSv)	16.54	19.95	15.84	9.65	9.37	500 mSv/y

**Table I-1b: Equivalent (extremity) doses to NEWs at CRL from 2016 - 2020**

<b>Dose Data</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Regulatory Limit</b>
Average extremity dose (mSv)	3.71	6.10	4.85	2.21	1.70	n/a
Maximum extremity dose (mSv)	41.59	85.06	44.83	21.38	11.86	500 mSv/y

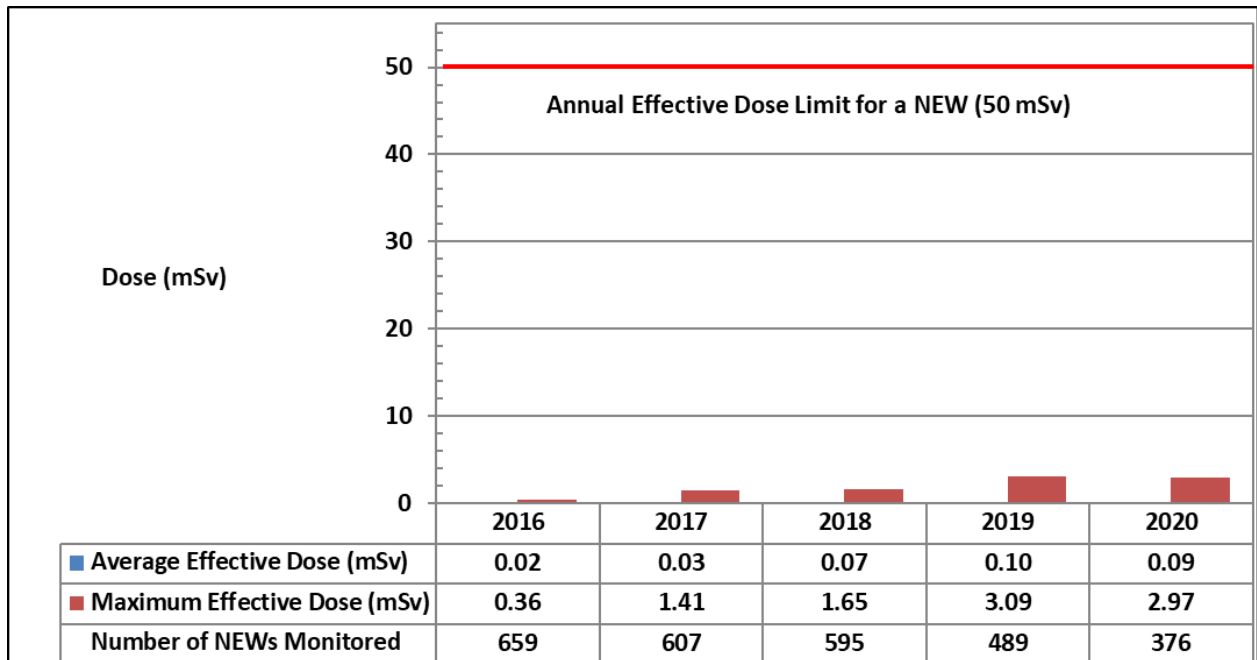
***Non-NEWs at CRL***

In 2020, the maximum annual effective dose received by a non-NEW was 0.08 mSv; 8 percent of the regulatory limit for effective dose of 1 mSv in a one-year dosimetry period.

**Whitshell Laboratories**

Figure I-2 provides the average effective doses and the maximum effective doses received by NEWs at WL from 2016 to 2020. In 2020, the maximum effective dose received by a NEW was 2.97 mSv; approximately 6 percent of the regulatory limit for effective dose of 50 mSv in a one-year dosimetry period. For the five-year dosimetry period of 2016 – 2020 the maximum individual dose to a NEW at WL was 7.24 mSv; which is approximately 7 percent of the regulatory limit for effective dose of 100 mSv in five-year dosimetry period.

The dose fluctuations from year to year are attributed to the scope and duration of the radiological work conducted, along with the dose rates associated with the work. No adverse trends were identified in 2020.

**Figure I-2: Average and maximum effective doses to NEWs at WL from 2016 - 2020**

As shown in Tables I-2a and I-2b, equivalent doses (skin and extremity, respectively) at the WL site were below the CNSC regulatory equivalent dose limits for a NEW of 500 mSv/y. The maximum equivalent (skin) dose received by a NEW in 2020 was 6.80 mSv; approximately 1.4 percent of the regulatory limit for equivalent dose to the skin of 500 mSv in a one-year dosimetry period. The maximum equivalent (extremity) dose received by a NEW in 2020 was 6.46 mSv; approximately 1.3 percent of the regulatory limit for equivalent dose to the hands and feet of 500 mSv in a one-year dosimetry period.

**Table I-2a: Equivalent (skin) doses to NEWs at WL from 2016 - 2020**

Dose Data	2016	2017	2018	2019	2020	Regulatory Limit
Average skin dose (mSv)	0.02	0.05	0.12	0.20	0.16	n/a
Maximum skin dose (mSv)	0.36	2.90	3.72	7.47	6.80	500 mSv/y

