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Exposé oral

Mémoire d' Anna Tilman

In the Matter of the

À l'égard de

Canadian Nuclear Laboratories

Laboratoires Nucléaires Canadiens

Application to renew its waste nuclear substance licence for the Port Hope Project

Demande concernant le renouvellement du permis de déchets de substances nucléaires pour le projet de Port Hope

Commission Public Hearing

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Canada

Submission to the Canadian Nuclear Safety Commission (CNSC)

with respect to

Canadian Nuclear Laboratories (CNL)

Application for Renewal of its Waste Nuclear Substance Licence For the Port Hope Project for a 10-year period

November 22 2022

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CNL's Licence Renewal Application

Port Hope - Long-Term Low-Level Radioactive Waste Management Project

Background and Overview[1]

The Port Hope Area Initiative (PHAI) is a federal government initiative based on a community proposal, which includes the Port Hope Long-Term Waste Management Project (Port Hope Project) and Port Granby Long-Term Waste Management Project (Port Granby Project).

The Government of Canada, through Natural Resources Canada (NRCan), has committed to clean-up low-level radioactive waste in the Port Hope area and to provide long-term safe management of the historic low-level radioactive wastes in the Port Hope area. These wastes arose from the activities of a former federal Crown Corporation (Eldorado Nuclear) and its private sector predecessors.

The Canadian Nuclear Laboratories (CNL) is implementing the PHAI on behalf of Atomic Energy of Canada Limited (AECL), a federal Crown corporation. CNL currently holds 4 licences issued by the CNSC associated with the PHAI:

- WNSL-W1-2310.02/2022 Port Hope Project (PHP)
- WNSL-W1-2311.00/2022 Port Granby Project (PGP)
- WNSL-W1-182.0/2022 Pine Street Extension Temporary Storage Site (PSETSS)
- WNSL-W1-344-1.8/ind. Port Hope Radioactive Waste Management Facility (PHRWMF)

  - The PHP involves the construction and operation of a long-term waste management facility (LTWMF), a Wastewater Treatment Plant (WWTP) and supporting infrastructure for the long-term management of approximately 1.2 million cubic metres of historic low-level radioactive waste; the cleanup activities of the waste from various sites in Port Hope; and the transportation of this waste to the LTWMF.
  - The PGP involves the construction and operation of a LTWMF, a WWTP and supporting infrastructure for the long-term management of approximately 1.3 million tonnes of historic low-level radioactive waste removed from a former waste management site on the shoreline of Lake Ontario in Southeast Clarington.
  - The PSETSS and PHRWMF are small temporary storage sites primarily used for the short-term storage of soils contaminated with low-level radioactive waste. These wastes originated from the contaminated sites within the Municipality of Port Hope and are being remediated as part of the current PHP licence. Contaminated soils are stored at the PSETSS and PHRWMF until transferred to the PHP LTWMF, which opened in 2016.

Each of these licenced activities form parts of the Port Hope Area Initiative (PHAI) cleanup of historic low-level radioactive waste (LLRW) in the municipalities of Port Hope and Clarington.

[1] CMD 22-H13 Executive Summary

CNL's Licence Renewal Application

CNL's Waste Nuclear Substance Licence (WNSL) for the Port Hope Project (PHP) expires December 31, 2022. On September 10, 2021, CNL submitted an application to the Canadian Nuclear Safety Commission (CNSC) for a 10-year licence renewal of its Port Hope Project (PHP) Waste Nuclear Substance Licence (WNSL). CNL is also requesting consolidation of this licence with three other WNSLs into a single PHP WNSL, each of which form parts of the Port Hope Area Initiative (PHAI) cleanup of historic low-level radioactive waste (LLRW).

CNL had also proposed to incorporate effluent release limits for the PHP wastewater treatment plant (WWTP) into the licensing basis and requested that the soil clean-up criteria for arsenic and uranium be increased in that application.

On March 4, 2022, CNL submitted an amendment to its application, requesting to:

i) consolidate the PHRWMF licence with the PHP licence; and

ii) remove its requested changes to the soil clean-up criteria for arsenic and uranium from its renewal application.

Consequently, CNL's licence renewal is currently requesting CNSC to:

1. Renew the PHP WNSL and consolidate the PHP licence with three other WNSLs associated with the PHAI into a single WNSL for a 10-year licence term.
2. Incorporate effluent release limits for the PHP WWTP into the licensing basis.
3. Meet the applicable requirements of the CNSC's recently published or revised waste management and decommissioning regulatory documents for the PHAI.

CNSC staff have concluded that CNL's licence renewal application has provided "adequate provision for the protection of the environment and health and safety of persons".[2]

In reviewing documents pertaining CNL's renewal application, it is evident that there are circumstances unknown or unanticipated that could well arise in such a massive and complicated project over a 10-year licence period. As a result, one should and could anticipate limitations and delays in the clean-up operations, including the capacity to transport and store all the historic waste safely. If so, this may result in CNL requesting changes in clean-up criteria and effluent release limits for specific substances, a situation that had arisen in CNL's original licence renewal request for example, with respect to uranium and arsenic levels.

