Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

# Report, General

## 2017 ANNUAL COMPLIANCE REPORT FOR DOUGLAS POINT AND GENTILLY-1 WASTE FACILITIES

**3640-00521-REPT-004**

**Revision 0**

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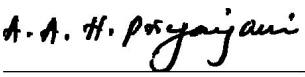

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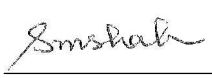

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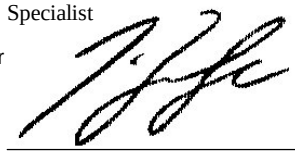

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2018/05/18
UNRESTRICTED

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# Report, General

## 2017 Annual Compliance Report for Douglas Point and Gentilly-1 Waste Facilities

## Off-Site Decommissioning Facilities

**3640-00521-REPT-004**
**Revision 0**

2018 May

UNRESTRICTED



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# 1. EXECUTIVE SUMMARY

This Annual Compliance Report for the calendar year 2017 has been prepared as per Licence Condition 5.1 of the Prototype Waste Facilities Decommissioning Licence, WFDL-W4-332.01/2034 [1-1].

This annual report describes the present status of the Prototype Waste Facilities and the notable activities conducted within these facilities for the 2017 calendar year reporting period. It includes the results of operations, the results of the monitoring programs, any changes made to key procedures, equipment, or structures, as well as a summary of any reports made pursuant to Sections 29 and 30 of the General Nuclear Safety and Control Regulations.

The Douglas Point Waste Facility (DPWF), Gentilly-1 Waste Facility (G1WF), and Nuclear Power Demonstration Waste Facility are licensed under one licence [1-1], which was issued on 2014 October 22 and expires on 2034 December 31.

This report is in the form prescribed by the guidelines in Section 5.1 of the Licence Conditions Handbook [1-2] and is divided into two major sections, one for the DPWF, and one for the G1WF. The 2017 annual compliance report for the Nuclear Power Demonstration Waste Facility will be submitted separately.

The following provides overall performance highlights for 2017 activities, which are described throughout the report:

- Corrective actions from the Life Management Plan (LMP) continued to be addressed for all facilities.
- Corrective actions from the Fire Hazard Analysis (FHA) were addressed for all facilities.
- As part of extensive housekeeping, Health, Safety, Security, and Environment (HSSE) and fire load reduction initiatives, a significant amount of radiological and non-radiological waste was removed from the sites.
- A number of minor modifications were completed at each facility in order to address maintenance and HSSE issues.
- A number of planning activities to support future decommissioning were completed at each site.
- There were no radiation incidents that occurred, which resulted in exceeding the action level or regulatory limits for the Prototype Waste Facilities. The maximum individual worker dose during 2017 was 0.37 mSv (accrued by a contractor) at DPWF and 0.18 mSv (accrued by a Canadian Nuclear Laboratories (CNL) employee) at G1WF.
- The majority of ambient environmental radiation fields and emissions remained stable in both facilities in 2017. There were no abrupt changes in the nature or magnitude of releases during 2017, and all environmental releases were a small fraction of their respective Derived Release Limits (DRLs).
- Events or conditions reported pursuant to Licence Condition 5.1 of the licence [1-1] were minor Storage with Surveillance (SWS) issues.

**Canadian Nuclear Laboratories is committed to achieving high standards of operational safety. The information and data presented in this report support the conclusion that safe performance is being achieved at the Douglas Point and Gentilly-1 Prototype Waste Facilities, while enhancements are also being implemented to improve results.**

## 1.1 References

[1-1] *Waste Facility Decommissioning Licence for Prototype Waste Facilities*, WFDL-W4-332.01/2034, 2014 October 22.

[1-2] *Licence Conditions Handbook for Prototype Waste Facilities (DP, Gentilly-1 & NPD)*, 3640-508760-HBK-001, Revision 0, 2014 August 14.

## 2. ACRONYMS

| | |
|---|---|
| ACM | Asbestos-Containing Material |
| AECL | Atomic Energy of Canada Limited |
| CANDU | Canada Deuterium Uranium |
| CAP | Corrective Action Plan |
| CNL | Canadian Nuclear Laboratories |
| CNSC | Canadian Nuclear Safety Commission |
| CRL | Chalk River Laboratories |
| CSA | Canadian Standards Association |
| DAW | Dry Active Waste |
| DPWF | Douglas Point Waste Facility |
| DRL | Derived Release Limit |
| ECIS | Emergency Coolant Injection System |
| FHA | Fire Hazard Analysis |
| G1WF | Gentilly-1 Waste Facility |
| HEPA | High-Efficiency Particulate Air |
| HSSE | Health, Safety, Security and Environment |
| HTPS | Heat Transport Purification System |
| IAEA | International Atomic Energy Agency |
| ImpAct | Improvement Action |
| JRG | Joint Review Group |
| LCH | Licence Conditions Handbook |
| LLRW | Low Level Radioactive Waste |
| LMP | Life Management Plan |
| NPRI | National Pollutant Release Inventory |
| OSH | Occupational Safety & Health |
| PCB | Polychlorinated Biphenyl |
| PHT | Primary Heat Transport |
| PIP | Public Information Program |
| PPE&C | Personal Protective Equipment and Clothing |
| PRD | Prototype Reactor Decommissioning |
| SWS | Storage with Surveillance |
| TLD | Thermoluminescent Dosimeter |
| VKT | Vehicle Kilometers Travelled |

# 3. DOUGLAS POINT WASTE FACILITY

This section of the Annual Compliance Report summarizes the activities at the DPWF for calendar year 2017.

The DPWF is located on the east shore of Lake Huron, in the Township of Bruce in the County of Bruce, embedded in the Bruce Power Nuclear Site.

The DPWF consists of the Reactor, Service, Purification, Administration and Turbine Buildings, Plate & Machine Shop and Tool Crib, along with the Spent Fuel Canister Area and Emergency Coolant Injection System (ECIS) Bunker and associated tank.

The Douglas Point prototype CANDU reactor was operated between 1968 and 1984 by Ontario Hydro and was permanently shut down after 16 years of operation.

Ontario Hydro turned over to Atomic Energy of Canada Limited (AECL) the shutdown Douglas Point Nuclear Generating Station and all associated operations including the title of the Douglas Point site as outlined in an agreement, which took effect on 1986 October 01. In 1987, all spent fuel in "wet storage" in the fuel bays was transferred to the dry irradiated fuel storage facility constructed on the DPWF site. A detailed description of the facility and its use is contained in the Douglas Point Waste Management Facility – Interim End-State Report [3-1].

Canadian Nuclear Laboratories maintains the DPWF in a safe and secure shutdown state under SWS until such time that final decommissioning is undertaken.

## 3.1 Operations

### 3.1.1 Routine Operations

Operations in 2017 consisted of routine inspections, housekeeping, regular monitoring, calibrations and maintenance of the facility and canister area to ensure that the facility is kept in a sustainable safe shutdown state allowing SWS activities to continue so that there is no hazard to the public or adverse impact on the environment.

Activities continued to address identified HSSE concerns. Specific activities included addressing FHA actions, LMP actions, self-assessments and inspections and other identified corrective actions.

The routine and corrective maintenance work was executed, as necessary, and included:

- A failed Sump Pump (P-18) in Sump D-4 was removed and replaced with a new unit.
- A 600 V heater in the ECIS bunker failed and was replaced with a new unit.

### 3.1.2 Non-Routine Operations

There are two dispersal tanks, 7921-TK2 and 7921-TK3, located in Room S-125. A small water leak had developed in Dispersal Tank, 7921-TK2. The leak was contained within the room. All

of the water from Dispersal Tank, 7921-TK2 and the other Dispersal Tank, 7921-TK3 was transferred to the Waste Treatment Centre at Chalk River Laboratories (CRL).

In order to facilitate future decommissioning activities in the Administration Building, facility staff were transferred to a new Modular Trailer Complex located on the south parking lot at DPWF.

Throughout the year, there were 24 times where Bruce Power Protective Services posted an officer at the Spent Fuel Canister area due to inclement weather (high winds, snow, fog, etc.) that activated false security alarms. There were no intrusion attempts to gain access to the Protected Area.

There were three times where Bruce Power Fire Protection Services responded to the DPWF due to false fire alarms originating from the Fire Alarm and Detection System. The majority of these events were related to individual detector failures.

A Designated Substance Survey was also completed [3-2] to identify the hazardous materials in the radiological zoned areas at the DPWF.

### 3.1.3 Trending of Events Related to Operational Activities

As events occur, they are recorded in the Improvement Action (ImpAct) system. This information is regularly reviewed to identify any trends. At this time, no trends related to operational activities have been identified, although false security alarms due to weather and fire service call-outs due to false alarms are being monitored.

### 3.1.4 Inspections/Audits

An International Atomic Energy Agency (IAEA) Physical Inventory Verification and Design Information Verification inspection was performed from 2017 September 13 to 14 [3-3]. A summary of the verification and the activities performed by the inspection team is documented in [3-3]. The final report from the IAEA has not yet been received.

A CNSC Type II Compliance Inspection was performed at the DPWF on 2017 October 26 and one recommendation was issued [3-4], [3-5].

A CNSC Security Compliance Inspection of the physical protection measures in place at the DPWF was performed from 2017 November 21 to 22 [3-6], and one Action Notice was issued and two corrective actions were identified [3-7].

A Nuclear Oversight Audit was performed at the DPWF [3-8] from 2017 December 18 to 20 by an audit team from the CNL Nuclear Oversight Department. The audit criteria was performance and compliance with the Canadian Standards Association (CSA) N286-05 [3-9] with respect to Preliminary and Detailed Decommissioning Plans. No audit findings were identified for the DPWF.

An Annual Site Safety and Health Committee inspection was performed on 2017 December 13, and the inspection report [3-10] identifies 12 improvement actions, which are tracked using CNL's ActionWay database for disposition in 2018.

### 3.1.5 Facility Positions

There was one change to the positions related to the Waste Facility Decommissioning Licence in 2017. In 2017 January, an appointment to the position of Facility Authority, replacing the previous incumbent was announced [3-11] and became effective on 2017 January 25.

## 3.2 Waste Inventory

Table 3-1 summarizes the waste present in the DPWF as of 2017 December 31.

**Table 3-1**
**Stored Waste in Douglas Point Waste Facility**

| Waste Type[1] | Source | Volume and Content | | |
|---|---|---|---|---|
| | | **Total Estimated Volume/Weight** | **Total Radioactivity Known or Estimated (Bq)** | **Primary Radionuclide Content** |
| Reactor Systems | Induced radioactivity in reactor core components | Not Available[3] | 5.25E+13 by the year 2015[2] | Co-60, Fe-55, Ni-63, Zr-95 |
| | Radioactive corrosion products and fission products deposited in the Primary Heat Transport (PHT) and Moderator Systems | | 1.28E+10 (for PHT) and 2.74E+08 (for Moderator system) by the year 2015[2] | Co-60, Cs-137, Eu-154 |
| | Induced radioactivity in the Biological Shield | | Unknown[4] | Co-60, Eu-152 |
| Ion Exchange Resin | Storage Tank #1 containing ion exchange resin from both the PHT and Moderator Systems | 26.3 $m^3$ | 4.47E+12 by the year 2015 | Co-60, Cs-137, C-14, Eu-152, Am-241, H-3 |
| | Storage Tank #2 containing ion exchange resin from both the PHT and Moderator Systems | 27.4 $m^3$ | 1.46E+12 by the year 2015 | Co-60, Cs-137, C-14, Eu-152, Am-241, H-3 |
| Intermediate Level Radioactive Waste | Radiological materials stored in the fuel transfer tunnel | 6.0 $m^3$ | Not Available[3] | Unknown[4] |
| | Booster Flow Tubes (18 Zr-2 tubes, six stainless steel tubes) | | | Co-60, Sb-125 |
| | Ram Extensions (14 stainless steel rods) | | | Co-60 |
| | Empty fuel bundle flask (aluminium clad and lead filled) | | | Unknown[4] |
| | Active pool debris (fuel end plates, broken sheath and tools, etc.) | | | Co-60 |

| Waste Type[1] | Source | Volume and Content | | |
|---|---|---|---|---|
| | | **Total Estimated Volume/Weight** | **Total Radioactivity Known or Estimated (Bq)** | **Primary Radionuclide Content** |
| Low Level Radioactive Waste (LLRW) | 16 drums of contaminated soil collected from property cleanup in 2001 | 3.0 $m^3$ | Unknown[4] | Cs-134, Cs-137, Eu-154, Bi-214, Am-241 |
| | Two B-25 waste containers containing Personal Protective Equipment and Clothing (PPE&C), and one partially-filled B-25 container of metal waste | 6.0 $m^3$ | 4.10E+07 | Am-241, Cm-243, Cm-244, Co-60, Cs-137, Eu-154, Pu-238, Pu-239, Pu-240, Sr-90, U-233, U-234, U-235, U-236, U-238 |
| | Legacy contaminated material in the Purification Building (metal, wood, lead bricks, concrete) | 40 $m^3$ | 2.73E+08 | Co-60, Cs-137, C-14, Eu-152, Am-241, H-3 |
| | Legacy contaminated material in Purification Building (Hazardous Materials) | 2 $m^3$ | 1.37E+07 | Co-60, Cs-137, C-14, Eu-152, Am-241, H-3, mercury, PCB's and asbestos |
| | Legacy liquid waste contained in the Hold-up Tank (7921-TK1) and in the Evaporator Feed Tank (7921-TK4) in the Service Building | 44,000 L | 6.60E+09 | Co-60, Cs-137, H-3 |
| Hazardous Waste | Fluorescent tubes, two Polychlorinated Biphenyl (PCB) containing and two non-PCB containing electronic ballasts, flammable liquids, paint and paint-related materials | 810 L<br>1500 kg | Non-radioactive and contains mercury, PCBs, oils and solvent | |

[1] Spent fuel bundles are not reported in this table.

[2] 2015 is used as a reference date to provide an estimated amount of radioactivity contained within the facility.

[3] The levels of activity for the Reactor Systems are based on time-decayed calculations of activity caused by activation of the reactor components. The estimated volume/weight of waste is not available and will be dependent upon the methods used to dismantle the reactor systems.

[4] No estimate or analysis has been made yet to quantify the activity/nuclides.

### 3.2.1 Changes to Waste Inventory

All waste transfers during 2017 are presented in Table 3-2.

**Table 3-2**
**Waste Transfers from Douglas Point Waste Facility During 2017**

| Waste Type | Waste Description | Transfer Date | Weight/ Volume | Radioactivity (Bq) | Primary Radionuclide Content | Destination |
|---|---|---|---|---|---|---|
| **Solid Non-Radioactive Waste** | Asbestos and ACM removed during the Temporary Boiler Installation Project | 2017-12-11 | 930 kg | Non-Radioactive | | Twin Creeks Landfill, Watford, ON |
| | Metal recyclables generated from project-specific work and general housekeeping | 2017-01-05<br>2017-02-17<br>2017-03-30<br>2017-07-20<br>2017-08-09<br>2017-10-25 | 15,650 kg | Non-Radioactive | | Triple M Metal; 86, Auto and Metal Recyclers |
| | Trash generated from project-specific work and housekeeping activities | 2017-01-05<br>2017-07-20 | 4900 kg | Non-Radioactive | | Mount Forest MFR |
| | Wood material from project-specific and housekeeping activities | 2017-01-17<br>2017-07-20 | 2250 kg | | | |
| | Redundant electronic waste from recycling (printers, scanners, etc.) | 2017-02-27 | 2740 kg | Non-Radioactive | | Ontario Electronic Stewardship |
| | | **TOTAL** | **26,470 kg** | | | |
| **Hazardous Waste** | Halocarbons (R-22 and R-134a refrigerant) | 2017-02-14 | 1.85 kg | Non-Radioactive | | Carrier Supply Wolseley Canada HVAC Supply |
| | Liquid hazardous waste (oil) | 2017-02-14 | 45 L | Non-Radioactive | | |
| | | **TOTAL** | **1.85 kg, 45 L** | | | |
| **Solid Low Level Radioactive Waste** | Trash generated from routine radioactive work such as PPE&C, housekeeping cleanup in Zone 2 and Zone 3 areas, High-Efficiency Particulate Air (HEPA) filters, plastic pails | 2017-02-28 | 8081 kg (25 $m^3$) | 1.71E+08 | Co-60, Cs-137, Eu-154, Am-241, Sr-90, U-233, U-234, U-235, U-236, U-238, Pu-238, Pu-239/240, Cm-243/244 | Waste Management Areas at CRL |
| **Liquid Low Level Radioactive Waste** | Legacy liquid waste from shutdown activities (from Dispersal Tank 7921-TK2 and TK-3 in storage since 1998) | 2017-11-02 (two shipments)<br>2017-11-06<br>2017-11-07<br>2017-11-30 | 100,400 L | 1.39E+10 | Co-60, Cs-137, H-3 | |
| | | **TOTAL** | **8081 kg<br>100,400 L** | | | |

### 3.2.2 Liquid Waste Generation

No liquid waste was generated due to operations during 2017 at the DPWF. Small volumes of groundwater (<500 L/yr) collected in the internal sumps of the facility were transferred to the storage tanks within the facility. Groundwater collected in the external sumps is directly discharged to the effluent outfall.