**Table I-2b: Equivalent (extremity) doses to NEWs at WL from 2016 - 2020**

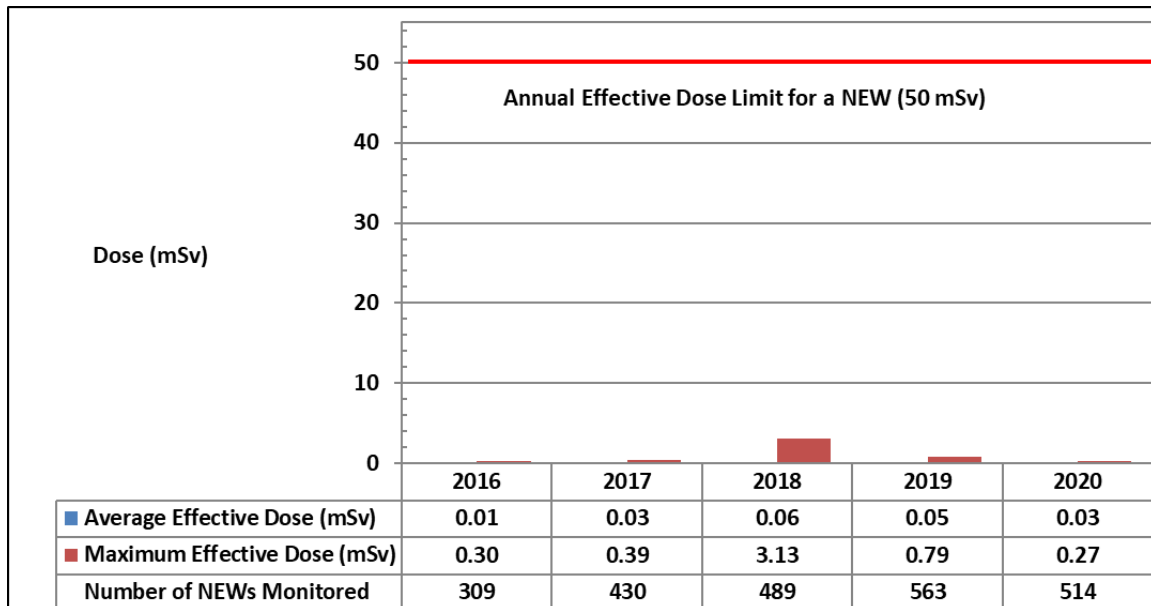
Dose Data	2016	2017	2018	2019	2020	Regulatory Limit
Average extremity dose (mSv)	0.05	1.51	5.02	4.80	1.43	n/a
Maximum extremity dose (mSv)	0.11	11.35	36.71	37.77	6.46	500 mSv/y

***Non-NEWs at WL***

In 2020, external dosimeters issued to non-NEWs at WL did not record any measurable doses.

**Port Hope Area Initiative****Port Granby**

Figure I-3 provides the average effective doses and the maximum effective doses for NEWs from 2016 to 2020. In 2020, the maximum effective dose received by a NEW at the PGP was 0.27 mSv, which is well below the CNSC's regulatory effective dose limit for NEWs of 50 mSv in a one-year dosimetry period. The total number of NEWs includes all contractors involved in work activities at the PGP as well as CNL staff.

**Figure I-3: Average and maximum effective doses to NEWs at PGP from 2016 - 2020**

Effective doses continued trending down in 2020 due to work at the PGP nearing completion of excavation activities, with the focus turning to capping of the LTWMF. With less waste being excavated in 2020, and as mound capping activities and site closure activities progress, it is expected that doses to workers will continue to trend downwards.

For the five-year dosimetry period, which began January 1, 2016, and concluded on December 31, 2020, the maximum cumulative effective dose received by a NEW at the PGP was 5.04 mSv, which is well below the CNSC's regulatory effective dose limit of 100 mSv in a five-year dosimetry period.

Annual average and maximum equivalent doses to the skin for NEWs at the PGP from 2016 to 2020 are provided in Table I-3. In 2020, the maximum skin dose received by a NEW at the PGP was 0.27 mSv, which is well below the CNSC's regulatory equivalent dose limit for NEWs of 500 mSv in a one-year dosimetry period.

**Table I-3: Equivalent (skin) doses to NEWs at PGP from 2016 - 2020**

<b>Dose Data</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Regulatory Limit</b>
Average skin dose (mSv)	0.01	0.04	0.05	0.05	0.03	n/a
Maximum skin dose (mSv)	0.30	0.34	2.44	0.79	0.27	500 mSv/y

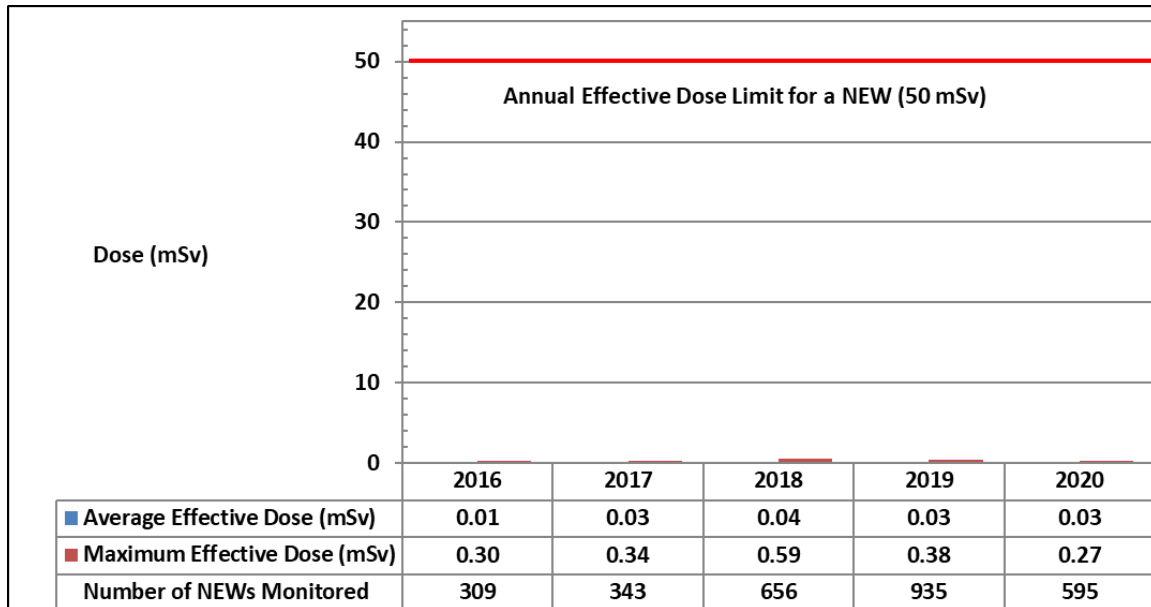
### **Port Hope**

Figure I-4 provides the average effective doses and the maximum effective doses for NEWs from 2016 to 2020. In 2020, the maximum effective dose received by a NEW at the PHP was 0.27 mSv, which is well below the CNSC's regulatory effective dose limit of 50 mSv in a one-year dosimetry period. The total number of NEWs includes all contractors involved in work activities at the PHP as well as CNL staff.