Unless the CNSC can ensure that any such requests would be made public and receive appropriate attention, it is arguable whether it can claim that it "has provided adequate provision for the protection of the environment and health and safety of persons" as stated in its CMD.[3]

[2] Ibid p. 1,2
[3] Ibid p.2

Given all the issues, anticipated or unanticipated, that may arise over the next decade, it is highly recommended that CNSC conduct a public review (e.g., within 5-7 years) to allow for an assessment of the clean-up operations to date.

Port Hope: Long-Term Low-Level Radioactive Waste Management Project (PHP)

Overview [4]

Port Hope hosted a radium refining facility from 1933 to the 1950's. This facility was owned by a former federal crown corporation, Eldorado Nuclear Limited. In the 1940's, the operation shifted to uranium conversion, an on-going activity in operation today at the Port Hope Conversion Facility, operated by Cameco Corporation.[5]

The wastes from Eldorado's operations were placed in the Welcome Waste Management Facility (WMMF), which was eventually closed in 1955, and in other locations throughout the urban area. Waste management operations shifted to Port Granby Residue Area in the mid-1950s. Originally, this waste consisted of iron and carbonate residues with trace amounts of other metals such as uranium, radium, arsenic, cobalt, copper, nickel, and zinc, and low-grade ore that was rejected from processing. Currently, the wastes are largely soil type materials that contain elevated levels of uranium, arsenic and radium.

In 2001, a legal agreement between the municipalities of Port Hope and Clarington and the Government of Canada set out the framework for the Port Hope Area Initiative (PHAI) and the launch of two environmental assessments (EA) for the clean-up and long-term management of historic low-level radioactive waste (LLRW) identified at major, industrial and small-scale sites within Port Hope and the Port Granby Residue Area.[6]

The PHAI is being carried out as two projects – the Port Hope Project (PHP) and the Port Granby Project (PGP). Each project has three phases, and both are currently in the same phase 2:

1. Pre-Construction Phase – Monitoring intended to supplement or confirm the baseline information used to conduct the EA studies.

2. Construction and Development Phase – Monitoring intended for verification of predicted environmental effects and the effectiveness of mitigation measures during project activities.

3. Maintenance and Monitoring Phase – Monitoring intended to verify that the environmental effects are as predicted by the EA and that the long-term waste management facility (LTWMF) is operating as expected. The duration of this phase will be several hundred years.

[4] CMD 22-H13 Environmental Protection Review Report Port Hope Area Initiative August 2022 p. 6

[5] This facility produces uranium hexafluoride and uranium dioxide, required in the production of fuel for light water and Candu-type, heavy water nuclear reactors.

[6] Additional information about the EAs for the two projects is provided in section 2.1 of CMD 22-H13.

PORT HOPE - THE "CLEAN-UP" AND THE LEGACY

In considering Canadian Nuclear Laboratories (CNL)'s licence application, it is important to consider its application in the context of the history of Port Hope and at the same time, other ongoing operations at Port Hope by two facilities operated by Cameco, namely, the Port Hope Conversion Facility (PHCF) and the fuel manufacturing (CFM) facility which assembles the fuel bundles. During the same period during which clean-up operations are taking place In Port Hope, Cameco's CFM applied for and was granted by the CNSC a 24% increase in production. What impact could this have on the transport of wastes and goods through the Port Hope area?

The CNSC needs to consider not only the requests CNL has made in its licence renewal application on a broad scope, but also the breadth and depth of other activities beyond the clean-up that would take place by Cameco's facilities in Port Hope. It also needs to keep uppermost in mind the history that has resulted in the level of contamination at Port Hope.

Port Hope has been the nexus of radium and uranium refining since the early 1930s. The legacy of refining these substances for over 80 years lies in its homes, schoolyards and buildings, its harbour, the soils, groundwater, and landfills, and in its residents, past, present and future.

Generations of residents in the Port Hope area and workers at the refinery had not been informed about the hazards that they were exposed to by radiological and non-radiological contaminants. During many years of operation, regulatory oversight was clearly absent. Even today, the regulations that are established are permissive and fail to protect human health, especially the most vulnerable, and the environment.

In dealing with the legacy contamination in and around the town, radioactive-contaminated material is excavated and transported by truckloads from and around homes and schools, the harbour, and other areas, to designated landfill sites. This is a massive operation carrying inherent risks of further exposing residents to hazardous material.

It is doubtful whether <u>all</u> the historic waste will or even <u>can</u> be removed, or that the "removal" will go smoothly, without any incident, be it from capacity for storing and containing the waste safely, or whether financial "restraints", including funding provided by the federal government to municipalities, indigenous organizations and community organizations, will be adequate to carry out this operation sagely and securely for the long period it will take, which is deemed the largest cleanup operation of its type in Canada.