## 3.3 Effluent Treatment and Waste Processing

There was no effluent treatment or waste processing conducted at the DPWF during 2017.

## 3.4 Changes or Modifications

Changes to methods or procedures, changes to equipment and modifications to the DPWF are described in this section.

### 3.4.1 Changes to Methods or Procedures

In 2017, the company-wide Management System documents were updated and these documents were provided to the CNSC [3-12], [3-13], [3-14]. No changes were made to the documents listed in Table A-1 of the Licence Conditions Handbook (LCH) [3-15]. Table 3-3 provides a list of changes made to Table A-2 of the LCH [3-15] specific to the DPWF.

**Table 3-3**
**Changes to Table A-2 of the Licence Conditions Handbook [3-15]**

| Document Number Listed in the LCH | Title Listed in the LCH | New Document Number | Title |
|---|---|---|---|
| 22-08951-FHA-001 | Douglas Point Waste Management Facility Fire Hazard Analysis | 22-08951-FHA-002 | Douglas Point Waste Management Facility Fire Hazard Assessment |
| 22-08620-021-000 | Douglas Point Emergency Response Service Agreement | 22-08620-021-000-0001 | Douglas Point Emergency Response Services Agreement between Bruce Power L.P. and AECL |
| Not listed | Not listed | 22-07220-PLA-001[1] | Douglas Point Waste Facility Effluent Monitoring Plan |

[1] New addition to Table A-2 of the LCH [3-15] that also requires notification to the CNSC prior to implementation of revision.

### 3.4.2 Changes to Equipment and Modifications to the Facility

All the following changes and modifications were planned and executed as per the CNL processes and procedures. All work was approved by the Facility Authority prior to commencement of work.

The changes and modifications including the implementation dates are as follows:

- Due to planned decommissioning work of the Tool Crib Building in 2017, where chemicals were also stored, a new storage area was required for the storage of chemicals. Therefore, modifications were made to Room S-133 in the Service Building in 2017 October to store these chemicals.
- An upgrade to the surveillance system in the Spent Fuel Canister area, which was initiated in 2016 was completed and tested in 2017 March.
- Two temporary boilers were installed in 2017 November in order to remove the DPWF from the Bruce Power-supplied steam system.
- A Modular Trailer Complex on the south parking lot at DPWF was installed in 2017 November.

## 3.5 Radiation Protection

### 3.5.1 Radiation Dose to Personnel

No CNL employees received measurable doses above 0.1 mSv (10 mrem) over the year. The highest dose received by a CNL employee (a Facility Supervisor) was 0.05 mSv (5 mrem).

One contractor (a Radiation Surveyor) received a dose of 0.37 mSv (37 mrem) over the year. No whole body radiation dose was recorded for any other contractors during this reporting period.

No whole body radiation dose greater than 0.1 mSv (10 mrem) was recorded for any visitors entering the DPWF during the reporting period. The highest dose received by a visitor was less than 0.001 mSv (1 µSv or 0.1 mrem).

Table 3-4 summarizes dose as a result of DPWF operations in 2017 by respective work group.

**Table 3-4**
**2017 Dose by Work Group at Douglas Point Waste Facility**

| Work Group | Number of Personnel | Whole-Body Dose Including Tritium Plus Committed Effective Dose from Non-Tritium Intakes | | | Collective Dose (Person-mSv) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Average (mSv) | Maximum (mSv) | Collective (Person-mSv) | Surface Dose including Tritium | Tritium Dose | Non-Tritium Committed Effective Dose | Neutron Dose | Extremity Dose |
| CNL Employees | 27 | 0.004 | 0.05 | 0.11 | 0.11 | 0 | 0 | 0 | 0 |
| Contractors | 65 | 0.005 | 0.37 | 0.37 | 0.37 | 0 | 0 | 0 | 0 |
| Visitors | 13 | 0 | 0[1] | 0[1] | 0[1] | 0 | 0 | 0 | 0 |
| **Total for DPWF Site** | **105** | **0.005** | **0.37** | **0.48** | **0.48** | **0** | **0** | **0** | **0** |

[1] Since the dose received by a visitor is less than 0.001 mSv, the Corporate Dosimetry System generates a value of zero.

### 3.5.2 Radiation Incidents

No radiation incidents occurred in 2017, which resulted in exceeding the 6 mSv (600 mrem) action level per four-week period for DPWF, as per the (LCH) [3-15].

### 3.5.3 Radiation Dose Changes or Trends

Figure 3-1 demonstrates an increase in collective dose from Calendar Year 2015 to 2017. There was an increase in the number of workers in the Corporate Dosimetry System from 78 in 2015 to 105 in 2017. In 2015, non-routine decommissioning activities were performed primarily in non-radiological areas such as the removal of the racking and caging system in the Turbine Building as well as upgrades to the fire sprinkler system. In 2016 and 2017, more work was performed in radiological areas such as the installation of a new Fire Alarm and Detection System throughout the facility including the Reactor Building and all other zoned areas (in 2016) and taking resin samples, verifying pipe dimensions in the resin tank access ports as well as ventilation modifications to the Reactor Building ventilation system (in 2017). Essentially, the average dose per person remained constant in 2016 and 2017, which was an increase from 2015.

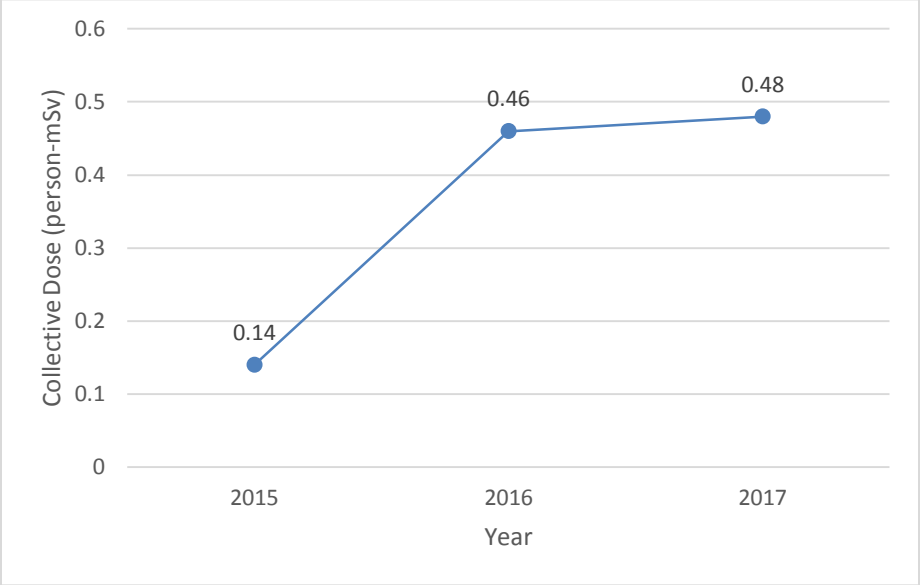



**Figure 3-1 Collective Dose Trend**

### 3.5.4 Monitoring Program Changes

Due to the increased amount of work occurring at DPWF, CNL has increased the bioassay monitoring from an Annual Whole Body Monitor to annual urine analysis for Pu-239 and bi-monthly gross beta urine analysis for Cs-137 and Sr-90 for selected staff. This will provide much earlier detection of any increase in uptake. Additional monitoring for other staff and contractors are determined on a project-by-project basis as identified in the project's Radiological Work Assessments.

### 3.5.5 Dose Impact Assessment

All doses for any individual worker during a four-week period in 2017 were a small fraction of the regulatory action level, thus, the resultant doses to personnel as a result of DPWF operations were negligible.

## 3.6 Environmental Protection

### 3.6.1 Ambient Radiation Field Monitoring

Ambient radiation field surveys performed at DPWF include dose rate measurements on contact of the Spent Fuel Storage Canisters (Table 3-5, Figure 3-2), dose rates calculated from Thermoluminescent Dosimeter (TLD) results at the canister area (Table 3-6, Figure 3-3), and gamma radiation measurements from discrete survey points within the Reactor Building (Table 3-7, Figure 3-4).

**Table 3-5**
**Contact Gamma Dose Rates on Spent Fuel Storage Canisters**

| Canister Number | Contact Gamma Dose Rate [1] (µSv/h) | | | | |
|---|---|---|---|---|---|
| | **2013** | **2014** | **2015** | **2016** | **2017** |
| 1 | M/T[2] | M/T[2] | M/T[2] | M/T[2] | M/T[2] |
| 2 | 0.94 to 2.10 | 0.82 to 2.16 | 2.31 | 2.03 | 2.37 |
| 3 | 1.13 to 1.40 | 1.00 to 1.59 | 1.60 | 1.41 | 1.59 |
| 4 | 1.02 to 1.70 | 0.94 to 1.60 | 1.57 | 1.54 | 1.59 |
| 5 | 1.71 to 2.19 | 1.54 to 2.11 | 1.93 | 1.64 | 1.83 |
| 6 | 1.44 to 1.94 | 1.41 to 1.72 | 1.92 | 1.61 | 1.83 |
| 7 | 1.40 to 1.54 | 1.34 to 1.53 | 1.54 | 1.45 | 1.41 |
| 8 | 1.24 to 1.80 | 1.29 to 1.89 | 1.73 | 1.64 | 1.56 |
| 9 | 1.44 to 2.05 | 1.54 to 2.26 | 1.86 | 1.94 | 1.74 |
| 10 | 1.52 to 2.16 | 1.47 to 2.00 | 1.77 | 1.76 | 2.02 |
| 11 | 1.31 to 1.73 | 1.20 to 1.66 | 1.61 | 1.64 | 2.08 |
| 12 | 1.15 to 1.83 | 1.03 to 1.52 | 1.58 | 1.43 | 1.62 |
| 13 | 1.81 to 2.20 | 1.92 to 2.19 | 1.92 | 1.82 | 1.97 |
| 14 | 1.73 to 2.17 | 1.19 to 2.11 | 1.88 | 1.94 | 2.09 |
| 15 | 1.00 to 1.61 | 0.97 to 1.73 | 1.93 | 1.63 | 1.59 |
| 16 | 0.68 to 1.85 | 0.67 to 1.86 | 1.71 | 1.47 | 1.64 |
| 17 | 1.42 to 1.83 | 1.43 to 1.68 | 1.64 | 1.68 | 1.66 |
| 18 | 1.55 to 1.82 | 1.37 to 1.96 | 1.77 | 1.77 | 1.88 |
| 19 | 1.00 to 1.75 | 0.96 to 1.75 | 1.66 | 1.53 | 1.73 |
| 20 | 0.98 to 1.69 | 0.85 to 1.79 | 1.55 | 1.58 | 1.50 |
| 21 | 1.55 to 2.11 | 1.48 to 1.88 | 1.85 | 1.70 | 1.96 |
| 22 | 1.29 to 1.98 | 1.32 to 1.72 | 1.76 | 1.67 | 1.85 |
| 23 | 1.08 to 1.64 | 1.03 to 1.57 | 1.54 | 1.34 | 1.56 |
| 24 | 0.97 to 1.87 | 1.17 to 1.75 | 1.91 | 1.57 | 1.66 |
| 25 | 1.40 to 1.64 | 1.44 to 1.69 | 1.71 | 1.47 | 1.65 |
| 26 | 1.44 to 1.85 | 1.50 to 1.65 | 1.70 | 1.62 | 1.71 |
| 27 | 1.07 to 1.90 | 1.01 to 1.73 | 1.63 | 1.89 | 1.71 |
| 28 | 0.81 to 1.58 | 0.69 to 1.55 | 1.47 | 1.45 | 1.61 |
| 29 | 1.45 to 1.66 | 1.50 to 1.82 | 1.69 | 1.69 | 1.64 |
| 30 | 1.34 to 2.01 | 1.18 to 1.83 | 1.78 | 1.73 | 1.65 |
| 31 | 1.00 to 1.39 | 0.94 to 1.50 | 1.41 | 1.27 | 1.46 |
| 32 | 1.17 to 2.00 | 1.15 to 2.06 | 1.83 | 1.64 | 1.83 |

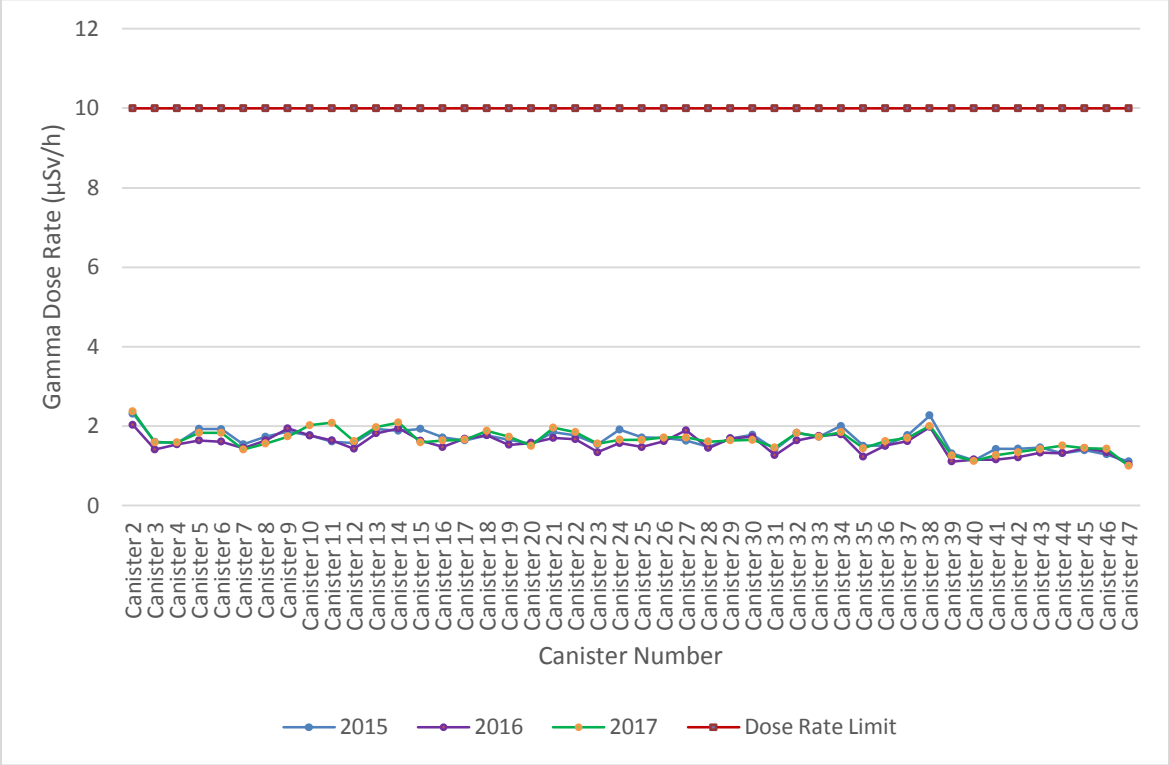
| Canister Number | Contact Gamma Dose Rate [1] (µSv/h) | | | | |
|---|---|---|---|---|---|
| | **2013** | **2014** | **2015** | **2016** | **2017** |
| 33 | 1.28 to 1.89 | 1.29 to 2.00 | 1.73 | 1.75 | 1.73 |
| 34 | 1.53 to 2.19 | 1.54 to 2.10 | 2.00 | 1.79 | 1.85 |
| 35 | 0.88 to 1.50 | 0.85 to 1.54 | 1.50 | 1.23 | 1.44 |
| 36 | 0.84 to 1.56 | 0.81 to 1.43 | 1.51 | 1.50 | 1.62 |
| 37 | 1.54 to 1.81 | 1.54 to 1.79 | 1.77 | 1.62 | 1.70 |
| 38 | 1.33 to 2.36 | 1.38 to 2.13 | 2.27 | 1.98 | 2.00 |
| 39 | 0.52 to 1.48 | 0.55 to 1.23 | 1.31 | 1.11 | 1.26 |
| 40 | 0.77 to 1.42 | 0.90 to 1.37 | 1.14 | 1.16 | 1.12 |
| 41 | 1.02 to 1.25 | 1.00 to 1.41 | 1.42 | 1.16 | 1.27 |
| 42 | 1.07 to 1.39 | 1.03 to 1.38 | 1.43 | 1.21 | 1.34 |
| 43 | 0.95 to 1.51 | 0.88 to 1.26 | 1.46 | 1.33 | 1.42 |
| 44 | 0.88 to 1.35 | 0.82 to 1.39 | 1.32 | 1.32 | 1.51 |
| 45 | 0.54 to 1.48 | 0.52 to 1.39 | 1.39 | 1.44 | 1.45 |
| 46 | 0.68 to 1.33 | 0.57 to 1.14 | 1.29 | 1.34 | 1.43 |
| 47 | 0.50 to 1.11 | 0.58 to 1.12 | 1.11 | 1.03 | 1.00 |

[1] "Contact Dose Rate Range" was determined using the highest contact dose rate reading from readings taken at the north, east, south, and west sides of the canisters at a height of two meters above the concrete slab.