Effective doses remained low in 2020 as there were no significant changes in the scope of work activities at the PHP.



**Figure I-4: Average and maximum effective doses to NEWs at PHP from 2016 - 2020**



For the five-year dosimetry period, which began January 1, 2016, and concluded on December 31, 2020, the maximum cumulative effective dose received by a NEW at the PHP was 1.16 mSv, which is well below the CNSC's regulatory effective dose limit of 100 mSv in a five-year dosimetry period.

Average and maximum equivalent doses to the skin for NEWs at the PHP from 2016 to 2020 are provided in Table I-4. In 2020, the maximum skin dose received by a NEW at the PHP was 0.27 mSv, which is well below the CNSC's regulatory equivalent dose limit of 500 mSv in a one-year dosimetry period.

**Table I-4: Equivalent (skin) doses to NEWs at PHP from 2016 - 2020**

Dose Data	2016	2017	2018	2019	2020	Regulatory Limit
Average skin dose (mSv)	0.01	0.04	0.04	0.04	0.03	n/a
Maximum skin dose (mSv)	0.30	0.34	0.33	0.60	0.27	500 mSv/y

#### *Non-NEWs at Port Hope Area Initiative*

Doses to non-NEWs at the Port Hope Area Initiative are either estimated based on radiological conditions of areas visited, or directly monitored by using electronic personal dosimeters.

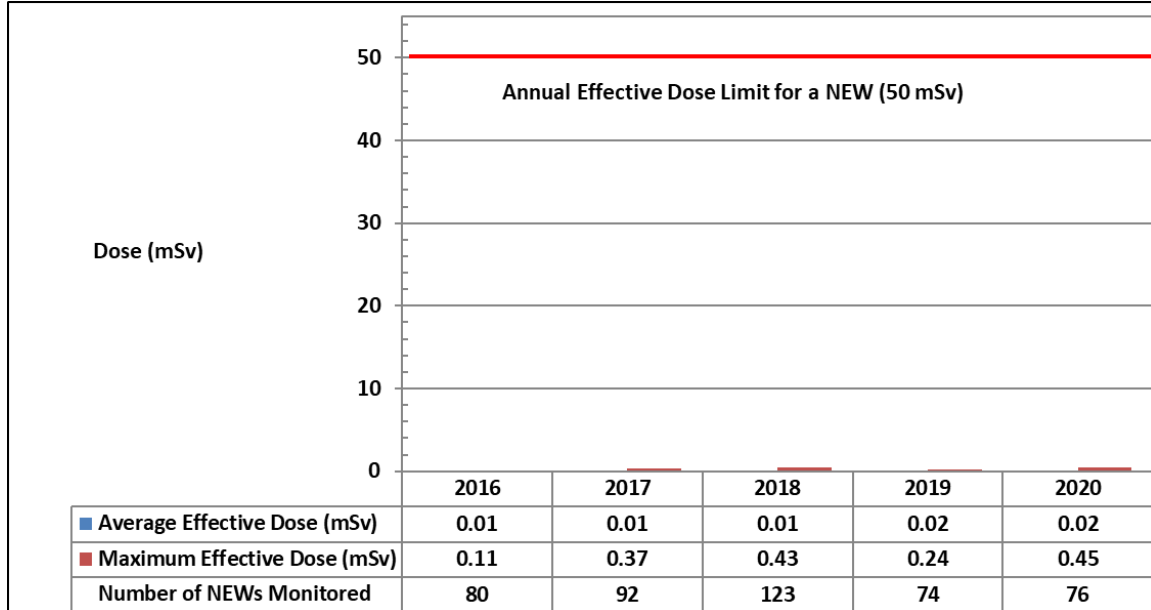
In 2020, no measurable doses were recorded for visitors and contractors that were not considered as NEWs at the PHP and the PGP.

## DP, G-1 and NPD Waste Facilities

### Douglas Point Waste Facility

Figure I-5 provides the average effective doses and the maximum effective doses for NEWs from 2016 to 2020. In 2020, the maximum effective dose received by a NEW at the DP site was 0.45 mSv, which is well below the CNSC's regulatory effective dose limit for NEWs of 50 mSv in a one-year dosimetry period.

**Figure I-5: Average and maximum effective doses to NEWs at DP from 2016 - 2020**



Over 2016 to 2020, there has been an execution of planned hazard reduction work activities at the DP site. In 2018, the majority of the maximum individual effective dose was attributed to the spent resin removal project. In 2019 and 2020, the hazard reduction work continued in the reactor building, including the dry active waste removal campaigns.

For the five-year dosimetry period, which began January 1, 2016, and concluded on December 31, 2020, the maximum cumulative effective dose received by a NEW at the DP site was 1.15 mSv, which is well below the CNSC's regulatory effective dose limit of 100 mSv in a five-year dosimetry period.

Annual average and maximum equivalent doses to the skin for NEWs at DP site from 2016 to 2020 are provided in Table I-5. In 2020, the maximum skin dose received by a NEW at the DP site was 0.51 mSv, which is well below the CNSC's regulatory equivalent dose limit for NEWs of 500 mSv in a one-year dosimetry period.

