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**Written submission from
Swim Drink Fish Canada /
Lake Ontario Waterkeeper**

**Mémoire de
Swim Drink Fish Canada /
Lake Ontario Waterkeeper**

**Regulatory Oversight Report for
Uranium and Nuclear Substance
Processing Facilities in Canada: 2018**

**Rapport de surveillance
réglementaire des installations de
traitement de l'uranium et des
substances nucléaires au Canada :
2018**

Commission Meeting

Réunion de la Commission

December 11, 2019

Le 11 décembre 2019

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Preliminary Submissions of Swim Drink Fish Canada/Lake Ontario Waterkeeper

Re: Commission meeting to consider CNSC Staff
Regulatory Oversight Report for Canadian Nuclear
Substance Processing Sites: 2018

Notice of Public Meeting, Ref. 2019-M35

November 12, 2019

Submitted to:
Participant Funding Program Administrators cnsccpf@canada.ca and the CNSC
Secretariat cnsccint@canada.ca

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Executive Summary

Swim Drink Fish Canada/Lake Ontario Waterkeeper (“Waterkeeper”) is a grassroots environmental organization that uses research, education, and legal tools to protect and restore the public’s right to swim, drink, and fish in Lake Ontario.

Waterkeeper has received participant funding to intervene in this current Canadian Nuclear Safety Commission (CNSC) Meeting to review the CNSC staff 2018 Annual Regulatory Oversight Report (ROR) for Canadian Nuclear Substance Processing Sites. Waterkeeper’s funding agreement requires the organization to prepare and deliver written submissions concerning unplanned events at Cameco’s Port Hope Conversion Facility (PHCF) and the Port Hope Harbour as well as public information programs concerning the PHCF and Port Hope Harbour.

Waterkeeper has retained two experts to prepare these submissions:

- **Pippa Feinstein, JD**, counsel and case manager for Waterkeeper, who has also conducted the review in these submissions concerning public engagement activities and information disclosure by Cameco, Canadian Nuclear Laboratories (CNL), CNSC staff and other government bodies and agencies responsible for the Port Hope Harbour; and
- **Wilf Ruland, P. Geo.**, an experienced hydrogeologist and recognized leading expert on the impacts of industrial facilities on local groundwater and surface water, who has focused his review on the PHCF and several unplanned events in and around the PHCF and Port Hope Harbour as well as their impacts to the local surface water in the harbour and Lake Ontario.

Waterkeeper has intervened regularly for over a decade concerning the PHCF facility as well as efforts to address legacy contamination in the Port Hope Harbour. Throughout this time, the organization has consistently highlighted the need for greater transparency and accountability, both of CNSC as the primary regulatory body overseeing the PHCF and Port Hope Harbour remediation work, as well as Cameco, CNL, and other government agencies.

Waterkeeper reviewed environmental reports and data concerning four unplanned assessing the possible environmental impacts of each. Waterkeeper also made recommendations to improve the way these events are publicly reported and advocated for greater disclosure of routine and event-specific environmental monitoring of the Port Hope Harbour.

This intervention also addresses the need for CNSC staff and Cameco to develop broader conceptions of public engagement and what it requires. Waterkeeper also addresses recent public polls that were referenced by CNSC staff and Cameco to indicate current public engagement activities were sufficient, finding that these polls do not in fact preclude the importance of additional public disclosures of environmental data.

Background

About Swim Drink Fish Canada/Lake Ontario Waterkeeper

Swim Drink Fish Canada/Lake Ontario Waterkeeper (“Waterkeeper”) is a grassroots environmental organization that uses research, education, and legal tools to protect and restore the public’s right to swim, drink, and fish in Lake Ontario. As a non-political registered charity, Waterkeeper focuses on research and justice issues in the public interest. It is dedicated to protecting and celebrating the Lake Ontario watershed, including the wetlands, streams, rivers, and creeks that flow into the lake.

Waterkeeper also works with communities to facilitate the use of environmental laws to protect their rights to swim, drink, and fish. The organization participates in legal processes to help ensure that environmental decisions are made on the basis of sound and tested scientific evidence by independent decision-makers and in the public interest. Waterkeeper is intervening before the Canadian Nuclear Safety Commission (CNSC) in the current Regulatory Oversight Report (ROR) Commission Meeting in order to ensure the Commission Tribunal considers the public’s need for a swimmable, drinkable, fishable Lake Ontario when reviewing the adequacy and responsibility of nuclear substance processing facilities’ operations during 2018.

This current intervention opportunity

Waterkeeper has received participant funding to intervene in this current Commission Meeting to review the CNSC staff 2018 Annual Regulatory Oversight Report (ROR) for Canadian Nuclear Substance Processing Sites. Waterkeeper’s funding agreement requires the organization to prepare and deliver written submissions concerning unplanned events at Cameco’s Port Hope Conversion Facility (PHCF) and the Port Hope Harbour as well as public engagement and reporting activities concerning the PHCF and Port Hope Harbour.

Waterkeeper has retained two experts to prepare these submissions:

- **Pippa Feinstein, JD**, counsel and case manager for Waterkeeper, who has also conducted the review in these submissions concerning public engagement activities and information disclosure by Cameco, Canadian Nuclear Laboratories CNL), CNSC staff and other government bodies and agencies responsible for the Port Hope Harbour; and
- **Wilf Ruland, P. Geo.**, an experienced hydrogeologist and recognized leading expert on the impacts of industrial facilities on local groundwater and surface water, who has focused his review on the PHCF and several unplanned events in and around the PHCF and Port Hope Harbour as well as their impacts to the local surface water in the harbour and Lake Ontario.

Waterkeeper’s past work on related issues

Waterkeeper has been reviewing and assessing clean-up efforts in Port Hope since the organization was founded in 2001. Over the last decade alone, Waterkeeper:

- intervened before the CNSC in 2008 when Cameco first applied to implement its (then) Vision 2010 project to improve conditions at its PHCF which borders the Port Hope Harbour;

- submitted comments to the Ontario Ministry of Environment in 2009 when Cameco applied for its Certificate of Approval from the provincial ministry concerning releases of liquid effluent from the PHCF;
- intervened before the CNSC in 2011 offering expert analysis and recommendations concerning the Environmental Impact Statement (EIS) and licence for Cameco’s proposed refurbishing and decommissioning work at the PHCF;
- intervened before the CNSC during the 2016 licence renewal hearing for the PHCF; and
- intervened before the CNSC in 2017 to follow-up on several Cameco and CNSC staff undertakings from the 2016 licence renewal proceedings during the Commission Meeting to consider CNSC staff’s ROR for nuclear processing facilities.¹

Throughout all of these interventions, Waterkeeper has consistently highlighted the need for greater transparency and accountability, both of CNSC as the primary regulatory body overseeing the PHCF and Port Hope Harbour remediation work, as well as Cameco and CNL (the two companies responsible for the PHCF and Port Hope Area Initiative respectively). Waterkeeper’s past interventions have also consistently underscored the need for more transparency and accountability by other government bodies and agencies including the Municipality of Port Hope, the Ontario Ministry of Environment, Conservation and Parks (MECP), and the federal Department of Fisheries and Oceans (DFO).

Over the last decade, Waterkeeper has called on CNSC staff to provide more detailed information to support its assertions that its oversight is sufficient as well as its claims that licensees’ operations do not pose environmental risks. Waterkeeper consistently advocates for greater environmental data disclosure including public access to both routine monitoring results as well as reports documenting unplanned incidents. Since 2014, Waterkeeper has recommended that the CNSC proactively make its own monitoring data publicly available in real-time and in machine-readable formats, and require its licensees to do the same. While this may take time to achieve, progress is long overdue.

Persisting concerns with current meeting intervention procedures

For this current intervention proceeding, Waterkeeper was able to obtain an unusually fulsome amount of environmental disclosure (including multiple sets of environmental monitoring data) to assist with its reviews. This unprecedented amount of data disclosure was in part because its requests spanned this intervention process as well as the CNL ROR proceedings which ended last month. This meant Waterkeeper has been able to gather information since August, much of which was received in time for these submissions. The volume of disclosure was also due to quick responses by CNSC staff, the Municipality of Port Hope, and Cameco to Waterkeeper’s information requests. Waterkeeper is grateful for all the environmental information (including requested data) received and for the respectful and timely responses received.

¹ For a more detailed overview of past work, see “Submissions of Swim Drink Fish Canada/Lake Ontario Waterkeeper Re; CNSC Review of the Regulatory Oversight Report for Uranium and Nuclear Substance Processing Facilities in Canada: 2016”, November 13, 2017, online: <http://www.waterkeeper.ca/blog/2017/11/23/waterkeeper-reviews-nuclear-safety-report-environmental-protection-performance>.

Significantly, the higher-than-usual disclosure amount has confirmed what Waterkeeper has always submitted to the Commission Tribunal: that greater transparency and environmental disclosure can help to build public trust and confidence in nuclear regulation which ultimately benefits the regulator and regulated entities as well as the public.

Further, the disclosures obtained for this current intervention process have confirmed for Waterkeeper that important and varied environmental data is being collected concerning a broad range of environmental conditions in surface water around the Port Hope Harbour, some of which is proactively being made publicly available, but much of which is not.² The environmental data already being collected by companies and government agencies should be more widely available and posted online. This would greatly assist public interest organizations such as Waterkeeper to verify whether nuclear processing facilities, and legacy nuclear waste remediation efforts, are operating responsibly and in a way that protects local ecosystems. It would also assist members of the public and CSOs preparing interventions before the CNSC.

The availability of data for this intervention also shows how simple and easy it could be for regulators and licensees to make this kind of information public proactively online. The data is already being collected and documented, it just needs to be publicly posted.

In the meantime, and even if more proactive disclosure occurs moving forward, Waterkeeper still believes that amendments are urgently needed to improve Commission Meeting intervention procedures to ensure they are more meaningful to public participants. The following recommendations would also help these Commission Meeting processes to promote greater transparency and accountability in the nuclear sector.

Timelines

Often, intervention preparation can be quite a fraught process due to short timelines provided by the Commission. However, in the case of this intervention, Waterkeeper was able to bridge its current research with work undertaken during the former CNL ROR proceeding that ended last month. This allowed it to partly avoid the inadequacies and limitations of the current intervention opportunity's timeline. Waterkeeper effectively began collecting the information required for this submission in late August. Had the organization only been able to work within the timelines given for this Processing ROR proceeding, this current submission would not likely have been possible.

Just under two months were provided as notice for funding applications to intervene in this proceeding, with the notice published on May 27, and funding applications due July 26, 2019. Once applications were submitted, it took another two months to render a funding decision, which was received by Waterkeeper on August 30, 2019. Waterkeeper's written submissions were required by November 12. The CNSC staff ROR, which is meant to help guide the current Commission Meeting intervention was only made available on October 11, effectively providing a month for its review. Thankfully, due to Waterkeeper's head start, it had obtained much of its required information by mid-October.

² Note: "proactive disclosure" refers to information automatically posted online, rather than information which may be available upon request by members of the public.

In several of its most recent interventions, Waterkeeper had recommended at least three months be afforded by the CNSC to intervenors for their reviews. The current intervention experience has affirmed that this is a much more workable timeframe for the organization. This three-month period should span from the date on which organizations are notified of the actual granted funding amounts until the date on which written submissions are due. The release of CNSC staff RORs should also be made as soon as possible to the funding announcement date to further assist intervenors in preparing their written submissions.

Recommendation 1: that the CNSC ensure intervenors have at least three months to prepare written interventions for future public meetings. This time period would span from the date on which organizations are notified of the actual granted funding amounts until the date on which written submissions are due.

Recommendation 2: that CNSC staff ensure their ROR is available to intervenors at least two months in advance of due dates for intervenor written submissions.

Access to information

It is important to note that for Waterkeeper's purposes, the ROR for nuclear processing facilities is an insufficient source of environmental information in and of itself. Only approximately seven pages of the entire ROR are devoted to environmental data, including Appendix F to the report which is meant to focus on more detailed data sets concerning the environmental performance of nuclear processing facilities. Further, data is often expressed as annual averages, preventing any understanding of seasonal variation or other trends or peaks in contaminant concentrations at facilities over the year-long period.

In his expert review, Mr. Ruland also found the descriptions of each processing facility lacked consistency. For example, the ROR provides tables with data concerning the groundwater conditions for some processing facilities, while groundwater conditions at other facilities are not mentioned at all. The same is true for the uneven way in which stormwater management and discharges are addressed (or not) in the ROR.³ No explanation for these inconsistencies between facilities are included in the ROR, and it remains unclear how CNSC staff determine which data should be reported in annual RORs.

Recommendation 3: that CNSC staff clarify how they select which environmental data to publish in RORs, and that they specify the basis of these decisions in future RORs.

Recommendation 4: that Commissioners require more fulsome and standardized disclosure of environmental data in all future CNSC staff RORs. This should include at least a description and analysis of all known discharges of liquids that could carry contaminants from facilities to local ground and surface water. This should include: process water, cooling water, groundwater, and sanitary and storm sewers.

³ See pages 4-5, and 12 of Wilf Ruland's expert report, Appendix A to these submissions.

While Cameco's quick responses to information requests greatly helped ensure there was sufficient information for the current intervention, Waterkeeper's past interventions have shown that not all regulated companies are so responsive and forthcoming with their information (and historically Cameco had not been as obliging, either). Current intervention timelines often mean that interventions focus mainly on obtaining information, and often have to be drafted without having received sufficient responses to information requests. The focus on obtaining information to inform interventions also means there is often insufficient time left for actual synthesis and analysis of information received. This can constitute not only a waste of Waterkeeper's experts' time and expertise, but a waste of the Commission's time and participant funding as well. Waterkeeper's experts are often already donating much of their time to supplement these intervention processes and contribute what they can to assist the organization in its important public interest work. More proactive disclosure by CNSC staff of materials used to inform their RORs would help address this concern.

Recommendation 5: that links to reference documents relied on by CNSC staff in their RORs be made publicly available (electronically) along with the publication of future RORs to ensure intervenors can reference these additional sources of information as early as possible in the intervention process.

Cameco's assistance and cooperation over the past month also illustrates that licensees' attitudes towards and conduct during information request processes can help to make public interventions more meaningful – for members of the public as well as Commissioners. Waterkeeper urges CNSC staff to work with all current licensees to emphasize the importance of being more responsive to intervenors' information requests during public hearing or meeting processes.

Finally, more formalized information request procedures spread over longer timeframes, would better support intervenors and ensure experts could provide more value-added information.

Recommendation 6: The CNSC should immediately initiate a comprehensive review of access to information or interrogatory processes for future Commission meetings and hearings in consultation with stakeholders.

Recommendation 7: In the meantime, the CNSC should immediately institute the following changes concerning access to information by intervenors for future Commission meetings:

- a. *When notifying organizations of their funding grants, Participant Funding Program officers should also provide contact information for designated individuals representing the nuclear facilities that are subject to the meeting reviews. These representatives should be prepared to field questions and should be made aware of intervenors' timeframes and deadlines; and*
- b. *Some CNSC staff time, and industry/proponent staff time must be designated to providing intervenor-requested information and engaging in follow-up information requests and/or site visits.*

Unplanned Event Reporting

The ROR document notes that there were 13 reported events at the PHCF over the course of 2018, however no description of any of these events is provided in the report.⁴ Three event reports for 2018 have been posted to Cameco's website on a webpage dedicated to the environmental and safety performance of the facility.

Waterkeeper has been able to obtain some information online as well as supplementary information directly from Cameco concerning four unplanned events that had the potential to impact local water quality (two of which were posted to Cameco's website). These events occurred either on or directly bordering the PHCF and constitute an important focus of this current intervention. The first event concerns the collapse of the West Wall of the Port Hope Harbour which borders the PHCF, the second event concerns a groundwater release from the PHCF to the Harbour, the third concerns a stormwater release from the PHCF to the Harbour, the fourth involved Action Level exceedances in the PHCF sanitary sewer. Each will be discussed in greater detail below.

Collapse of the West Wall of the Port Hope Harbour

On October 12 Waterkeeper saw a news story documenting the collapse, three days earlier, of the west harbour wall in Port Hope Harbour.⁵ The story noted that the collapse was not a surprise as it had been deteriorating for some time. It assured the public on behalf of the municipality that "there are no human or safety concerns related to this incident and that the area will continue to be monitored regularly".

The following three follow-up actions were also shared:

- A new silt curtain was sourced and scheduled for installation that week. The barrier was to be installed along the length of the west harbour wall, from the north to the south end, and was designed to prevent suspended materials from migrating into the rest of the harbour.
- End-to-end investigation of the sanitary sewer line was completed using a closed-circuit camera. Municipal staff determined that the pipe is clear and stable.
- The municipality's regular water sampling schedule was enhanced and was being conducted by municipal staff daily. The Canadian Nuclear Safety Commission (CNSC) was also conducting water sampling to ensure water safety and compliance.⁶

⁴ CNSC Staff Regulatory Oversight Report Concerning Nuclear Substance Processing Facilities, 2018, at 42.

⁵ Greg Davis, "Repairs underway following Port Hope harbour wall collapse", *Global News*, October 12, 2018, online: <<https://globalnews.ca/news/4542149/repairs-underway-port-hope-harbour-wall-collapse/>>.

⁶ *Ibid.*

A press release from the municipality of Port Hope had been published on October 9, 2019 with these same pieces of information,⁷ though it would not have had the same reach as the online article.