[2] M/T = empty canister.

Figure 3-2 shows the contact gamma dose rates on each fuel canister measured in 2015, 2016 and 2017. The design dose rate limit on contact of the spent fuel canisters is 10 µSv/h [3-16] as shown in Figure 3-2.

Figure 3-2 demonstrates that there are no significant statistical variations of the data over time, and the dose rates are significantly less than the design dose rate limit.




Note: Canister 1 is empty and therefore, not included in the figure.

**Figure 3-2 Contact Gamma Dose Rates on Spent Fuel Storage Canisters**

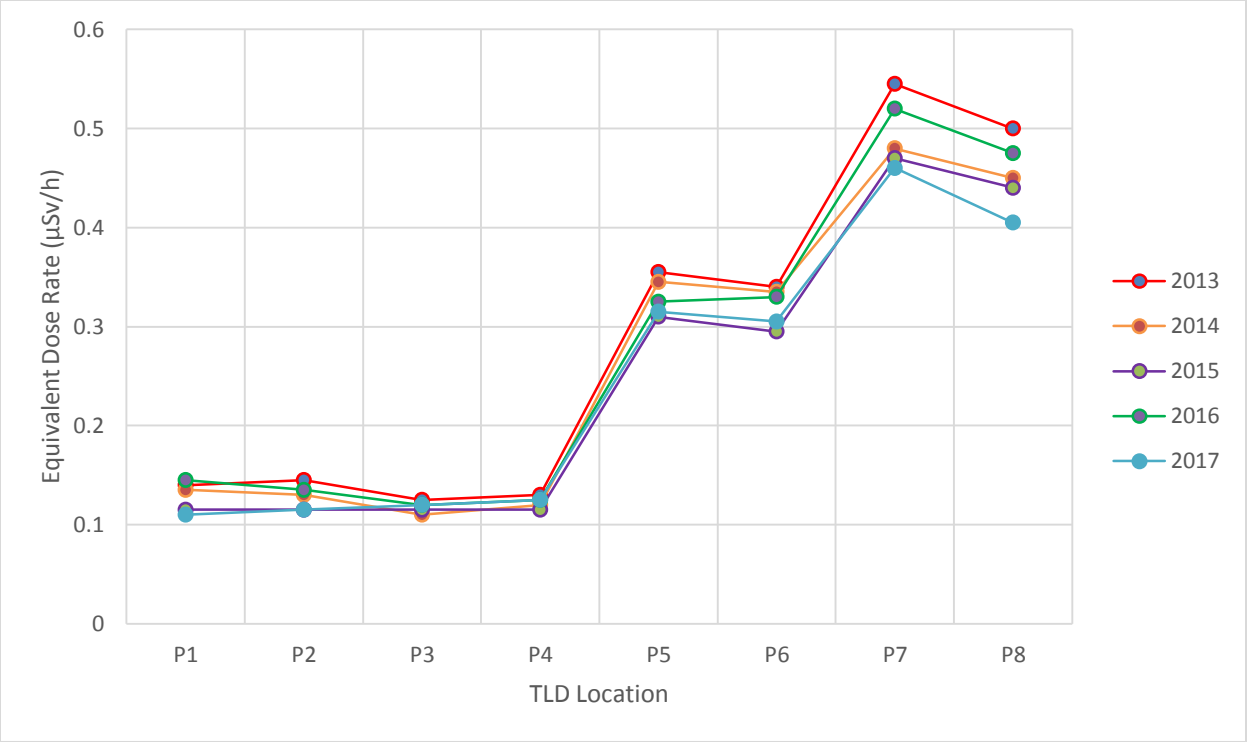
**Table 3-6**
**Equivalent Dose Rates Calculated from TLD Results at the Spent Fuel Storage Canister Area**

| TLD Location[1] | Equivalent Dose Rates from TLDs [2] (µSv/h) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2013 May 07 | 2013 Oct 24 | 2014 May 20 | 2014 Dec 08 | 2015 May 07 | 2015 Oct 23 | 2016 Apr 15 | 2016 Oct 10 | 2017 Apr 18 | 2017 Oct 20 |
| P1 | 0.15 | 0.13 | 0.13 | 0.14 | 0.11 | 0.12 | 0.16 | 0.13 | 0.10 | 0.12 |
| P2 | 0.15 | 0.14 | 0.13 | 0.13 | 0.11 | 0.12 | 0.14 | 0.13 | 0.12 | 0.11 |
| P3 | 0.13 | 0.12 | 0.11 | 0.11 | 0.12 | 0.11 | 0.13 | 0.11 | 0.13 | 0.11 |
| P4 | 0.13 | 0.13 | 0.12 | 0.12 | 0.11 | 0.12 | 0.13 | 0.12 | 0.14 | 0.11 |
| P5 | 0.36 | 0.35 | 0.35 | 0.34 | 0.31 | 0.31 | 0.32 | 0.33 | 0.33 | 0.30 |
| P6 | 0.34 | 0.34 | 0.36 | 0.31 | 0.29 | 0.30 | 0.30 | 0.36 | 0.32 | 0.29 |
| P7 | 0.53 | 0.56 | 0.51 | 0.45 | 0.48 | 0.46 | 0.51 | 0.53 | 0.45 | 0.47 |
| P8 | 0.50 | 0.50 | 0.49 | 0.41 | 0.44 | 0.44 | 0.47 | 0.48 | 0.43 | 0.38 |

[1] TLD locations P1-P4 are positioned on the fence surrounding the fuel canister site, and TLD locations P5-P8 are positioned on the edge of the fuel canister concrete pad.

[2] For each TLD location, the exposure values (mR) for the two TLDs were averaged. The dose rate was then determined by dividing the average (mR) by the total exposure time (hours) and converted to µSv/h.

Figure 3-3 shows the equivalent dose rates calculated from TLD results at the spent fuel canister area, and illustrates a general downward trend of the dose rate results over the period 2013 to 2017. It is also noticed that the dose rates remained low and are indicative of no change in the containment of radioactivity in the spent fuel baskets.




Note: The dose rates have been averaged for each calendar year.

**Figure 3-3 Spent Fuel Canister Area Calculated Equivalent Dose Rates from TLD Results**

**Table 3-7**
**Reactor Building Gamma Radiation Survey**

| Gamma Survey Point | Description of Survey Location | Gamma Dose Rate [1] (µSv/h) | | | | |
|---|---|---|---|---|---|---|
| | | 2013 | 2014 | 2015 | 2016 | 2017 |
| SP-01 | Moderator Room by Elevator | 26.8 | 22.9 | 22.9 | 22.4 | 17.5 |
| SP-02 | Moderator Room by Mod. Pumps | 55.5 | 48.1 | 43.4 | 42.4 | 34.5 |
| SP-03 | By West 3261-TK1 | 8.85 | 7.84 | 7.47 | 7.03 | 6.03 |
| SP-04 | East Dousing Passage by Plenum | 7.05 | 5.89 | 5.03 | 3.65 | 3.96 |
| SP-05 | 3252-PM13 South East Passage | 9.09 | 7.33 | 6.74 | 6.96 | 6.18 |
| SP-06 | South West Dousing Passage | 25.5 | 23.7 | 22.8 | 20.4 | 20.2 |
| SP-07 | East Activity Monitoring Room | 3.16 | 2.97 | 2.93 | 2.89 | 2.98 |
| SP-08 | West Activity Monitoring Room | 0.94 | 0.55 | 0.85 | 0.78 | 0.93 |
| SP-09 | Front of East Vault Window | 0.15 | 0.17 | 0.19 | 0.16 | 0.16 |
| SP-10 | Calandria Repair Area | 0.97 | 0.70 | 0.59 | 0.57 | 0.33 |
| SP-11 | Fuelling Machine Maintenance Area | 8.24 | 3.99 | 3.21 | 3.27 | 3.25 |
| SP-12 | Front of 3331-FR2 | 1.29 | 1.05 | 1.20 | 1.09 | 0.94 |
| SP-13 | Near Pipe Elbow (3331-FR2) | 0.89 | 0.76 | 0.74 | 0.72 | 0.63 |
| SP-14 | Front of QT-220 | 1.36 | 1.11 | 1.18 | 0.92 | 0.73 |
| SP-15 | South Heat Transfer Pressure Transmitters | 3.89 | 3.05 | 3.74 | 3.36 | 2.56 |
| SP-16 | 3331-V28 | 2.60 | 2.84 | 2.43 | 2.25 | 1.89 |
| SP-17 | Front of Recombiners | 0.95 | 1.03 | 0.97 | 0.84 | 0.71 |
| SP-18 | Boiler Aux. Room (bottom of stairs) | 9.36 | 7.26 | 7.71 | 7.27 | 7.73 |
| SP-19 | Catwalk in Boiler Room (North Central) | 11.5 | 10.1 | 9.48 | 8.40 | 8.67 |
| SP-20 | Catwalk in East Boiler Room (East Central) | 12.0 | 12.9 | 9.45 | 9.22 | 7.13 |
| SP-21 | Catwalk West of 3311-P3 (Blank) | 14.6 | 12.4 | 15.9 | 8.51 | 14.7 |
| SP-22 | Catwalk West Boiler Room (West Central) | 9.04 | 7.63 | 7.81 | 5.60 | 5.42 |
| SP-23 | Catwalk East of 3311-P8 (Blank) | 8.76 | 8.28 | 8.02 | 6.09 | 6.91 |
| SP-24 | Dryers 7312-DR19 & DR11 | 2.77 | 2.71 | 2.47 | 2.40 | 2.18 |
| SP-25 | Degassing Tank (3351-TK1) | 6.97 | 6.40 | 5.70 | 5.87 | 4.51 |
| SP-26 | East Fuelling Machine Vault by East Track | 46.8 | 43.2 | 44.3 | 40.4 | 35.9 |
| SP-27 | Outside East Feeder Cabinet | 107 | 97.2 | 92.1 | N/A[2] | N/A[2] |
| SP-28 | West Fuelling Machine Vault by West Track | 41.6 | 42.7 | 39.8 | 38.8 | 33.9 |
| SP-29 | Outside West Feeder Cabinet | 71.9 | 64.0 | 62.1 | N/A[2] | N/A[2] |
| SP-30 | South Boiler Room by Reactor Deck | 2.80 | 2.24 | 2.48 | 2.73 | 2.18 |
| SP-31 | East Blowout Panels by Reactor Building Wall | 5.01 | 4.04 | 4.18 | 4.09 | 3.98 |

| Gamma Survey Point | Description of Survey Location | Gamma Dose Rate [1] (µSv/h) | | | | |
|---|---|---|---|---|---|---|
| | | 2013 | 2014 | 2015 | 2016 | 2017 |
| SP-32 | West Blowout Panels by Reactor Building Wall | 5.26 | 4.28 | 4.00 | 4.33 | 3.60 |

[1] The gamma dose rate results were based on time-integrated measurements using an Eberline FH40G meter. The gamma instrument provided the values directly in µSv/h.

[2] Unable to perform survey due to inaccessibility to the locations.

Figure 3-4 illustrates the gamma dose rates obtained from discrete survey points in the DPWF Reactor Building. The trend of the values obtained is decreasing, which is explained with the decaying of radioactive isotopes with time. Survey points SP-26 to SP-29 show higher dose rate readings due to their location. SP-26 and SP-28 are located inside the fuelling machine vaults on either side of the calandria. SP-27 and SP-29 are located just outside the feeder cabinets and these areas were last surveyed in 2015. These areas are not routinely accessed when entries are made into the Reactor Building.

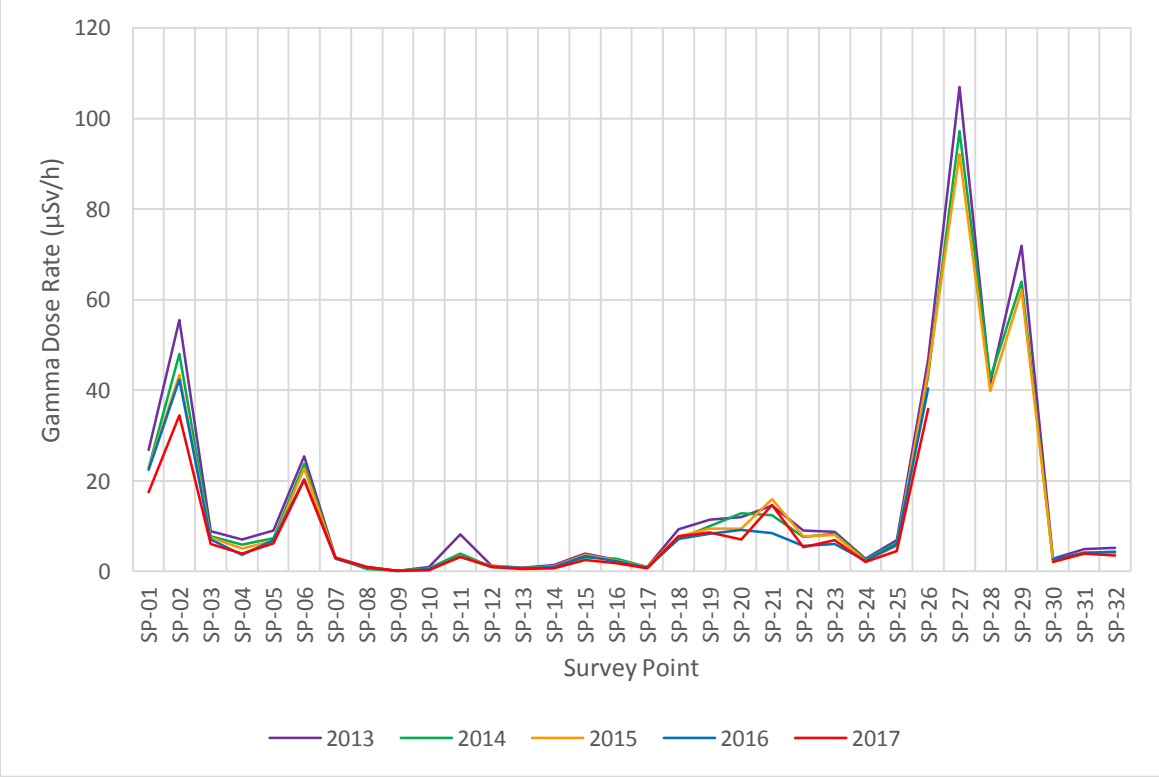



**Figure 3-4 Gamma Dose Rates within the Reactor Building**

### 3.6.2 Effluent Monitoring Program

The Prototype Reactor Decommissioning (PRD) Facilities Effluent Monitoring Program operates under CSA Standard N288.5, *Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills* at each PRD site [3-17].

The Effluent Monitoring Program at the DPWF consists of:

- An annual check against the National Pollutant Release Inventory (NPRI) reporting requirements.
- An annual check against the Greenhouse Gas Emissions reporting requirements.
- Monitoring and reporting any losses of halocarbon refrigerants and fire suppressants over 10 kg, in compliance with the Federal Halocarbon Regulations.
- Airborne release monitoring through tritium and gross particulate (i.e. gross alpha and gross beta) monitoring of the ventilation stack emissions (Table 3-8).
- Waterborne release monitoring through tritium, gross alpha, and gross beta monitoring of the Reactor Building and Service Building external sumps (Table 3-9).

A description and justification for the parameters monitored, frequency of monitoring, and potential contaminant sources is provided in the DPWF Effluent Monitoring Plan [3-18].

There were no supplementary studies conducted in 2017.

#### 3.6.2.1 Audits/Reviews

There were no audits or reviews of the Effluent Monitoring Program at DPWF in 2017.

#### 3.6.2.2 National Pollutant Release Inventory

The DPWF currently does not meet the reporting threshold of 20, 000 hours worked and, is therefore, not required to report under NPRI.

#### 3.6.2.3 Greenhouse Gas Emissions

The DPWF would be required to report releases under the *Greenhouse Gas Emissions Notice* [3-19], provided that the facility emitted over the 10, 000 tons of $CO_2$ equivalent ($CO_2e$) within 2017. Reporting thresholds were not met for DPWF in 2017.

#### 3.6.2.4 Halocarbons

There were no halocarbon releases above the reportable limits during 2017.