**Table I-5: Equivalent (skin) doses to NEWs at DP from 2016 - 2020**

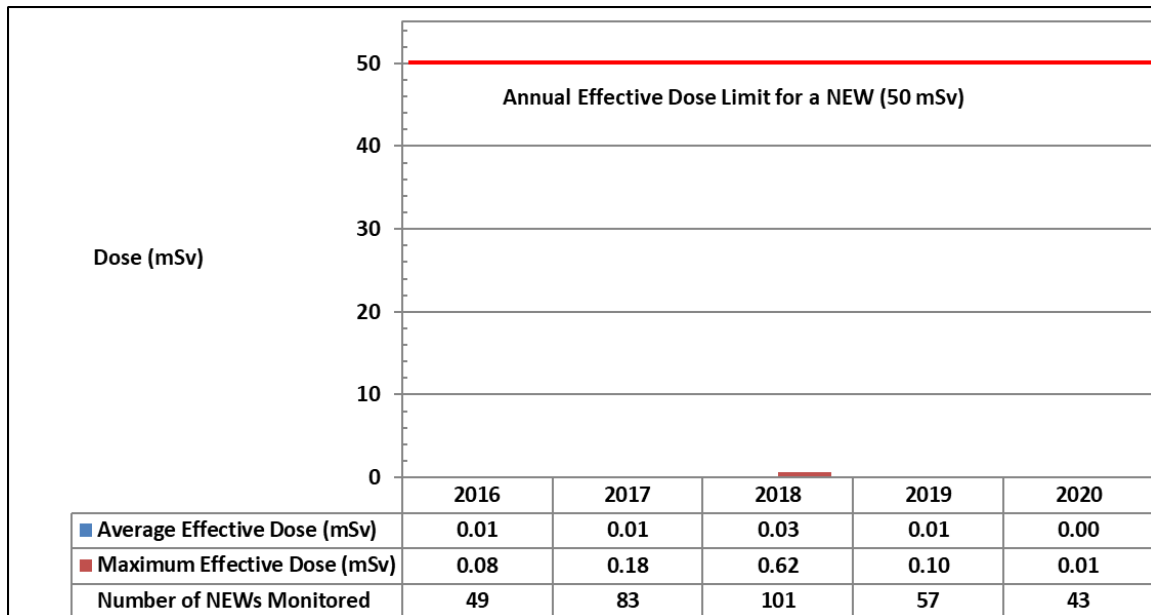
Dose Data	2016	2017	2018	2019	2020	Regulatory Limit
Average skin dose (mSv)	0.01	0.01	0.01	0.02	0.03	n/a
Maximum skin dose (mSv)	0.11	0.37	0.43	0.24	0.51	500 mSv/y

***Non-NEWs at DP***

In 2020, external dosimeters issued to non-NEWs at DP did not record any measurable doses.

***Gentilly-1 Waste Facility***

Figure I-6 provides the average effective doses and the maximum effective doses for NEWs from 2016 to 2020. In 2020, the maximum effective dose received by a NEW at the G-1 site was 0.01 mSv, which is well below the CNSC's regulatory effective dose limit for NEWs of 50 mSv in a one-year dosimetry period.

**Figure I-6: Average and maximum effective doses to NEWs at G-1 from 2016 - 2020**

Over 2016 to 2020, there has been an execution of planned hazard reduction work activities at the G-1 site. In 2018, the majority of the maximum individual effective dose was attributed to the spent resin removal project. In 2019 and 2020, the hazard reduction work continued, including asbestos abatement and dry active waste removal. This work had a low potential for worker exposures and resulted in lower effective doses observed as compared to the previous years.

For the five-year dosimetry period, which began January 1, 2016, and concluded on December 31, 2020, the maximum cumulative effective dose received by a NEW at the G-1 site was 0.67 mSv, which is well below the CNSC's regulatory effective dose limit of 100 mSv in a five-year dosimetry period.

Annual average and maximum equivalent doses to the skin for NEWs at the G-1 site from 2016 to 2020 are provided in Table I-6. In 2020, the maximum skin dose received by a NEW at the G-1 site was 0.01 mSv, which is well below the CNSC's regulatory equivalent dose limit for NEWs of 500 mSv in a one-year dosimetry period.

**Table I-6: Equivalent (skin) doses to NEWs at G-1 from 2016 - 2020**

<b>Dose Data</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Regulatory Limit</b>
Average skin dose (mSv)	0.01	0.01	0.03	0.01	0.00	n/a
Maximum skin dose (mSv)	0.08	0.18	0.62	0.16	0.01	500 mSv/y