Apparently, care and control of the west wall of the harbour is the primary responsibility of the Municipality of Port Hope and not the CNSC or a CNSC-licensee. However, CNL is conducting remediation work in the Port Hope Harbour and is aware of conditions there (conducting routine monitoring of surface water quality in the harbour) as is Cameco. Further, the west wall had been a barrier stopping contaminated groundwater below Cameco's PHCF from entering the harbour. Thus, when it fell, so did that important barrier, permitting an increase in groundwater contamination from the PHCF to the harbour until a turbidity curtain was installed and subsequent repairs could be undertaken.⁸

Surface water quality data from the Port Hope Harbour was obtained by Waterkeeper from CNSC staff, the Municipality of Port Hope, Cameco, and CNL.⁹ Most data indicated detectable but fairly modest increases in uranium concentration in the harbour that likely resulted from the wall collapse. The municipality measured <0.5 ug/L, Cameco measured an average of 11ug/L in the fourth quarter of 2018 with peak levels around 31 ug/L.¹⁰ Water samples taken on October 11 by CNSC staff measured up to 10.42 ug/L.¹¹

Waterkeeper has long-advocated for better coordination and cooperation between the different agencies and companies responsible for addressing Port Hope's legacy waste issues. The monitoring data Waterkeeper was provided with for this intervention confirmed that complementary regulation and monitoring of the Port Hope Harbour is extremely important for a number of reasons. First, it ensures a holistic understanding of surface water conditions, with each government agency responsible for distinct but overlapping aspects of the same area. Second, the parameters being tested for by all government agencies and companies together are usually broader than those for any one agency or company alone. Third, monitoring results for the same substances by different agencies can confirm general readings. All these factors can result in more comprehensive and effective understandings of environmental conditions, which in turn can ensure more effective oversight.

For example, CNSC staff tested for cobalt, nickel, arsenic (As), antimony, lead, thorium, uranium (U), gross alpha, Radium-226 (Ra-226), Total Suspended Solids (TSS). CNL tested for TSS, Total As and dissolved As, Total U and dissolved U, Ra-226, as well as field parameters (including optical dissolved oxygen (ODO % Sat), oxidation reduction potential (ORP), total dissolved solids (SPC), temperature, turbidity, and pH). The municipality tested for As, U, total coliform, *e. coli*,

⁷ Municipality of Port Hope, "Media Release: Port Hope West Harbour Wall", October 9, 2019, online: <<http://www.porthope.ca/news/media-release-port-hope-west-harbour-wall>>.

⁸ See Ruland Report generally and at 15 in particular for a characterization of groundwater quality issues at the PHCF, Appendix A to these submissions.

⁹ Note: CNL had actually denied any data to Waterkeeper concerning the Port Hope Harbour during last month's CNL ROR intervention process. CNL sampling results for this intervention were supplied by Cameco with CNL's permission.

¹⁰ Ruland Report, Appendix A to these submissions, at 20.

¹¹ CNSC Staff Regulatory Oversight Report Concerning Nuclear Substance Processing Facilities, 2018, at 2.

heterotrophic plate count, field free chlorine, and temperature. Cameco has identified the following as contaminants of concern (COCs) at the PHCF site: U, As, ammonia, nitrate, fluoride, Ra-226, trichloroethylene, dichloroethylene, and vinyl chloride and certain of their annual and quarterly compliance and monitoring reports contain only some of this data.¹² Here, the different testing parameters contribute to a more fulsome conception of harbour water conditions, and also ensure the accuracy of results for commonly tested contaminants.¹³

While it is heartening to know much of this monitoring is ongoing, only the Municipality of Port Hope regularly publishes its water quality monitoring results online. Waterkeeper recommends that all companies and government agencies conducting water quality monitoring in and around the Port Hope Harbour and PHCF make their sampling results publicly available. The gold standard for doing so would be real-time posting of this data in machine-readable formats.

Recommendation 8: that all governments and government agencies proactively and publicly release monitoring data. As much as possible, data should be provided in real time and machine readable formats.

Recommendation 9: that CNSC staff, CNL, Cameco, and the municipality of Port Hope consider collaborating more on major incident communications to ensure the public knows in a timely way:

- a) when the incident occurred;
- b) measured environmental effects (including sharing available monitoring data); and
- c) a description of any mitigation and/or remediation efforts undertaken to address incidents after they occur.

Groundwater release from the PHCF into the Harbour

On January 11, 2018, a cold snap caused a transfer pipe to crack carrying contaminated groundwater from a purge well to be discharged into the harbour. The following incident report was posted to the Cameco website:

Date	January 11, 2018
Incident	Groundwater release
Details	Due to fluctuating weather conditions, a transfer pipe was damaged and released a small amount of groundwater to the storm water system which drains to the harbour adjacent to the Port Hope conversion facility. The duration of the leak was less than one hour.
Corrective Action	Pumping wells were shut off to halt groundwater flow through the pipe. The Canadian Nuclear Safety Commission, the Ministry of Environment and Climate Change and the Municipality of Port Hope were notified.
Cameco Environmental Effect Rating	<u>1</u>

¹² Ruland Report, Appendix A to these submissions, at 13.

¹³ Confirmed via email correspondence with Wilf Ruland, November 9, 2019.

Event report from Cameco website, accessed October 16, 2019.¹⁴

This report does not have a posting date, nor does it note the quantity or concentration of groundwater released to the harbour, or applicable Action Levels (ALs), Derived Release Limits (DRLs) or regulatory limits. Instead, Cameco asserts that the incident did not have a significant environmental impact, noting it was assigned an environmental effect rating of 1 (as are virtually all events reported to their website). This rating is meant to indicate there is no measurable environmental effect resulting from the incident).

Waterkeeper requested a copy of the event report prepared by Cameco for the CNSC, Spills Action Centre, and municipality as well as any relevant monitoring data. Cameco provided a redacted version of that report which noted that an estimated 325 L of contaminated groundwater (with a uranium concentration of approximately 5,600 ug/L) was likely released into the harbour over the course of this event which lasted less than an hour.¹⁵ No values were provided for any other potentially released contaminants.

Stormwater release from the PHCF into the Harbour

On August 8, 2018, heavy rain caused stormwater to flood two buildings at the PHCF, which was directed by Cameco staff to a nearby storm sewer catch basin, and ultimately the Port Hope Harbour.

Date	August 8, 2018
Incident	Reportable Spill and ERT Response
Details	Heavy rain caused localized flooding at the conversion facility in the vicinity of the waste processing facility. Cameco's Emergency Response Team (ERT) was activated. To prevent rainwater from making contact with electrical systems and posing a safety hazard, rainwater that had entered an electrical room was redirected to the ground outside. There were no injuries and no impact to the environment.
Corrective Action	Cameco is further investigating the incident. The Canadian Nuclear Safety Commission, the Spills Action Centre and the Municipality of Port Hope were notified.
Cameco Environmental Effect Rating	1

Event report from Cameco website, accessed October 16, 2019.¹⁶

Again, this report does not have a posting date, nor does it note the quantity or concentration of groundwater released to the harbour, or applicable Action Levels (ALs), Derived Release Limits (DRLs) or regulatory limits. Cameco assigned it an environmental effect rating of 1.

¹⁴ See online: <https://www.cameco.com/businesses/fuel-services/conversion-port-hope/environment-safety>.

¹⁵ Ruland Report, Appendix A to these submissions, at 19.

¹⁶ See online: <https://www.cameco.com/businesses/fuel-services/conversion-port-hope/environment-safety>.

Waterkeeper requested a copy of the event report prepared by Cameco for the CNSC, Spills Action Centre, and municipality as well as any relevant monitoring data. Waterkeeper was granted a redacted version of Cameco’s report which noted that it was impossible for Cameco to estimate the volume of liquid involved. Water quality sampling was done of the overflow as well as from a nearby stormwater outlet discharging into the harbour. Uranium levels in both were between 45-46 ug/L.¹⁷ No values were provided for any other potentially released contaminants.

Waterkeeper has been concerned about stormwater releases from the PHCF in recent years, especially as not all of its outfalls have been subject to regular testing. However, the site’s surface drainage system will be the subject of significant repair and renovation works in the near future which will allow Cameco to mitigate if not prevent these sewer exceedances and failures.¹⁸

It is important to note that for all events described above, the ultimate receiving waters were in Port Hope’s Harbour. During Waterkeeper’s past interventions concerning the Port Hope Area Initiative, Mr. Ruland highlighted the need for water quality remediation measures of some kind to address increasing concentrations of contaminants while remediation work in the area is ongoing.¹⁹ To date, Waterkeeper is not aware of any specific steps taken by any authority or company to mitigate harbour water quality.

Recommendation 10: that CNL and Cameco collaborate with the municipality of Port Hope to take positive steps towards remediating water quality in the Port Hope Harbour that would prevent or mitigate activities and incidents that would further contaminate surface water in the harbour.

There is also a need to better understand if significant releases of contaminated water from the Harbour are flowing into the wider lake. After reviewing current information from CNL, Cameco, CNSC staff, and the Municipality of Port Hope, it appears there is a noticeable lack of monitoring points in the lake outside of the harbour, especially points downstream from the PHCF.²⁰

Recommendation 11: that more water quality testing be conducted by Cameco, CNL, and CNSC staff in the lake outside of the harbour and downstream from the PHCF to ensure the harbour water is being adequately contained.

Action Level exceedance in the PHCF sanitary sewer

From August 8-10, 2018, daily ALs were exceeded in sanitary sewers due to leakage of contaminated groundwater into the sewers – this leakage caused by elevated groundwater levels resulting from the August 8 heavy rainfall. No values have been given for uranium levels in the sanitary sewers, though Cameco has asserted that the monthly release limit of 275 ug/L was not

¹⁷ Ruland Report, Appendix A to these submissions, at 19.

¹⁸ Conference call with Cameco, November 8, 2019.

¹⁹ See: “Submissions of Lake Ontario Waterkeeper Re: Reviewing Canadian Nuclear Safety Commission (CNSC) staff’s status report on Canadian Nuclear Laboratories Limited’s (CNL) Port Hope Area Initiative (PHAI), and participating in the Commission Process, October 3, 2016, online: <http://www.waterkeeper.ca/blog/2016/10/11/reviewing-lake-ontarios-ailing-radioactive-wounds-in-port-hope-phai-and-camecos-conversion-facility> at 12.

²⁰ Ruland Report ,Appendix A to these submissions, at 18.

exceeded.²¹ These sewers feed into the municipal water treatment plant where they receive varying levels of treatment (depending on the contaminant as well as whether there are any bypass events and the plant) before being discharged into Lake Ontario.

This event was not posted to the Cameco website as the company only began posting sanitary sewer events in 2019. To date, 10 reportable events involving sanitary sewers have been reported to its website in 2019, which never would have been publicly available before.²² Waterkeeper commends Cameco for making this change and posting these types of events this year and moving forward. It will be important to track these events over time, especially as precipitation events in the region are likely to continue to increase in frequency and severity with climate change.

Generally, what is clear from all four incidents discussed above is that Cameco has knowledge of much more information concerning unplanned events than it makes public. Further, the reports it prepares for agencies responsible for overseeing the facility and regulating unplanned events include valuable environmental data. It should therefore not be considered unreasonable to require Cameco to make more data available to the public online in posted event reports. In particular, a date should be provided noting when the report was posted to the Cameco website in addition to the actual event date. All available environmental data concerning the quantity, or estimated quantity, of the release as well as concentrations of released contaminants (i.e. data prior to dilution in the environment) should be included. Applicable ALs, DRLs, and regulatory limits should also be available (either in the report itself or via an easily accessible link) so that members of the public can understand reported release amounts and concentrations in context. Further, data should be provided (either in the report itself or via an easily accessible link) of any measured environmental impacts (i.e. post-dilution data). Finally, for incidents requiring mitigation and/or remediation activities, a description of these activities should be provided as well as any updates on their success (where such records are already required by governing agencies).

Recommendation 14: that Cameco include the following in its online event reports:

- a) *The event's posting date to Cameco's website;*
- b) *quantity and concentration of released contaminants;*
- c) *applicable ALs, DRLs, and regulatory limits;*
- d) *measured environmental impacts; and*
- e) *a description of any mitigation and/or remediation efforts undertaken to address incidents after they occur.*

Public engagement

The remainder of this report contains discussions concerning CNSC staff's conceptualization of public engagement in their ROR. It also evaluates the larger regulatory and policy context of public engagement and the importance of environmental information disclosure that includes public

²¹ The daily AL for uranium at the PHCF is 100 ug/L. Ruland Report, Appendix A to these submissions, at 19.

²² See online: <https://www.cameco.com/businesses/fuel-services/conversion-port-hope/environment-safety>.

access to disaggregated data (recommended above). Finally, this section ends with an evaluation of Cameco's public engagement polls noting that they should not be considered to preclude the need for greater environmental reporting.

CNSC staff's conceptualization of public engagement in the ROR

Cameco's public engagement activities are modest. However, CNSC staff list them in the ROR (e.g. an open house event, use of social media, and updating its website) and quickly deem them satisfactory.²³ When describing public engagement in the ROR, it is apparent that CNSC staff's conceptualization of what should constitute engagement is too limited. As a result, it is likely their fairly narrow definition of what public engagement means and requires that leads them to find Cameco's current engagement practices to be sufficient.

While Cameco's presence is felt in Port Hope, and general awareness of PHCF is high, these are insufficient indicators in and of themselves of adequate public engagement. There are several indicators of robust public engagement that are completely missing from any discussion of this issue in the ROR.

First, the public is not a homogeneous entity. Different segments of the public will have an interest, need, and capacity for different types of information as well as different types of communication between themselves and Cameco.²⁴ Most references to "the public" seem to really be talking about local residents, who again should not be considered a homogenous group. What one local resident may want to know, and the extent to which they may want to interact with OPG, will differ greatly from another resident and be determined by many social and economic factors. Both will differ in a myriad of ways from Civil Society Organizations (CSOs), and CSOs will differ from one another based on their own particular mandates and areas of expertise. To assume that the same engagement exercises will work for all members of an unspecified public body will lead to further inaccurate findings and assertions by CNSC staff examining the success of Cameco activities and their satisfactoriness.

Second, all engagement activities undertaken by Cameco, and assessed by CNSC staff in the current ROR, focus on one-way communication *from* Cameco *to* "the public". No examples are mentioned of any communication or information-sharing *from* members of the public *to* Cameco. Nor are any discussions included in the ROR concerning what Cameco would do should it receive this information. Significantly, CNSC hearing and meeting processes constitute one of the more structured and meaningful avenues by which communication between Cameco and diverse stakeholders can flow both ways. As such, it is surprising that these processes are not addressed at all in the ROR.

Third, no mention is made in the ROR of interactions between Cameco and CSOs, especially CSOs that constitute regular interveners during CNSC hearing and meeting processes. As such, these organizations (which include Waterkeeper) are effectively excluded from CNSC staff's

²³ CNSC staff's Regulatory Oversight Report of Nuclear Substance Processing Sites, 2018 at 56.

²⁴ Note: this point was the focus of the most recent federal Open Government Action Plan, which is discussed more below.

definition of “the public” and public engagement. This is a significant oversight that does a disservice to the important work these organizations do to help ensure greater transparency and accountability of Cameco operations and CNSC regulation of them.

Finally, while information-sharing is mentioned by CNSC staff in their references to Cameco engagement activities, no mention is made of data sharing which is recognized as a crucial aspect of meaningful information disclosure. This final point will be discussed in greater detail below.

The CNSC’s provision of environmental information

The CNSC’s mandate requires it to provide and ensure the provision of environmental information to members of the public. Section 9(b) of the *Nuclear Safety and Control Act* specifies that the CNSC’s objectives include:

disseminat[ing] objective scientific, technical and regulatory information to the public concerning the activities of the Commission and the effects, on the environment and on the health and safety of persons, of the development, production, possession and use [of nuclear substances].²⁵

Further, the CNSC’s own Participant Funding Program recognizes the importance of value-added information provided by qualified individuals and organizations representing diverse public interests.²⁶

Underlying these provisions is the recognition that individuals and communities have a right to know how operations at regulated nuclear facilities may impact them, including their health and their environment.

The public has a right to a healthy Lake Ontario and information concerning the health of the lake, which is recognized in other Canadian statutes as well. The preamble of the Great Lakes Protection Act (GLPA) states that “all Ontarians have an interest in the ecological health of the Great Lakes-St. Lawrence River Basin”.²⁷ Ontario’s Environmental Bill of Rights acknowledges that Ontarians have the right to a healthful environment.²⁸ However, inadequate access to information concerning the ecological footprint of nuclear generating sites and their associated waste facilities prevents the public from being able to assess how these sites may affect their right to a healthful environment, or whether such an impact can be considered acceptable.

The federal government’s commitment to open data

The federal government’s current Open Government National Action Plan, recognizes that this is “a moment of global importance for the open government movement”,

Rapid digital progress is increasing people’s expectations for their governments. Citizens want us to show we are ready and capable, and we will look out for them... Taking

²⁵ *Nuclear Control and Safety Act*, RSC 1997, c 9, at s 9(b).

²⁶ See PFP description: Canadian Nuclear Safety Commission, Participant Funding Program Eligibility Criteria, online: < <http://nuclearsafety.gc.ca/eng/the-commission/participant-funding-program/eligibility-criteria.cfm>>.

²⁷ *Great Lakes Protection Act*, SO 2015, c 24, Preamble.

²⁸ *Environmental Bill of Rights*, SO 1993, c 28, Preamble.

action to build public trust in government institutions is of ongoing importance. Open government can be an important way to renew that trust. It can show how governments are working, how they seek to understand citizens' needs, and how they serve those needs. It can also help to keep governments honest and accountable.²⁹

The core goal of the plan is to create “a governing culture that fosters greater openness and accountability, enhances citizen participation in policymaking and service design, and creates a more efficient and responsive government”.³⁰ Open Science continues to be a special priority area for the plan, including greater public access to environmental data.

However, nuclear-related data appears to be significantly underrepresented when compared with other industries and other data concerning non radiological or non-nuclear-specific contaminants.

The public has a right to know about the quality of the environments of which they are a part, and meaningfully informing the public necessarily requires public access to environmental data.³¹ While government and industry representatives can assert that members of the public are safe and that ecosystems are unaffected by nuclear facilities, these assurances need to be supported with publicly accessible data.