#### 3.6.2.5 Radiological Airborne Releases

The HEPA-filtered ventilation system in the Reactor Building was operated for a total of 834 hours in 2017. This run-time was much lower than the 2016 operating time of 1, 535 hours, which was due to increased work in the Reactor Building, particularly due to the

installation of a new Fire Alarm and Detection System. The 2017 annual airborne effluent monitoring report is provided in Table 3-8.

**Table 3-8**
**Annual Airborne Effluent Monitoring Report for 2017**

| Radionuclide | Release for Period (Bq) | DRL (Bq/a) | % of DRL | Average (Bq) 2013-2017 |
|---|---|---|---|---|
| Tritium | 1.12E+11 | 5.46E+17 | <0.01 | 1.43E+11 |
| Gross Alpha[1] | 1.64E+03 | 3.69E+12[2] | <0.01 | 1.66E+03[1] |
| Gross Beta[1] | 2.29E+04 | 3.69E+12[2] | <0.01 | 2.10E+04[1] |

[1] Parameter added as of 2016 April [3-17]. Averages are based on 2016 and 2017.

[2] DRL for Gross Alpha and Gross Beta is based on Sr-90, the most conservative radionuclide.

The total airborne tritium release was 1.12E+11 Bq compared with a DRL of 5.46E+17 Bq/a (<0.01% of the DRL) [3-20]. The average airborne release from 2013 to 2017 for tritium is 1.43E+11 Bq. There is no evident trend in the airborne tritium releases as shown in Figure 3-5.

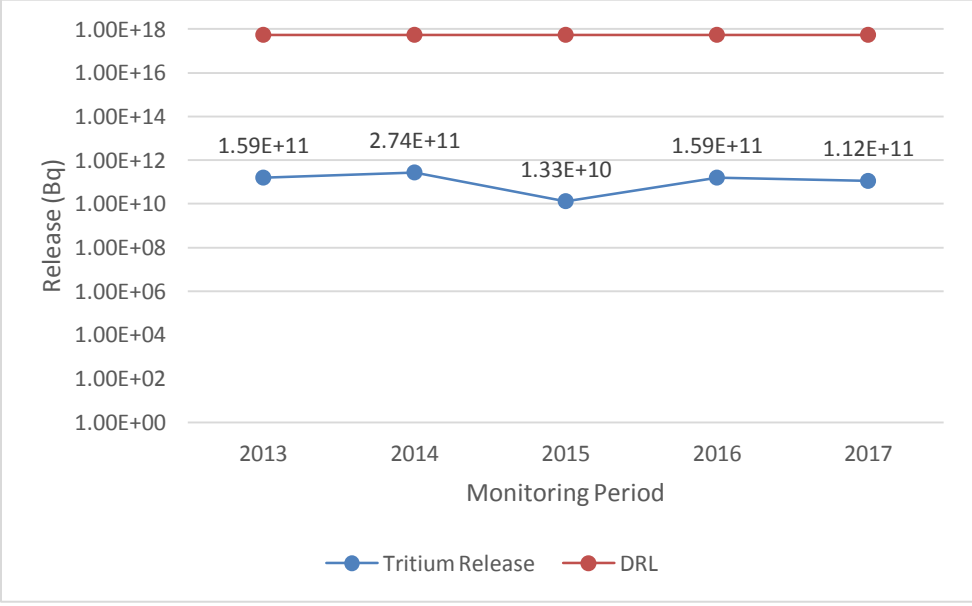



**Figure 3-5 Airborne Release Trend for Tritium**

### 3.6.2.6 Liquid Releases

All internal liquids are collected and stored in holding tanks within the facility. Therefore, there were no releases of internal liquids to the environment.

Liquid effluent releases are a result of the external groundwater diversion system (via the Reactor Building and Service Building external sumps). The system diverted an estimated 34 506,108 L of groundwater during 2017. This estimation is based on both the original design flow rate of the sumps, as well as an average historical volume displacement for the sumps that now operate without run-time indicators or flow meters.

The annual liquid effluent monitoring report for 2017 is provided in Table 3-9.

**Table 3-9**
**Annual Liquid Effluent Monitoring Report for 2017**

| Radionuclide | Release for Period (Bq) | DRL (Bq/a) | % of DRL | Average (Bq) 2013-2017 |
|---|---|---|---|---|
| Tritium | 3.57E+10 | 2.04E+17 | <0.01 | 4.79E+10 |
| Gross Alpha[1] | 1.12E+07 | 3.43E+13[2] | <0.01 | 1.01E+07[1] |
| Gross Beta | 2.56E+07 | 3.43E+13[2] | <0.01 | 4.52E+07 |

[1] Parameter added as of 2016 April [3-17]. Averages are based on 2016 and 2017.

[2] DRL for Gross Alpha and Gross Beta is based on Cs-134, the most restrictive radionuclide.

As shown in Table 3-9, the total liquid tritium release was 3.57E+10 Bq compared with a DRL of 2.04E+17 Bq/a (<0.01% of the DRL) [3-20]. The average liquid release from 2013 to 2017 for tritium was 4.79E+10 Bq. There is no significant evident trend in the liquid tritium releases as shown in Figure 3-6.

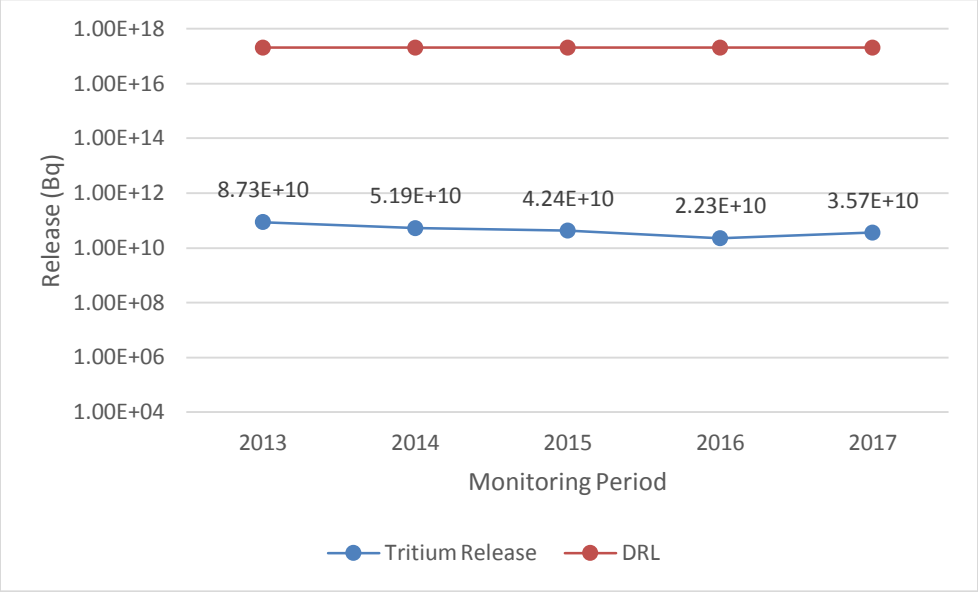



**Figure 3-6 Liquid Release Trend for Tritium**

The total liquid gross beta release was 2.56E+07 Bq compared with a DRL of 3.43E+13 Bq/a (<0.01% of the DRL) [3-20]. The average liquid release from 2013 to 2017 for gross beta was 4.52E+07 Bq. There is no significant evident trend in the liquid gross beta releases as shown in Figure 3-7.

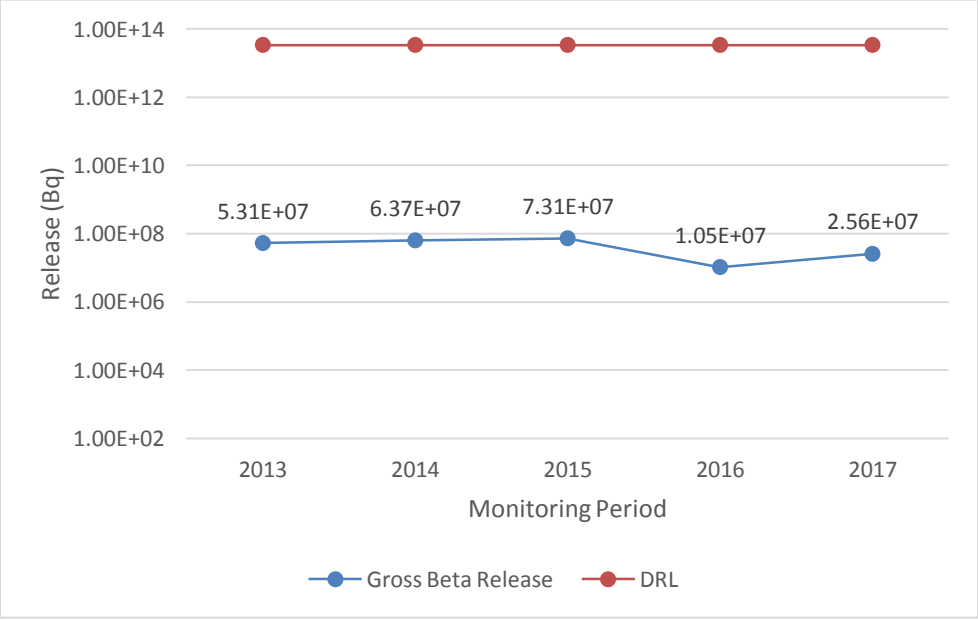



**Figure 3-7 Liquid Release Trend for Gross Beta**

The total liquid gross alpha release was 1.12E+07 Bq compared with a DRL of 3.43E+13 Bq/a (<0.01% of the DRL) [3-20]. Alpha releases have now been monitored for only two years and, therefore, an average trend has not been established yet. In comparison, alpha releases for 2016 was 8.98E+06 Bq.

### 3.6.3 Contamination Incidents

#### 3.6.3.1 Radiological

There were no radiological contamination incidents in 2017.

#### 3.6.3.2 Hazardous Substances

There were no incidents involving hazardous substances or materials in 2017.

### 3.6.4 Release Incidents

There were no incidents where releases exceeded their respective DRLs in 2017.

### 3.6.5 Monitoring Program Changes

There were no changes to the Environmental Program monitoring protocols. All waterborne and airborne effluent samples are now being analyzed at CRL to ensure that the CSA N288.5 Standard [3-21] is being met.

As reported in the 2016 Annual Compliance Report [3-22], CNL has ceased monitoring of Carbon-14 in 2017; an assessment to support the CSA N288.5 Standard [3-21] demonstrated that this monitoring was not required.

### 3.6.6 Release Impact Assessments

All releases of radioactive material in DPWF effluents during 2017 were a small fraction of their respective DRLs and thus, continue to indicate minimal impact on the public or the environment.

## 3.7 List of Discoveries

### 3.7.1 Conflicts or Inconsistencies

No conflicts or inconsistencies between licence conditions, codes or standards or regulatory documents referenced in the LCH [3-15] were identified by CNL.

### 3.7.2 Reportable Events

Pursuant to Licence Condition 5.1 of the licence [3-23], this section provides a list of reportable events and conditions, which occurred at the DPWF during 2017, along with actions that were taken, and the results of any sampling performed.

- On the evening of January 04 and the morning of January 05, Bruce Power Security was dispatched to the DPWF spent fuel canister area in response to intermittent alarms that were triggered by severe weather and high winds. Bruce Power Security staff remained on site until the remote monitoring was restored [3-24].
- On the evening of January 10 and the morning of January 11, Bruce Power Security was dispatched to the DPWF spent fuel canister area in response to intermittent alarms that were triggered by severe weather and high winds. The event lasted for approximately 13 hours. Bruce Power Security staff remained on site until the remote monitoring was restored [3-25].
- On January 25, Bruce Power Emergency Response Team was dispatched to the DPWF in response to a fire alarm that was activated due to a faulty detector in Room T-123. Staff was evacuated and a walk-down was conducted at the facility. It was determined that there was no fire in the facility. After resetting the fire detection system, building occupants were allowed to re-enter the facility [3-26].
- On November 10 during a camera audit at night time, Bruce Power Security noticed that the lighting around the DPWF spent fuel canister area had failed. A Security Guard was immediately posted to the area to ensure that the area remained secure. It was determined that there was an electrical short in the system. A temporary lighting system was installed until the repairs to the lighting circuit were completed [3-27].

  Lighting circuit faults were identified and repaired. Normal site conditions were re-established on November 21 [3-28].

### 3.7.3 Corrective Action Plans

No corrective action plans were generated during 2017.

## 3.8 Compliance with Other Federal or Provincial Legislation

The Joint Review Group (JRG) that is chaired by the CNSC reviews the activities at the DPWF. The members of the JRG include representatives from Environment and Climate Change Canada, Ontario Ministry of the Environment and Ontario Ministry of Labour. They are invited to the Annual Compliance Inspection and are provided with copies of the Annual Compliance Reports.

The DPWF has one Ontario Elevating Device Licence (Licence Number 014847) issued from the Technical Standards and Safety Authority for the operation of the elevator in the Turbine Building.

The DPWF is a registered generator of Hazardous Waste (ID #ON4321441) with the Ontario Ministry of the Environment and Climate Change. This ID number is required to be placed on all shipments of Hazardous Waste such as mercury, PCBs, oils and solvents.

There are no identified species at risk at DPWF. Grounds maintenance operations ensure that the grass does not reach six inches in height so that Eastern Meadowlarks and Bobolinks do not

nest on the site. Also, there is no indication that Barn Swallows are present on the site primarily because the building materials used on the structures at DPWF are not favourable for their nests.

## 3.9 Human Performance Program

Canadian Nuclear Laboratories maintains a Human Performance Program to continuously monitor human performance and reduce the likelihood of nuclear safety events caused by human factors. The program includes review of internal and external operating experience events, utilization of Event-Free Tools, and field observation and coaching to re-inforce a healthy nuclear safety culture.

Canadian Nuclear Laboratories also utilizes a corrective action program as a process for identifying, prioritizing, documenting, trending, tracking, preventing, and resolving problems. The use of the ImpAct process continues to foster the internal reporting of lower significance level events (Level-4 and some Level-3), affording the opportunity to implement continuous improvement initiatives through a robust Corrective Action Program. During 2017, 13 Level-4 ImpActs were initiated by DPWF staff.

The DPWF personnel are adequately trained (and refreshed) to ensure safe operation of the facility [3-29]. Table 3-10 summarizes the training completed by DPWF operational staff during 2017.

**Table 3-10**
**Direct Operational Staff Training in 2017**

| Date Attended | Course Code | Course Title | Duration (hrs) | No. of Attendees |
|---|---|---|---|---|
| 2017/01/23<br>2017/03/21 | RP-G3-Refresher | Group 3 - Refresher (R3) | 7.5 | 2 |
| 2017/01/24 | OSH-2035 | OSH Dynamic Learning Activity (Working at Heights, Lock Out/Tag Out, Work Permit) Refresher | 1 | 1 |
| 2017/01/25<br>2017/10/25 | FIRE-1001 | Fire Extinguisher (CW- Ref 5 yrs/NRU-Ref 3 yrs) | 3.5 | 2 |
| 2017/01/25<br>2017/05/16 | FIRE-1002-Online | Fire Prevention (CW- Ref 5 yrs/NRU-Ref 3 yrs) | 1.5 | 2 |
| 2017/01/25 | LGL-1002 | Values and Ethics at CNL: Advanced | 3.75 | 1 |
| 2017/02/02 | RP-Misc-06 | Responsible User Radiation Source (R3) | 1 | 1 |
| 2017/02/24<br>2017/03/07<br>2017/03/13 | OSH-2011-Online | Work Permit Refresher | 1 | 3 |
| 2017/03/07 | RP-Misc-07-Online | Radiation Protection Awareness Program for Managers (R5) | 1 | 1 |
| 2017/03/07 | ENVP-1004-Online | Environmental Protection for Managers/Supervisors (R5) | 2 | 1 |

| Date Attended | Course Code | Course Title | Duration (hrs) | No. of Attendees |
|---|---|---|---|---|
| 2017/03/07 | FIRE-1003-Online | Fire Protection Program for Managers (R5/3) | 1 | 1 |
| 2017/03/13 | LGL-1003-Online | Values and Ethics at CNL | 1 | 3 |
| 2017/04/24 | | | | |
| 2017/05/31 | | | | |
| 2017/04/13 | PMO-1038 | Project Time Management Information Session | 2 | 3 |
| 2017/05/23 | ENG-1001 | Eng. Change Control: Engineering/Operations | 7.5 | 1 |
| 2017/06/29 | SECU-1006-Online | Level 2 Security Clearance Awareness | 0.25 | 2 |
| 2017/09/05 | TD-1018-Online | CNL General Safety Orientation | 1 | 1 |
| 2017/11/14 | RP-G2-Refresher | Group 2 Radiation Protection Refresher (R3) | 15 | 1 |
| 2017/11/27 | OSH-1003 | Aerial Platform -Theory (R3) | 3.5 | 2 |

## 3.10 Public Information Program

The Public Information Program (PIP) covers activities of public interest that occur at CNL. It has been prepared in accordance with the CNSC Regulatory Document RD/GD-99.3, *Public Information and Disclosure* [3-30]. Additional information regarding how the PIP meets the regulatory requirements and identified activities for each target audience can be found in the *Public Information Program for Canadian Nuclear Laboratories* [3-31]. The document informs the general public, local communities surrounding the various sites, the news media, elected and appointed government officials, the supply chain and other stakeholders such as industry, academia and science & technology audiences about the activities ongoing at CNL sites, the potential impacts of these activities on the health and safety of workers, members of the public and on the environment. The overriding objective of the program is to build public awareness, understanding and a supportive appreciation of the Laboratories' value and relevance to Canadians.