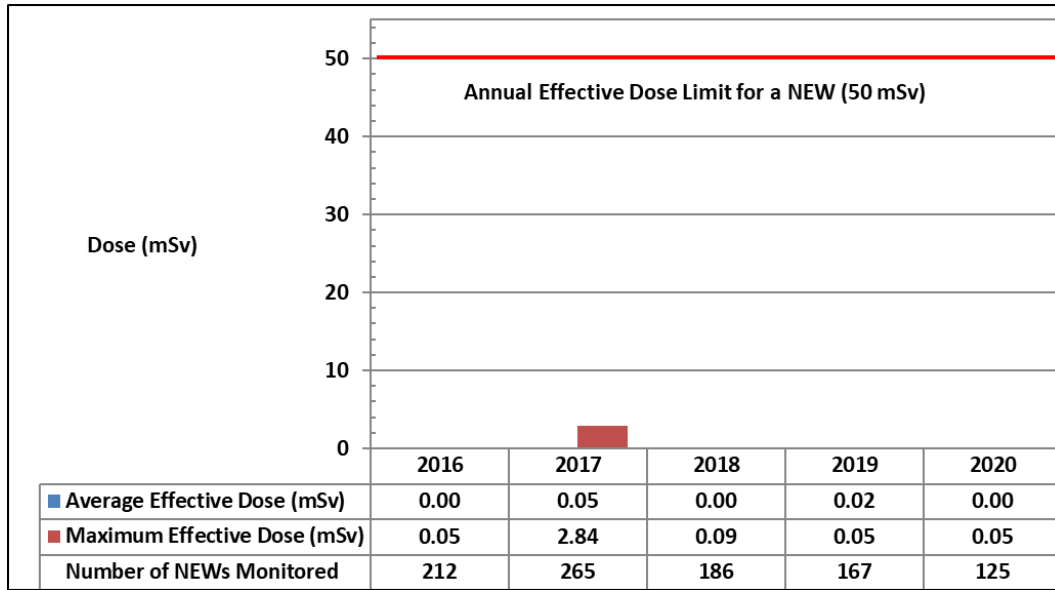
***Non-NEWs at Gently-1***

In 2020, external dosimeters issued to non-NEWs at G-1 did not record any measurable doses.

***Nuclear Power Demonstration Waste Facility***

Figure I-7 provides the average effective doses and the maximum effective doses for NEWs from 2016 to 2020. In 2020, the maximum effective dose received by a NEW at the NPD site was 0.05 mSv, which is well below the CNSC's regulatory effective dose limit for NEWs of 50 mSv in a one-year dosimetry period.

**Figure I-7: Average and maximum effective doses to NEWs at NPD from 2016 - 2020**



Effective doses over these years are consistently low and reflect storage with surveillance activities such as routine inspection and maintenance, as well as some hazard reduction activities. Effective doses in 2017 did see an increase due to planned work activities involving engineering assessments, thorough facility characterization and large-scale hazard reduction activities (asbestos abatement). It is noted that the 2017 maximum effective dose for a NEW has been corrected in Figure I-7. It had previously been reported by CNL as 3.02 mSv.

For the five-year dosimetry period, which began January 1, 2016, and concluded on December 31, 2020, the maximum cumulative effective dose received by a NEW at the NPD site was 2.84 mSv, which is well below the CNSC's regulatory effective dose limit of 100 mSv in a five-year dosimetry period

Annual average and maximum equivalent doses to the skin for NEWs at the NPD site from 2016 to 2020 are provided in Table I-7. In 2020, the maximum skin dose received by a NEW at the NPD site was 0.05 mSv, which is well below the CNSC's regulatory equivalent dose limit for NEWs of 500 mSv in a one-year dosimetry period.

**Table I-7: Equivalent (skin) doses to NEWs at NPD from 2016 - 2020**

Dose Data	2016	2017	2018	2019	2020	Regulatory Limit
Average skin dose (mSv)	0.00	0.04	0.00	0.03	0.00	n/a
Maximum skin dose (mSv)	0.05	3.02	0.09	0.05	0.05	500 mSv/y

***Non-NEWs at NPD***

In 2020, external dosimeters issued to non-NEWs at NPD did not record any measurable doses.

## J. LOST-TIME INJURY INFORMATION

This appendix contains information on the number, frequency and severity of RLTIs at the CNL sites covered by this ROR, with information presented separately for CNL employees and contractors.

### CNL Employees

Frequency and severity are calculated per 100 full-time workers (equivalent to 200,000 worker-hours per year) using the following formulas:

**Frequency rate** = (# of Lost-Time Injuries) x (200 000 hrs of exposure) / (person hours worked)

**Severity rate** = (# of Working Days Lost) x (200 000 hrs of exposure) / (person hours worked)

**Table J-1: Summary of CRL's RLTIs, frequency and severity (Source: CNL)**

Year	2016	2017	2018	2019	2020
Person Hours Worked (all CNL)	6 405 670	-	-	-	-
Person Hours Worked	-	5 597 015	5 396 450	5 729 010	5 346 690
Lost-Time Injuries	6	4	5	1	4
Working Days Lost	47	10	69	75	78
Frequency	0.19	0.14	0.19	0.03	0.15
Severity	1.47	0.36	2.56	2.62	2.92
<p><i>Note that prior to 2017, CNL did not provide data for person-hours worked on CRL site alone, therefore total CNL hours worked are used in place of that data. This skews frequency and severity data for the CRL site for the 2016 year, and makes comparison between pre- and post-2017 data for CRL difficult.</i></p>					

For 2020, 78 working days were lost at CRL, the most in this five-year period. The majority of these days are attributable to 1 CNL employee who missed more than 60 days with their injury caused after slipping on ice and sustaining a head injury.

**Table J-2: Summary of WL's RLTIs, frequency and severity (Source: CNL)**

Year	2016	2017	2018	2019	2020
Person Hours Worked	684 450	706 000	688 000	642 000	584 030
Lost-Time Injuries	1	3	1	0	1
Working Days Lost	5	27	5	0	2
Frequency	0.29	0.85	0.28	0	0.34
Severity	1.46	7.67	1.45	0	0.68

**Table J-3: Summary of PHPs RLTIs, frequency and severity (Source: CNL)**

Year	2016	2017	2018	2019	2020
Person Hours Worked	-	-	-	298 377	391 875
Lost-Time Injuries	0	0	0	1	0
Working Days Lost	0	0	0	33	0
Frequency	0	0	0	0.68	0
Severity	0	0	0	22.57	0
<i>Note that prior to 2019, CNL did not provide data on person-hours worked on the PHP site.</i>					

**Table J-4: Summary of PGP's RLTIs, frequency and severity (Source: CNL)**

Year	2016	2017	2018	2019	2020
Person Hours Worked	-	-	-	41 622	30 000
Lost-Time Injuries	0	0	0	1	0
Working Days Lost	0	0	0	1	0
Frequency	0	0	0	4.81	0
Severity	0	0	0	4.81	0
<i>Note that prior to 2019, CNL did not provide data on person-hours worked on the PGP site.</i>					

**Table J-5: Summary of DP, G-1, and NPD RLTIs, frequency and severity (Source: CNL)**

Year	2016	2017	2018	2019	2020
<i>CNL staff at the DP, G-1, and NPD sites have not recorded a lost-time injury since 2016.</i>					



### **Contractors at CNL sites**

The number of contractor recordable lost-time incidents reported to CNL in 2020 is shown in Table J-6.