The CNSC's REGDOC 3.2.1.

The CNSC recently amended its own internal regulatory document concerning public information and disclosure requirements for all regulated facilities. This policy states the “primary goal of a public information and disclosure program... is to ensure that information related to health, safety and security of persons and the environment, and other issues associated with the lifecycle of the nuclear facilities are effectively communicated to the public.”³²

Robust public disclosure protocols at regulated nuclear facilities are a cornerstone of ensuring the industry's transparency and accountability. They are an important way by which more trusting relationships can develop between industry and the public, not to mention an important way in which facilities can obtain social licenses to operate in communities. Licensees often claim the safe and responsible operation of their nuclear facilities. However, providing sufficient information

²⁹ See online: <https://open.canada.ca/en/content/canadas-2018-2020-national-action-plan-open-government#toc8>.

³⁰ *Ibid.*

³¹ The public Right to Know in environmental contexts has been most developed in the US, constituting a guiding principle in recent federal and state legislation and policy, see: <https://19january2017snapshot.epa.gov/www3/epahome/r2k.htm>. Also, see generally the work of the Environmental Data & Governance Initiative, online: <https://envirodatagov.org/environmental-data-justice/>; and the Right2Know Network, online: < <https://ourrighttoknow.ca/campaigns/right-to-know-network/> >. See also: Peter H Sand, “The Right to Know: Environmental Information Disclosure by Government and Industry”, January 2005.

³² REGDOC-3.2.1 *Public Information and Disclosure*, s 2.1, online: <<http://nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-documents/published/html/regdoc3-2-1/index.cfm>>. Note, this was the same in the previous *Public Information and Disclosure*, Regulatory Document 99.3, March 2012, s 2.1. There is a REGDOC 3.1.1 which concerns public reporting requirements of licensed nuclear facilities, however it only applies to nuclear power plants.

to the public that supports these claims is vital. Regular, proactive, and comprehensive public information-sharing also supports evidence-based and participatory decision-making processes.

2019 Port Hope Public Opinion Survey

For the last few years, Cameco has commissioned an annual public opinion survey in Port Hope. The survey is referenced in CNSC staff’s ROR to assert the adequacy of Cameco’s public engagement, citing statistics in the report that assert 74% of respondents were aware that Cameco hosts open houses, and 83% of respondents who believe Cameco “protects people and the environment”.³³

These studies seem to have surveyed approximately 400 residents of the municipality each year (via landline, mobile phone and online), and ask general questions about residents’ awareness of and confidence in Cameco and its operation of the PHCF.³⁴ However, while CNSC staff and Cameco assert that these studies prove the sufficiency of public engagement activities, the statistics also support Waterkeeper’s recommendations for additional environmental disclosure.

No respondents were asked whether they would support further information disclosure so that their operations could be verified by interested members of the public or CSOs – thus it would be problematic to assert this would not be the case. Environmental concerns constituted the majority of specific concerns recorded by the survey – approximately 15% were concerned about environmental impacts of the PHCF (this was higher for respondents under 30), an additional 20% were concerned about impacts to the waterfront, and a further 15% expressed concerns related to leaks, water contamination, and dumping. Thus, the survey indicates that Port Hope residents care deeply for the ecological wellbeing of the Harbour and waterfront as well as potential impacts the PHCF may have on these precious resources.³⁵ In the 2018 public poll, similar results were recorded with the PHCF’s environmental impact constituting the most significant concern (45% of respondents, up from 22% the previous year).³⁶ Ultimately, given public interest in the environmental performance of the PHCF, Waterkeeper submits the survey would support its recommendations for additional environmental and data disclosures concerning routine operations and monitoring as well as information and data specific to event reports.

Conclusion

Waterkeeper has intervened regularly for over a decade concerning the PHCF facility as well as efforts to address legacy contamination in the Port Hope Harbour. Throughout this time, the organization has consistently highlighted the need for greater transparency and accountability, both of CNSC as the primary regulatory body overseeing the PHCF and Port Hope Harbour remediation work, as well as Cameco, CNL, and other government agencies.

³³ CNSC staff’s Regulatory Oversight Report of Nuclear Substance Processing Sites, 2018 at 56.

³⁴ See online: <https://www.camecofuel.com/library/media-library/documents/2019-port-hope-public-opinion-survey-summary-report>.

³⁵ *Ibid* at 16.

³⁶ See online: <https://www.camecofuel.com/uploads/downloads/2018-Port-Hope-Report-Summary.pdf>, at 11.

Waterkeeper reviewed environmental reports and data concerning four unplanned assessing the possible environmental impacts of each. Waterkeeper also made recommendations to improve the way these events are publicly reported and advocated for greater disclosure of routine and event-specific environmental monitoring of the Port Hope Harbour.

This intervention also addresses the need for CNSC staff and Cameco to develop broader conceptions of public engagement and what it requires. Waterkeeper also addresses recent public polls that were referenced by CNSC staff and Cameco to indicate current public engagement activities were sufficient, finding that these polls do not in fact preclude the importance of additional public disclosures of environmental data.

Summary of Recommendations

Recommendation 1: that the CNSC ensure intervenors have at least three months to prepare written interventions for future public meetings. This time period would span from the date on which organizations are notified of the actual granted funding amounts until the date on which written submissions are due.

Recommendation 2: that CNSC staff ensure their ROR is available to intervenors at least two months in advance of due dates for intervenor written submissions.

Recommendation 3: that CNSC staff clarify how they select which environmental data to publish in RORs, and that they specify the basis of these decisions in future RORs.

Recommendation 4: that Commissioners require more fulsome and standardized disclosure of environmental data in all future CNSC staff RORs. This should include at least a description and analysis of all known discharges of liquids that could carry contaminants from facilities to local ground and surface water. This should include: process water, cooling water, groundwater, and sanitary and storm sewers.

Recommendation 5: that links to reference documents relied on by CNSC staff in their RORs be made publicly available (electronically) along with the publication of future RORs to ensure intervenors can reference these additional sources of information as early as possible in the intervention process.

Recommendation 6: The CNSC should immediately initiate a comprehensive review of access to information or interrogatory processes for future Commission meetings and hearings in consultation with stakeholders.

Recommendation 7: In the meantime, the CNSC should immediately institute the following changes concerning access to information by intervenors for future Commission meetings:

- c. When notifying organizations of their funding grants, Participant Funding Program officers should also provide contact information for designated individuals representing the nuclear facilities that are subject to the meeting reviews. These representatives should be prepared to field questions and should be made aware of intervenors' timeframes and deadlines; and*

- d. *Some CNSC staff time, and industry/proponent staff time must be designated to providing intervenor-requested information and engaging in follow-up information requests and/or site visits.*

Recommendation 8: that all governments and government agencies proactively and publicly release monitoring data. As much as possible, data should be provided in real time and machine readable formats.

Recommendation 9: that CNSC staff, CNL, Cameco, and the municipality of Port Hope consider collaborating more on major incident communications to ensure the public knows in a timely way:

- d) when the incident occurred;*
- e) measured environmental effects (including sharing available monitoring data); and*
- f) a description of any mitigation and/or remediation efforts undertaken to address incidents after they occur.*

Recommendation 10: that CNL and Cameco collaborate with the municipality of Port Hope to take positive steps towards remediating water quality in the Port Hope Harbour that would prevent or mitigate activities and incidents that would further contaminate surface water in the harbour.

Recommendation 11: that more water quality testing be conducted by Cameco, CNL, and CNSC staff in the lake outside of the harbour and downstream from the PHCF to ensure the harbour water is being adequately contained.

Appendix A

Independent Review of CNSC's 2018 Regulatory Oversight Report for Uranium and Nuclear Substance Processing Facilities, and Review of 2018 Reports on Cameco's Port Hope Conversion Facility

Prepared for:

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November 12, 2019

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Introduction

I am a hydrogeologist, and I have worked as a professional for 33 years (2 years in Germany and 31 years in Canada). I am a specialist in groundwater and surface water contamination issues, and have investigated many such issues over the course of my consulting career. I have done considerable nuclear-related work in the past 10 years.

I have given testimony as an expert witness on hydrogeological issues before various boards, including the Environmental Review Tribunal, the Environmental Assessment Board, the Joint Board, the Ontario Municipal Board, the Niagara Escarpment Commission, and the Canadian Nuclear Safety Commission (CNSC). A copy of my Curriculum Vitae is available upon request.

I am retained as an expert by Swim Drink Fish Canada / Lake Ontario Waterkeeper (LOW) to provide an independent review of the CNSC's 2018 Regulatory Oversight Report for Uranium and Nuclear Substance Processing Facilities (hereafter referred to as the "2018 NSPF Report"), with a focus on environmental protection performance including storm water runoff management at Cameco's Port Hope Conversion Facility. LOW was awarded CNSC funding to support my review.

There are two parts to my review:

Part 1)

Review of the adequacy of the 2018 NSPF Report in describing the groundwater and surface water quality impacts related to inorganic, organic, and radiological contaminants which may be associated with any aspect of the facilities featured in the report.

Part 2)

Review of various 2018 reports on the environmental protection performance at Cameco's Port Hope Conversion Facility (PHCF).

In order to carry out my work, I have reviewed a number of documents and the most important of these are listed as references in **Appendix 1** of this review.

In order to carry out my **Part 1** work I carried out a straightforward review of the 2018 NSPF Report. I would have liked to explore the environmental performance of each of the facilities featured in the report in detail by seeking further information, but my scaled back CNSC funding award was not adequate for this level of detail in my review.

In order to carry out my **Part 2** work I carefully considered all available information on the 2018 performance of the PHCF. In the course of my Part 2 review work I also met by phone with Cameco staff on Nov. 8, 2019 and asked questions about various aspects of the PHCF's 2018 environmental performance.

This report outlines my findings, conclusions and recommendations following my Part 1 and Part 2 reviews.

Part 1 - Review of Adequacy of the 2018 NSPF Report

a) Introduction

The 2018 NSPF Report focuses on three safety and control areas (SCAs): radiation protection, environmental protection, and conventional health and safety. My comments as a water expert will only pertain to the environmental protection component of the report.

From my perspective as a hydrogeologist the adequacy of the 2018 NSPF Report can be measured at this time by the degree to which the report provides a concise yet complete overview of facility impacts on groundwater and surface water conditions for each of the facilities featured in the report.

My overall finding is that in this regard the 2018 NSPF Report could be significantly improved. This finding is the same as it was 2 years ago, when I carried out a review of the 2016 NSPF report - there has been little progress made in dealing with the issues which I had identified at that time.

Any Uranium / Nuclear Substance Processing facilities will have the following possible discharges of liquids which could carry contaminants and potentially cause unacceptable off-site environmental impacts:

- process water;
- cooling water;
- off-site groundwater flow which may carry contaminants leaching from on-site soil contamination;
- sanitary sewer discharges;
- storm sewer discharges.

The 2018 NSPF Report provides an overview description of conditions at 4 Uranium processing facilities and 3 nuclear substance processing facilities. In my review of the 2018 NSPF Report I have considered the report's description of conditions at each facility from the perspective of consistency (between facility descriptions) and completeness (for each facility). I will deal with each of these issues in turn.

b) Consistency of Facility Descriptions and Discussions

There are 4 identically titled subsections containing description/discussion for each of the seven facilities featured in the 2018 NSPF Report - one of which is Environmental Protection, within which all discussion of soil and water impacts is found.

I have found that there are significant differences in terms of overall content and level of detail within the Environmental Protection subsection for each facility. The differences can not be explained away simply by virtue of the fact that each facility has a different geographical setting, a different design and layout, and different production processes.

For example there is a discussion of groundwater monitoring in the Environmental Protection section of the 2018 NSPF Report pertaining to the Cameco Blind River Refinery which contains details such as peak Uranium concentrations in groundwater (which are quite low), and a table of related Uranium groundwater data in Appendix F.

On the other hand the discussion of groundwater monitoring at the Cameco Port Hope Conversion Facility provides only information on the mass of Uranium and other contaminants being removed from groundwater by on-site purge wells. There is no information at all about levels of Uranium or other concentrations of Contaminants of Concern (COCs) in groundwater, even though the groundwater at this site is heavily contaminated and requires the use of the aforementioned groundwater purge well system.

Another example of reporting inconsistencies in the 2018 NSPF Report centers around the subject of stormwater discharges from each facility. Following is a summary of how stormwater discharges and downstream monitoring (which would assess the effects of such discharges) are handled and reported for each of the four Uranium processing facilities featured in the 2018 NSPF Report:

Cameco Blind River Refinery

- All stormwater is collected in lagoons (together with other plant effluents), treated as needed, and discharged with prior monitoring for uranium, nitrate, radon-226, and pH.
- A table (Table 3.3) is provided which shows average concentrations of these parameters for the past 5 years.
- Downstream surface water monitoring is being done at the facility's outfall diffuser in Lake Huron, with results provided in Table F-1.

Cameco Port Hope Conversion Facility (PHCF)

- Even though stormwater monitoring is being done internally, there is no mention of the PHCF's stormwater discharges at all in the 2018 NSPF Report.
- No stormwater monitoring data are provided in the report even though it is my strong sense (based on the detailed knowledge I have of this particular facility) that the highest ongoing inputs of uranium from the PHCF to the Port Hope Harbour are currently via leaking storm sewer lines.
- Downstream surface water monitoring is done in Port Hope Harbour (which receives stormwater and cooling water discharges from the facility), and results are generally benign due to the massive dilution provided by the cooling water and harbour water.

Cameco Fuel Manufacturing Inc

- I could find no mention of stormwater discharges at all in the 2018 NSPF Report for this facility, and there is no indication that such discharges are monitored.
- Downstream surface water monitoring is done 3 times per year, and results provided in the report are generally benign.

BWXT Nuclear Energy Canada Inc.

- I could find no mention of stormwater discharges at all for the 2 facilities (in Toronto and Peterborough), and there is no indication that such discharges are monitored.
- I could find no mention of downstream surface water monitoring being done for the 2 facilities.

There are similar differences in quantity and quality of reporting for the facilities featured in the 2018 NSPF Report when it comes to soils contamination, groundwater contamination, and discharges to sanitary sewers. These differences in reporting are problematic, and there is room for significant improvement in this regard.

I think that in a report of this type, each of the possible pathways by which liquid contamination could originate and escape from the site should be listed and discussed in sufficient detail to allow the reader to get a sense of the relative significance of the pathway. Downstream monitoring results should also be presented and discussed for each facility.

It is also currently very challenging to check any of the claims about site performance in the 2018 NSPF Report because there are few references provided to the more detailed documentation/reporting which has been summarized in the section for each facility.

Recommendation 1

a) In future NSPF Reports the discussion for each featured facility should include a description and analysis of each of the possible discharges of liquids which could carry contaminants and potentially cause unacceptable off-site environmental impacts:

- process water;
- cooling water;
- off-site groundwater flow which may carry contaminants leaching from on-site soil contamination;
- sanitary sewer discharges;
- storm sewer discharges.

b) Full references and/or links should be provided to the more detailed documentation/reporting which has been summarized in the report's section for each facility.

I firmly believe that taking a systematic approach to the reporting for each facility will make for a better and more helpful report overall.

c) Completeness of Description/Discussion for Each Facility

Following is an overview of my findings regarding the completeness of the description and discussion regarding potential water-related impacts for each of the facilities featured in the 2018 NSPF Report.

In general the facility descriptions and discussions of monitoring results were helpful, but in most cases they were not complete - so there is room for improvement in this reporting.

i) Cameco Blind River Refinery (BRR)

- Each of the surface liquid streams (plant effluent, stormwater effluent, and sewage treatment plant effluent) was identified, and the method of treatment and monitoring (including overview results) was presented.
- All surface liquid streams are collected in lagoons, treated as needed, and discharged with prior monitoring for uranium, nitrate, radon-226, and pH.
- A table (Table 3.3) is provided which shows average concentrations of these parameters in the combined liquid effluents for the past 5 years.

- The text of the report indicates that the BRR has action levels (which are used to ensure that license limits for various parameters will not be exceeded), and states that no action levels were exceeded at any time in 2018. Missing from the report's discussion and the table of related results (Table 3-3) are the actual action levels for this facility.
- Groundwater monitoring results are discussed and an overview is presented in Table F-1 in Appendix F.
- Downstream surface water monitoring is being done at the facility's outfall diffuser in Lake Huron, with results provided in Appendix F, Table F-2. The results are benign.

ii) Cameco Port Hope Conversion Facility (PHCF)

- There was a description of the groundwater pump and treat system and the groundwater monitoring program in the 2018 NSPF Report, but useful data were not provided.
- Contaminant concentrations in groundwater were not presented.
- The mass of COC's being removed by the groundwater pump and treat system was provided, but not the percent capture rate.
- There is no process water generated at this facility.
- Liquid streams include the (once through) coolant water and sanitary sewer discharges.
- The report does not specifically address the coolant water discharges.
- A daily action level (100 ug/L Uranium) and a monthly release limit (275 ug/L) for sanitary sewage have recently been implemented for this facility. The action level was exceeded on multiple occasions in 2017, 2018 (and in 2019). These exceedences are attributed to unusually high Lake Ontario water levels which in turn backed up and raised groundwater levels beneath the site, allowing inflow of contaminated groundwater into the sanitary sewer system. (This implies that there are significant leaks in the sanitary sewer system).
- Cameco has responded with a detailed investigation and targeted repairs on sections of the sanitary sewer network.
- Even though stormwater monitoring is being done internally, there is no mention of the PHCF's stormwater discharges at all in the 2018 NSPF Report.
- No stormwater monitoring data are provided in the report even though it is my strong sense (based on the detailed knowledge I have of this particular facility) that the highest ongoing inputs of uranium from the PHCF to the Port Hope Harbour are currently via leaking storm sewer lines.
- Downstream surface water monitoring is done in Port Hope Harbour (which receives stormwater and cooling water discharges from the facility), and the 2018 test results are generally benign due to the massive dilution provided by the water in the harbour.
- Table F-5 in Appendix F shows that average Uranium levels in the harbour in 2018 were at the highest levels seen since 2014 (in fact these were the highest levels since 2009). There is no mention in the report of what likely caused the rise in Uranium levels (a collapse of a significant length of the west wall of the Port Hope harbour's turning basin in October 2018).
- Table F-5 in Appendix F shows that average fluoride levels have gradually risen to just above the CCME guideline (0.12 mg/L) in the Harbour with 2018 levels of 0.16 mg/L, but it is not clear why this is occurring. The issue is not discussed in the report.

iii) Cameco Fuel Manufacturing Inc

- Process effluent is collected, treated to remove uranium, and then tested prior to controlled release to the sanitary sewer. Test results are presented in Table 5.3, but results are expressed in loadings of kg of uranium/year, which makes comparison to surface water standards impossible.
- The license limit for effluent discharges to the sanitary sewer (of 475 kg/year uranium) is absurdly high and should be revised downward to recognize that uranium is also a potent chemical contaminant.
- I could find no mention of stormwater discharges at all for this facility, and there is no indication that such discharges are monitored.
- Downstream surface water monitoring for Uranium is done 3 times per year at 9 stations, and results are said to be generally benign. Actual data are not provided in the report.
- There is a groundwater monitoring program for this facility (involving a network of 70 monitoring wells), but no details were provided other than an unsettling statement that *“the groundwater monitoring results confirm that current operations are not contributing to the concentrations of uranium in groundwater on the licensed property.”*
- There is no disclosure of the levels of groundwater contamination by uranium or other parameters on the property, but it is my sense based on the statement above that they will be elevated.

iv) BWXT Nuclear Energy Canada Inc.