Through the PIP, CNL routinely reports the results of monitoring programs to sustain open and transparent communication with stakeholders.

Finally, an effective PIP provides additional information to community stakeholders and ensures community input is sought, received and action is taken.

Canadian Nuclear Laboratories facilitated a number of public engagements during the 2017 timeframe during which DPWF was included in a broad discussion of decommissioning at CNL.

Information on the DPWF is available through the Bruce Power Visitors Centre and the DPWF is a featured stop on public bus tours of the Bruce Power site.

### 3.11 List of Reports

Below is a list of all correspondence, which also include the reports prepared and submitted to the CNSC regarding the DPWF during 2017.

- S. Kenny, Letter to E. Fortier, *For Event Report D&WM-17-0072 – Intermittent Fault of Remote Monitoring System at the Douglas Point Waste Facility*, 22-CNNO-17-0001-L, 2017 January 17.
- S. Kenny, Letter to E. Fortier, *D&WM-17-0144 – Intermittent Fault of Remote Monitoring System at the Douglas Point Waste Facility*, 22-CNNO-17-0002-L, 2017 January 17.
- S. Karivelil, Letter to K. Glenn, *Change in Designated Representative of the Licensee: Appointment of Facility Authority for Douglas Point and Gentilly-1 Waste Facilities*, 3640-CNNO-17-0001-L, 2017 January 20.
- I. Bainbridge, Letter to E. Fortier, *Progress Update for Douglas Point and Gentilly-1 Fire Hazard Analysis Corrective Action Plan*, 3640-CNNO-17-0002-L, 2017 January 26.
- I. Bainbridge, Letter to E. Fortier, *Notification of Decommissioning Work Planned at the Douglas Point Waste Facility (DPWF)*, 22-CNNO-17-0003-L, 2017 January 26.
- I. Bainbridge, Letter to E. Fortier, *Submission of Record of Preliminary Verbal Report – Fire Alarm Tripped at Douglas Point Waste Facility, ImpAct / D&WM-17-0361*, 22-CNNO-17-0004-L, 2017 January 26.
- K. Daniels, Letter to H. Tadros, *Transformation of Canadian Nuclear Laboratories' Management System Framework – Submission of Documents – Batch-1*, 145-CNNO-17-0003-L, 2017 January 31.
- K. Daniels, Letter to H. Tadros, *Transformation of Canadian Nuclear Laboratories' Management System Framework – Submission of Documents – Batch-2*, 145-CNNO-17-0006-L, 2017 February 21.
- I. Bainbridge, Letter to R. Lall, *Submission of the Fire Hazard Analysis and Associated Corrective Action Plan for the Douglas Point Waste Facility*, 22-CNNO-17-0005-L, 2017 February 28.
- K. Daniels, Letter to H. Tadros, *Transformation of Canadian Nuclear Laboratories' Management System Framework – Submission of Documents – Batch-3*, 145-CNNO-17-0009-L, 2017 March 23.
- M. Vickerd, Letter to C. Morency, *Canadian Nuclear Laboratories (CNL) Prototype Waste Facilities Submission of Updated Documents in PRD Licence Conditions Handbook*, 3640-CNNO-17-0004-L, 2017 April 26.
- I. Bainbridge, Letter to R. Lall, *Submission of Characterization Reports from Fiscal Year 2016/17 Resin Sampling Work at Douglas Point and Gentilly-1 Waste Facilities*, 3640-CNNO-17-0003-L, 2017 April 27.

- I. Bainbridge, Letter to R. Lall, *Submission of Intended Work at Douglas Point Waste Facility over the next One to Two Years*, 22-CNNO-17-0006-L, 2017 May 02.
- I. Bainbridge and M. Vickerd, Letter to R. Lall and C. Morency, *2016 Annual Compliance Report for Prototype Waste Facilities (Douglas Point, Gentilly-1 & Nuclear Power Demonstration)*, 3640-CNNO-17-0005-L, 2017 May 29.
- I. Bainbridge, Letter to R. Lall, *Submission of Detailed Decommissioning Plan for the Machine Shop and Plate Shop and the Tool Crib Building at the Douglas Point Waste Facility (DPWF)*, 22-CNNO-17-0007-L, 2017 July 13.
- C. Clark, Letter to M. Beaudette, *Douglas Point Waste Management Facility Site Security Report (Confidential)*, 119-CNNO-17-0044-L, 2017 August 29.
- I. Bainbridge, Letter to R. Lall, *Provision of Alternate Steam Supply at the Douglas Point Waste Facility*, 22-CNNO-17-0008-L, 2017 September 05.
- I. Bainbridge, Letter to R. Lall, *Progress Update for Douglas Point Waste Facility Fire Hazard Analysis Corrective Action Plan*, 22-CNNO-17-0009-L, 2017 September 27.
- I. Bainbridge, Letter to R. Lall, *Addendum to Detailed Decommissioning Plan for the Plate Shop, Machine Shop and Tool Crib Buildings at the Douglas Point Waste Facility (DPWF)*, 22-CNNO-17-0010-L, 2017 November 01.
- I. Bainbridge, Letter to R. Lall, *CNL Responses to CNSC Staff Comments Concerning Douglas Point and Gentilly-1 Waste Facilities in 2016 Annual Compliance Report*, 3640-CNNO-17-0006-L, 2017 November 02.
- I. Bainbridge, Letter to R. Lall, *Detailed Report, Lack of Lighting on Fuel Canister Area at Douglas Point, IMPACT # D&WM-17-4932*, 22-CNNO-17-0011-L, 2017 November 30.
- I. Bainbridge, Letter to R. Lall, *Progress Update: Resin Tanks and Storage Vaults at Douglas Point and Gentilly-1 Waste Facilities*, 3640-CNNO-17-0007-L, 2017 December 07.
- I. Bainbridge, Letter to R. Lall, *Submission of Detailed Decommissioning Plan for the Emergency Coolant Injection System (ECIS) Tank at the Douglas Point Waste Facility (DPWF)*, 22-CNNO-17-0012-L, 2017 December 07.

## 3.12 References

[3-1] *Douglas Point Waste Facility Interim End-State Report*, 22-00960-IES-001, Revision 1, 2016 January.

[3-2] *Designated Substances and Hazardous Materials Survey Final Report*, 22-08960-REPT-007, Revision 0, 2018 January.

[3-3] G. Peplinskie, Memorandum to File, *Douglas Point Design Information Verification (DIV) and Physical Inventory Verification (PIV) Inspection, 2017 Sept 13 & 14*, 22-01608-046-000-0001, 2017 September 22.

[3-4] K. Lange, Letter to I. Bainbridge, *Compliance Inspection of Douglas Point Waste Facility*, 22-NOCN-18-0001-L, 2018 February 20.

[3-5] *CNSC Compliance Inspection Report*, CNL-DPWF-2017-01, 2018 February 20.

[3-6] M. Beaudette, Letter to C. Clark, *Security Compliance Inspection November 21-22, 2017: Canadian Nuclear Laboratories Douglas Point Waste Management Facility (DPWMF)*, 119-NOCN-17-0027-L, e-Doc 5298728, 2017 August 09.

[3-7] I. Bainbridge, Letter to M. Beaudette, *Corrective Action Plan (CAP) for Action Notice 2017 NSD-DPWMF-AN01, Douglas Point Waste Facility (DPWF)*, 22-CNNO-18-0002-L, 2018 February 27.

[3-8] *Audit Report (R0) - NPD Waste Facility & Douglas Point Waste Facility*, 145-01914-190-261-0001, 2018 January 30.

[3-9] CSA N286.05, *Management System Requirements for Nuclear Power Plants (reaffirmed 2011), Annex E – Supplementary Requirements for Decommissioning*.

[3-10] N. Benkhe, Memorandum to G. Peplinskie, *SSHC Workplace Inspection – Douglas Point – Dec 13th 2017*, 22-08000-046-000-0003, Revision 0, 2018 January 17.

[3-11] S. Karivelil, Letter to K. Glenn, *Change in Designated Representative of the Licensee: Appointment of Facility Authority for Douglas Point and Gentilly-1 Waste Facilities*, 3640-CNNO-17-0001-L, 2017 January 20.

[3-12] K. Daniels, Letter to H. Tadros, *Transformation of Canadian Nuclear Laboratories' Management System Framework – Submission of Documents – Batch-1*, 145-CNNO-17-0003-L, 2017 January 31.

[3-13] K. Daniels, Letter to H. Tadros, *Transformation of Canadian Nuclear Laboratories' Management System Framework – Submission of Documents – Batch-2*, 145-CNNO-17-0006-L, 2017 February 21.

[3-14] K. Daniels, Letter to H. Tadros, *Transformation of Canadian Nuclear Laboratories' Management System Framework – Submission of Documents – Batch-3*, 145-CNNO-17-0009-L, 2017 March 23.

[3-15] *Licence Conditions Handbook for Prototype Waste Facilities (DP, Gentilly-1 & NPD)*, 3640-508760-HBK-001, Revision 0, 2014 August 14.

[3-16] *Radiation Protection Requirements*, RC-2000-633-0, Revision 2, 2000 October.

[3-17] S.B. Kenny, Letter to E. Fortier, *Implementation of CSA Standard N288.5, Guidelines for Effluent Monitoring on the Prototype Reactor Decommissioning Facilities*, 3640-CNNO-16-0005-L, 2016 April 29.

[3-18] *Douglas Point Waste Facility Effluent Monitoring Plan*, 22-07220-PLA-001, Revision 0, 2016 April.

[3-19] *Notice with Respect to Reporting of Greenhouse Gases (GHGs) for 2017*, Canada Gazette Part I, Volume 151, No. 52, 2017 December 30.

[3-20] Nuclear Safety Note, *Derived Release Limits for CNL's Douglas Point Waste Facility*, 22-03480-NSN-002, Revision 1, 2015 March.

[3-21] CSA Standard, N288.5-11 (R2016), *Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills*.

[3-22] *2016 Annual Compliance Report for Prototype Waste Facilities (Douglas Point, Gentilly-1 & Nuclear Power Demonstration)*, 3640-00521-REPT-003, Revision 0, 2017 May.

[3-23] *Waste Facility Decommissioning Licence for Prototype Waste Facilities*, WFDL-W4-332.01/2034, 2014 October 22.

[3-24] S. Kenny, Letter to E. Fortier, *For Event Report D&WM-17-0072 – Intermittent Fault of Remote Monitoring System at the Douglas Point Waste Facility*, 22-CNNO-17-0001-L, 2017 January 17.

[3-25] S. Kenny, Letter to E. Fortier, *D&WM-17-0144 – Intermittent Fault of Remote Monitoring System at the Douglas Point Waste Facility*, 22-CNNO-17-0002-L, 2017 January 17.

[3-26] I. Bainbridge, Letter to E. Fortier, *Submission of Record of Preliminary Verbal Report – Fire Alarm Tripped at Douglas Pont Waste Facility, ImpAct / D&WM-17-0361*, 22-CNNO-17-0004-L, 2017 January 26.

[3-27] I. Bainbridge, Email to R. Lall, *Preliminary Verbal Report – Loss of Lighting at Douglas Point Fuel Storage Area*, 22-CNNO-17-0003-E, 2017 November 14.

[3-28] I. Bainbridge, Letter to R. Lall, *Detailed Report, Lack of Lighting on Fuel Canister Area at Douglas Point, IMPACT # D&WM-17-4932*, 22-CNNO-17-0011-L, 2017 November 30.

[3-29] *Training*, 900-510200-PDD-001, Revision 1, 2018 March.

[3-30] CNSC Regulatory Document, RD/GD-99.3, *Public Information and Disclosure*.

[3-31] *Public Information Program for Canadian Nuclear Laboratories (CNL)*, CW-513430-REPT-001, Revision 2, 2017 March.

# 4. GENTILLY-1 WASTE FACILITY

This section of the Annual Compliance Report summarizes the activities at the Gentilly-1 Waste Facility (G1WF) during the calendar year 2017.

The G1WF is situated within Hydro-Québec's Gentilly-2 Nuclear Generating Station site located at Pointe-aux-Roches, on the south shore of the St. Lawrence River in the Province of Québec.

The facility consists of specified areas, under CNL control, within the Turbine and Service Buildings, the Reactor Building, the Resin Storage Area and the Spent Fuel Storage Canister Room. Canadian Nuclear Laboratories is not responsible for the property on which the CNL-owned facilities reside.

Gentilly-1, the 250 MWe CANDU-BLW prototype reactor, began operation in 1972 May. The Gentilly-1 Nuclear Power Plant was owned by AECL and operated by Hydro-Québec. It was put into a laid up state from 1980 to 1984. In 1984, a decommissioning program to bring the Gentilly-1 station to a safe sustainable shutdown state allowing SWS was initiated. Portions of the station hosting the major inventories of radionuclides were isolated and the remainder of the station is used for other purposes, as appropriate, such as storage of low-level radioactive packaged waste. This Phase 1 decommissioning program was completed in 1986.

A more detailed description of the facility can be found in the *Gentilly-1 Waste Management Facility Interim End-State Report* [4-1]. Canadian Nuclear Laboratories maintains the G1WF in a safe and secure shut down state under SWS until such time that final decommissioning is undertaken.

## 4.1 Operations

### 4.1.1 Routine Operations

Operations in 2017 consisted of routine inspections, housekeeping, regular monitoring, calibrations, and maintenance of the facility to ensure that the facility is kept in a safe, sustainable shutdown state allowing SWS activities to continue so that there was no hazard to the public or adverse impact on the environment.

Activities continued to address identified HSSE concerns. Specific activities included addressing FHA actions, LMP actions, self-assessments and inspections, and other identified corrective actions.

The routine and corrective maintenance work was executed, as necessary, and included removing a failed Sump Pump (P-3) and replacing with a new unit.

### 4.1.2 Non-Routine Operations

Non-routine operations consisted of activities supporting future decommissioning, the most major of which included:

- The Turbine Building and ancillary equipment characterization (the characterization report is expected to be completed in 2018).
- The ACM abatement in the Turbine Building and the Reactor Building.
- The Turbine Building crane assessment and 55-tonne crane brake repair.
- The Dry Active Waste (DAW) removal from the first floor of the Reactor Building.
- The mobilization phase of the Heat Transport Purification System (HTPS) resin retrieval project (installation of weather shelter, fire detection system and ventilation system, and pre-commissioning testing of all equipment).
- A Designated Substance Survey [4-2] to identify the hazardous materials in the G1WF.

### 4.1.3 Trending of Events Related to Operational Activities

As events occur, they are recorded in the ImpAct system. This information is regularly reviewed to identify any trends. At this time, no trends related to operational activities have been identified.

### 4.1.4 Inspections/Audits

The G1WF was not selected for an IAEA inspection in 2017. A CNSC Security Compliance Inspection was performed at G1WF on 2017 August 30 [4-3]. As a result of this inspection, no compliance actions were issued [4-4]. An Annual Site Safety and Health Committee inspection was performed at G1WF on 2017 September 19 and the inspection report [4-5] identifies five improvement actions, which are tracked using CNL's Actionway database.

### 4.1.5 Facility Positions

There was one change to the positions related to the Waste Facility Decommissioning Licence in 2017. In 2017 January, an appointment to the position of Facility Authority, replacing the previous incumbent was announced [4-6] and became effective on 2017 January 25.

## 4.2 Waste Inventory

Table 4-1 summarizes the waste present in the G1WF as of 2017 December 31. Other hazardous materials present in the G1WF include asbestos insulation and ACM, PCB and lead paint on the structures and six PCB-containing light ballasts. These materials are not considered stored waste, therefore, are not listed in Table 4-1.