CNL records the number of lost-time injuries reported to CNL by their contractors. However, contractor employee hours worked is considered sensitive information and the contractors do not divulge the specific number of hours worked to CNL as their client. Therefore, CNL does not provide frequency and severity rates for contractors since these calculations require hours worked.

**Table J-6: Contractor lost-time injuries in 2020** (*Source: CNL*)

Site	CRL	WL	PHP	PGP	DP	G-1	NPD
Lost-Time Injuries (Change from 2019)	0	0	0 (-1)	0 (-1)	0	0	0

## K. TOTAL ANNUAL RELEASE OF RADIONUCLIDES

Licenseses are required to demonstrate that their releases are below their DRLs and that the sum of their releases is below 1 mSv/y, which is the public regulatory dose limit. To ensure these limits are respected, licenseses also are required to develop ALs significantly below their DRLs as a means of detecting elevated releases meriting follow-up investigations and actions to ensure releases are adequately controlled.

The following tables provide the annual load of key radionuclides directly released to atmosphere or to surface waters from licensed facilities operated by CNL for the reporting period of 2016-2020. Applicable DRLs are also presented where they exist. There are no comparisons to limits and guidelines for the PHP or PGP as the limits in licences are based on either monthly mean, weekly mean, or grab samples.

Over this reporting period, there have been no licence limit exceedances.

As CNL is the licence holder for G-1, releases would be reported in this ROR. However, an effluent monitoring plan assessment conducted in 2016 confirmed that there is minimal or no source of airborne radioactivity at G-1. Therefore, airborne emissions are no longer monitored. Furthermore, all liquids from facility sumps were transferred to the Gentilly-2 facility effluent system to be managed and discharged by Hydro-Quebec.

CNSC staff have commenced publishing annual releases of radionuclides to the environment from facilities on the CNSC Open Government Portal:

<https://open.canada.ca/data/en/dataset/6ed50cd9-0d8c-471b-a5f6-26088298870e>.

### Chalk River Laboratories

**Table K-1: Chalk River Laboratories annual radionuclide releases to atmosphere for 2016 - 2020**

Year	Elemental Tritium (Bq)	Tritium: (HTO: Bq)	Carbon-14 (Bq)	Iodine-131 (Bq)	Noble Gas (Bq-MeV)	Argon-41 (Bq)	Xenon-133 (Bq)
<b>DRL</b>	<b>3.84E+17</b>	<b>1.25E+16</b>	<b>2.14E+15</b>	<b>3.96E+12</b>	<b>4.96E+16</b>	<b>6.50E+16</b>	<b>8.35E+17</b>
2020	5.06E+12	2.54E+13	2.61E+10	2.44E+07	N/A <sup>a</sup>	N/A <sup>b</sup>	N/A <sup>c</sup>
2019	5.51E+12	1.98E+14	3.44E+10	2.14E+07	N/A <sup>a</sup>	N/A <sup>b</sup>	N/A <sup>c</sup>
2018	6.86E+12	2.34E+14	2.59E+11	1.05E+08	6.50E+12	2.64E+15	N/A <sup>c</sup>
2017	4.64E+12	2.53E+14	4.91E+11	3.78E+08	6.50E+12	1.16E+16	N/A <sup>c</sup>
2016	2.55E+12	2.45E+14	4.85E+11	5.17E+10	3.97E+14	1.07E+16	3.12E+15

<sup>a</sup> After the safe shutdown of the Molybdenum Production Facility, there are no airborne releases of noble gases

<sup>b</sup> After the safe shutdown of the NRU reactor, there are no airborne releases of Argon-41

<sup>c</sup> After the safe shutdown of the Molybdenum Production Facility, there are no airborne releases of Xenon-133

**Table K-2: Chalk River Laboratories annual radionuclide releases to surface water for 2016 - 2020**

<b>Year</b>	<b>Tritium: (HTO: Bq)</b>	<b>Gross Alpha (Bq)</b>	<b>Gross Beta (Bq)</b>
<b>DRL</b>	<b>1.03E+17</b>	<b>1.32E+12</b>	<b>2.70E+13</b>
2020	1.08E+13	2.40E+08	1.75E+10
2019	1.31E+13	4.62E+08	2.75E+10
2018	1.93E+13	6.88E+08	2.84E+10
2017	3.81E+13	7.66E+08	4.17E+10
2016	3.50E+13	6.60E+08	3.22E+10

**Whiteshell Laboratories****Table K-3: Whiteshell Laboratories annual radionuclide releases to atmosphere for 2016 - 2020**

<b>Year</b>	<b>Tritium: (HTO: Bq)</b>	<b>Gross Alpha (Bq)</b>	<b>Gross Beta (Bq)</b>
<b>DRL</b>	<b>8.58E+16</b>	<b>9.00E+10</b>	<b>3.60E+11</b>
2020	1.31E+10	9.98E+04	2.13E+05
2019	3.34E+10	9.31E+04	3.27E+05
2018	1.31E+10	9.13E+04	1.70E+05
2017	5.03E+10	9.34E+04	2.24E+05
2016	3.24E+10	9.46E+04	2.12E+05