- BWXT has two facilities being reported on, in Toronto and in Peterborough.
- Waste water from the BWXT facilities is collected, filtered and tested prior to its release to the sanitary sewers - with test results provided in Table 6-3.
- The report indicates that there are action levels which are used to screen sampling results, but what these action levels might be is not divulged (they are not shown in Table 6-3).
- The license limits for effluent discharges from the 2 facilities to the sanitary sewer (of 9,000 kg/year and 760 kg/year of Uranium) are preposterously high and should be revised downward to recognize that Uranium is also a potent chemical contaminant with surface water limits in Ontario of 5 ug/L.
- I could find no mention of stormwater discharges at all for these facilities, and there is no indication that such discharges are monitored.
- I could find no mention of downstream surface water monitoring being done for either of these facilities.
- I could find no mention of groundwater quality monitoring being done at these facilities.

v) SRB Technologies (Canada) Incorporated

- Tritium effluent discharged from the facility is monitored, with average annual results provided in Table F-16 in Appendix F.
- Discharges and the license limit in Table F-16 were expressed in Terabequerels per year (TBq/year) or Trillions of Bequerels per year - which is an effectively meaningless unit of measurement unless total annual flows in Litres are also provided (they weren't).
- Stormwater system discharges are tested, however no results were provided. By comparison, results were provided in the 2016 NSPF Report. Is something being hidden?

- Groundwater monitoring is done at 46 wells, with an overview of results across the site and surroundings provided in Figure 8-4.
- Figure 8-4 only shows 2 of 21 on-site wells, and 6 of 25 off-site wells. Groundwater flow directions are not shown on the figure.
- Only one on-site well has tritium levels above the Ontario Drinking Water Quality Standard of 7,000 Bq/L, with average levels of about 40,000 Bq/L in this most contaminated well (MW06-10).
- A total of 25 off-site residential and business wells are also sampled with the highest residential well tritium level of 120 Bq/L being noted.

vi) Nordion (Canada) Inc.

- All liquid effluent from this facility is collected and sampled prior to discharge. Results of testing are provided in Table F-18 of Appendix F.
- Discharges and the license limit in Table F-18 were expressed in Gigabequerels per year (GBq/year) or Billions of Bequerels per year - which is a effectively meaningless unit of measurement unless total annual flows in Litres are also provided (they weren't).
- All test results meet the Licence Limits - in many cases the Licence Limits (which are Derived Release Limits) are a factor of 50,000 to 1,000,000 times higher than the levels in the effluent. This either means that the effluent is very clean, or that the License Limits are too high. In the absence of total annual flows in Litres per year there is no way of knowing.
- The report indicates that there are also Action Levels (which were met) but the Action Levels are not specified.
- Nordion has a progressive groundwater monitoring program, which includes sampling of 9 wells for radiological and conventional industrial contaminants. Test results are not provided, but are said to be below background levels and/or method detection limits.
- There is no mention of stormwater discharges from the facility, and likewise no mention of stormwater quality monitoring.
- I could find no mention of downstream surface water monitoring being done for this facility.

vii) Best Theratronics

- In recent years this company had an inventory of waste nuclear substances (including depleted uranium) high enough to attract a CNSC Order to reduce the inventory and/or increase its financial assurances for future decommissioning costs. This issue was apparently resolved in 2017.
- There are apparently no liquid radiological releases from this facility. The question of whether there are emissions of other liquids containing conventional contaminants is not addressed in the report.
- There is no environmental monitoring being done at this facility at all.
- The rationale for the lack of monitoring is the assumption that there are no radiological releases that require control or monitoring. I find this to be an aggressively optimistic approach to the management and oversight of a modern industrial facility.
- **I strongly urge CNSC to develop and implement a requirement for at least a minimal groundwater and surface water quality monitoring program for any industrial facility which is processing uranium and/or other nuclear substances in Canada.**

Recommendation 2

The CNSC should develop and implement requirements for a minimum groundwater and surface water quality monitoring program for any industrial facility which is processing Uranium and/or other nuclear substances.

d) License Limits for the Facilities Featured in the 2018 NSPF Report

As indicated in the previous section, license limits for some of the facilities featured in the 2018 NSPF Report are astonishingly high. It is my professional opinion that CNSC should change the manner in which license limits are determined, to ensure that they are more reasonable and more protective of the natural environment.

If we consider for example the license limits for Uranium for effluent discharges to the sanitary sewer for the BWXT facilities in Toronto (9,000 kg/year) and Peterborough (760 kg/year) then it quickly becomes clear that these are absurd limits. (I should note that many of the facilities featured in the 2018 NSPF Report have unacceptably high limits - I am just using these facilities' limits as an example.)

Uranium is a radionuclide, and it is my understanding that historically CNSC's license limits for Uranium have been based on calculations which only consider its radiological properties and potential human exposures. This approach ignores the fact that Uranium is also a potent chemical contaminant, with significant toxicity - for example to aquatic life.

I am assuming the BWXT (Toronto) licence limit of 9,000 kg/year of Uranium for sanitary sewer discharges does not imply that anyone at the CNSC or BWXT is seriously suggesting that it would be acceptable to discharge just under that amount of Uranium to Toronto's sanitary sewer system.

Liquids discharged to a sanitary sewer end up in a municipal waste water treatment plant (WWTP), and then in surface water (in this case, Lake Ontario). Sewage treatment processes at the WWTP will typically reduce concentrations of many contaminants from the treated wastewaters, but these are then concentrated in the biosolids (sewage sludge). Biosolids are often spread on farm fields. It would not be good for the environment in the Lake Ontario watershed to have Uranium-laced biosolids spread on farm fields.

Toronto's Sewer Use By-law does not include testing for Uranium, presumably based on the assumption that potential sources of Uranium are regulated and that such regulation would prohibit the discharge of significant amounts of Uranium to the sewer system.

In my professional opinion 9,000 kg/year is a very significant amount of Uranium. Under no circumstances should that much Uranium be discharged to Toronto's sanitary sewer system annually. If so, then the question arises why a CNSC-regulated facility has such a high Uranium licence limit for its discharges to the sanitary sewer system.

I should note that BWXT Toronto's actual annual effluent discharge of uranium in 2018 was 0.935 kg, and figures for the last 5 years were all under 1 kg/year (see Table F-10 of Appendix F). The comparison of what is actually being discharged to the Uranium licence limit of 9,000 kg/year reveals how artificially high the licence limit really is.

Having artificially high licence limits for uranium and other radionuclides does not build public confidence in Canada's processing facilities for uranium and other nuclear substances, nor does it build confidence in the regulator of those facilities - the CNSC.

The 2018 NSPF Report states the following about BWXT's effluent discharges:

"In 2018, the releases continued to be well below the licence limit. The results demonstrate that liquid effluent releases are being controlled effectively at the BWXT facilities."

In fact, the BWXT facilities could be massively polluting Toronto's and Peterborough's sanitary sewer systems and still be "well below the licence limit". It reflects well on BWXT that its facility discharges are far below what the CNSC would allow under the current licence limits. But it does not reflect well on the CNSC that it has such absurdly high licence limits in the first place. This sort of approach to nuclear regulation will not enhance public respect or confidence for the CNSC.

Recommendation 3

The CNSC should initiate a process to review the licence limits for liquid discharges of radiological contaminants from each of the facilities featured in the 2018 NSPF Report.

The licence limits for liquid discharges of any given radionuclide should consider both its radiological properties as well as its chemical properties, and should be protective of both human health and the health of aquatic organisms.

Part 2 - Review of the Environmental Performance of the PHCF in 2016

a) Introduction

I have conducted a more detailed review of one section of the 2018 NSPF Report, namely the section dealing with the Cameco Port Hope Conversion Facility (PHCF).

I have done this more detailed review in order to fulfil the terms of the CNSC's funding award, which specified that I should conduct a review of the 2018 NSPF Report "*and comment on the two unplanned events that occurred at the Port Hope Conversion Facility*". In order to provide my comments on the 2 unplanned events at the PHCF I considered it important to conduct a "big picture" analysis of the facility's liquid emissions in order to have the overall context of what is happening at the site.

Part I, Section 4 of the 2018 NSPF Report deals with the PHCF. I have carefully reviewed that section of the report, and **Part 1, Section c) ii)** of this review above provides an overview of the 2018 NSPF Report's description/discussion regarding the PHCF (which is reproduced in the next section of this review). I will then provide a more detailed description and analyses of the PHCF in the following sections of this review.

b) Overview of the 2018 NSPF Report's Section on the PHCF

The following paragraph is taken from **Part 1, Section c) ii)** of this review.

- *There was a description of the groundwater pump and treat system and the groundwater monitoring program in the 2018 NSPF Report, but useful data were not provided.*
- *Contaminant concentrations in groundwater were not presented.*
- *The mass of COC's being removed by the groundwater pump and treat system was provided, but not the percent capture rate.*
- *There is no process water generated at this facility.*
- *Liquid streams include the (once through) coolant water and sanitary sewer discharges. - The report does not specifically address the coolant water discharges.*
- *A daily action level (100 ug/L Uranium) and a monthly release limit (275 ug/L) for sanitary sewage have recently been implemented for this facility. The action level was exceeded on multiple occasions in 2017, 2018 (and in 2019). These exceedences are attributed to unusually high Lake Ontario water levels which in turn backed up and raised groundwater levels beneath the site, allowing inflow of contaminated groundwater into the sanitary sewer system. (This implies that there are significant leaks in the sanitary sewer system).*
- *Cameco has responded with a detailed investigation and targeted repairs on sections of the sanitary sewer network.*
- *Even though stormwater monitoring is being done internally, there is no mention of the PHCF's stormwater discharges at all in the 2018 NSPF Report.*
- *No stormwater monitoring data are provided in the report even though it is my strong sense (based on the detailed knowledge I have of this particular facility) that the highest ongoing inputs of uranium from the PHCF to the Port Hope Harbour are currently via leaking storm sewer lines.*
- *Downstream surface water monitoring is done in Port Hope Harbour (which receives stormwater and cooling water discharges from the facility), and results are generally benign due to the massive dilution provided by the water in the harbour.*
- *Table F-5 in Appendix F shows that average Uranium levels in the harbour in 2018 were at the highest levels seen since 2014 (in fact these were the highest levels since 2009). There is no mention in the report of what caused the elevated Uranium levels (a collapse of a significant length of the west wall of the Port Hope harbour's turning basin in October 2018).*
- *Table F-5 in Appendix F shows that average fluoride levels have risen to just above the CCME guideline (0.12 mg/L) in the Harbour with 2018 levels of 0.16 mg/L, but it is not clear why this is occurring. The issue is not discussed in the report.*

The bottom line is that while the 2018 NSPF Report provides some information on the environmental performance of the PHCF, the report is lacking in detail and is not complete. Links to reference documents would be tremendously helpful to reviewers.

A more detailed description of the PHCF followed by a discussion and analysis of its environmental performance in 2018 is provided in the next sections of this review. My comments and recommendations are based on careful consideration of the 2018 NSPF Report as well as other background documents which I requested or which are available to me regarding the PHCF.

c) More Detailed Discussion of the PHCF's Environmental Performance in 2018

The Port Hope Conversion Facility (PHCF) is an active Uranium processing facility which has been the site of operations for the processing of nuclear materials since 1932. In the early decades of operations, little was known about the harmful nature of the materials being handled at the site.

More recent investigations have shown that water and soils on the site and its surroundings have been contaminated by a variety of radiological and non-radiological contaminants.

i) Overview of COCs and Types of Contamination

Following are the identified contaminants of concern (COCs) for the PHCF:

- Uranium,
- Arsenic,
- Ammonia,
- Nitrate,
- Fluoride,
- Radium-226,
- Trichloroethylene,
- Dichloroethylene, and
- Vinyl Chloride.

Types of water/soil contamination which are of potential concern include the following:

- there are contaminated soils across significant areas on the PHCF site, including the main plant site and the Centre Pier;
- there are contaminated sediments (several meters thick) in the Port Hope Harbour;
- there is contaminated groundwater which is present in three main plumes on the PHCF site, and although most is contained and treated some of this contaminated groundwater is discharging to the Port Hope Harbour;
- the aging and leaky PHCF storm sewer system is acting as a conduit and carrying contaminated groundwater into the Port Hope Harbour (esp. when lake levels are high);
- the aging sanitary sewer system is leaking and depending on lake water levels is either leaking contaminants into the groundwater (at times of low lake levels) or is acting as a conduit and carrying contaminated groundwater into the Port Hope Sewage Treatment Plant (at times of high lake levels);
- the discharges from the PHCF facility to the municipal sanitary sewer system are carrying contaminants into the Port Hope Sewage Treatment Plant.

ii) Contaminated Soils at the PHCF

Contaminated soils are present in various locations across the PHCF, including the main plant site (with hot spots at the Uranium Hexafluoride (UF₆) Plant, and in areas closest to the Harbour) and the Center Pier. The contaminants include Low Level Radioactive Wastes (LLRWs) such as Uranium as well as various conventional industrial contaminants.

Much of the PHCF property is paved and almost all unpaved areas are relatively flat, so in most cases the contaminated soils are locked in place and not subject to erosion. However if water passes through the contaminated soils, then there is a potential for contaminants to be leached from the soils and transported to the Harbour via the groundwater flow system (or the leaking storm sewer and sanitary sewer systems).

The contaminated soils on the PHCF property should be dealt with as part of a systematic remediation of the site. In the short term, the soils are isolated from the environment by the paved surfaces of the facility.

Significant amounts of PHCF contaminated soils (especially those situated in areas closest to the Port Hope Harbour) are planned to be removed as part of the Vision In Motion (VIM) project over the next few years. This is a very positive initiative.

iii) Contaminated Sediments in Port Hope Harbour

Contaminated materials are found in sediments in the Port Hope Harbour, which is adjacent to and has been contaminated by the PHCF. The Port Hope Harbour is one of 43 designated Great Lakes Areas of Concern under the Canada - United States Great Lakes Water Quality Agreement.

The International Joint Commission website provides a description of the contaminated harbour sediments (which it indicates are contaminated with uranium- and thorium-series radionuclides, heavy metals, and PCBs) here:

[http://ijc.org/files/publications/
PortHopeHarbourAreaOfConcernStatusOfBeneficialUseImpairments.pdf](http://ijc.org/files/publications/PortHopeHarbourAreaOfConcernStatusOfBeneficialUseImpairments.pdf)

The Canadian Government's description of the Port Hope Harbour contamination can be found here:

<http://www.ec.gc.ca/raps-pas/default.asp?lang=En&n=8BB3DAED-1>

Under the Port Hope Area Initiative (PHAI), all of the the contaminated sediments in the Port Hope Harbour are to be excavated and deposited in the Port Hope Long Term Waste Management Facility. This work will be carried out over approximately the next 5 years - there is no need for any other action in the interim.

iv) Contaminated Groundwater at the PHCF

There is extensive and significant groundwater contamination on the PHCF property. The indicator parameter which in most cases can be used to track this contamination is Uranium, which is also one of the COCs.

The Ontario Drinking Water Quality Standard (ODWQS) for Uranium is 20 micrograms per Liter (ug/L) and the Ontario Provincial Water Quality Objective (PWQO) for Uranium is 5 ug/L. The CCME limit for surface waters is 15 ug/L. Uranium levels in the groundwater beneath the Cameco property are often in the 1000s of ug/L, with peak levels of about 20,000 ug/L just east of the UO2 plant in 2018.

This contaminated groundwater is mostly being contained and collected through a Pump and Treat (P+T) system involving 12 pumping wells, and is monitored through over 100 monitoring wells. It is estimated that currently on the order of 60% of the groundwater flow to the Harbour is contained by the P+T System, and that the original approximately 40 kg/year mass loading of uranium to the Harbour has been reduced by over 90% to about 4.2 kg/year in 2018 by the P+T system.

In part the mass loading to the harbour has been reduced by the effective capture of groundwater from the hot spots on the PHCF property, and in part because groundwater concentrations for various contaminants are falling over time due to the mass removal from the groundwater system.