**Table 4-1**
**Stored Waste in Gentilly-1 Waste Facility**

| Waste Type [1] | Source | Volume and Content | | |
|---|---|---|---|---|
| | | Total Estimated Volume ($m^3$) | Total Radioactivity Estimated (Bq) | Primary Radionuclide Content |
| Reactor Systems | Induced radioactivity in reactor core components and the Biological Shield. | Not Available[3] | 2.11E+14 by the year 2015[2] | Ni-63, Co-60, Eu-152, Fe-55 |
| | Radioactive corrosion products and fission products deposited in the PHT and Moderator System. | | 1.17E+11 (for PHT) and 1.77E+10 (for Moderator System) by the year 2015[2] | Cs-137, Co-60 |
| Ion Exchange Resin | Ion exchange resin from the PHT and Moderator Systems. | 58.0 | 2.46E+11 by the year 2015 | Co-60, Cs-137, C-14, Eu-152, Am-241, H-3 |
| LLRW | Various metals, filters and compacted waste, contained in mild steel rectangular containers and drums stored in the Reactor Building. | 341.6 | To be confirmed during removal in 2018 | Cs-137, Co-60 |
| | LLRW from the 1997 historical Gentilly-1 waste transfer project from Gentilly-2 Radiation Waste Storage Area. | 1.0 | | |
| | LLRW generated from Turbine Characterization and asbestos abatement activities, stored in the Turbine Building. | 7.5 | Trace (contaminated PPE&C) | Cs-137, Co-60 |
| | LLRW generated from the Resin Characterization Project sampling campaign. | 2.5 | Trace (contaminated PPE&C) | Cs-137, Co-60 |

[1] Spent fuel bundles are not reported in this table.

[2] 2015 is used as a reference date to provide an estimated amount of radioactivity contained within the facility.

[3] The levels of activity for the Reactor Systems are based on time-decayed calculations of activity caused by activation of the reactor components. The estimated volume/weight of waste is not available and will be dependent upon the methods used to dismantle the reactor systems.

### 4.2.1 Changes to Waste Inventory

All waste transfers during 2017 are presented in Table 4-2.

**Table 4-2**
**Waste Transfers from G1WF During 2017**

| Waste Type | Waste Description | Transfer Date | Weight (kg) | Radioactivity (Bq) | Radionuclide Content | Destination |
|---|---|---|---|---|---|---|
| **Solid Low Level Radioactive Waste** | 76 drums containing various materials, filters, compacted waste and mild steel | 2017-11-23 | 6688 | 7.29E+04 | Cs-137, Ra-226, K-40, Co-60, Ac-228, Th-232 | Energy Solution, Waste Characterization and Disposal Facility in Brampton, Ontario |
| | 56 drums and 10 over packed drums containing various materials, filters, compacted waste and mild steel | 2017-11-28 | 9461 | 6.33E+04 | | |
| | 66 drums and 6 over packed drums containing various materials, filters, compacted waste and mild steel | 2017-11-30 | 11,450 | 6.90E+04 | | |
| | 24 over packed drums and 8 x 1.6 $m^3$ containers containing various materials, filters, compacted waste and mild steel | 2017-12-05 | 6552 | 3.07E+04 | | |
| | 11 x 1.6 $m^3$ containers, 7 drums, 2 over packed drums, 3 metal cans containing PPE&C, various materials, filters, compacted waste and mild steel. | 2017-12-07 | 6101 | 2.40E+04 | | |
| | | **TOTAL** | **40,252 kg** | | | |

### 4.2.2 Liquid Waste Generation

Groundwater collected in internal sumps and condensate from dehumidifiers is collected, sampled and discharged via Hydro-Québec's liquid treatment system.

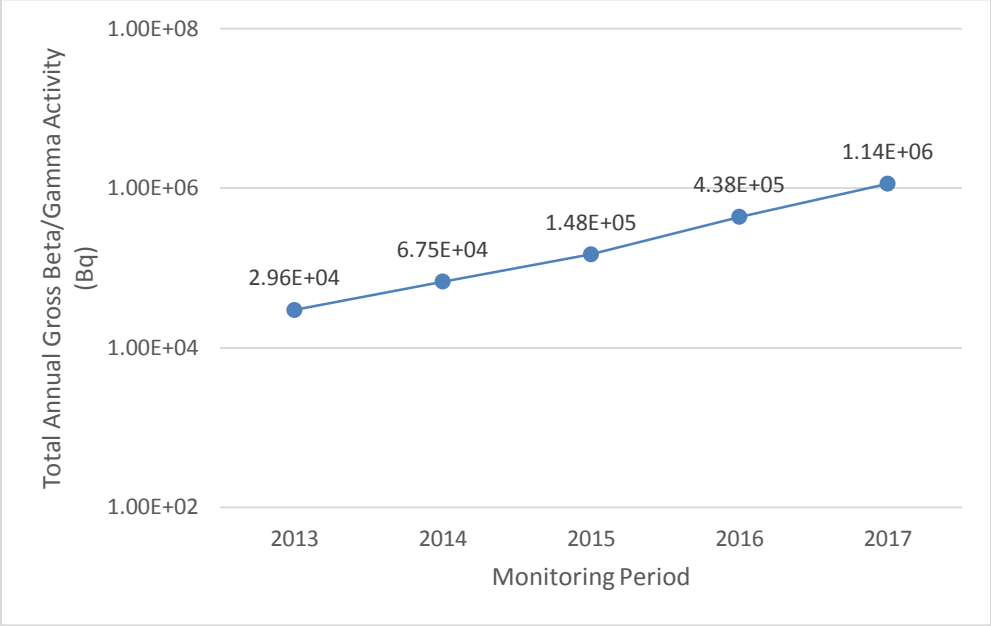
The total volume of sump liquids generated by G1WF in 2017 was approximately 20 000 L. The total annual radioactivity in liquid waste from G1WF sump transfers was 1.14E+06 Bq of gross beta-gamma and 6.05E+08 Bq of tritium as shown in Table 4-3.

**Table 4-3**
**Liquid Waste Transfers from Facility Sumps**

| Transfer Date[1] | Room | Volume (L) | Gross Beta-Gamma | | Tritium | |
|---|---|---|---|---|---|---|
| | | | Activity Concentration (Bq/L) | Total Release (Bq) | Activity Concentration (Bq/L) | Total Release (Bq) |
| 2017-05-08 | S-012 | 4000 | 2.41E+01 | 9.62E+04 | 8.88E+02 | 3.55E+06 |
| 2017-05-08 | T-005 | 1000 | 7.22E+00 | 7.22E+03 | 8.55E+04 | 8.55E+07 |
| 2017-05-10 | S-012 | 2000 | 1.48E+01 | 2.97E+04 | 7.40E+02 | 1.48E+06 |
| 2017-05-24 | S-012 | 3000 | 1.25E+01 | 3.75E+04 | 4.81E+03 | 1.44E+07 |
| 2017-07-11 | T-005 | 3000 | 9.03E+00 | 2.71E+04 | 3.70E+02 | 1.11E+06 |
| 2017-07-18 | T-004 | 1000 | 4.00E+02 | 4.00E+05 | 6.73E+04 | 6.73E+07 |
| 2017-07-27 | T-004 | 1000 | 3.92E+00 | 3.92E+03 | 7.40E+02 | 7.40E+05 |
| 2017-07-27 | T-005 | 3000 | 9.36E+00 | 2.81E+04 | 8.70E+04 | 2.61E+08 |
| 2017-10-05 | T-005 | 2000 | 2.56E+02 | 5.11E+05 | 8.51E+04 | 1.70E+08 |
| **TOTAL ANNUAL RELEASE** | | **20,000** | | **1.14E+06** | | **6.05E+08** |

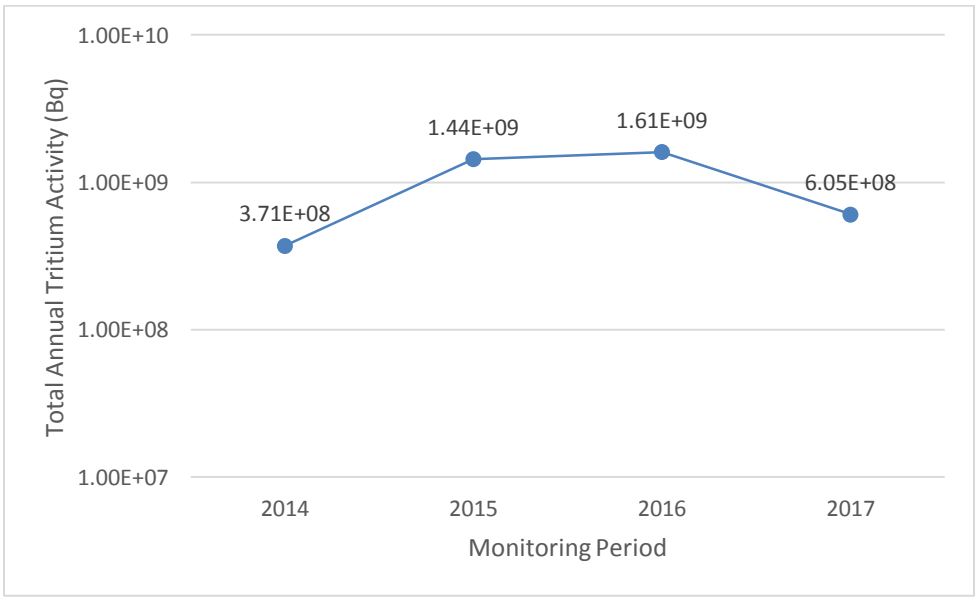
[1] Transfers from the sumps are intermittent based on volume collected.

The total volume of sump water generated at the G1WF in 2017 (20 000 L) was higher than the previous years (4 000 L in 2014, 14 000 L in 2015, and 19 200 L in 2016). The volume of water being collected is mainly generated by the dehumidifier in the Reactor Building. As work activities have increased in the Reactor Building in 2017, it has resulted in higher humidity content in the building, generating a higher volume of water. Therefore, the total activity for beta-gamma has increased in 2017, as shown in Figure 4-1, but remains within acceptable Hydro-Québec discharge criterion. Tritium release trend in liquid waste is shown in Figure 4-2.




Note: G1WF does not have any DRLs as the discharges are through Hydro-Québec's discharge point. Hydro-Québec's DRL is 5.3E+13 Bq/a.

**Figure 4-1 Gross Beta-Gamma Release Trend in Liquid Waste**




Note: The tritium activity in liquids from G1WF sump transfers was not available for reporting periods prior to 2014, and therefore, the activity in 2013 is not included in the Figure.

G1WF does not have any DRLs as the discharges are through Hydro-Québec's discharge point. Hydro-Québec's DRL is 1.1E+19 Bq/a.

**Figure 4-2 Tritium Release Trend in Liquid Waste**

## 4.3 Effluent Treatment and Waste Processing

No effluent treatment or waste processing was performed at the G1WF in 2017.

## 4.4 Changes or Modifications

Changes to methods or procedures, changes to equipment and modifications to the G1WF are described in this section.

### 4.4.1 Changes to Methods or Procedures

In 2017, the company-wide Management System documents were updated and these documents were provided to the CNSC [4-7], [4-8], [4-9]. No changes were made to the documents listed in Table A-1 of the LCH [4-10]. Table 4-4 provides a list of changes made to Table A-2 of the LCH [4-10] specific to the G1WF.

**Table 4-4**
**Changes to Table A-2 of the Licence Conditions Handbook [4-10]**

| Document Number Listed in the LCH | Title Listed in the LCH | New Document Number | Title |
|---|---|---|---|
| 61-01600-SWS-001 | Gentilly-1 Waste Management Facility Storage with Surveillance Plan | 61-508330-SWS-001 | Gentilly-1 Waste Management Facility Storage with Surveillance Plan |
| 61-508720-FHA-001 | Gentilly-1 Waste Management Facility Fire Hazard Analysis | 61-508720-FHA-002 | G1 Facility – Fire Hazard Analysis Document |
| 61-00060-021-000 | Hydro-Québec for Security Guard Services | 61-00060-021-000-0001 | Security Guard Services Agreement between Hydro-Québec and AECL |
| 61-01600-PDP-001 | Gentilly-1 Waste Management Facility Preliminary Decommissioning Plan | 61-508310-PDP-001 | Gentilly-1 Waste Management Facility Preliminary Decommissioning Plan |
| | | 61-508310-PDP-002 | Gentilly-1 Waste Management Facility Preliminary Decommissioning Plan - ADDENDUM |
| Not listed | Not listed | 61-509200-PLA-001[1] | Gentilly-1 Waste Facility Effluent Monitoring Plan |

[1] New addition to Table A-2 of the LCH [4-10] that also requires notification to the CNSC prior to implementation of revision.

### 4.4.2 Changes to Equipment and Modifications to the Facility

All the following changes and modifications were planned and executed as per the CNL processes and procedures. All work was approved by the Facility Authority prior to commencement of work.

The changes and modifications including the implementation dates are as follows:

- The Turbine Building 55-tonne crane brake was replaced with an equivalent engineered approved brake. As part of this maintenance work, an engineered approved load cell limiter was installed to increase the safety of workers during operation. The crane was also re-certified and is fully operational.

  Implementation date – 2017 October.
- Sample coupons were taken from various selected areas of the Turbine Building and ancillary equipment for characterization purposes to support future decommissioning.

  Implementation date – 2017 June.
- Asbestos abatement was performed in the Turbine Building and the Reactor Building to reduce hazards in the facility.

  Implementation dates – 2017 July, and August.

While not a modification to the structure of the facility, it should be noted that the DAW contained in drums and containers was removed from the first floor of the Reactor Building.

Implementation dates – 2017 November, and December.

## 4.5 Radiation Protection

### 4.5.1 Radiation Dose to Personnel

As the field work at the G1WF increased in 2017, the radiation dose to personnel also increased. The highest dose received by a CNL employee (a Maintainer) was 0.18 mSv (18 mrem).

The highest dose received by a contractor (a Field Engineer) was 0.13 mSv (13 mrem).

No extremity dose was recorded and no dose was received by any visitor in 2017.

Table 4-5 summarizes dose by work group as a result of G1WF operations in 2017.

**Table 4-5**
**2017 Dose by Work Group at Gentilly-1 Waste Facility**

| Work Group | Number of Personnel | Whole-Body Dose Including Tritium Plus Committed Effective Dose from Non-Tritium Intakes | | | Collective Dose (Person-mSv) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Average (mSv) | Maximum (mSv) | Collective (person-mSv) | Surface Dose including Tritium | Tritium Dose | Non-Tritium Committed Effective Dose | Neutron Dose | Extremity Dose |
| CNL employees | 28 | 0.03 | 0.18 | 0.77 | 0.77 | 0 | 0 | 0 | 0 |
| Contractors | 55 | 0.004 | 0.13 | 0.21 | 0.21 | 0 | 0 | 0 | 0 |
| Visitors | 19 | 0 | 0[1] | 0[1] | 0[1] | 0 | 0 | 0 | 0 |
| **Total for G1WF Site** | **102** | **0.01** | **0.18** | **0.98** | **0.98** | **0** | **0** | **0** | **0** |

[1] Since the dose received by a visitor is less than 0.001 mSv, the Corporate Dosimetry System generates a value of zero.

### 4.5.2 Radiation Incidents

No radiation incident occurred in 2017, which resulted in exceeding the 6 mSv (600 mrem) action level per four week period for G1WF, as per the LCH [4-10].

### 4.5.3 Radiation Dose Changes or Trends

The previous Annual Compliance Reports have presented the collective doses for CNL employees only. As more work is being carried out by Contractors, going forward, these reports will include analyses of the trend of the collective doses for the G1WF site, including the CNL employees, contractors and visitors.

There is a clear increase of the G1WF site collective dose (CNL employees, contractors and visitors) from 2015 to 2017 (0.25 person-mSv in 2015, 0.56 person-mSv in 2016 and 0.98 person-mSv in 2017). This increase was due to increase in planned work activities at the site, both maintenance tasks and project activities (e.g. characterization of the Turbine Building and HTPS Resin Removal Project). Figure 4-3 demonstrates the increasing trend of the G1WF site collective dose over the last three years as the G1WF decommissioning support projects are increasing. It should be noted that the annual collective dose prior to 2015 is not detailed, but was stable and below 0.1 person-mSv due to the execution of only the SWS activities, which are low dose activities.