**Table K-4: Whiteshell Laboratories annual radionuclide releases to surface water for 2016 - 2020**

Year	Gross Alpha (Bq)	Uranium-total (Bq)	Plutonium-239/240 (Bq)	Plutonium-238 (Bq)	Americium-241 (Bq)	Gross Beta (Bq)	Strontium-90 (Bq)	Cesium-137 (Bq)
<b>DRL</b>	<b>1.33E+10<sup>a</sup></b>	<b>1.50E+11</b>	<b>1.33E+10</b>	<b>1.39E+10</b>	<b>1.25E+10</b>	<b>1.56E+11<sup>a</sup></b>	<b>1.56E+11</b>	<b>1.39E+11</b>
2020	6.67E+07	1.30E+07	3.94E+07	2.39E+07	1.80E+07	3.62E+08	5.71E+07	1.86E+07
2019	5.82E+07	1.49E+07	4.70E+07	4.86E+07	2.01E+07	3.43E+08	5.95E+07	2.11E+07
2018	3.90E+07	1.16E+07	2.32E+07	1.84E+07	4.21E+06	1.94E+08	3.21E+07	1.51E+07
2017	3.88E+07	1.69E+07	1.20E+07	8.69E+06	5.10E+06	2.97E+08	6.67E+07	1.89E+07
2016	4.59E+07	N/A <sup>b</sup>	N/A <sup>b</sup>	N/A <sup>b</sup>	N/A <sup>b</sup>	2.83E+08	6.08E+07	1.28E+07

<sup>a</sup> For gross alpha and gross beta activities, CNL used the most restrictive DRL (i.e. Sr-90 for gross beta and Pu-239 and Pu-240 for gross alpha)

<sup>b</sup> Monitoring of uranium-total, Plutonium-239/240, Plutonium-238, and Americium-241 began in 2017

### **Port Hope Area Initiative**

Table K-5 shows releases from the PGP and Table K-6 shows releases from the PHP. For both projects, the loadings were calculated by multiplying the monthly total volume released by the monthly average concentrations. The total annual loadings are a sum of the monthly loads. There were no exceedances of regulatory limits.

### **Port Granby Project**

CNL began using the new Waste Water Treatment Plant in 2016 to treat contaminated water at the PGP.

**Table K-5: Port Granby Project annual radionuclide releases to surface water for 2016- 2020**

Year	Radium-226 (MBq)	Uranium (kg)
2020	0.7	0.5
2019	2.2	2.7
2018	1.0	1.3
2017	1.0	1.4
2016	2.4	15.6

### **Port Hope Project**

CNL began using the new Waste Water Treatment Plant in 2017 to treat contaminated water, in place of the old Water Treatment Building. During heavy rainfall events in 2017, 2018, and 2019, CNL restarted the old Water Treatment Building to treat excess contaminated water, in accordance with their water contingency plan, in order to avoid a release of untreated water to the environment. The old Water Treatment Building was not used in 2020.

**Table K-6: Port Hope Project annual radionuclide releases to surface water for 2016 - 2020**

<b>Year</b>	<b>Radium-226 (MBq)</b>	<b>Uranium (kg)</b>
2020	0.8	0.2
2019	13.6	6.9
2018	6.2	14.3
2017	16.6	110.2
2016	3.3	19.3

### **Douglas Point**

**Table K-7: Douglas Point annual radionuclide releases to atmosphere for 2016 - 2020**

<b>Year</b>	<b>Tritium: (HTO: Bq)</b>	<b>Gross Alpha (Bq)</b>	<b>Gross Beta (Bq)</b>	<b>Carbon-14 (Bq)</b>
<b>DRL</b>	<b>5.46E+17</b>	<b>N/A</b>	<b>3.69E+12</b>	<b>3.22E+15</b>
2020	4.10E+11	8.44E+03	1.38E+05	N/A <sup>a</sup>
2019	2.41E+11	4.94E+03	3.90E+04	N/A <sup>a</sup>
2018	7.96E+11	3.07E+03	4.55E+04	1.51E+09
2017	1.12E+11	1.64E+03	2.29E+04	N/A <sup>b</sup>
2016	1.59E+11	1.68E+03	1.91E+04	N/A <sup>b</sup>

<sup>a</sup> C-14 was not measured in 2019 or 2020 because there were no projects identified that had the potential to generate C-14 emissions

<sup>b</sup> Monitoring of C-14 was completed in 2018 for activities that had potential for a measurable release of C-14

**Table K-8: Douglas Point annual radionuclide releases to surface water for 2016 - 2020**

<b>Year</b>	<b>Tritium: (HTO: Bq)</b>	<b>Gross Alpha (Bq)</b>	<b>Gross Beta (Bq)</b>
<b>DRL</b>	<b>2.04E+17</b>	<b>N/A</b>	<b>3.43E+13</b>
2020	1.74E+10	8.34E+06	3.31E+07
2019	3.73E+10	6.75E+06	4.52E+07
2018	2.73E+10	1.18E+07	1.97E+07
2017	3.57E+10	1.12E+07	2.56E+07
2016	2.23E+10	9.00E+06	1.05E+07

**Nuclear Power Demonstration****Table K-9: Nuclear Power Demonstration annual radionuclide releases to atmosphere for 2016 - 2020**

<b>Year</b>	<b>Tritium: (HTO: Bq)</b>	<b>Gross Beta (Bq)</b>
<b>DRL</b>	<b>4.52E+16</b>	<b>3.83E+12</b>
2020	3.65E+11	4.43E+04
2019	1.59E+11	4.21E+04
2018	3.08E+11	4.23E+04
2017	1.48E+12	1.84E+05
2016	2.53E+11	4.30E+04

**Table K-10: Nuclear Power Demonstration annual radionuclide releases to surface water for 2016 - 2020**

<b>Year</b>	<b>Tritium: (HTO: Bq)</b>	<b>Gross Beta (Bq)</b>
<b>DRL</b>	<b>4.33E+17</b>	<b>2.56E+13</b>
2020	6.67E+09	2.05E+08
2019	2.52E+10	4.06E+07
2018	1.80E+09	5.91E+07
2017	7.21E+10	1.80E+08
2016	6.57E+10	3.33E+07

## L. ESTIMATED DOSE TO THE PUBLIC

This appendix contains information on the estimated dose to the public around CNL sites. Regulatory release limits known as DRLs are site-specific calculated releases that could, if exceeded, expose a member of the public of the most highly exposed group to a committed dose equal to the regulatory annual dose limit of 1 mSv/y. DRLs are calculated using CSA standard N288.1-14, [Guidelines for calculating derived release limits for radioactive materials in airborne and liquid effluents for normal operation of nuclear facilities](#) [38].