Further expansion of the system (with 5 new wells) is planned as part of VIM, which will help to further reduce the mass loading to the Harbour. In the meantime the system is functioning well and the situation is stable with no need for other action. However I recommend that a calculation of the combined annual mass loading of Uranium to the Harbour from all areas of uncontained contaminated groundwater should be done every year and reported in the Annual Compliance Monitoring Reports.

v) PHCF-Contaminated Storm Sewer Discharges to the Harbour

When I first conducted a review of the PHCF under a prior contract for LOW in 2011, I found evidence of a storm sewer system which had not been well maintained and monitored - and which was leaking significant amounts of contaminated water into the Port Hope Harbour.

It was (and still is) my interpretation that the majority of the contamination in the storm sewer discharges to the Harbour is caused by discharge of contaminated groundwater into the system via leaks and breaks in the aging storm sewer network.

At the time of my review in 2011 the available information indicated that average Uranium concentrations in the storm sewer discharges to the Harbour were 218 ug/L, compared to the PWQO for Uranium of 5 ug/L. I was quite concerned about what I found in my 2011 review of the storm water system, and I provided a number of recommendations for Cameco to address the problem.

I am pleased to report that significant progress has been made by Cameco in the 8 years since I issued my original report:

- a major study of the storm sewer system was conducted in 2011;
- the volume of water being captured by the P+T System was increased significantly, reducing the amount of groundwater available to leak into the storm sewer system;
- a number of the storm sewer lines and outfalls have been decommissioned, reducing the number of active storm sewer outlets to the Harbour to 10;
- regular semi-annual water quality monitoring was conducted on 5 of the 10 active outlets in 2018, with the results reported in the 2018 Annual Compliance Monitoring and Operational Performance Report;
- toxicity testing was done on the 5 active outlets being tested for water quality, and all tests passed.

This having been said, there are still significant problems associated with Cameco's storm sewer discharges to the Port Hope Harbour:

- 1) There are no specific Effluent Release Limits for the storm sewer discharges, nor are there specific Action Levels for the storm sewer discharges - in effect, these discharges are currently unregulated. Despite my urging, this issue has not been addressed by CNSC to date.
- 2) Although Cameco conducts a semi-annual storm sewer discharge monitoring program on 5 of the 10 active outlets, there is no information on the other 5 outlets.
- 3) It is not clear whether Cameco's stormwater quality monitoring information is available to Cameco's regulator - the CNSC. Certainly there is no mention of storm water discharges in the section of the 2018 NSPF Report which deals with the PHCF.
- 4) I believe that the majority of the water contamination in the Harbour is currently coming from the contaminated storm sewer discharges, which in 2009 had average Uranium concentrations of 218 ug/L. Data provided to me personally indicate that the average Uranium levels in storm sewer discharges in 2015 were 116 ug/L, and in 2016 were 134 ug/L. Data in Table 36 of the 2018 Annual Compliance Monitoring and Operational Performance Report indicate that 2018 average levels were 204 ug/L. This rising trend is a concern.
- 5) The storm sewer discharges are not metered, so there is no way of determining a flow-weighted average Uranium concentration or the mass-loading to the Harbour from these discharges.
- 6) Please note that I have only been discussing Uranium as it is the site indicator parameter and one of the site COCs - but there are also many other contaminants which will be present in the unregulated storm sewer discharges to the Harbour from the PHCF. I have no information available to me regarding the releases of other harmful contaminants (COCs) to the harbour from the Cameco PHCF's unregulated storm sewer discharges.

Average 2018 levels of Uranium in Port Hope Harbour were 5.2 ug/L (compared to average 2018 Uranium levels of 204 ug/L in the PHCF's storm sewer discharges to the Harbour), so there is clearly considerable mixing and dilution occurring in the Harbour. By comparison, the PWQO for Uranium is 5 ug/L.

Very significant improvements to the storm sewer network will be carried out as part of the Vision In Motion (VIM) process over the next 5 years:

- The number of active storm sewer outlets is to be reduced from 10 to 4.
- New piping will be installed in many areas, reducing or eliminating the potential for leakage of contaminated groundwater into the system.
- Flows from the 4 outlets will be metered, allowing mass loading calculations to be carried out and flow-weighted average discharge concentrations to be calculated.
- The storm sewer system will be equipped with oil and grit separators, which will help improve discharge water quality.

Given the apparently current low levels of Uranium in Port Hope Harbour (averaging 5.2 ug/L in 2018) I see no need to undertake any works on the storm sewer system prior to the major works planned as part of the VIM project over the next 5 years.

I do however recommend a stepped up frequency of monitoring of water quality in the storm sewer discharges (from semiannually to quarterly). Monitoring should be for the full list of COCs for the site. Monitoring should be carried out at all 10 active outlets.

Recommendation 4

a) Monitoring should be done at every active storm sewer outlet at the PHCF, and should be done on a quarterly basis.

b) If an outlet is dry on a scheduled monitoring date, then follow ups should be done on days with sufficient precipitation that flow is occurring.

c) PHCF storm sewer monitoring should be done for the full list of COCs for the PHCF.

d) Storm sewer discharges from the PHCF to the Port Hope Harbour need to be regulated by the CNSC. Monthly release limits and daily action levels for such discharges should be developed and enforced by the CNSC for the PHCF - and for the other facilities featured in the 2018 NSPF Report.

vi) Discharges from the PHCF to the Municipal Sanitary Sewer

There are also discharges of wastewater from the PHCF to the municipal sanitary sewer. Contained in these discharges are inputs from washrooms, showers, site laundry facilities, and Powerhouse boiler blowdown. Recent monitoring results are indicating that some parts of the sanitary sewer system have developed significant leaks which require remediation.

Uranium levels in the sanitary sewer discharges averaged 18 ug/L in 2014 to 2016, but then jumped to 44 ug/L in 2017 and were 37 ug/L in 2018 (vs. the PWQO for Uranium of 5 ug/L). As part of the PHCF relicensing process, a daily sanitary sewer discharge action level of 100 ug/L and a monthly release limit of 275 ug/L were developed for Uranium discharges.

While monthly averages have stayed below the release limit, daily action levels have been exceeded on several occasions in 2018. Exceedences of daily action levels for Uranium in sanitary sewer system discharges persisted into 2019. Cameco attributes the elevated Uranium levels in the sanitary sewer discharges to leaks in the system which allowed contaminated groundwater to leak into the system at a time when high lake levels backed up and raised groundwater levels.

If water can leak into the sanitary sewer system then it can also leak out - and outward leakage at time of lower lake levels may be behind some of the nitrate and ammonia contamination which is present in the groundwater flow system at the PHCF.

Cameco has been actively working on repair and remediation of leaks in the sanitary sewer system starting in 2017 and continuing through 2018 into 2019. The slight decline in Uranium levels from 2017 to 2018 may be reflecting some positive effects of those repairs and renovations.

Following treatment at the Port Hope Sewage Treatment Plant (STP), the treated PHCF wastewater is discharged to Lake Ontario. It is not clear whether the Port Hope STP is able to remove the low levels of Uranium and other contaminants in the wastewater from the PHCF - but it will certainly provide significant dilution, as will the lake.

I have not found water quality monitoring information for Lake Ontario in the PHCF-related reports, however such information is available in the annual monitoring reports for the Port Hope Water System - average Uranium levels in the lake in 2018 were 0.37 ug/L. **There is a need for regular testing of Lake Ontario just downstream of the Port Hope Harbour - and for those test results to be made accessible to the public.**

vii) Coolant Water Discharges

The PHCF has a once-through cooling water system. Flow rates are substantial, with 2018 average daily flow rates in the two coolant water streams of 11,211,000 Litres per day (L/day) and 1,143 L/day.

Discharges from the system are regulated by Ontario's Ministry of the Environment and Climate Change, which requires that Cameco shall use best efforts to ensure that monthly average concentrations of uranium and fluoride in the effluent are less than or equal to levels of uranium and fluoride in the coolant water intake stream.

I have reviewed the monitoring results for the coolant water discharges in Table 33 of the 2018 Annual Compliance Monitoring & Operational Performance Report and have no concerns about this effluent stream from the facility.

viii) Water Quality Impacts of Unplanned Events at the PHCF in 2018

There were a total 4 unplanned events at the PHCF in 2018 which I will be discussing below:

- January 11, 2018 Groundwater Release
- August 8, 2018 Stormwater Release
- August 8-10, 2018 Sanitary Sewer Action Level Exceedence
- October 6, 2018 Collapse of Segment of West Harbour Wall (adjacent to PHCF property)

January 8, 2018 Groundwater Release

In this event, contaminated groundwater being pumped from a purge well leaked from a transfer pipe which had broken during a recent cold snap. Uranium levels of the water were 5,600 ug/L, and an estimated 325 Litres may have reached the harbour via the storm sewer system during the time (less than 1 hour) the leak was occurring. PHCF staff acted quickly - shutting off the system, and then cutting off the flow through the storm sewer system. A water sample taken at the adjacent harbour wall showed Uranium levels of 8.1 ug/L. I do not believe that there were significant environmental impacts from this release.

August 8, 2018 Stormwater Release

During a heavy precipitation-related event, a surge of water running over the ground surface flowed into and covered the floor of 2 buildings (5B and 5C), and then ran out into a nearby storm sewer catch basin. There are no estimates of the volume of liquid involved. Water quality of a sample of the overflow showed 46 ug/L Uranium, and almost the same Uranium level (45 ug/L) was found discharging into the harbour from the downstream storm sewer outlet (#11). I do not believe that there were significant environmental impacts from this release.

August 8-10, 2018 Sanitary Sewer Action Level Exceedence

As a consequence of elevated groundwater levels from the same August 8th precipitation event, leakage of contaminated groundwater into the sanitary sewer in the area of Building 27 led to exceedences of the daily action level of 100 ug/L of Uranium. The monthly release limit of 275 ug/L Uranium was not exceeded. The actual Uranium levels in the sanitary sewer have not been disclosed, nor is there any estimate of the rate of flow in the sanitary sewer during this event. Given that the flows went to the Port Hope STP, there should have been treatment of the discharged water (provided that the plant was not on by-pass). I do not believe that there were significant environmental impacts from this exceedence, however I note that there were also action level exceedences in the sanitary sewer system on April 16-19, and May 29-30, 2018 and further exceedences in 2019. The combined effect of these exceedences may have been more significant.

October 9, 2018 Collapse of Portion of West Harbour Retaining Wall

A portion of the west harbour retaining wall (which had been monitored for possible failure since 2007) collapsed on October 9, 2018. Although the retaining wall is owned by and the responsibility of the Town of Port Hope, the wall's collapse allowed contaminated groundwater from the nearby PHCF property to flow more freely into the harbour.

Measures were undertaken as quickly as possible to isolate the west wall with a turbidity curtain until repairs could be carried out. Testing done by the Town of Port Hope suggests that Uranium levels in the harbour remained low (<0.5 ug/L) in the harbour in the two weeks after the collapse. However Cameco's 2018 Groundwater and Surface Water Review Report suggests in Section 4.2.1 that the elevated levels of Uranium in Q4, 2018 (averaging 11 ug/L) may have been related to the failure of the wall. Likewise the PHCF's 2018 Compliance Monitoring Report shows peak Uranium levels in the harbour of around 31 ug/L and suggests that these elevated levels were primarily attributed to Uranium mobilization stemming from the wall's failure.

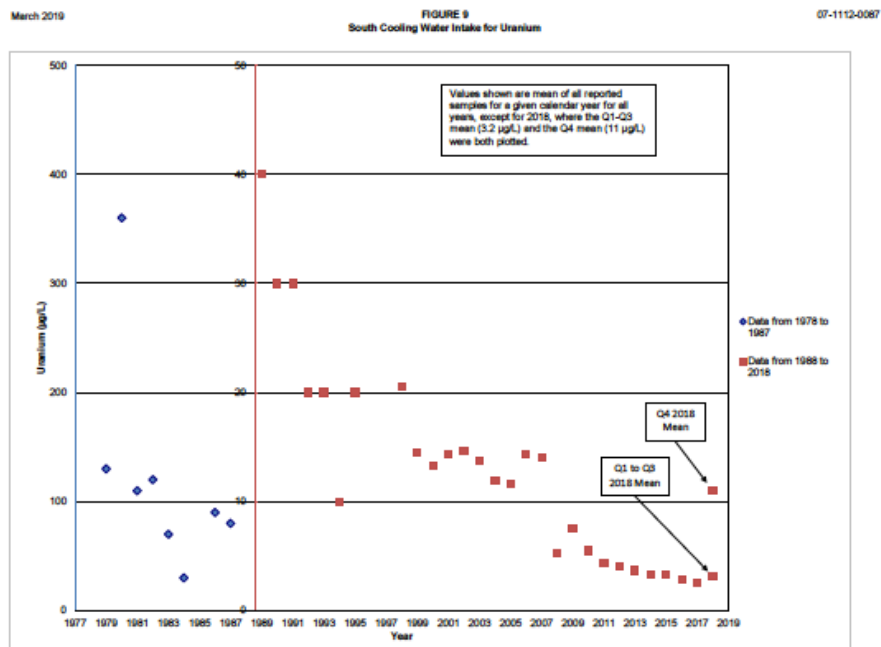
In any event I do not consider the ultimate impacts of this event to be significant in light of the commencement of harbour remediation activities (which will include dredging of contaminated sediments from the harbour) under the Vision in Motion or VIM project, which commenced in Q4, 2018 and which will be ongoing for the next several years.

ix) Water Quality in Port Hope Harbour and Lake Ontario

The Port Hope Harbour is the receiving surface water body for the following liquid emissions from the PHCF:

- contaminated groundwater which is not contained by the Pump and Treat system;
- coolant water discharges;
- storm sewer discharges.

Cameco is making best efforts to reduce its contaminant inputs to the Port Hope Harbour. The company's success in its efforts to date can be measured by considering the long-term record of water quality testing results for the Harbour which are shown in Figure 9 below (taken from the PHCF 2018 Annual Groundwater and Surface Water Review report).



In considering Figure 9 it is important to be aware that there are 2 vertical axes, one for the 1979 to 1987 data and a second one for the 1988 to 2018 data.

Review of Figure 9 shows a Harbour which in the 1980s was badly contaminated, with Uranium levels averaging around 100 ug/L compared to a PWQO limit of 5 ug/L. Harbour water quality has improved considerably since then, with average annual Uranium levels in the Harbour below 10 ug/L since 2007 (and below 5 ug/L from 2010 through 2017). It is only in Q4, 2018 that Uranium levels in the Harbour have spiked to 11 ug/L, for the reasons outlined above.

It has been clear to me when meeting with Cameco officials that they are doing their best to run a productive and efficient and safe facility, but are also trying hard to reduce or eliminate that facility's environmental impacts. Figure 9 stands as a testimonial to their successful efforts in this regard. The observed improvements to Harbour water quality will also of course be of benefit to Lake Ontario.

Lake Ontario is the receiving surface water body for the following liquid emissions from the PHCF:

- treated sanitary sewer discharges (except during any by-pass events);
- minor flows of contaminated groundwater.

After some searching, I was able to find monitoring data for water quality in Lake Ontario in Port Hope. The data show no sign of any significant influence from the Cameco property in 2018 (average uranium levels in Lake Ontario were about 0.4 ug/L) - but **there is a need for regular testing of Lake Ontario just downstream of the Port Hope Harbour - and for those test results to be made readily accessible to the public.**

Water quality in the harbour will be degraded during the contaminated sediment removal (which is being done as part of the Port Hope Area Initiative or PHAI) and associated contaminated soils removal on the PHCF property (which is being done as part of the VIM process). Harbour water quality should ultimately be improved after the completion of these major remedial projects.

In the meantime it will be important to ensure proper safeguards are in place to ensure that degraded Harbour water does not escape to Lake Ontario during the period when the PHAI/VIM remedial activities are ongoing, and to ensure that water quality in Lake Ontario is being properly monitored during that period to ensure that there are no impacts to the lake and its aquatic life. I am concerned that I was not able to easily access current water quality information for the lake outside of the Harbour.

x) The Need For An Overview Report on Liquid Emissions from the PHCF

It is currently quite a challenge for anyone seeking to understand the nature and potential impacts of liquid emissions from the PHCF to find the information needed. Information on different liquid flows is found in several different reports. This needs to change!

Based on the information available to me, I can provide the following overview regarding Uranium loading from liquid discharges from the PHCF in 2018:

- There are no **process water** discharges to the harbour or lake.
- **Cooling water** is flow-through, with no significant impacts on water quality.
- **Contaminated groundwater** discharges to the harbour were about 4.2 kg of Uranium in 2018, based on average pumping rates of about 55,500 Litres per day and average Uranium levels of about 207 ug/L.
- **Sanitary sewer** discharges to the Port Hope STP were about 4.6 kg of Uranium in 2018, based on average flows of about 361,000 Litres per day and average Uranium levels of about 37 ug/L.
- Contaminated **stormwater system** discharges are unknown, because flows are not metered but the average Uranium levels in the 5 outlets being monitored were 204 ug/L. However I believe that stormwater flow volumes from the site will exceed the sanitary sewer flows, so given the comparable Uranium levels I believe that the stormwater flows from the PHCF are currently the greatest source of Uranium (and other COPC) loading to the harbour and Lake Ontario.

It has taken a lot of work to assemble the above summary - in future it would be tremendously helpful if there were one overview document prepared by Cameco which provided information on Lake Ontario and Harbour water quality, as well as water quality results for the various streams of liquid discharges from the PHCF.

Recommendation 5

a) The CNSC should require Cameco to produce an annual overview report on water quality and the various liquid discharges from the PHCF.

The report should include information, references and links regarding the following:

- **the full list of COCs for the PHCF;**
- **the area of contaminated groundwater and the extent to which it is being contained by the Pump and Treat system;**
- **discharges to the sanitary sewer system;**
- **coolant water discharges;**
- **storm water discharges;**
- **calculations of mass loading of uranium and other key COCs to the Harbour from each liquid discharge stream;**
- **water quality in Port Hope Harbour;**
- **water quality in Lake Ontario in proximity to the PHCF.**

b) The other Uranium and nuclear substance processing facilities featured in the 2018 NSPF Report should likewise be required by CNSC to produce an annual overview report on water quality and the various liquid discharges (including mass loading calculations) from their facilities.