Cameco's PHCF operates 24 hours a day year-round, except for shut-downs. As long as this facility continues its operations, emissions of uranium, arsenic and other toxins, referred to as Chemicals of Potential Concern (COPC), will continue to contaminate the air, land and water and affect the health and impact the environment of the community.

While buffer zones are typically established around dangerous industries to protect residents from ongoing emissions of dangerous substances and accidental discharges and to minimize the effects from an explosion or other incident at the facility, no buffer zone exists to separate the town's residents from this facility. The public can walk around its entire perimeter, at times within a metre or so, of uranium being stored and processed.

At the same time that Cameco's plant will operate during CNL's proposed 10-year licence period, massive clean-up operations are being carried out, not only for the historic waste, but also for the waste resulting from the clean-up, demolition, and remediation activities at the plant.

Additional workforce will be required to carry on this hazardous work on the facility site. An untold number of truckloads of hazardous materials, including historic waste and waste for remediating the site, will be transported to a long-term waste management facility yet to be built located in the Municipality of Port Hope for years.

Emissions of uranium and other dangerous toxins will continue to contaminate the air, land and water and affect the health of the community. This is a burden that no community should have to bear. It is illogical, if not impossible, to presume that all the activities and operations involved can be made so safe that all risk or most risks can be eliminated.

THE HISTORY AND THE LEGACY OF WASTES

While one is considering the present and future circumstances of the clean-up operations and the ongoing operations of the Cameco facility, it is vital to take into account the long history of operations at Port Hope that has left a legacy of hazardous waste, both radioactive substances as well as other toxic material, including arsenic and other metals.

Eldorado Gold Mines Ltd. first opened its radium refinery in Port Hope in 1932 in the middle of the town's waterfront, looming over the harbour. It is the oldest nuclear facility in the world. In the 1940s, it became a Crown Corporation and was converted to a uranium refinery for the "Manhattan Project". It was Canada's only uranium refinery until 1983, at which time the Blind River refinery opened. As noted in this submission, the Port Hope plant now functions as a conversion facility (PHCF) under Cameco, preparing uranium fuel for reactors around the world.

In taking over ownership of the refinery in the 1940s, the federal government began dismantling facilities that had been used for the production of radium when the plant shifted operations to refine uranium.[7] The used building materials that were contaminated with radionuclides were given away by the government to anyone who wanted them and used in homes and other buildings throughout Port Hope.

Initially, the processing residues from the refinery were retained on site. But from 1939 until 1948, these residues, essentially radioactive waste laden with arsenic and other toxins, were taken off site to several locations in and around the town. Despite having been warned by the American Government in 1945 of the dangers of radiation, no warning was given to the people who used these discarded materials.[8] Consequently, many sites in the Port Hope area became contaminated by spillage during transport, by unrecorded, unmonitored or unauthorized diversion of contaminated fill and other materials, and by erosion.

For about forty years, the potential problems arising from the refinery and its emissions received little note. All this time, uranium waste was used as fill, put in dumps, into the

[7] http://www.llrwmo.org/en/porthope/history.html
[8] http://www.oag-bvg.gc.ca/internet/English/pet_232_e_30304.html

harbour, and incorporated into building materials used in the town. Then in 1975, extraordinarily high levels of radon gas were detected at an extension of St. Mary's elementary school, built a decade earlier over radioactive fill from the plant. This "incident" drew national public attention.

By 1982, about 100,000 tonnes of severely contaminated soil and materials were removed from hundreds of homes and gardens in town and transported to Chalk River, Ontario, the research and development headquarters of Atomic Energy of Canada Limited (AECL), a crown corporation. Chalk River ran out of capacity and no other community wanted the radioactive waste. The "cleanup" ceased abruptly, leaving the waste that had been excavated and not removed in piles, ravines and dump sites around town, in the ground and in the harbour's sediment. [9] This situation remained in limbo for decades.

In 2004, radioactive contamination from radon was discovered at another school, Dr. L.B. Powers Public School. Records from the AECL trace detection of the contamination back to 1978, but the public was not informed of this contamination.

Eventually, the town and the federal government reached an agreement to store the historic waste locally. However, there are concerns as to whether this "cleanup" can ever be considered to be complete or for that matter, safely carried out.[10]

The Legacy Wastes

Estimates of over 1.6 million cubic metres (m^3) of soil contaminated with radioactive material, heavy metals and chemical toxins (referred to as Low Level Radioactive Waste, LLRW) reside in the Port Hope area, from decades of operations at the refinery.