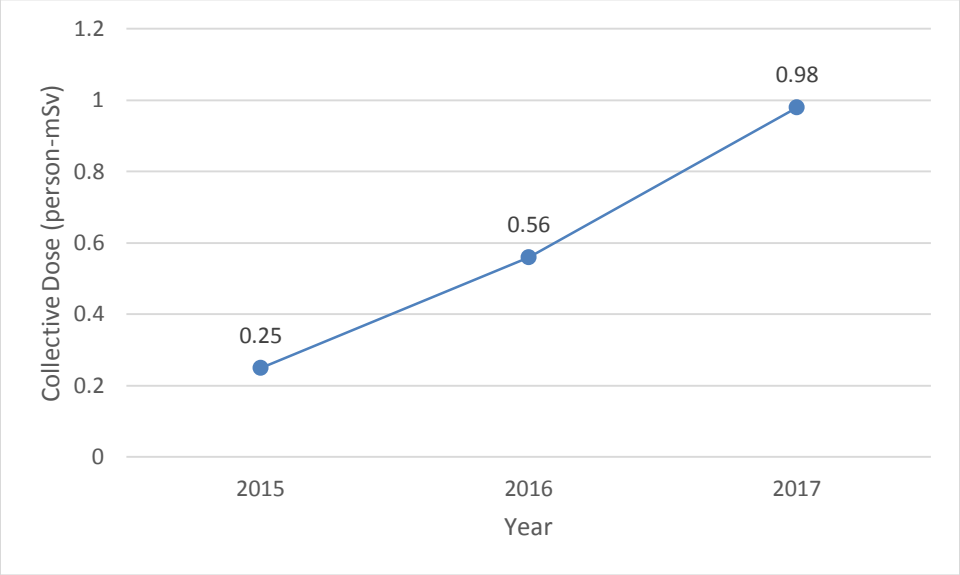



**Figure 4-3 Collective Dose Trend**

### 4.5.4 Monitoring Program Changes

There was no change to the dosimetry monitoring program during 2017.

### 4.5.5 Dose Impact Assessment

All doses for any individual worker during a four-week period in 2017 were a small fraction of the regulatory action level (<2%), thus, the resultant doses to personnel as a result of G1WF operations were negligible.

## 4.6 Environmental Protection

### 4.6.1 Ambient Radiation Field Monitoring

Routine ambient radiation field surveys performed at the G1WF include dose rate measurements on contact of the Spent Fuel Storage Canisters (Table 4-6, Figure 4-4), gamma doses rates measured from TLDs placed around the Spent Fuel Storage Canisters (Table 4-7, Figure 4-5), and gamma radiation measurements from discrete survey points within the G1WF Reactor Building (Table 4-8, Figure 4-6).

**Table 4-6**
**Contact Gamma Dose Rates on Spent Fuel Storage Canisters**

| Canister Number | Contact Gamma Dose Rate (µSv/h)[1] | | | | |
|---|---|---|---|---|---|
| | 2013 | 2014 | 2015 | 2016 | 2017 |
| 1 | 0.58 to 0.75 | 0.55 to 0.64 | 0.73 | 0.70 | 0.55 |
| 2 | 0.56 to 0.82 | 0.51 to 0.70 | 0.76 | 0.69 | 0.56 |
| 3 | 0.53 to 0.82 | 0.35 to 0.69 | 0.70 | 0.65 | 0.51 |
| 4 | 0.75 to 0.89 | 0.71 to 0.98 | 0.98 | 1.10 | 0.79 |
| 5 | 0.61 to 0.74 | 0.51 to 0.73 | 0.62 | 0.71 | 0.51 |
| 6 | 0.68 to 0.85 | 0.40 to 0.85 | 0.78 | 0.93 | 0.58 |
| 7 | 0.55 to 0.64 | 0.48 to 0.72 | 0.83 | 0.74 | 0.54 |
| 8 | 0.74 to 0.90 | 0.56 to 0.87 | 0.69 | 0.93 | 0.67 |
| 9 | 0.72 to 0.92 | 0.55 to 0.83 | 0.84 | 0.88 | 0.65 |
| 10 | 0.64 to 0.83 | 0.54 to 0.80 | 0.73 | 0.68 | 0.59 |
| 11 | 0.68 to 0.92 | 0.56 to 0.86 | 0.84 | 0.75 | 0.61 |

[1] Dose rates are a range of instrument readings taken at the same positions on the north, east, south and west side of each canister. Since 2015, only the average reading is provided to simplify reporting of values and trending.

Figure 4-4 shows the contact gamma dose rate on each fuel canister measured over the last three years. The design dose rate limit on contact of the spent fuel canisters is 10 µSv/h [4-11].

Figure 4-4 demonstrates that the G1WF Spent Fuel Canister Gamma Dose Rate is decreasing, as expected due to decay of the radionuclides over time. The two year trend (2016 and 2017) of each canister is decreasing, indicating no apparent changes to the radiological conditions inside each canister. Figure 4-4 demonstrates that there are no significant statistical variations of the data over time, and the dose rates are significantly less than the design dose rate limit.

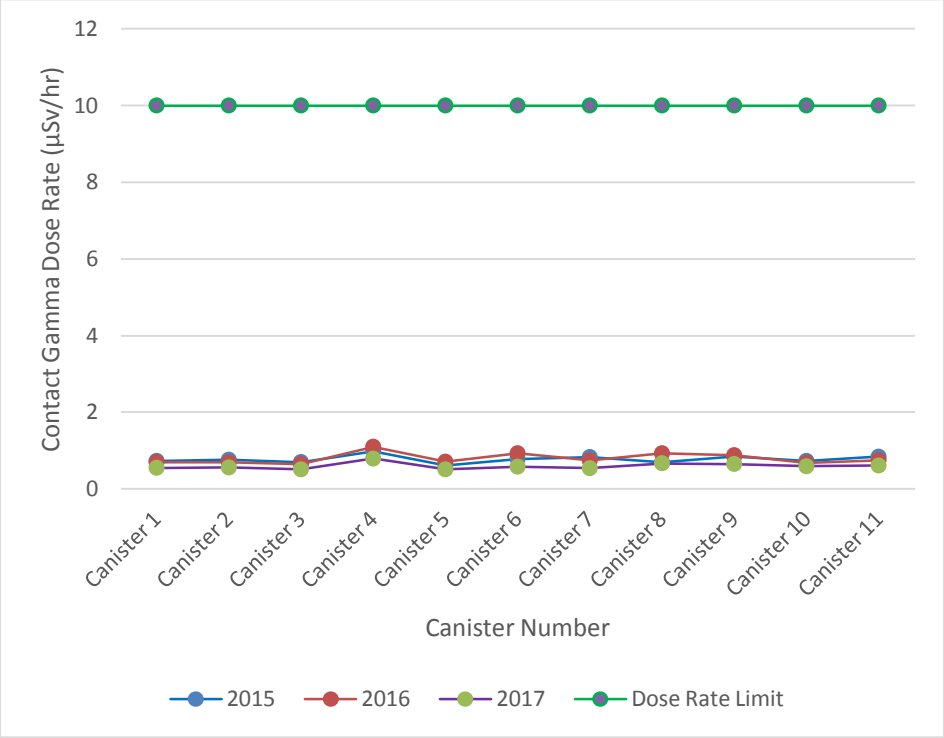



**Figure 4-4 Contact Gamma Dose Rates on Spent Fuel Storage Canisters**

**Table 4-7**
**Equivalent Dose Rates Calculated from TLD Results at the Spent Fuel Storage Canister Area**

| TLD Location | Calculated Equivalent Dose Rates from TLD Results (µSv/h)[1] | | | | |
|---|---|---|---|---|---|
| | 2013 (Nov. 04) | 2014 (Dec. 01) | 2015 (Nov. 26) | 2016 (Oct. 20) | 2017 (Nov. 01) |
| P1 North | 0.29 | 0.29 | 0.24 | 0.24 | 0.21 |
| P2 North | 0.28 | 0.27 | 0.29 | 0.25 | 0.22 |
| P3 East | 0.31 | 0.27 | 0.26 | 0.25 | 0.21 |
| P4 East | 0.27 | 0.27 | 0.24 | 0.24 | 0.19 |
| P5 South | 0.27 | 0.25 | 0.25 | 0.23 | 0.21 |
| P6 South | 0.36 | 0.33 | 0.34 | 0.30 | 0.27 |
| P7 West | 0.38 | 0.39 | 0.41 | 0.35 | 0.32 |
| P8 West | 0.34 | 0.32 | 0.28 | 0.26 | 0.24 |

[1] For each TLD location, the exposure values (µR) for the two TLDs were averaged. The dose rate was then determined by dividing the average (µR) by the total exposure time (hours) and converted to µSv/h.

Figure 4-5 illustrates a general downward trend of the dose rate results obtained from the G1WF Spent Fuel Canister Room TLD readings over the period 2013 to 2017. It is also noticed that the dose rates remained low and are indicative of no change in the containment of radioactivity in the spent fuel baskets.

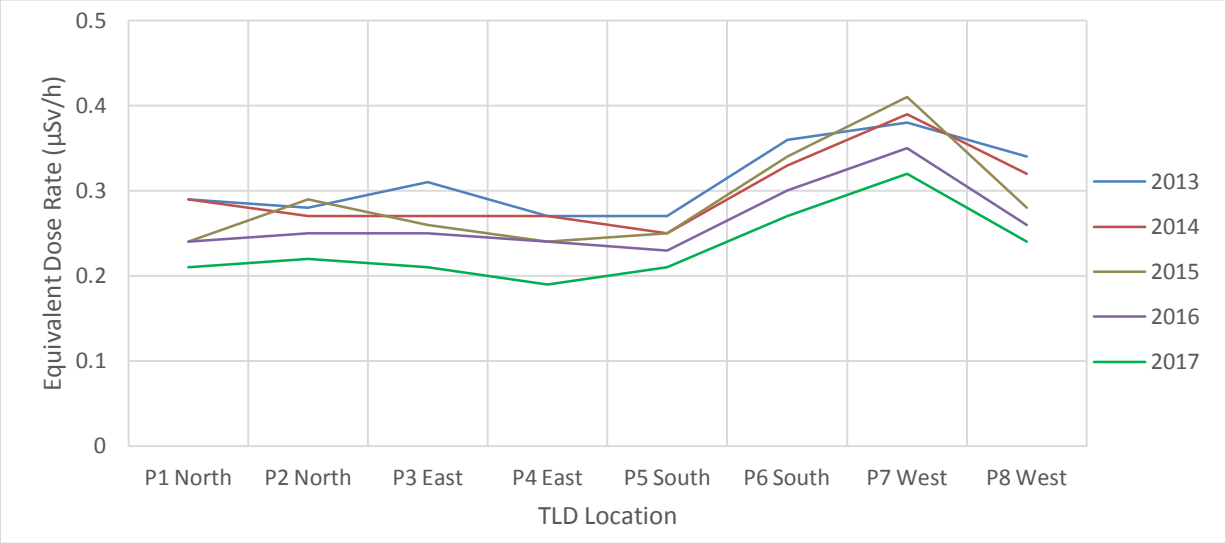



**Figure 4-5 Spent Fuel Canister Room Calculated Equivalent Dose Rates from TLD Results**

**Table 4-8**
**Reactor Building Gamma Radiation Survey**

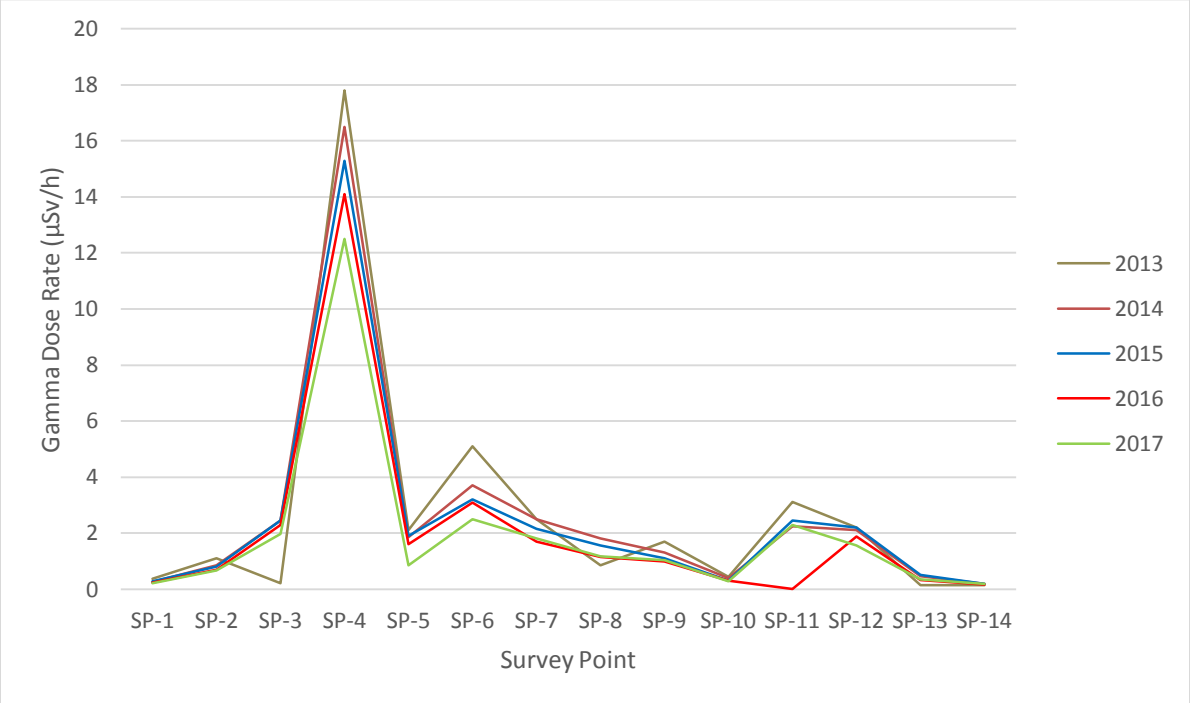
| Annual Gamma Survey Point | Location | Description of Survey Location | Dose Rate (µSv/h) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2013 | 2014 | 2015 | 2016 | 2017 |
| SP-01 | Room 107 | West of 3211 TK-1 | 0.37 | 0.25 | 0.29 | 0.24 | 0.20 |
| SP-02 | Room 105 | North of 3311-P4 | 1.10 | 0.85 | 0.80 | 0.70 | 0.66 |
| SP-03 | Room 106 | South of 3311-P3 | 0.21 | 2.45 | 2.45 | 2.30 | 1.97 |
| SP-04 | Room 104 | Inside Fuelling Machine Vault | 17.80[1] | 16.50[1] | 15.30[1] | 14.10[1] | 12.50[1] |
| SP-05 | Room 406 | South of 3341 Headers | 2.10 | 1.85 | 1.90 | 1.60 | 0.86 |
| SP-06 | Room 403 | East Side of Boiler Cabinet | 5.09 | 3.70 | 3.20 | 3.10 | 2.50 |
| SP-07 | Room 501 | Reactivity Mechanism Deck | 2.50 | 2.50 | 2.15 | 1.70 | 1.82 |
| SP-08 | Room 501 | South-east Steam Drum | 0.85 | 1.80 | 1.55 | 1.14 | 1.17 |
| SP-09 | Room 501 | North-west Steam Drum | 1.70 | 1.30 | 1.10 | 0.98 | 1.03 |

| Annual Gamma Survey Point | Location | Description of Survey Location | Dose Rate (µSv/h) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2013 | 2014 | 2015 | 2016 | 2017 |
| SP-10 | Room 404 | West Side by Booster Ports | 0.43 | 0.40 | 0.31 | 0.31 | 0.29 |
| SP-11 | Room 010 | South Exit to Room 008 | 3.12 | 2.25 | 2.45 | 2.00[2] | 2.30 |
| SP-12 | Room 010 | North Exit to Room 007 | 2.21 | 2.10 | 2.20 | 1.89 | 1.55 |
| SP-13 | Room 011 | West Passage by 3251-TK1&2 | 0.14 | 0.47 | 0.51 | 0.32 | 0.35 |
| SP-14 | Room 011 | Bottom of South-West Stairs | 0.14 | 0.18 | 0.18 | 0.16 | 0.19 |

[1] The dose rates continue to be higher than all other survey points, as this survey point is inside the Fuelling Machine Vault, where doses are expected to be elevated.

[2] A dose rate of 0.20 µSv/h was inadvertently reported to the CNSC in the 2016 Annual Compliance Report [4-12].

Figure 4-6 illustrates the gamma dose rates obtained in the G1WF Reactor Building. The trend of the values obtained is also decreasing, which is explained with the decaying of radioactive isotopes with time.




Note: SP-4 shows a higher dose rate since this survey point is inside the Fuelling Machine Vault.

**Figure 4-6 Gamma Dose Rates within the Reactor Building**

### 4.6.2 Effluent Monitoring Program

The PRD Facilities Effluent Monitoring Program operates under CSA Standard N288.5, *Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills* at each PRD site [4-13].

The Effluent Monitoring Program at the G1WF consists of:

- An annual check against the National Pollutant Release Inventory (NPRI) reporting requirements.
- An annual check against the Greenhouse Gas Emissions reporting requirements.
- Monitoring and reporting any losses of halocarbon refrigerants and fire suppressants over 10 kg, in compliance with the Federal Halocarbon Regulations.

A description and justification for the scope of effluent monitoring is provided in the *Gentilly-1 Waste Facility Effluent Monitoring Plan* [4-14].

There were no supplementary studies conducted in 2017.

#### 4.6.2.1 Audits/Reviews

There were no audits or reviews of the Effluent Monitoring Program at G1WF in 2017.

#### 4.6.2.2 National Pollutant Release Inventory

The G1WF currently does not meet the reporting threshold of 20 000 hours worked and, is therefore, not required to report under NPRI.