Discussion

The 2018 NSPF Report is an important document. Prepared by CNSC staff, it provides the 2018 annual update on the performance of Canada's Uranium and Nuclear Substance Processing facilities. Helpful information is provided on the environmental protection efforts of each of the facilities featured in the report. However in my review of the 2018 NSPF Report I have found several deficiencies which should be corrected by the CNSC.

The information in the 2018 NSPF Report on liquid emissions and their potential impacts is not consistent (from one facility to another), nor is it complete for any given facility. There is also a lack of references or links to the original reports which are the basis for the facility summaries.

It was disconcerting to find that there is a Uranium / Nuclear Substance Processing facility in Canada which has no environmental monitoring program whatsoever (Best Theratronics). The CNSC should reconsider this approach to regulation, and develop minimum monitoring requirements for all facilities which it is regulating.

Many of the licence limits for liquid emissions of uranium and other COCs from Canada's uranium and nuclear substance processing facilities are outdated and are not protective of the natural environment. The CNSC needs to rethink and overhaul its approach to license limits. More reasonable actions levels and monthly release limits have been introduced for some facilities, but there has been no progress at others.

I was only able to conduct a more detailed assessment of the environmental performance of one of the facilities featured in the 2018 NSPF Report - namely the PHCF. The environmental performance of the PHCF in terms of minimizing impacts from liquid emissions was satisfactory in 2018. 2018 marked the first year in over a decade in which water quality in the Port Hope Harbour declined. Water quality monitoring of storm sewer discharges from the PHCF to the Harbour needs to be improved and formalized.

An annual overview report on liquid discharges is needed for the PHCF, and for each of the other facilities being reported on in the 2018 NSPF Report. At the other facilities, there also needs to be comprehensive water quality monitoring which encompasses every type of liquid discharge from the property.

There is a clear benefit to such monitoring. The PHCF has been an industry leader, by proactively introducing monitoring of things like stormwater quality and sanitary sewage quality some time ago. This monitoring has helped identify weaknesses in the stormwater system and the sanitary sewer system at the PHCF, and this has helped staff work on making the necessary repairs and improvements to the system. These repairs and improvements in turn will ultimately lead to reductions in contaminants discharging from the PHCF into the harbour and Lake Ontario.

The introduction of comprehensive water quality monitoring which encompasses every liquid discharge from other facilities featured in the 2018 NSPF Report is long overdue.

Conclusions

- 1) The 2018 NSPF Report is an important document - prepared by CNSC staff, it provides the 2018 annual update on the performance of Canada's Uranium / Nuclear Substance Processing facilities. Helpful information is provided on the environmental protection efforts of each of the facilities featured in the report.

- 2) The information provided on liquid emissions and their potential impacts is not consistent (from one facility to another), nor is it complete for any given facility. Particularly problematic for the reviewer is the lack of references and/or links to the original reports which are the basis for the summaries provided in the 2018 NSPF Report. **Sections b) and c) of Part 1** of this review outline and discuss these concerns.

- 3) The license limits for liquid emissions from many of the facilities featured in the 2018 NSPF Report are astonishingly high. It is my professional opinion that CNSC should change the manner in which license limits are determined, to ensure that they are more reasonable and more protective of the natural environment. Having artificially high licence limits for liquid emissions of uranium and other radionuclides does not build public confidence in Canada's processing facilities for uranium and other nuclear substances, nor does it build confidence in the regulator of those facilities - the CNSC. **Section d) of Part 1** of this review outlines and discusses these concerns.

- 4) **Part 2** of this review considers all aspects of the 2018 environmental performance of the PHCF in terms of liquid emissions from the facility. Overall Cameco is doing a satisfactory job of managing the liquid emissions from this facility, however 2018 presented some extraordinary challenges which are discussed in detail in **Part 2**.

- 5) The weakest aspect of Cameco's liquid emission management at the PHCF pertains to the management and monitoring of storm water emissions from the facility to Port Hope Harbour. The Vision in Motion (VIM) process will bring with it major improvements in stormwater management by the time it is completed in 2024. In the meantime, improvements to the stormwater monitoring program should be implemented. These issues are discussed in detail in **Part 2, Section c) v)** of this review.

- 6) The introduction of comprehensive water quality monitoring requirements which encompass every liquid discharge from other facilities featured in the 2018 NSPF Report is long overdue. As part of that monitoring requirement, an overview report which summarizes every kind of liquid discharge is needed for each facility.

- 7) Recommendations are provided throughout the report, and summarized in the next section of this review.

Recommendations

Recommendation 1

a) In future NSPF Reports the discussion for each featured facility should include a description and analysis of each of the possible discharges of liquids which could carry contaminants and potentially cause unacceptable off-site environmental impacts:

- process water;
- cooling water;
- off-site groundwater flow which may carry contaminants leaching from on-site soil contamination;
- sanitary sewer discharges;
- storm sewer discharges.

b) Full references and/or links should be provided to the more detailed documentation/reporting which has been summarized in the report's section for each facility.

Recommendation 2

The CNSC should develop and implement requirements for a minimum groundwater and surface water quality monitoring program for any industrial facility which is processing uranium and/or other nuclear substances.

Recommendation 3

The CNSC should initiate a process to review the licence limits for liquid discharges of radiological contaminants from each of the facilities featured in the 2018 NSPF Report.

The licence limits for liquid discharges of any given radionuclide should consider both its radiological properties as well as its chemical properties, and should be protective of both human health and the health of aquatic organisms.

Recommendation 4

a) Monitoring should be done at every active storm sewer outlet at the PHCF, and should be done on a quarterly basis.

b) If an outlet is dry on a scheduled monitoring date, then follow ups should be done on days with sufficient precipitation that flow is occurring.

c) PHCF storm sewer monitoring should be done for the full list of COCs for the PHCF.

Recommendations

Recommendation 4 - continued

d) Storm sewer discharges from the PHCF to the Port Hope Harbour need to be regulated by the CNSC. Monthly release limits and daily action levels for storm sewer discharges should be developed and enforced by the CNSC for the PHCF, and for the other facilities featured in the 2018 NSPF Report.

Recommendation 5

a) The CNSC should require Cameco to produce an annual overview report on water quality and the various liquid discharges from the PHCF.

The report should include information, references and links regarding the following:

- the full list of COCs for the PHCF;**
- the area of contaminated groundwater and the extent to which it is being contained by the Pump and Treat system;**
- discharges to the sanitary sewer system;**
- coolant water discharges;**
- storm water discharges;**
- calculations of mass loading of uranium and other key COCs to the Harbour from each liquid discharge stream;**
- water quality in Port Hope Harbour;**
- water quality in Lake Ontario in proximity to the PHCF.**

b) The other Uranium and nuclear substance processing facilities featured in the 2018 NSPF Report should likewise be required by CNSC to produce an annual overview report on water quality and the various liquid discharges from their facilities.

Signature and Professional Stamp

This Independent Report has been prepared in its entirety by Wilf Ruland (P. Geo.). It is based on my honest conviction and my knowledge of the matters discussed herein following careful review of the CNSC's 2018 Regulatory Oversight Report for Uranium and Nuclear Substance Processing Facilities, as well as consideration or reference to other documents listed in the Reference List.

This report has been prepared for my clients (Lake Ontario Waterkeeper), and its preparation has been funded by the Canadian Nuclear Safety Commission.

Signed on November 12th, 2019



Wilf Ruland

Wilf Ruland (P. Geo.)

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Appendix 1- List of Documentation Reviewed or Referenced

The references considered in the course of preparing this independent report include the following:

Cameco PHCF, Calculating Dose to the Public, Derived Release Limits and Operating Release Levels Public Summary. Undated document.

Cameco PHCF, Environmental Risk Assessment, Public Summary. Undated document.

Annual Groundwater and Surface Water Review Report, Cameco Corporation, PHCF. March 2019. Report prepared by Golder Associates Ltd. for Cameco.

Cameco 2018 4th Quarterly Compliance Monitoring & Operational Performance Report. Submitted on: February 28, 2019

Cameco 2018 3rd Quarterly Compliance Monitoring & Operational Performance Report. Submitted on: November 19, 2018

Cameco 2018 2nd Quarterly Compliance Monitoring & Operational Performance Report. Submitted on: August 16, 2018

Cameco 2018 1st Quarterly Compliance Monitoring & Operational Performance Report. Submitted on: May 18, 2018

Cameco 2018 Annual Compliance Monitoring & Operational Performance Report. Submitted on: March 29, 2019

CNSC. Annual Report, Regulatory Oversight Report for Uranium and Nuclear Substance Processing Facilities in Canada: 2018. Oct. 11, 2019.

Golder Associates Ltd. July 4, 2019. Letter re: Port Hope Harbour Turning Basin - West Wall Coping Movement (2019).

Licence Conditions Handbook, Cameco PHCF, Nuclear Fuel Facility Operating Licence FFOL-3631.00/2027, Revision 1. Prepared by CNSC staff, March 10, 2017.

Nuclear Fuel Facility Operating Licence Cameco Corporation PHCF. Licence Number: FFOL-3631.00/2027. Valid from 01 March 2017 to 28 February 2027.

Environmental Assessment Report, Cameco PHCF Operating License Renewal. Prepared by CNSC staff, September 2016

Ontario Ministry of the Environment, Amended Environmental Compliance Approval No. 4998-9CKL7F for Cameco PHCF. Issued November 12, 2013

Ruland, Wilf (P. Geo.). November 3rd, 2017. Independent Review of CNSC's 2016 Regulatory Oversight Report for Uranium and Nuclear Substance Processing Facilities, Including Cameco's Port Hope Conversion Facility. Prepared for: Lake Ontario Waterkeeper by Wilf Ruland (P. Geo.).

Ruland, Wilf (P. Geo.). October 3rd, 2016. Independent Review of Hydrogeological Issues Pertaining to a Review of the Cameco Vision in Motion Initiative and Cameco's Application for a 2017 Renewal of Site License. Prepared for: Lake Ontario Waterkeeper by Wilf Ruland (P. Geo.).

Ruland, Wilf (P. Geo.). July 7th, 2011. Independent Review of Hydrogeological Issues Pertaining to the Cameco Environmental Impact Statement for the Proposed Vision 2010 Project. Prepared for: Lake Ontario Waterkeeper by Wilf Ruland (P. Geo.).

Municipality of Port Hope. September 19, 2019. Memorandum Regarding Response to Ontario Waterkeepers Association - Information Request Concerning Port Hope Harbour Wall Collapse. Also Excel File containing harbour water quality test results.

APPENDIX B: Information requests and responses

Ms. Feinstein made the following information request to CNL on August 15th, 2019:

- 1) the identified cause for the wall collapse;
- 2) whether similar risk conditions exist for any remaining walls;
- 3) whether any water quality testing was conducted in the area after the collapse;
 - a. if so, a list of contaminants that were tested for and the results of water quality sampling;
- 4) a description of mitigation and remediation measures taken since the incident;
- 5) A copy of the incident report for the event that was sent to the CNSC; and
- 6) A copy of the incident report which was sent to the MECP.

On August 29th, CNL informed Ms. Feinstein that information should be obtained from the Municipality of Port Hope as it had control over the west harbour wall:

“It should be noted that Canadian Nuclear Laboratories (CNL) did not (and still does not) have care and control of the municipally owned west wall of the Port Hope Harbour during the collapse.

The deteriorating condition of the aging harbour walls and the potential for their collapse was known and taken into account during the planning phase for the harbour remediation, as part of the Port Hope Area Initiative (PHAI). Although it was determined that the collapse was not related to PHAI work being undertaken on the Centre Pier and the east side of the harbour at the time, CNL worked closely with the Municipality and Cameco to provide technical assistance.

The Municipality of Port Hope issued a media release about the incident (attached) that provides information on the collapse and is the point of contact for information on any testing done at the time and any reports submitted.

CNL’s rehabilitation of the remaining harbour walls began earlier this year to prepare the harbour for dredging. On the north and south side, (pipe) pilings were installed to protect the timber crib structure that is currently there. On the west wall, a section of which had collapsed prior to this event, a grout curtain is installed to prevent water seepage underneath the new combi wall when it is built. Installation of pilings on the Queen’s Wharf also started this year, although completion of that work has been postponed as result of the high water levels experienced in the area. The shoring in that area will include drilling pipe piles against the existing wall along the wharf, which will continue once the waters recede to avoid underwater drilling.

As CNL continues work in the harbour in preparation for dredging, the safety of our workers, the public and the environment remain our priority.”

forwarded the information request to the Municipality of Port Hope on September 4th. She was contacted September 5th with a promise to provide a response to questions by the 18th.

Ms. Feinstein was contacted September 17th by the municipality noting it could only provide responses by the 19th or 20th.

The following responses (in red) were provided September 19th, in addition to a copy of a previously prepared briefing report from Golder Associates reviewing the incident and its effects for Cameco Corporation (dated July 4, 2019 – the contents are too extensive to be attached to this Appendix):

- 1) The identified cause for the wall collapse;
 - a. the partial collapse of the west harbour wall concrete coping is believed to be a result of age, deterioration of sub grade cribbing, and erosion of soils surrounding the west wall. There has been incremental movement that has consistently been monitored since 2007 and the Municipality proactively installed a turbidity (otherwise known as silt) curtain in the spring of 2017 as a potential mitigation measure should the wall collapse as this area is within our drinking water intake protection zone. In advance of the west turning basin wall coping collapse in October 2018, Canadian Nuclear Laboratories (CNL) had also been operating a heavy duty turbidity curtain in the harbour approach channel in association with the Phase 1 wave attenuator placement and harbour remediation preparations. Subsequent to the partial west wall coping collapse in October 2018, the Municipality installed a second turbidity curtain across the full span of the turning basin west wall, with a north-south orientation. Moreover, Golder Associates was retained to design an engineered revetment to stabilize the wall. In consultation and cooperation with CNL and Cameco, the revetment was installed in December 2018.
- 2) Whether similar risk conditions exist for any remaining walls;
 - a. it has been known there is Harbour wall movement had been documented at various locations across the harbour, however, monitoring points along the mid portion of the west turning basin wall associated with the October 2018 coping failure had by far shown the greatest rates of displacement. A 2019 third party geotechnical assessment of the remaining west turning basin wall coping identified a potential short term failure risk for the coping segment immediately north of the revetment zone. Remaining harbour wall segments are not at risk of failure in the short term. Cameco has provided and consented to the release of the enclosed Golder Associates Ltd. letter dated July 4, 2019.
- 3) Whether any water quality testing was conducted in the area after the collapse;
 - a. the Municipality undertook a daily sampling program after the collapse commencing on October 10th through October 25, 2017. Both the MECP and CNSC were satisfied with the performance of the turbidity (silt) curtain and mitigative measures installed by the Municipality and our Water Treatment Plant Manager / Overall Responsible Operator for protection of our drinking water system intake Zone. b) if so, a list of contaminants that were tested for and the results of water quality sampling; the Municipality continues weekly sampling with raw samples off our low lift header tap in the lab and treated sample from the treated sample tap in our lab. Basically before and after filtration that includes, but not limited to contaminants of potential concern for low level radioactive waste, specifically arsenic and uranium in both the raw water and treated water samples. Results of the sampling may be provided upon request, and the sampling is on-going as part of a regulatory compliance regime the Municipality is required to do. The sampling frequency was increased to daily immediately after the collapse to ensure water quality, both inside the harbour, immediate proximity to the west wall both in front of and behind the silt curtain, and at the wave attenuator both inside the attenuator and out in the lakeside. The Water Keepers are invited to consult directly with the regulators if there are any questions regarding test results and compliance measures.
- 4) A description of mitigation and remediation measures taken since the incident;
 - a. see Response to Q # 3. The Municipality continues to monitor water quality through its routine sampling regime. As with any other municipal construction activity where excavation work occurs the Construction Monitoring Program through CNL was engaged at the time of the west turning basin coping wall collapse to assess and manage LLRW

contaminated soils excavated during the revetment construction period. CNL has care and control of the harbour and Centre Pier for remediation activities, EXCEPT for the west wall.

- 5) A copy of the incident report for the event that was sent to the CNSC;
 - a. the harbour west wall is owned by the Municipality of Port Hope and outside of a Federally CNSC licensed facility, and therefore under jurisdiction of the Ministry of Environment, Conservation and Parks. There is no incident report to be shared as the protocol for reporting is to Spills Action Ontario by telephone.
- 6) A copy of the incident report which was sent to the MECP;
 - a. see response to Question # 5 above.

Ms. Feinstein sent follow-up queries on September 25th:

- 1) You mention that the results of sampling could be made available upon request. Can I make that request to you or is another channel required? It would be helpful if we could see sampling results from between 9-10 months prior to the wall collapse up until the present.
- 2) You note primary contaminants of concern that were tested for were arsenic and uranium. Is this a comprehensive list? Were any other substances tested for?
- 3) I understand s.12 of OReg 675/98 requires written reports of all incidents reported to the Spills Action Centre, even if the report need only be made to the MECP officer over the phone. Would it be possible for you to share that report?

On October 3rd, the municipality sent sample results from the date of the collapse to October 24th as well as the results leading up to the collapse starting the previous August. A link to Port Hope's annual and summary reports was also provided.

On October 16, LOW requested the following information from CNSC staff:

- 1) Copies of the raw (i.e. disaggregated) results of all CNSC staff sampling conducted in and around the Port Hope Harbour to measure the potential impacts of the west wall's collapse last October?

This information was provided by CNSC staff on October 18, 2019.