Efforts in the past to move this legacy waste were fraught with problems. For example, in 1948, waste from the refinery shifted from the town to the Welcome Waste Management Facility (WWMF) nearby, a licensed waste site in the tiny hamlet of Welcome in the Municipality of Port Hope. Within just six years, after receiving about 480,000 m^3 of refinery waste, the WWMF was closed down. A new waste management site opened in 1955 in Port Granby, a few kilometres west of Port Hope on the shores of Lake Ontario. This site accumulated about 450,000 m^3 of refinery waste until 1988, when it was also closed. Both waste facilities were owned by Eldorado. In 1988, Eldorado was dissolved and the Cameco Corporation was formed, taking over ownership of the two waste sites.

This waste escaped any government oversight or regulation until 1975, when the Atomic Energy Control Board (AECB) began to regulate what is referred to as Low Level Radioactive Waste (LLRW). This resulted in the shipment of some of the radioactive soil and materials from residential, commercial and public properties in Port Hope to Chalk River.[11]

Approximately 1.2 million m^3 of uranium-and radium-contaminated soil remain in and around Port Hope, in roadbeds, ravines and parks, the municipal landfill, private homes, schoolyards,

[9] Nuclear Reaction", Kate Harries, Walrus Magazine 2008; www.walrusmagazine.com/print/2008.03-environment-radiation

[10] Ibid Estimates of over 2 million cubic metres of contaminated soil may still remain after the clean-up.

[11] Ibid

farm fields, the public beach, and the bottom of the local harbour. Some residents believe that the amount of waste is grossly underestimated.[12]

In 1982, responsibility for this waste was placed under the federal government's newly created Low-Level Radioactive Waste Management Office (LLWMO), operated by AECL and funded by National Resources Canada (NRCan). The Office was to collaborate with local communities to find a safe and acceptable solution for the waste. This process stretched out for well over twenty-five years. No community was willing to serve as a "host" to permanently store the Port Hope Area waste. Consequently, the outcome, announced October 16, 2009, was to transfer the waste locally to a "new" waste site, which happened to be the old Welcome Waste site.[13]

The new Welcome facility is to house all the designated contaminated waste from Port Hope as well the waste from the previous storage facility at that site. Remediation of residential properties commenced in early 2018. Once complete, the storage mound is to be sealed, covered with grass, and become a park.[14]

The new Port Granby site, just north of the original Port Granby site on the shores of Lake Ontario, is currently under construction. It is intended to store the radioactive waste that lies in the old site.[15] The original Port Granby site is now officially capped and closed. However, approval has been given to alter the legal agreement (which did not permit transfers from one municipality to another) and allow hundreds of truckloads of sludge from there to the Port Hope temporary storage facility over the next 3 years.

Digging up radioactively-contaminated soil in Port Hope is a major and potentially very hazardous undertaking. Most of the waste lies beneath homes and in the sediment of the harbour. Any excavation and dredging the harbour could lead to the release of radioactive material, such as radium, radon, heavy metals (e.g., lead, arsenic), asbestos, and other toxic substances), some of which could become airborne and spread hundreds of kilometres.

Estimates are that at least 50,000 truckloads (typical dump truck loads) will be required to move 500,000 cubic metres of waste alone through residential, industrial and rural areas.

Additional workforce will be needed, on site and in transporting the wastes, Utmost caution will be needed to protect the workers who will directly be handling and be potentially exposed to the waste. Despite reassurances by those in charge of their utmost confidence in their ability to do the work safely, citing the use of covered trucks, dust suppression and monitoring, the track record to date in all aspects of this legacy waste does not inspire confidence.

These waste sites will require monitoring for hundreds of years to ensure their safety. With projects of this enormity, there will likely be issues emerging that have never been considered, potential delays, and cost overruns, to say the least. After all, this is **the biggest radioactive waste cleanup in Canadian history.**

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[12] http://www.porthopehealthconcerns.com/history_contamination.htm

[13] Refer to http://www.phai.ca/userfiles/file/PDFs/Port_Hope/2009-08-26-27-Decision-AECL-PortHope-e-Edocs3440575.pdf

[14] http://www.phai.ca/en/porthope/phases.html

[15] http://www.nuclearsafety.gc.ca/eng/commission/pdf/2011-09-27-Decision-PortGranby-e-Edocs3846017.pdf

PHP Clean-up - Criteria Change – Uranium and Arsenic

CNL's original application in March 2020 requested a change to the clean-up criteria for arsenic and uranium. This change would remove reference to the uranium criterion, which would remain as it currently is, at 23 parts per million (ppm). With respect to arsenic, CNL had proposed a revised clean-up level of 56 ppm, which is a significant increase from the current level of 18 ppm.[16] (An original proposal for arsenic had been in the order of 100 ppm.)