As per the [Radiation Protection Regulations](#) [8] subsection 1(3), and considering the fact that the radiological releases from all the sites covered by this ROR have remained small fractions of the DRLs applicable to those sites, the contribution to the dose to the public from these releases remains a very small fraction of the prescribed limit for the general public.

### Chalk River Laboratories

The maximum dose in each year since 2016 has been well below the dose limit of 1 mSv/y. Furthermore, at no point during this period have the emissions from the CRL site exceeded the constraint for dose to the public of 0.30 mSv/y.

**Table L-1: CRL maximum effective dose to a member of the public from 2016 - 2020**

Dose Data	2016	2017	2018	2019	2020	Regulatory Limit
Maximum Effective Dose (mSv)	0.0780	0.0870	0.0360	0.0039	0.0074	1 mSv/y

### Whiteshell Laboratories

The dose to critical groups from releases from CNL-WL in 2020 was well below the regulatory dose limit of 1 mSv/y.

**Table L-2: WL maximum effective dose to a member of the public from 2016 - 2020**

Dose Data	2016	2017	2018	2019	2020	Regulatory Limit
Maximum effective dose (mSv)	0.00007	0.00005	0.00004	0.00009	0.000003	1 mSv/y

### Port Hope Area Initiative

A modified approach for calculating estimated dose to the public was performed by CNL for PHAI sites beginning in 2019, and included both radon monitoring and fence line dosimeter measurements at both PHP and PGP sites.

The annual estimated doses to the public in 2020 at PHP and PGP were well below the annual regulatory dose limit of 1 mSv.

**Table L-3: PGP maximum effective dose to a member of the public from 2016 - 2020**

Dose data	2016	2017	2018	2019	2020	Regulatory limit
Maximum effective dose (mSv)	0.0054	0.0057	0.0200	0.0396	0.020	1 mSv/y

**Table L-4: PHP maximum effective dose to a member of the public from 2016 - 2020**

Dose data	2016	2017	2018	2019	2020	Regulatory limit
Maximum effective dose (mSv)	0.0120	0.0045	0.0275	0.0360	0.033	1 mSv/y

### Douglas Point Waste Facility

In 2016, CNL conducted a gap analysis against CSA N288.4, and determined that given the very low levels of contaminants in airborne and waterborne effluents, there was no regulatory requirement for an environmental monitoring program at DP. CNSC staff reviewed and accepted this gap analysis. All releases of radioactive material in DP effluents are a small fraction of their respective DRLs and thus, continue to indicate minimal impact on the public or the environment.

### Gentilly-1 Waste Facility

The effluent monitoring plan assessment conducted in 2016 by CNL determined that there is minimal or no source of airborne radioactivity from routine operations at G-1. In addition, all liquid releases were discharged through the Gentilly-2 effluent system, operated by Hydro-Québec, and represent a small fraction of the total releases from the larger Gentilly site. Hydro-Québec's Gentilly-2 environmental monitoring program captures any environmental impacts from the small contribution from G-1. The dose to the public from the Gentilly-2 nuclear site, including contributions from G-1, remain below 0.01 mSv/y.



**Nuclear Power Demonstration Waste Facility**

NPD is no longer discharging liquid effluents from the facility sumps to the Ottawa River, and there were no such releases during the 2020 reporting period. All other releases of radioactive material in NPD effluents are a small fraction of their respective DRLs and thus, continue to indicate minimal impact on the public or the environment. CNL's environmental monitoring at CRL will regionally overlap with NPD, so information from CRL's off-site environmental monitoring program could also be considered. CNSC staff have determined that the public dose from NPD remains at a very small fraction of the public dose limit.

## M. PARTICIPANT FUNDING AWARDED FOR THE 2020 CNL REGULATORY OVERSIGHT REPORT

<b>Recipient</b>	<b>Amount (up to)</b>
Algonquins of Ontario	\$19,460
Canadian Environmental Law Association	\$8,000
Kebaowek First Nation	\$6,821
Grand Council of Treaty 3	\$14,162.50
Manitoba Metis Federation	\$26,075
Métis Nation of Ontario	\$11,680
Curve Lake First Nation	\$12,760
Historic Saugeen Métis	\$600
<b>Total</b>	<b>\$99,558.50</b>

Further information on the CNSC's Participant Funding Program can be found on the CNSC's Website at: <http://www.nuclearsafety.gc.ca/eng/the-commission/participant-funding-program/index.cfm>

## N. SELECTED WEBSITES

Canadian Nuclear Laboratories - [www.cnl.ca](http://www.cnl.ca)

Canadian Nuclear Safety Commission - [www.nuclearsafety.gc.ca](http://www.nuclearsafety.gc.ca)

Canadian Standards Association - [www.csagroup.org/](http://www.csagroup.org/)

CNL Annual Compliance Monitoring Reports via the CNL website -  
<https://www.cnl.ca/environmental-stewardship/performance-reporting/>

CSA Standards via the CNSC website - <https://nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-documents/csa-standards.cfm>

CNL Regulatory Oversight Reports via the CNSC website -  
<http://www.nuclearsafety.gc.ca/eng/resources/publications/reports/regulatory-oversight-reports/CNL-sites.cfm>

PHAI Reports and Plans via the PHAI website -  
[https://www.phai.ca/en/home/phai/public-documents/reports\\_plans.aspx](https://www.phai.ca/en/home/phai/public-documents/reports_plans.aspx)