Ms. Feinstein submitted the following information request to Cameco on October 16:

1. Please provide copies of any written reports sent to the Canadian Nuclear Safety Commission (CNSC), Ontario Ministry of Environment and Climate Change, and Municipality of Port Hope notifying them of the groundwater release that occurred on January 11, 2018.
 - a) Please also provide copies of any internal reports made describing the event and subsequent mitigation or remediation activities, including any event-specific groundwater or surface water quality monitoring after the event.
2. Please provide copies of any written reports sent to the CNSC, Spills Action Centre, and Municipality of Port Hope concerning the reportable spill that occurred on August 8, 2018.
 - a) Please also provide copies of any internal reports made describing the event and subsequent mitigation or remediation activities, including any event-specific groundwater or surface water quality monitoring after the event.
3. At page 42 of the CNSC staff CMD concerning their ROR for Processing facilities in 2018, there is a reference to a public poll conducted by the PHCF concerning public satisfaction with information disclosures by the PHCF. Would you be able to share additional information concerning this poll? Of particular interest would be:
 - a) any report that was written summarizing the poll's findings;
 - b) the number of public participants who responded to the poll;
 - c) a description of who was targeted to complete the poll and how they were chosen; as well as

d) copies of all questions asked in the poll.

Ms. Feinstein sent further information requests October 23:

- the 2018 Groundwater and Surface Water Review Reports for the PHCF;
- the 2018 Quarterly Compliance Monitoring and Operational Performance Reports for the PHCF; and
- any other report which will contain surface water quality data/analysis for the Port Hope Harbour in 2018 (which is not already covered in the above reports).

Waterkeeper received installments of information from Cameco on October 23, 25, and 30th.

Held conference call on November 8, 2019 with Mr. Ruland, Ms. Feinstein, and representatives from Cameco.

Appendix C

Pippa Feinstein BA (Hons), JD
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Education

- **LLM** (2019), Osgoode Hall Law School, Toronto ON
 - Faculty of Graduate Studies Entrance Scholarship (2018-9)
 - Hon. Willard Z. Estey Teaching Fellowship (2018-9)
- **Certificate in Alternative Dispute Resolution** (2015), York University, Toronto, ON.
- **JD** (2013), University of Alberta, Edmonton, AB.
 - Suzanne Mah Award for Community Leadership and Commitment to Human Rights (2013)
- **BA (Honours)** (2009), McGill University, Montreal, QC.

Work Experience

- **Lawyer and legal educator in sole practice** (May 2014 - Present) Toronto, ON.
 - Provide legal representation to grassroots community groups, and more established charities and not-for-profit organizations. Areas of practice include not-for-profit law, access to information, environmental and energy law, and alternative dispute resolution.
- **External Research Expert** (May 2017 – June 2018), Toronto, ON.
 - The National Inquiry into Murdered and Missing Indigenous Women and Girls, Winnipeg, MB.
- **Community Mediator, Bylaw and Private Complaints** (August 2015 – present)
 - Conflict Resolution Service, Dixie Bloor Neighbourhood Centre, Mississauga, ON.
- **Community Mediator, Criminal Court Diversion** (January 2016 – present)
 - Conflict Resolution Service, Warden Woods Community Centre, Scarborough, ON.
- **Law Foundation of Ontario Public Interest Articling Fellow** (2013-2014)
 - Lake Ontario Waterkeeper, Toronto, ON.
 - Selected as one of seven law students (the only student in environmental law) to be funded by the Law Foundation of Ontario to article with a non-profit organization.

Selected Publications

- Sarah Hamill & Pippa Feinstein, “**The Silencing of Queer Voices in the Litigation over Trinity Western University’s Proposed Law School**” (2018) 34:2 Windsor Y B Access Just 156.
- Pippa Feinstein, “**The Canadian Nuclear Safety Commission: Case Study**” (January 2018)
 - Written for Voices-Voix Canada, available at voices-voix.ca.
- “**An Ontario model public sewage alert**”, (January 2018) Toronto, ON.
 - Written for the Canadian Freshwater Alliance and an ad-hoc group of Canadian and US environmental non-profit organizations concerned about the lack of real-time public notification of sewage releases to waterbodies in the Great Lakes watersheds.
- Pippa Feinstein, “**National Energy Board vs. Canadian Nuclear Safety Commission: Comparing ethical standards behind closed doors**” (September 26, 2016)
 - Drafted for Lake Ontario Waterkeeper and picked up in the Globe and Mail and Toronto Star, available at waterkeeper.ca.
- Pippa Feinstein, “**Loyalty Oaths and the Public Service: Case Study**”
 - Written for Voices-Voix Canada, available at voices-voix.ca. These case studies document ways in which the federal government curbs political dissent in Canada.
- Pippa Feinstein, “**The National Energy Board: Case Study**”

- Written for Voices-Voix Canada, available at voices-voix.ca.
- Pippa Feinstein, **“Federal Judicial Appointments: Case Study”**
 - Co-authored with Megan Pearce for Voices-Voix Canada, available at voices-voix.ca.
- Pippa Feinstein, **“An LSC Interactive Frequently Asked Questions (FAQ) Document for the National Inquiry into Violence against Indigenous Women”**
 - Written for the Legal Strategy Coalition on Violence Against Indigenous Women, available at leaf.ca/LSC.
- Pippa Feinstein, **“A Guide to Canadian Border Security Agency (CBSA) Enforcement in Edmonton”** (August, 2015)
 - Written with input from community organizations and CBSA employees as an accessible resource for those in Edmonton without immigration status.
- Pippa Feinstein & Megan Pearce, **“Dismantling Democracy: Stifling debate and dissent in Canada”** (May 2015)
 - Report co-written for Voices-Voix Canada, available at voices-voix.ca.
- Pippa Feinstein & Megan Pearce, **“Review of Reports and Recommendations on Violence Against Indigenous Women in Canada”** (February 25, 2015)
 - Report written for the Legal Strategy Coalition on Violence Against Indigenous Women, available at leaf.ca/LSC.
- Pippa Feinstein & Megan Pearce, **“What does it take to protect Indigenous women from violence?”** (December 11, 2014)
 - Op-ed co-written for rabble.ca.

Selected Presentations and Workshops

- **“Queer international legal theory and “queer visibility”: challenging mainstream international law and predominant global legal orders”** (forthcoming, March 29, 2019) Toronto, ON.
 - 12th Annual Toronto Group Conference for the Study of International, Transnational, and Comparative Law, “Resistance to International Law and the Global Legal Order”.
- **“Understanding and using Canadian access to information law”** (February 13, 2019) Toronto, ON.
 - Tools for Change’s capacity-building workshop series. These workshops are provided to increase the skill sets of engaged members of the public, grassroots organizations, students, and more established NGOs advocating for social, environmental, and economic change.
- **“Adding formal legal processes to the advocate’s toolkit”** (November 15, 2018) Toronto, ON.
 - Tools for Change’s capacity-building workshop series.
- **“Submissions on the current state and future of national energy data”**, (May 29, 2018) Ottawa, ON.
 - Invited to address the House of Commons’ Standing Committee on Natural Resources, based on the submissions I prepared for the National Energy Board Modernization Expert Panel.
- **“Updates concerning sewage bypass public alerts in Ontario”**, (November 13, 2017) Toronto, ON.
 - The People’s Great Lakes Summit, organized and hosted by the Canadian Environmental Law Association.
- **“Understanding and addressing conflict in groups”** (March 21, 2017) Toronto, ON.
 - Tools for Change’s capacity-building workshop series.
- **“An introduction to legal structures, internal infrastructure, and strategic planning for art collectives”** (March 8, 2017) Toronto, ON.
 - Scarborough Arts’ pilot program providing capacity-building residencies for art collectives.
- **“The contribution of socio-cultural difference to conflict”** (October 14, 2016) Toronto, ON.
 - Alternative Dispute Resolution Institute of Canada Annual Conference.
- **“Backgrounder for the Assembly of First Nations Pre-Inquiry Forum”** (February 4, 2016) Enoch Cree Nation, AB.

- Missing and Murdered Indigenous Women & Girls – AFN Pre-Inquiry Forum.
- **“Legal Strategies to address violence against Indigenous women and girls”** (May 9, 2015) Saskatoon, SK.
 - Sallows-Fry Conference, “A Canadian Crisis: The Criminalization & Imprisonment of Indigenous Women & Those with Disabling Mental Health Issues”.
- **"The Secret Power of Facts: how collecting and sharing information empowers people to protect the environment"** (February 22, 2014) Ottawa, ON.
 - Canadian Association of Environmental Law Students' Societies (CAELS) Annual Conference.

Selected list of cases

- **Pickering Nuclear Generating Station Licence Renewal**, June 2018, Canadian Nuclear Safety Commission.
- **Deloro Mine Site Remediation Licence Renewal**, October 2017, Canadian Nuclear Safety Commission.
- **National Energy Board Modernization Public Consultation**, 2017, Natural Resources Canada.
- **TransCanada Energy East and Eastern Mainline Project Applications**, 2016 - 2017, National Energy Board.
- **Pickering Waste Management Facility Licence Renewal**, April 2017, Canadian Nuclear Safety Commission.
- **Port Hope Area Initiative Commission Update Report**, November 2016, Canadian Nuclear Safety Commission.
- **Cameco Port Hope Conversion Facility Licence Renewal**, November 2016, Canadian Nuclear Safety Commission.
- **Darlington Nuclear Generating Station Licence Renewal**, November 2015, Canadian Nuclear Safety Commission.
- **SRB Technologies Licence Renewal**, May 2015, Canadian Nuclear Safety Commission.
- **Ontario Power Generation Rate Increase Application**, June 2014, Ontario Energy Board.
- **Toronto Island Airport Expansion Application**, December 2013, Toronto City Council.
- **Enbridge Line 9B Reversal Application**, October 2013, National Energy Board.

Community Engagement Experience

- **Member**, Voices-Voix Editorial Collective (2015 – present)
 - I identify issues for, and draft, new case studies for the Voices Documentation Project. The project is geared towards educating members of the public about threats to Canadian democracy.
- **Chair, Social Action Committee**, First Narayever Congregation (2016 – 2018)
- **Board Secretary and Director**, Scarborough Arts (2014 – 2016)
- **Winner**, Second Annual West Coast Environmental Law Twitter Moot (2013)
 - This was an initiative that sought to increase public engagement with and understanding of issues in environmental law. I represented the Centre for Indigenous Environmental Resources (CIER).
- **Legal Clinic Student** (2012-2013), University of Alberta Faculty of Law 'Low Income Individuals and the Law' Clinical Placement and Seminar, Edmonton, AB.
- **Delegate** (2011), **VP External** (2012), University of Alberta Oil Sands Student Delegation, Edmonton, AB.
- **Co-leader/Coordinator** (2010 – 2012), ‘Edmonton REDdress Project’, Edmonton, AB.
- **Researcher and Project Leader** (2010 – 2013), Pro Bono Students Canada, Edmonton, AB.
- **Delegate**, (2009), Delegation and politician-shadowing program, Equal Voice, Ottawa, ON.

Called to the Ontario Bar June 2014. Member in good standing of the Law Society of Ontario.

Appendix D

Curriculum Vitae of Wilf Ruland (Professional Geoscientist)

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Education:

1988 Master of Sciences in Earth Sciences,
University of Waterloo.
Supervisor: Dr. John Cherry

Master's project focussed on the hydrogeological properties of fractured clay deposits in Lambton County. 15 courses provided a broad background in hydrogeology.

1982 Honours Bachelor of Science in Geography and Geology,
McMaster University.

30 courses provided a broad background in natural science, geography and geology.

Experience:

Since 1988 Environmental Consultant, as head of own consulting firm (Citizens' Environmental Consulting).

Active as advisor and consultant on issues related to groundwater or surface water contamination or depletion for private citizens, citizens' groups, environmental groups, First Nations, companies and public agencies from across Ontario.

Specialization in addressing landfill-related groundwater and surface water contamination problems through review of hydrogeological impact studies, field investigations, and participation in public meetings and hearings.

Ongoing contracts include investigations of water contamination at landfills near St. Catharines, Brockville, Kingston, Waterloo, and Windsor.

Other significant areas of work include review of pit and quarry proposals and applications for Permits to Take Water, investigations of well interference resulting from quarries, and groundwater contamination emanating from major industrial properties and gas stations.

Experience: continued

1988-1993 Research Associate, Waterloo Centre for Groundwater Research,
University of Waterloo

Work included research into the hydrogeology of fractured clays and into the impacts of landfills on groundwater.

1983-1985 Hydrogeologist, Ingenieur-Geologisches Institut, Westheim, Germany.

Work included hydrogeological field work, supervision and evaluation of drilling programs, supervision and evaluation of pumping tests, research and preparation of hydrogeologic reports, and supervision of environmental monitoring for a major railway construction project.

Publications, Papers and Research Reports:

Worthington, S.R.H., Smart, C.C., and Ruland, W.W. 2012. Effective Porosity of a Carbonate Aquifer with Bacterial Contamination: Walkerton, Ontario, Canada. Published in the Journal of Hydrology, Vol. 464-465 (2012), p. 517-527.

Ruland, W.W. 2005. Presentation on Source Water Considerations and the Walkerton Setting. Presented at the Canadian Water Network's Walkerton Water and Public Health Training Workshop, May 28 - June 2, 2005.

Worthington, S.R.H., Smart, C.C., and Ruland, W.W. 2002. Assessment of Groundwater Velocities to the Municipal Wells at Walkerton. Paper presented at the 3rd Joint IAH-CNC/CGS Conference, October 20 - 23, 2002 in Niagara Falls, Ontario.

Worthington, S.R.H., Smart, C.C., and Ruland, W. 2001. Karst Hydrogeological Investigations at Walkerton. Report prepared for and submitted as evidence at the Walkerton Inquiry.

Ruland, W.W., Schellenberg, S.S., and Farquhar, G. 1993. The Fate of Landfill Leachate in Waste Water Treatment Plants and in Groundwater at Attenuation Landfills. Report prepared for the Ontario Ministry of Environment and Energy.

Ruland, W.W., Cherry, J.A., and Feenstra, S. 1991. The Depth of Fractures and Active Ground Water Flow in a Clayey Till Plain in Southwestern Ontario. Published in the Journal of Ground Water, Vol. 29, No. 3, p. 405-417.

D'Astous, A.Y., Ruland, W.W., Bruce, R.J., Cherry, J.A., and Gillham, R.W. 1989. Fracture Effects in the Shallow Groundwater Zone in Weathered Sarnia Area Clay. Published in the Canadian Geotechnical Journal, Vol. 26, No. 1, p. 43-56.

Fracture Depths and Active Groundwater Flow in a Clayey Till in Lambton County, Ontario. 1988. Unpublished M.Sc. Project, University of Waterloo.

Cherry, J.A., MacQuarrie, K.T.B., and Ruland, W.W. 1987. Hydrogeologic Aspects of Landfill Impacts on Groundwater and Some Regulatory Implications. Paper presented at the PCAO/MOE Seminar on Landfill Regulations May 13, 1987.

Wilf Ruland (P. Geo.) - Partial List of Consulting Experience:

1) Investigations/Reviews of Landfill-Related Water Contamination:

Niagara Road 12 Landfill, near Grimsby, Ontario.

- Peer Review for the Niagara Road 12 Litizen Liaison Committee (2008-2010).

Humberstone Landfill in Welland, Ontario.

- Peer Review for the Humberstone Public Liaison Committee (since 2007).

City of Owen Sound's Derby Landfill site, near Owen Sound, Ontario.

- investigation and review for the Ledingham family (2004-2006)

Town of Northeastern Manitoulin and the Islands Landfill, near Little Current, Ontario;

- investigation and review for Mr. Raeburn Smith and Mrs. Virginia Smith (2004 - 2013).

Rennie and Brampton Street Landfill Sites, Hamilton, Ontario;

- Peer Review for the Rennie/Brampton Citizens' Liaison Committee (2001-2005).

Town of Thessalon Landfill Site, near Thessalon, Ontario;

- investigation for Mr. Mark Petingalo and Mrs. Wendy Petingalo (in 2000).

City of Brockville Landfill Site, Brockville, Ontario;

- review for Brockville Public Liaison and Monitoring Group (since 1997).

Fletcher Tile Landfill Site, near Chatham, Ontario;

- investigation for Citizens Opposed to Landfill Development (1996-1997).

Bracebridge Landfill Site, Bracebridge, Ontario;

- investigation for Dr. David Kent (1995-1996).

Waterloo Sanitary Landfill Site, Waterloo, Ontario;

- review for Waterloo Waste and Water Watchers (since 1995).

Innisfil Landfill Site, Innisville, Ontario; investigation for Mrs. Helen Hodgson (1995 - 1999).

Tom Howe Landfill Site, near Hagersville, Ontario;

- review for the Mississaugas of the New Credit First Nation (since 1994).

Wolfe Island Waste Disposal Site, Wolfe Island, Ontario;

- investigation for Ms. Theresa James (since 1994).

Bensfort Road Landfill, near Peterborough, Ontario;

- investigation for Mr. Gary McCarrell and Mrs. Lori McCarrell (1991-1993).

Orillia Landfill Site, in Orillia, Ontario; investigation for Citizens Acting Now (1991).

Storrington Landfill near Kingston, Ontario;

- investigation for Storrington Committee Against Trash (1990-1997).

Glenridge Quarry Landfill in St. Catharines, Ontario;

- review for Glenridge Landfill Citizens' Committee (1989-2016).

Warwick Landfill near Watford, Ontario;
- investigation for Watford Warwick Landfill Committee (1989-1996).

Brow Quarry Landfill near Dundas, Ontario;
- investigation for Greensville Against Serious Pollution (1988-1989).

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Essex County Landfill No. 3 in Maidstone Township, Ontario;
- reviews for Maidstone Against Dumping and Maidstone Township (1988-2008).

Town of Cobourg Landfill, in Haldimand Township, Ontario;
- investigation for Mr. Joe Sherman (1988-1991).