Port Hope Community Health Concerns Committee (PHCHCC) [17]

CNL's proposed criteria changes for these substances generated much concern by the PHCHCC. In fact, the citizen's committee wrote to Prime Minister Trudeau (March 8 2021) clearly indicating that CNL's proposal would substantially weaken cleanup criteria for radioactive wastes in Port Hope and would result in an increase of the volume of contamination left behind for future generations. In its letter, the PHCHCC requested that CNL be required to withdraw their proposal and ensure existing federal commitments to the community are kept and wastes remediated as promised.[18]

CNL was seeking regulatory approval to arbitrarily establish new criteria and authorize PHAI to leave 50% more uranium (up to 35 ppm) and 450% more arsenic (up to 100 ppm) in the soil than the present criteria which were agreed to years ago after extensive consultations. This proposal would result in more contamination left in Port Hope after the cleanup for future generations than had been originally planned.

The current criteria already represent a major compromise in that the post-cleanup operations would leave soil levels of uranium up to 23 ppm, which exceeds the Ontario Ministry of Environment (MOE) soil standard (2011) of 2.5 ppm of uranium. The Ontario MOE soil standard for arsenic of 18 ppm would be met.[19]

On March 4, 2022, CNL submitted an amendment to its application, removing the request for changes to the clean-up criteria. Any future requests by CNL to change the clean-up criteria would require Commission approval and would need consideration at a future licence hearing.

After multiple reviews and discussions with CNL regarding its proposed clean-up criteria, CNSC staff and Health Canada determined that there was insufficient evidence to support the selection or use of the proposed arsenic clean-up criteria.

Furthermore, reviews conducted by Ontario Ministry of Environment Conservation and Parks (MECP), Ontario Public Health (OPH)] and Haliburton Kawartha Pine Ridge District Health Unit concluded that further information was required to validate the assumptions and calculations used in the risk assessment.

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[16] CMD 22-H13 Pp 1, 6 and 10 (PHP Clean-up Criteria Change)

[17] https://www.nrcan.gc.ca/sites/nrcan/files/engagements/radwaste/PHCHCC%20Letter%20to%20PM%20March8final.docx.pdf

[19] *"Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", Ontario MOEE, April, 2011.*

Waste Water Treatment Plants (WWTP)

The WWTPs at the PHP and PGP treat impacted water resulting from the project activities. This includes surface water impacted by contaminated soils, groundwater, and contaminated water from within the Long Term Waste Management Facility (LTWMF) when it is capped.

The PHP WWTP has been operational and discharging treated liquid effluent to Lake Ontario since January 2017. The PGP WWTP has been operating under liquid effluent release limits approved by the Commission on April 5, 2019.

Prior to the commissioning of the PHP and PGP WWTPs in 2016, CNL operated Water Treatment Plants (WTPs). These plants had limited capabilities for treating Chemicals of Potential Concern (COPCs) in the liquid effluent. For example, the PHP WTP had set licence limits for specific COPCs, i.e., radium-226, arsenic and pH. CNL had proposed changes to the limits for uranium and arsenic but had to pull back from that request.

While the PHP WTP is still operational, it is only used in the event of an emergency to augment the treatment capacity of the PHP WWTP. For example, during heavy rainfall events in 2017, 2018, 2019 and 2020, CNL restarted the PHP WTP to treat excess waste water. The operation of the PHP WTP is only permitted following CNL's notification to CNSC staff in accordance with CNL's emergency water contingency plan. This plan is in place to avoid a release of untreated water to the environment.[20]

The treated liquid effluent from the WWTPs is aligned with Federal and Provincial surface water quality guidelines. Once treated, the effluent is released to Lake Ontario. [21]

Port Hope Harbour & Centre Pier

The Port Hope Harbour site is by far the most complex site of the PHAI. The site was designated an Area of Concern (AOC) in 1987 under the Canada-U.S. Great Lakes Water Quality Agreement and remains as an AOC today.[22]

The contamination in the Harbour resulted from industrial activity by Eldorado Mining and Refining between 1933 and 1953, resulting in an estimated 85,000-95,000 cubic meters of contaminated sediment which overlies the till and bedrock surface throughout the approach channel and turning basin of the harbour.

Remediation of the Harbour involves the removal of contaminated sediment down to bedrock or hard till; the removal and replacement of the deteriorated harbour walls where required to support remediation; the removal of historic Low Level radioactive Waste (LLRW) and industrial waste from the Center Pier, and subsequently, the restoration of the harbour to a natural state.

The thickness of the contaminated sediment is variable, extending to as much as 4 m deep. It is removed by both mechanical and hydraulic dredging, and then placed on the adjacent Centre

[20]The June 2017 event is summarized in section 3.3.3.1 of CMD 22-H13

[21] CMD 22-H13 Section 5.6

[22] CMD-H13.1 p.4 Port Granby Long-Term Low-Level Radioactive Waste Management Project licence [2], the Pine Street Extension Temporary Storage Site licence [3] and the Port Hope Radioactive Waste Management Facility licence. Refer to pp 100-101 of this CMD for specific information on the proposed work.