#### 4.6.2.3 Greenhouse Gas Emissions

The G1WF would be required to report releases under the *Greenhouse Gas Emissions Notice* [4-15] provided that the facility emitted over the 10, 000 tons of $CO_2$ equivalent ($CO_2e$) within 2017. Reporting thresholds were not met for G1WF in 2017.

#### 4.6.2.4 Halocarbons

There were no halocarbon releases above the reportable limits during 2017.

#### 4.6.2.5 Radiological Airborne Releases

The effluent monitoring plan assessment conducted in 2016, determined that there is minimal or no source of airborne radioactivity at the G1WF [4-14]. Therefore, airborne emissions are currently not monitored at the G1WF.

#### 4.6.2.6 Liquid Releases

All liquids from facility sumps were transferred to the Gentilly-2 facility effluent system to be managed and discharged by Hydro-Québec (See Section 4.2.2).

### 4.6.3 Groundwater Monitoring

The four groundwater monitoring boreholes (#22, 23, 24, and 25) located near the resin storage vault were inspected in 2017 May and October. In October, boreholes #24 and 25 were dry but a liquid sample could be collected from boreholes #22 and 23.

In the majority of the sampling campaigns over the last five years (2013 to 2017), these boreholes have been dry. As a result, there is not enough data to establish a trend or statistical average. However, the analysis results that have been obtained indicate the resin storage vault is performing as required, and there has been no observable impact on the environment.

Table 4-9 shows the concentrations of tritium and gross beta measured from boreholes over the last five years. No figure was provided because of the inconsistency of the data.

**Table 4-9**
**Radioactivity from Resin Storage Vault Groundwater Monitoring**

| Borehole | Parameter | Period | Concentration (Bq/L) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2013 | 2014 | 2015 | 2016 | 2017 |
| #22 | Tritium | Spring | 9,600[1] | Dry | <370* | <370* | <216* |
| | | Fall | Dry | Dry | Dry | <370* | <370* |
| | Gross Beta | Spring | NM[2] | Dry | 1.74 | 60.31[3] | 0.56 |
| | | Fall | Dry | Dry | Dry | 3.9 | 5.51 |
| | | | | | | | |
| #23 | Tritium | Spring | Dry | <1,850 | <370* | <370* | <216* |
| | | Fall | Dry | Dry | <458* | <370* | <370* |
| | Gross Beta | Spring | Dry | < 3.7 | 1.07 | 0.60 | 0.61 |
| | | Fall | Dry | Dry | 1.37 | 0.39 | 3.36 |
| | | | | | | | |
| #24 | Tritium | Spring | Dry | <1,850 | Dry | <370* | <216* |
| | | Fall | Dry | Dry | Dry | Dry | Dry |
| | Gross Beta | Spring | Dry | <3.7 | Dry | 2.73 | 0.22 |
| | | Fall | Dry | Dry | Dry | Dry | Dry |
| | | | | | | | |
| #25 | Tritium | Spring | Dry | <1,850 | Dry | <370* | 259 |
| | | Fall | Dry | Dry | Dry | Dry | Dry |
| | Gross Beta | Spring | Dry | <3.7 | Dry | 0.71 | 1.12 |
| | | Fall | Dry | Dry | Dry | Dry | Dry |

[1] Sample size provided was insufficient (e.g. 0.1 g).

[2] NM - Not Measured. Sample size provided was insufficient (e.g. 0.1 g).

[3] Higher than the previous years, but not atypical for this area. Also, the analytical results noted suspended solids.

* Based on values that were at the Minimum Detectable Activity.

### 4.6.4 Contamination Incidents

#### 4.6.4.1 Radiological

There were no radiological contamination incidents in 2017.

#### 4.6.4.2 Hazardous Substances

There were no incidents involving hazardous substances or materials in 2017.

### 4.6.5 Release Incidents

There were no radioactive release incidents in 2017.

### 4.6.6 Monitoring Program Changes

There were no monitoring program changes in the year 2017.

### 4.6.7 Release Impact Assessments

There were no airborne releases from the G1WF in 2017. All liquid releases were discharged through Gentilly-2 effluent system, and represent a small fraction of the total release. As a result, there was no significant impact on the environment or the public from G1WF operations.

## 4.7 List of Discoveries

### 4.7.1 Conflicts or Inconsistencies

No conflicts or inconsistencies between licence conditions, codes or standards or regulatory documents referenced in the LCH [4-10] were identified by CNL.

### 4.7.2 Reportable Events

There were no reportable events at G1WF in 2017.

### 4.7.3 Corrective Action Plans

No corrective action plans were generated during 2017.

## 4.8 Compliance with Other Federal or Provincial Legislation

The activities at the G1WF are reviewed by the JRG that is chaired by the CNSC. The members of the JRG include representatives from Environment and Climate Change Canada and the Québec Ministry of the Environment. They are invited to the Annual Compliance Inspection and CNL provides them with copies of the Annual Compliance Reports.

There are no permits, certificates or other licences that apply to the operation of the G1WF.

There are several nests of Cliff Swallows observed on the Reactor Building at the G1WF. Although the Cliff Swallows are not a species at risk, since they are migratory birds, the

Migratory Birds Convention Act protects the species and their nests. The Cliff Swallows using the building for nesting are currently not posing any operational challenges to the G1WF staff, and therefore, the species can continue to nest on the building. The G1WF staff is aware of the prohibitions contained in the Migratory Birds Convention Act and its associated Regulations, and will continue to monitor the activities of the species during the breeding season.

## 4.9 Human Performance Program

Canadian Nuclear Laboratories maintains a Human Performance Program to continuously monitor human performance and reduce the likelihood of nuclear safety events caused by human factors. The program includes the review of internal and external operating experience events, the utilization of Event-Free Tools, and field observation and coaching to re-enforce a healthy nuclear safety culture.

Canadian Nuclear Laboratories also maintains a corrective action program as a process for identifying, prioritizing, documenting, trending, tracking, preventing and resolving problems. The use of the ImpAct process continues to foster the internal reporting of lower significance level events (Level-4 and some Level-3), affording the opportunity to implement continuous improvement initiatives through a robust Corrective Action Program. During 2017, two Level-4 ImpActs were initiated by G1WF staff.

The G1WF personnel are adequately trained (and refreshed) to ensure safe operation of the facility [4-16]. Table 4-10 summarizes the training completed by operational staff during 2017.

**Table 4-10**
**Direct Operational Staff Training in 2017**

| Date Attended | Course Code | Course Title | Duration (hrs) | No. of Attendees |
|---|---|---|---|---|
| 2017-01-10 | TD-1019 | CNL Culture Shift Energizing Launch | 7.5 | 1 |
| 2017-01-12 | OSH-2011-online | Work Permit Refresher | 1 | 1 |
| 2017-01-23 | OSH-1007 | Asbestos Module 6E | 3 | 1 |
| 2017-01-24 | OSH-1023-CRL | Contractor HSSE Management Level 1 (CRL) | 8 | 1 |
| 2017-01-25 | FIRE-1001 | Fire Extinguisher (CW-Ref 5 yrs/NRU-Ref 3 yrs) | 3.5 | 1 |
| 2017-01-25 | FIRE-1002-Online | Fire Prevention (CW-Ref 5 yrs/NRU-Ref 3 yrs) | 1.5 | 1 |
| 2017-01-25 | LGL-1002 | Values and Ethics at CNL: Advanced | 3.75 | 1 |
| 2017-01-26 | HU-1020 | Slip Simulator Training | 2 | 1 |
| 2017-02-07 | OSH-1005 | Working at Heights | 3.5 | 1 |
| 2017-02-07 | OSH-1004 | Lock Out/Tag Out | 3.5 | 1 |
| 2017-02-09 | OSH-1006 | Confined Space Entry | 3.5 | 1 |
| 2017-02-28 | RP-G3-Refresher | Group 3 – Refresher (R3) | 7.5 | 1 |
| 2017-03-14 | LGL-1003-online | Values and Ethics at CNL | 1 | 2 |
| 2017-06-29 | | | | |
| 2017-04-27 | OSH-2020-A | First Aid Standard, CPR, AED Recertification | 7.5 | 1 |
| 2017-06-29 | SECU-1006-Online | Level 2 Security Clearance Awareness | 0.25 | 1 |
| 2017-11-27 | OSH-1003 | Aerial Platform – Theory (R3) | 3.5 | 1 |

## 4.10 Public Information Program

The PIP covers activities of public interest that occur at CNL. It has been prepared in accordance with the CNSC Regulatory Document RD/GD-99.3, Public Information and Disclosure [4-17]. Additional information regarding how the PIP meets regulatory requirements and identified activities for each target audience can be found in the *Public Information Program for Canadian Nuclear Laboratories (CNL)* [4-18]. The document informs the general public, the local communities surrounding the various sites, the news media, the elected and appointed government officials, the supply chain and other stakeholders such as industry, academia and science & technology audiences about the activities ongoing at CNL sites, the potential impacts of these activities on the health and safety of workers, members of the public, and on the environment. The overriding objective of the program is to build public awareness, understanding and a supportive appreciation of the Laboratories' value and relevance to Canadians.

Through the PIP, CNL routinely reports the results of monitoring programs to sustain open and transparent communication with stakeholders.

Finally, an effective PIP provides additional information to community stakeholders and ensures community input is sought, received and action is taken.

Canadian Nuclear Laboratories facilitated a number of public engagements during the 2017 timeframe during which G1WF was included in a broad discussion of decommissioning at CNL.

Hydro-Québec also provides information regarding the G1WF to the local communities through their public outreach program.

## 4.11 List of Reports

Below is a list of all correspondence, which also include the reports prepared and submitted to the CNSC regarding the G1WF during 2017.

- S. Karivelil, Letter to K. Glenn, *Change in Designated Representative of the Licensee: Appointment of Facility Authority for Douglas Point and Gentilly-1 Waste Facilities*, 3640-CNNO-17-0001-L, 2017 January 20.
- I. Bainbridge, Letter to E. Fortier, *Progress Update for Douglas Point and Gentilly-1 Fire Hazard Analysis Corrective Action Plan*, 3640-CNNO-17-0002-L, 2017 January 26.
- K. Daniels, Letter to H. Tadros, *Transformation of Canadian Nuclear Laboratories' Management System Framework – Submission of Documents – Batch-1*, 145-CNNO-17-0003-L, 2017 January 31.
- K. Daniels, Letter to H. Tadros, *Transformation of Canadian Nuclear Laboratories' Management System Framework – Submission of Documents – Batch-2*, 145-CNNO-17-0006-L, 2017 February 21.
- I. Bainbridge, Letter to R. Lall, *Submission of Fire Hazards Analysis and Associated Corrective Action Plan for the Gentilly-1 Waste Facility*, 61-CNNO-17-0001-L, 2017 February 28.

- K. Daniels, Letter to H. Tadros, *Transformation of Canadian Nuclear Laboratories' Management System Framework – Submission of Documents – Batch-3*, 145-CNNO-17-0009-L, 2017 March 23.
- M. Vickerd, Letter to C. Morency, *Canadian Nuclear Laboratories (CNL) Prototype Waste Facilities Submission of Updated Documents in PRD Licence Conditions Handbook*, 3640-CNNO-17-0004-L, 2017 April 26.
- I. Bainbridge, Letter to R. Lall, *Submission of Characterization Reports from Fiscal Year 2016/17 Resin Sampling Work at Douglas Point and Gentilly-1 Waste Facilities*, 3640-CNNO-17-0003-L, 2017 April 27.
- I. Bainbridge, Letter to R. Lall, *Submission of Intended Work at Gentilly-1 Waste Facility Over the Next One to Two Years*, 61-CNNO-17-0002-L, 2017 May 02.
- I. Bainbridge and M. Vickerd, Letter to R. Lall and C. Morency, *2016 Annual Compliance Report for Prototype Waste Facilities (Douglas Point, Gentilly-1 & Nuclear Power Demonstration)*, 3640-CNNO-17-0005-L, 2017 May 29.
- C. Clark, Letter to M. Beaudette, *Gentilly-1 Site Security Report (Confidential)*, 119-CNNO-17-0045-L, 2017 August 29.
- I. Bainbridge, Letter to R. Lall, *Submission of Addendum to the Gentilly-1 Waste Facility Preliminary Decommissioning Plan*, 61-CNNO-17-0005-L, 2017 September 26.
- I. Bainbridge, Letter to R. Lall, *Progress Update for Gentilly-1 Waste Facility Fire Hazard Analysis Corrective Action Plan*, 61-CNNO-17-0003-L, 2017 September 27.
- I. Bainbridge, Letter to R. Lall, *Notification of Retrieval of Heat Transport Purification System Resins at Gentilly-1 Waste Facility*, 61-CNNO-17-0006-L, 2017 October 12.
- I. Bainbridge, Letter to R. Lall, *CNL Responses to CNSC Staff Comments Concerning Douglas Point and Gentilly-1 Waste Facilities in 2016 Annual Compliance Report*, 3640-CNNO-17-0006-L, 2017 November 02.
- I. Bainbridge, Letter to R. Lall, *Independent Third Party Review of Modifications Intended to the Gentilly-1 Waste Facility Fire Detection System*, 61-CNNO-17-0007-L, 2017 November 09.
- I. Bainbridge, Letter to R. Lall, *Progress Update: Resin Tanks and Storage Vaults at Douglas Point and Gentilly-1 Waste Facilities*, 3640-CNNO-17-0007-L, 2017 December 07.

## 4.12 References

[4-1] *Gentilly-1 Waste Management Facility Interim End-State Report*, 61-508350-IES-001, Revision 0, 2014 August.

[4-2] *Gentilly-1 Waste Facility - Designated Substances Survey*, 61-510400-REPT-001, Revision 0, 2018 March.

[4-3] M. Beaudette, Letter to C. Clark, *Security Compliance Inspection at Canadian Nuclear Laboratories Gentilly-1 Waste Management Facility (G1WMF) – August 30, 2017*, e-Doc 5306178, 119-NOCN-17-0026-L, 2017 August 02.

[4-4] M. Beaudette, Letter to K. Kehler, *Canadian Nuclear Laboratories, Gentilly-1 Waste Management Facility (G1WMF) – Report No. G1WMF-NSD-2017-001 (Confidential)*, 61-NOCN-17-0003-L, 2017 November 14.

[4-5] N. Benkhe, *Memorandum to J. Therrien, SSHC Workplace Inspection – Gentilly – Sep 19th 2017*, 61-510410-046-000-0003, Revision 0, 2017 September 19.

[4-6] S. Karivelil, Letter to K. Glenn, *Change in Designated Representative of the Licensee: Appointment of Facility Authority for Douglas Point and Gentilly-1 Waste Facilities,* 3640-CNNO-17-0001-L, 2017 January 20.

[4-7] K. Daniels, Letter to H. Tadros, *Transformation of Canadian Nuclear Laboratories' Management System Framework – Submission of Documents – Batch-1*, 145-CNNO-17-0003-L, 2017 January 31.

[4-8] K. Daniels, Letter to H. Tadros, *Transformation of Canadian Nuclear Laboratories' Management System Framework – Submission of Documents – Batch-2*, 145-CNNO-17-0006-L, 2017 February 21.

[4-9] K. Daniels, Letter to H. Tadros, *Transformation of Canadian Nuclear Laboratories' Management System Framework – Submission of Documents – Batch-3*, 145-CNNO-17-0009-L, 2017 March 23.

[4-10] *Licence Conditions Handbook for Prototype Waste Facilities (DP, Gentilly-1 & NPD)*, 3640-508760-HBK-001, Revision 0, 2014 August 14.

[4-11] *Radiation Protection Requirements*, RC-2000-633-0, Revision 2, 2000 October.

[4-12] *2016 Annual Compliance Report for Prototype Waste Facilities (Douglas Point, Gentilly-1 & Nuclear Power Demonstration)*, 3640-00521-REPT-003, Revision 0, 2017 May.

[4-13] S.B. Kenny, Letter to E. Fortier, *Implementation of CSA Standard N288.5, Guidelines for Effluent Monitoring on the Prototype Reactor Decommissioning Facilities*, 3640-CNNO-16-0005-L, 2016 April 29.

[4-14] *Gentilly-1 Waste Facility Effluent Monitoring Plan*, 61-509200-PLA-001, Revision 0, 2016 April.

[4-15] *Notice with Respect to Reporting of Greenhouse Gases (GHGS) for 2017*, Canada Gazette Part I, Volume 151, No. 52, 2017 December 30.

[4-16] *Training*, 900-510200-PDD-001, Revision 1, 2018 March.

[4-17] CNSC Regulatory Document RD/GD-99.3, *Public Information and Disclosure*.

[4-18] *Public Information Program for Canadian Nuclear Laboratories (CNL)*, CW-513430-REPT-001, Revision 2, 2017 March.