2) Reviews of Proposals to Site New or Expand Existing Landfills

Peer Review of (amended) Terms of Reference for the Walker Environmental Group Southwestern Landfill proposed, to be situated near Ingersoll, Ontario;
- review for the OPAL Alliance (2013/2014).

Review of the proposed Capital Region Resources Recovery Center and Landfill;
- review for the Citizens' Environmental Stewardship Association - East of Ottawa (2013).

Proposal to massively expand the Richmond Landfill near Napanee, Ontario;
- review for the Concerned Citizens Committee of Tyendinaga Twp. (2004 - 2006).

Proposal to expand and significantly alter the Edwards Landfill
(including excavation of hazardous wastes, and relocation of other wastes) near Cayuga, Ontario;
- review for Haldimand Against Landfill Transfers (2004 - 2006)

Proposal to massively expand the Warwick Landfill near Watford, Ontario;
- Peer Review for the Township of Warwick (1998-2008).

Proposal to site a landfill near Cochrane, Ontario;
- review for the Fournier Action Committee (1997 -1999).

Proposal to site a landfill in the abandoned Adams Mine Site near Kirkland Lake;
- review for the Coalition of Temiskaming Concerned Citizens (in 1995).

Proposal to site a landfill in the Taro East Quarry near the Niagara Escarpment
in Stoney Creek, Ontario;
- review for Stoney Creek Residents Against Pollution (in 1995).

Proposal to develop a perimeter-berm landfill around the Lake Ontario Steel Company Limited property
in Whitby, Ontario; Peer Review for the Lasco Berm Liason Committee (1991-1995).

Proposal to build a landfill in a Class 2 Wetland near Cayuga, Ontario;
- review for Haldimand-Norfolk Organization for a Pure Environment (1989-1990).

Proposal to site a landfill in the Acton Quarry near Milton, Ontario;
- review for Protect Our Water and Environmental Resources (in 1989).

3) Review of Landfill Closure and End Use Plans

Closure Plan for the Wolfe Island Landfill Site (since 2012); review done for Ms. Theresa James.

Closure Plan for the Tom Howe Landfill Site; review done for the Mississaugas of the New Credit First Nation (2005, and 2009/2010).

Closure Plan for the Richmond Landfill near Napanee, Ontario; for the Concerned Citizens Committee of Tyendinaga Twp. (2007).

End Use Plan for the Glenridge Quarry Naturalization Site (formerly the Glenridge Landfill), for the Glenridge Landfill Liaison Committee (2002).

Closure and post-Closure Care Plan for the Brockville Landfill Site, for the Brockville Public Liaison and Monitoring Group (2000-2001).

Closure and End Use Plan for Essex County Landfill No. 3, for Maidstone Against Dumping (1996).

Closure Plan for the Cobourg Landfill. For Mr. Joe Sherman (1990s).

Closure Plan for the Brow Quarry Landfill. For Greenville Against Serious Pollution (1990s).

4) Other Landfill-Related Projects

Peer Review of proposal to expand the Clean Harbors Hazardous Waste Landfill Facility near Sarnia, Ontario (2010-2015); for the Township of St. Clair.

Investigation and review of groundwater and surface water contamination being caused by a cement kiln dust landfill near Bath, Ontario. Negotiated an agreement with Lafarge Cement to remediate the existing landfill and use an industry-standard design on a go-forward basis. For Lake Ontario Waterkeeper (2007-2010).

Member of the Expert Panel (appointed by the Minister of the Environment) to look into potential health and environmental impacts from the Taro East Landfill in Stoney Creek, Ontario (in 2000). The final report of the Expert Panel was released in October 2000, and the Addendum Report was released in December 2000.

Technical advisor to private citizens who successfully prosecuted the City of Hamilton (which pleaded guilty) for contamination by PCB-laden leachate of Redhill Creek (in 2000). The resulting \$450,000 fine was a record for fines paid under such prosecutions.

5) Reviews of Waste Management Master Plan (WMMP) Studies

Region of Region of Waterloo Management Master Plan (WMMP);
- review for the Waterloo Landfill Liaison Committee (2013).

Region of Haldimand-Norfolk Waste Management Master Plan (WMMP);
- review for the Mississaugas of the New Credit First Nation (1995-1996).

South Simcoe County Waste Management Master Plan;
- review for the South Simcoe Waste Action Network (1994-1995).

Leeds and Grenville Waste Management Master Plan;
- review for Sabourins Crossing Residents Against Megadumps (in 1994).

Pembroke and Area Waste Management Master Plan;
- review for the Snake River/Micksburg Anti-Dump Association (1991-1992).

Northumberland County Waste Management Master Plan;
- review for Mr. and Mrs. J. Sherman (1989-1991).

Wellington County Waste Management Master Plan;
- review for the Concerned Alma Citizens (1988-1991).

6) Nuclear-Related Peer Review Work

Review of the proposed license renewal for the Pickering Nuclear Generating Station.
- review for Lake Ontario Waterkeeper (2018).

Review of the proposed in-site decommissioning of the Nuclear Demonstration Project (NPD) Reactor on the Ottawa River near Rolphton, Ontario.
- review for the Algonquin Anishinabeg Nation Tribal Council (2018).

Review of the 2016 Regulatory Oversight Report for Uranium and Nuclear Substance Processing Facilities, Including Cameco's Port Hope Conversion Facility.
- review for Lake Ontario Waterkeeper (2017)

Review of the proposed Near-Surface Disposal Facility for Low Level Nuclear Wastes at the Chalk River Laboratories site, near Chalk River Ontario.
- review for Ottawa River Keeper (2017).

Review of the decommissioning plans for the Deloro Mine Site near Deloro, Ontario.
- review done for Lake Ontario Waterkeeper (2017).

Review of the Port Hope Area Initiative (PHAI) (involving remediation of widespread low-level radioactive wastes, with deposition into 2 specially designed landfills in the Port Hope Area;
- review for Lake Ontario Waterkeeper (2016).

Review of the proposed Deep Geologic Repository (DGR) for low- and intermediate level nuclear wastes;
- review for the Canadian Environmental Law Association (2013)

Review of the Draft Environmental Impact Statement for the proposed Darlington 'B' New Nuclear Power Plant Project;
- review for Lake Ontario Waterkeeper (2010-2012).

Review of the proposed remediation of the Cameco Nuclear Waste Processing Facility in Port Hope, Ontario;
- review for Lake Ontario Waterkeeper (starting in 2010).

Review of the Draft Guidelines for the Environmental Impact Statement for the proposed Darlington 'B' New Nuclear Power Plant Project;
- review for Lake Ontario Waterkeeper (2008).

7) Other Investigations/Reviews of Groundwater Contamination

Review of clean-up of an area of contamination at a former Ontario Hydro Transformer Station;
- review conducted for Ms. Kathy MacLeod (2014).

Contamination by petroleum hydrocarbons of a greenhouse property from an adjacent Hydro One maintenance center in Kenora, Ontario;
- investigation for the Schmidt Family (2008)

Impacts of residual contamination on a former industrial property, which is now the site of St. Mary's High School;
- investigation for Environment Hamilton (2002 - 2004).

Contamination by petroleum hydrocarbons and volatile organic chemicals (VOCs) from a former service center near High Park, Toronto;
- investigation for Mr. Gerard Kennedy, MPP (in 2002).

Contamination of municipal water supply wells by E-coli bacteria in Walkerton, Ontario;
- investigation for Concerned Walkerton Citizens (2000 - 2002).

Contamination by petroleum hydrocarbons and volatile organic chemicals (VOCs) from an Imperial Oil fuel and liquid transfer facility in Kapuskasing, Ontario;
- investigation for the Schlechter family (in 2000).

Contamination by petroleum hydrocarbons from a Gulf Canada gas station in Port Loring, Ontario;
- investigation done for People Against Contaminated Water (PACW); (1999 - 2001).

Contamination by petroleum hydrocarbons from a gas station in Bamberg, Ontario;
- investigation for the Bush and Fink families (1997 - 1998).

Groundwater contamination in Cambridge, Ontario caused by Ciba-Geigy Canada Ltd;
- investigation conducted for Thomas Construction Company Ltd. (1993 - 1997).

Groundwater contamination from the Bristol Aerospace Plant near Lockport, Manitoba;
- investigation for Mrs. Elizabeth Andresen and Miss Ursula von Krogh (in 1993).

Extensive/review of water contamination in Elmira, Ontario caused by Uniroyal Chemical Ltd (subsequently renamed Crompton Corp. and now Chemtura Canada Co;
- investigation for various clients, most recently the Region of Waterloo (since 1989).

8) Permits to Take Water and Drinking Water Systems

Review of an application for a Permit to Take Water to allow draining of a 25 hectare lake on the Carmeuse Canada Lime Inc. property situated near Ingersoll, Ontario.
for the OPAL Alliance (2014).

Preparation of applications to the Ministry of the Environment to upgrade the drinking water systems for Camp NeeKauNis near Waubaushene, Ontario (since 2012).

Review of an application for a Permit to Take Water for a Water Bottling Operation (to be operated by CJC Bottling Limited), with water to be taken from a well which feeds the headwaters of Colborne Creek; for the Concerned Citizens of Northumberland (2001 - 2004).

Review of an application for a Permit to Take Water for a municipal water supply project (for the Village of Woodville), with water to be taken from pumping wells near 5 families' homes;
- for the Mariposa Aquifer Protection Association (2000 - 2004).

Review of an application for a Permit to Take Water for a Water Bottling Operation (to be operated by Artemesia Springs Limited), with water to be taken from a springwell which feeds a headwater stream of the Rocky Saugeen River;
- for the Water Protection Coalition of South Grey (1999 - 2001).

Review of an application for a Permit to Take Water for a Water Bottling Operation (to be operated by Aquafarms 93 Limited), with water to be taken from a spring and 3 pumping wells situated near the headwaters of the Beaver River;
- for Ms. Samantha Wickens and other local residents (in 1999).

Preparation of an application for a Permit to Take Water for a fish farming operation (to be operated by Van Aqua Inc.), with water to be taken from a pumping well near the Town of Burford in Brant County; for Mr. Peter Van Kruistum (in 1988).

9) Reviews/Investigations Related to Impacts of Major Water-Takings

Impacts of ongoing pumping of municipal supply wells K50/K51 in Wilmot Township;
- review for Wilmot Center Monitoring Program Public Liaison Committee (since 2003).

Impacts of ongoing dewatering of the Canadian Gypsum Company mine near Hagersville Ontario;
- review for residents of 3rd Line, Six Nations Indian Reserve (1999-2003).

10) Reviews/Investigations related to Impacts from Pits, Quarries, and Mines

Review of Environmental Impact Statement (EIS) for the proposed Marathon PGM-Cu Mine Project which has been put forward by Stillwater Canada Inc. (SCI).
- review for Northwatch (ongoing 2013-2014).

Investigation of potential impacts from the Miller Braeside Quarry near Braeside, Ontario;
- review for Friends Addressing Concerns Together in McNab/Braeside (since 2008).

Investigation of potential impacts from the unlicensed Nichol Quarry near Hagersville, Ontario;
- review for the Mississaugas of the New Credit First Nation (2007-2011).

Impacts of the proposed expansion of the Nelson Aggregates Quarry near Mount Nemo, Ontario;
- review for Protecting Escarpment Rural Land (2005-2007).

Cumulative impacts of the proposed Halminen Quarry and Lafarge Quarry near Buckhorn, Ontario;
- review for Friends of Life in the Kawarthas (2004 - 2006).

Impacts of the proposed expansion of the Graham Brothers Aggregates Limited gravel pit near Caledon;
- review for Dr. David Sylvester (2000 - 2001).

Impacts of the proposed Nichol Gravel Limited quarry near Hagersville, Ontario;
Quarry operated in violation of MNR and MOE regulations for many years;
- review for the Mississaugas of the New Credit First Nation (1999 - 2011).
- Impacts of well interference from the Canadian Gypsum Company mine near Hagersville;
- investigation for several families on the Six Nations Reserve (1999 - 2003).

Impacts of well interference from the Dunnville Rock Products Quarry near Dunnville;
- investigation for Mr. Ken Ricker and Mrs. Ethel Ricker (1997 - 2000).

Impacts of water takings associated with the Acton Quarry near Acton, Ontario;
- review for Protect Our Water and Environmental Resources (1997-2007).

Impacts of a quarry proposed adjacent to Mitchell Lake, near Victoria Road, Ontario;
- review for the Northern Victoria Ratepayers Association (1997 - 1999).

Impacts of a quarry, proposed to be located on the Bruce Peninsula;
- review for Mr. Ziggy Kleinau (1996).

Impacts of a proposed gravel pit, to be sited near Grippen Lake, Ontario;
- review for Township Residents Against Pit Pollution (1995 - 1998).

Impacts of a gravel pit to be built in an Earth Science Area of Natural Interest (ANSI);
- review for Ms. Jeanette Mazur (1995 - 1996).

Impacts of the proposed Seeley and Arnill Quarry near Orillia, Ontario;
- review for Mr. David Lowry (1993 - 1997)

Impacts of a proposed expansion of the Walker Brothers Quarry, near St. Catharines;
- review for Mrs. Ronnie DeMeel (1992).

Impacts of six (6) proposed gravel pit operations in Oro Twp., Ontario;
- review for Dr. E.J. Beaton and Dr. A.C. Beaton (1990 - 1992).

11) Participation in Public Hearings

A hearing pertaining to the proposed sale of a County landfill site (which was never constructed) with a stale-dated 20 year old approval, to a private firm. The proposed site appears now to be part of a wetland complex which may be provincially significant.

- before the Environmental Review Tribunal
- Decision pending.

A hearing into a proposed rural subdivision in the Hamlet of Hartington, involving a 30% increase in the number of wells and septic systems in an area of inadequate and impaired groundwater supply;

- before the Ontario Municipal Board;
- Decision dated November 15, 2018.

A hearing into a proposed 10-year license extension for the Cameco Nuclear Waste Processing Facility in Port Hope, Ontario including proposed remediation of contamination by radionuclides of the Cameco property and the Port Hope Harbour;

- before the Canadian Nuclear Safety Commission;
- Decision dated February 27, 2017.

A hearing into the appeal of deficient monitoring, contingency, and closure plans for the badly leaking Richmond Landfill near Napanee, Ontario.

- before the Environmental Review Tribunal; Decision dated December 24, 2015.

A hearing into the proposed massive expansion of a quarry and proposed development of an asphalt plant on the Braeside Ridge, in the middle of a potential Provincially Significant Wetland complex and uphill of numerous residential wells.

- before the Ontario Municipal Board;
- Decision dated October 27, 2015.

A hearing into the proposed Deep Geologic Repository, designed to accept low- and intermediate-level nuclear waste, and to be situated at the Bruce Nuclear Plant;

- before the Canadian Nuclear Safety Commission;
- Decision dated May 6, 2015.

An application to site a quarry in a Provincially Significant Wetland Complex near Duntroon, Ont;

- before the Ontario Municipal Board;
- Decision dated August 24, 2012.

A hearing into the proposed Darlington 'B' New Nuclear Power Plant Project;

- before the Canadian Nuclear Safety Commission;
- Decision dated August 17, 2012.

An application to develop a quarry in the Niagara Escarpment Plan area near Duntroon, Ontario;

- before the Joint Board;
- Decision dated June 18, 2012.

An application to develop a gravel pit in the Municipality of Grey Highlands, Ontario;

- before the Ontario Municipal Board; Decision dated April 30, 2008.

An application to massively expand the Dufferin Aggregates Milton Quarry;

- before the Joint Board;
- Decision dated June 8, 2005.

An application for conversion of 81 cottages into permanent homes adjacent to a World Biosphere Reserve, Class 1 Wetland and Wilderness Area in Turkey Point;

- before the Ontario Municipal Board;
- Decision dated August 13, 2002.

An application to develop a quarry near Mitchell Lake and Victoria Road, Ontario;

- before the Ontario Municipal Board;
- Decision dated January 22, 1999.

An application to develop a gravel pit adjacent to a Class 1 Wetland along the shore of Lake Katchewanooka near Lakefield, Ontario;

- before the Ontario Municipal Board;
- Decision dated June 4, 1998.

An application to develop a quarry near Kinmount, Ontario;

- before the Ontario Municipal Board;
- Decision dated August 18, 1995.

An act (Bill 62) to amend the Environmental Protection Act to phase out landfilling in the Niagara Escarpment Plan Area;

- before the Standing Committee on the Administration of Justice;
- Bill 62 received Royal Assent June 23, 1994.

An application to expand the Eastview Road Landfill Site near Guelph, Ontario;

- before the Environmental Assessment Board;
- Decision EP 92-02 dated September 22, 1993.

An application to develop six (6) gravel pits on the Oro Moraine in Oro Twp.;

- before the Ontario Municipal Board;
- Decision dated July 23, 1993.

An application to expand the Storrington Landfill Site;

- before the Environmental Assessment Board;
- Decision EP 91-01 dated March 31, 1993.

An amendment (No. 52/89) to the Niagara Escarpment Plan to delete waste disposal sites as a permitted land use in lands protected by the Plan;

- before a Niagara Escarpment Commission Hearing Officer;
- Decision dated Oct. 22, 1991.

An appeal against a zoning bylaw and a proposed plan of subdivision (which allowed construction of a golf course on a Class 1 Wetland);

- before the Ontario Municipal Board;
- Decision dated August 29, 1990.

An application to expand the Seeley and Arnill Aggregates Ltd. gravel pit in Oro Twp.;

- before the Ontario Municipal Board;
- Decision dated May 29, 1990.

An application to expand Essex County Landfill No. 3;

- before the Environmental Assessment Board;
- Decision EP 89-02 dated December 12, 1989.

An application to expand the Town of Cobourg landfill;

- before the Environmental Assessment Board;
- Decision EP 89-01 dated October 16, 1989.