Pier property to allow for dewatering and subsequently transported to the Port Hope Long-term Waste Management Facility (PH LTWMF). The water generated by this process is treated by a temporary water treatment system located on the Center Pier and is discharged back into the harbour.

In 2018/2019 a wave attenuator was installed at the harbour entrance from Lake Ontario to separate the work area from the lake. Erosion controls, a water treatment system and infrastructure for dewatering of sediments have also been installed.

Where there is a deviation found between predicted effects and what is being measured, adaptive management practices are applied to determine what additional mitigation measures are required.

A particular example of this occurred in the fall of 2021 at the Port Hope Harbour dredging operations and contaminant migration. While the original EA prediction made certain assumptions regarding inflows and how the inner harbour would be isolated, the actual conditions related to daily inputs of water to the inner harbour during dredging were found to be different than anticipated by the EA. **Specifically, levels of total and dissolved arsenic and uranium exceeded predicted levels in the water column.**

CNL requested that the permitted criteria levels of arsenic and uranium be increased (Arsenic criteria from 18 ppm to 56 ppm, Uranium criteria from 23 ppm to 35 ppm). However considerable opposition to this request from communities and government agencies resulted in maintaining the current maximum criteria levels of arsenic and uranium.

Given the level of contamination and condition of the harbour, the amount of work involved in the clean-up operations at the harbour is extensive, complicated, and potentially dangerous, both to the environment, the workers involved, and the community as a whole. It cannot be underestimated. The overriding question is to what degree the harbour can be "cleaned".

Cleaning up the Harbour [23]

Several agencies (levels of government – federal and provincial regulators and conservations authorities) are engaged in the clean-up operations to ensure transparency and solicit feedback in the development of a path forward to ensure the ongoing protection of Lake Ontario and the Ganaraska River, a significant tributary of Lake Ontario. This resulted in the development of a monitoring program to ensure the protection of the aquatic environment while dredging activities continue at the Port Hope Harbour.[24]

The PHAI cleanup of the Port Hope Harbour began in 2001, with mechanical dredging of the approach channel and the turning basin. This type of dredging facilitates the removal of large objects from the water and also removes contaminated sediment. The sediment is then dewatered before being transported for storage at the Long-Term Waste Management Facility. Barges are used to assist in this process, particularly to store the dredged material as well as host the dredging equipment during in-water work. Hydraulic dredging of the sediments is

[23] https://www.phai.ca/cleaning-up-the-port-hope-harbour/

[24] The Ganaraska River is populated almost entirely with wild, naturally reproducing fish.

expected to start later this year and the barges will facilitate the transition from an excavator to a dredge pump. As of October 2021, almost 9,000 tonnes of dewatered material has been solidified and transported for long-term storage.

"De-fishing" of the inner harbour is underway. This term means that fish are removed from the area being worked on to another location just outside the area so the fish don't get killed by dredging and other clean-up activities.[25] It is typically done annually as a means of protecting aquatic life. This work requires a closed system.[26] Previous electrofishing campaigns resulted in over 6,000 fish of varying species being safely removed and relocated to Lake Ontario outside the Inner harbour work area.[27]

Dredging activities are carefully monitored for potential impacts that were identified during the Environmental Assessment and additional mitigation measures are put in place as needed. For example, early on in the dredging process, some fish were found in the sediment processing area, mainly identified as catfish. These are bottom dwelling fish that were not recovered during previous electrofishing campaigns, and have remained in the inner harbour. However, as the recovered fish were discovered in the sediment dewatering area, CNL staff and contractors are unable to place the fish back into the harbour as this would constitute a safety concern.

This particular situation demonstrates the dangers involved in the clean-up process itself that are not initially considered or unknown, and arise unexpectedly, with no safe recourse.

Following the remediation phase, the harbour is to undergo habitat restoration that includes improved habitat for fish and other species that exist in that region. The placement of sand, gravel, cobble and rocks in the corners of the turning basin is expected to provide habitat diversity, shelter for various fish species and promote the growth of aquatic plants.

With the cleanup of the Port Hope Harbour completed, the expectation is that the site will be removed from the Great Lakes **Areas of Concern**. At this stage, no specific time has been indicated when or if this would happen.

Radiation Exposure to Nuclear Energy Workers (NEWs)[28]

Radiological hazards result from exposure to uranium and decay progeny, including Thorium-230, Radium-226 and short-lived radon decay products and to a lesser extent, isotopes in the natural Thorium-232 decay chain. The primary exposure pathway is external gamma radiation, followed by inhalation of radon gas and progeny. Inhalation and ingestion of long-lived radioactive dust also contributes to total effective dose. Radiation exposures of persons are monitored to ensure compliance with the CNSC's regulatory dose limits, PHAI Action Levels and to maintain radiation doses to "As Low As Reasonably Achievable (ALARA)".

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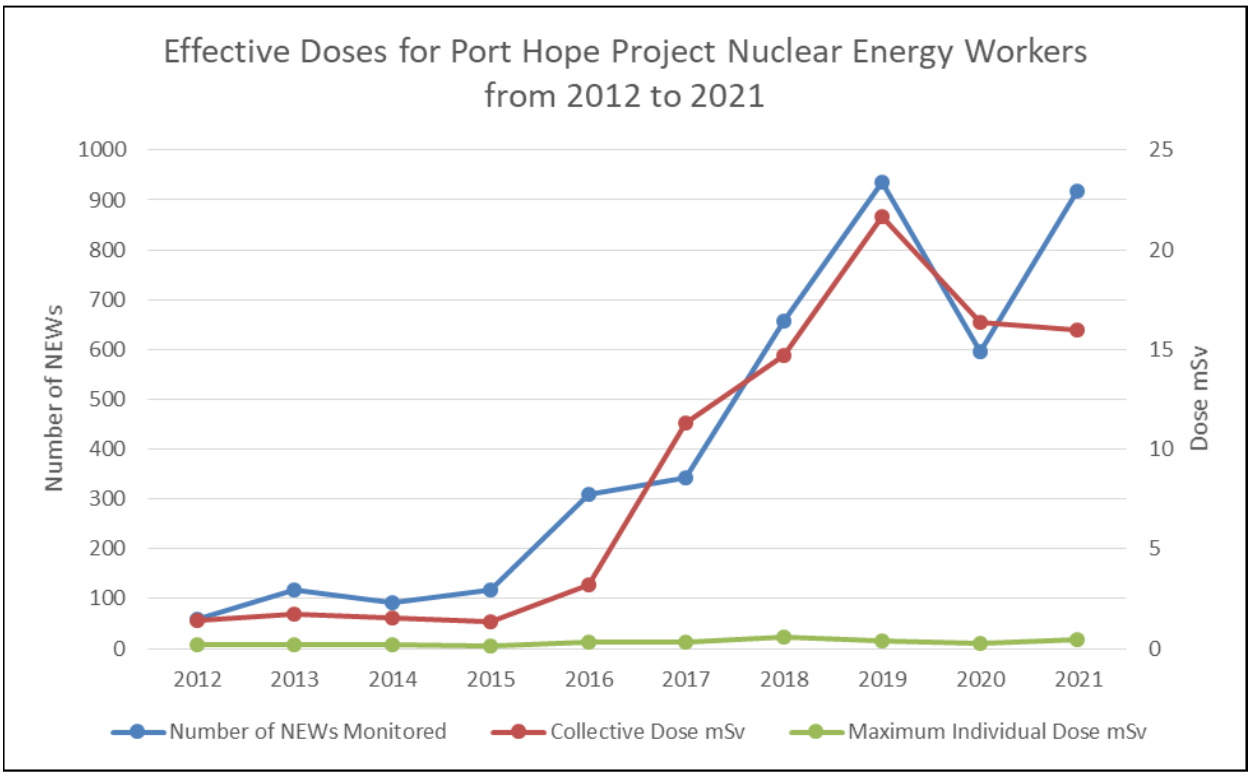
[25] https://www.phai.ca/success_stories/port-hope-harbour/

[26] Lake Ontario Management Unit: Ontario Ministry of Northern Development, Mines, Natural Resources & Forestry issues the permit for de-fishing.

[27] Electrofishing is **a technique used by fish biologists to collect fish in freshwater streams, rivers, and lakes**. This tool uses an electric field, emitted from a pulser, to temporarily stun fish.

[28] CMD 22 –H13.1 p. 125 - 128



In CNL's submission, it notes that "in the 5-year dosimetry period of January 1, 2016 to December 31, 2020 the PHP had increased in scope of work, contributing to the overall increase in the number of Nuclear Energy Workers (NEWs) and thus the collective dose."
While that may be the case, one may presume that in the next period or decade, the collective dose could well increase.

Reportable Events

While what is referred to as "reportable events" provide a listing of accidents, or events that have occurred in a specific year, there are limitations as to what is considered a reportable event. Also, the details of these events are not necessarily public.[29]

Based on CNSC's submission;

There were two reportable events at the Port Hope Project (PHP) in 2021:

> The first event was a release of 15 cubic metres of untreated water to the inner harbour from the Port Hope Harbour Centre Pier. The discharged water contained chromium VI, fluoranthene, pyrene and aluminum in excess of the environmental compliance approval, issued by the Ontario Ministry of the Environment Conservation and Parks. The cause of the event was related to procedural adherence, a breakdown in communication, and a gap in a contractor's environmental program.
>
> The second reportable event was related to truck carrying clean backfill and striking an overhead powerline on Shuter Street in Port Hope.

As of July 1, 2022, 5 reportable events occurred at the PHP, as described below:

> In January CNL reported 2 events related to the packaging and transportation of radioactive material (refer to section 3.14.3.1 of this CMD).
>
> In June 2022, CNL reported an effluent action level exceedance for arsenic. The cause of the exceedance was due to an increase of influent water temperature in conjunction with the age of the reverse osmosis membrane. CNL is intending to replace the reverse osmosis membrane to restore the effectiveness of the system. That same month, CNL reported that the PHP WWTP, the weekly release limit for copper and the action level for zinc were exceeded.
>
> Another event related to wooden pallets supporting super-sacks of Cameco waste that were placed into the LTWMF, which is a deviation from the waste placement design.

While the CNSC does not seem to be overly concerned about these events or the potential adverse environmental and health effects to the public, and the workers, these events should have been avoided and not be summarily dismissed. CNSC finds that CNL is meeting reporting requirements. However, this is an inadequate response to "events" overall. It brings to question what type of event and frequency of events would even raise concern as to CNL's practice and CNSC's oversight.

With regard to past reporting practices, which required quarterly reports on monitoring and project updates, the recent publication of CNSC's REGDOC-3.1.3 recommended by CNSC staff is intended to provide a consistent approach to reporting. Whether this change would be an improvement with respect to reporting is yet unknown. What is even more important is the need to have consistent, clear, and detailed reporting of "events" with specific details available to the **public**, especially to residents in the Port Hope Area and workers at the CNL facilities.

[29] CNSC CMD 22-H13 p. 25 Table 2

Lessons Learned?

Some of the major challenges faced during the remediation of the former Port Granby (PG) Waste Management Facility, which had significant impacts on schedule and cost, included "unanticipated" waste types (compressed gas cylinders) discovered during excavation in 2017 and several unpredictable precipitation events during excavation in 2017 and 2019. This resulted in surface-water runoff and collection points in several areas of the former PG Waste Management Facility.

The excessive rainfall restricted and suspended excavation activities of LLRW from the former PG Waste Management Facility. Consequently, CNL implemented changes to mitigate the impact of heavy precipitation at both the Port Hope and Port Granby sites.[30]

All waste was removed from the former Port Granby Waste Management Facility to the newly constructed PG LTWMF by September 2020. The final waste volumes were 1.3 million metric tonnes (~650,000 m^3), significantly higher than the original forecast volume of 1.036 million metric tonnes (518,000 m^3).[31] Interestingly, the waste volumes were over 20% higher than predicted. But it is not just the volumes but the actual substances themselves and their toxicity that are critical.

Cumulative Effects

While some attention is being paid to Chemicals of Potential Concern (COPC), there is a notable absence of consideration by both the CNSC and CNL of the cumulative effects of these substances to the environment, the lake and to human health and the workers at the facilities.

Setting individual limits for specific COPCs and radioisotopes may provide some degree of acknowledgment of the potential hazardous effects of these substances, but this does not allow for consideration of the effects of cumulative effects of exposure to numerous substances over time, or to the variability in individual responses to such substances. Under no circumstances, should the term "harmless" be used.

Waste Management Program and Decommissioning Plans [32]

The current PHAI licences do not have a specific licence condition for a waste management program. While the wastes generated as a result of the PHP and PGP activities are being stored in the PHP and PGP LTWMFs, as the projects transition to long-term maintenance and monitoring (Phase III), it will not be possible for the LTWMFs to accept waste.

Consequently, CNL will need and will be required by the CNSC to develop and implement waste-related programs and decommissioning plans for the PHP and PGP supporting infrastructure as they transition to Phase III of the clean-up to meet regulatory requirements.

[30] CMD 22 H13-1 p. 60
[31] Ibid p. 65
[32] Ibid Section 3.11.4 and 3.11.5 pp. 65,66,63

In fact, CNSC staff have proposed two standardized licence conditions for the waste management SCA that require CNL to implement and maintain a waste management program and to maintain a decommissioning plan.[33]

Concluding Remarks

There is no doubt that clean-up operations must continue for decades, but these operations must be done with the utmost care for the environment and human health in the Port Hope area and criteria must not be weakened, but rather strengthened as to levels of the pollutants in the wastes, such as arsenic and uranium, as a prime example.

Can this waste be safely contained in perpetuity – if that is that even possible? This is the big unknown. Already, the effects of weather, climate change, have hampered some of the clean-up operations.

Clearly, in dealing with such a massive and complicated matter, there are far more factors that can emerge or be anticipated. It is also critical to have a robust monitoring program in place. At the same time, CNSC's proposal for that require CNL to implement and maintain a waste management program and to maintain a decommissioning plan is essential and supported.

The reality, though, is that "clean-up" really means removing contaminated materials from one site to another to hopefully store the stuff indefinitely, which in itself, may be impossible.

After all, we are talking about radioactive and other toxic wastes originating from the early 1930's that have resulted in such a level of contamination rendering the Port Hope Harbour declared an Area of Concern (AOC) in the Great Lakes. Will that designation ever be removed?

That would be something to work toward!

[33] ibid p.63