

**Remediation of Centre Pier, Port Hope, Ontario: Historical, Logistical, Regulatory and Technical Challenges – 13118**

Andrea Ferguson Jones, P.Geol., Glenn Case, P. Eng. and Dave Lawrence, P.Eng.

\* MMM Group Limited, 100 Commerce Valley Drive West, Thornhill, Ontario, Canada L3T 0A1  
[FergusonJonesA@mmm.ca](mailto:FergusonJonesA@mmm.ca)

\*\* Atomic Energy of Canada Limited, 115 Toronto Road, Port Hope, Ontario, Canada L1A 3S4  
[caseg@aecl.ca](mailto:caseg@aecl.ca)

\*\*\*Public Works and Government Services Canada, 115 Toronto Road, Port Hope, Ontario, Canada L1A 3S4  
[Dave.Lawrence@pwgsc-tpsgc.gc.ca](mailto:Dave.Lawrence@pwgsc-tpsgc.gc.ca)

**ABSTRACT**

Centre Pier is a 3.9 ha property owned by the Commissioners of the Port Hope Harbour in the Municipality of Port Hope, Ontario, Canada. It is centrally located on the Port Hope waterfront and is bounded on the west by the Port Hope Harbour, on the east by the Ganaraska River, on the south by Lake Ontario, and on the north by a railway corridor. The property is currently leased by the Commissioners of the Port Hope Harbour to the Cameco Corporation which owns the four onsite buildings that are used as warehouse space for their uranium conversion facility located on the western side of the Harbour. Remediation of this site forms part of the Port Hope Project being undertaken by Atomic Energy of Canada Limited (AECL) and Public Works and Government Services Canada (PWGSC) as part of the Port Hope Area Initiative (PHAI).

Soil impacts include radiological, metals and petroleum hydrocarbons resulting from long term historical industrial use. Radiological impacts in soil extend across most of the site primarily within the upper metre of fill. Metals-contaminated soil is present across the entire site in the underlying fill material. The metals-contaminated fill extends to a maximum depth of 2.0 m below grade at the north end of the site which is underlain by peat. However, the metals-contaminated soil could extend to the top of the bedrock on the remainder of the site. Based on the elevation of the bedrock in the adjacent river and Harbour Basin, the metals-contaminated soil may extend to a depth of 5.6 m or 6.5 m below existing grade. Petroleum-contaminated soil is present on the southeast side of the site, where a storage tank farm was previously located.

Challenges include:

- The complex history of the site both relating to site use and Pier construction. Pier development began in the 1800s and was undertaken by many different entities. Modifications and repairs were made over the years resulting in several different types of Pier walls and fill that must be considered during remediation. A wide variety of industrial activity on the Pier including extensive foundry operations as well as the industrial nature of the fill used to construct the Pier has resulted in extensive contamination distribution. The Pier structure will require reinforcement to permit both the remediation of the Pier and the adjacent Harbour and remediation techniques will need to be well suited to minimize disruption of wall structures as well as being able to deal with fill ranging from ash to boulders.
- Multiple stakeholders are responsible for building demolition, remediation of radiological impacts, remediation of industrial impacts and the use of the site as a staging area for Harbour

sediment remediation. The successful remediation of the Centre Pier will require careful negotiation and planning for the various remediation activities noted above.

- The depth of contamination on the Pier would result in the complete removal of the Pier if all contamination were to be excavated. Therefore, a Risk Assessment will be conducted to determine the appropriate means for *in situ* risk management for materials to be left in place below a proposed depth of 1.5 m below current grade. With the concurrence of the property owners and Provincial regulators, the Risk Assessment will be undertaken in accordance with the Provincial requirements that will ensure adequate protection of the environment and future users of the site.
- The end use of the Pier has yet to be confirmed by the Municipality.

## **INTRODUCTION**

Centre Pier is a 3.9 ha property owned by the Commissioners of the Port Hope Harbour in the Municipality of Port Hope, Ontario, Canada. It is centrally located on the Port Hope waterfront and is bounded on the west by the Port Hope Harbour, on the east by the Ganaraska River, on the south by Lake Ontario and on the north by a railway corridor. The property is currently leased by the Commissioners of the Port Hope Harbour to Cameco Corporation (Cameco) which owns the four onsite buildings used as warehouse space for their uranium conversion facility located on the western side of the Port Hope harbour. Remediation of this site forms part of the Port Hope Project being undertaken by Atomic Energy of Canada Limited (AECL) and Public Works and Government Services Canada (PWGSC) as part of the Port Hope Area Initiative (PHAI).

Soil impacts include radiological, metals and petroleum hydrocarbons resulting from long-term historical industrial use. The remediation of Centre Pier requires the consideration of an aging and varied Pier structure, numerous stakeholders that have a role in remediation planning and execution, a requirement for risk assessment and uncertainty surrounding potential end uses of the site.

## **CENTRE PIER HISTORY AND STRUCTURE**

The development of Centre Pier began in the 1800s to serve the growing shipping and eventual rail traffic through Port Hope. [1] Development through government grants was undertaken by the Port Hope Harbour and Wharf Company initially and then followed by the Port Hope, Lindsay and Beaverton Railroad Company in the late 1800s as a rail link was established. By the early 1900s, Centre Pier and the Grand Trunk Railway, which was eventually taken over by the Canadian National Railway, were key elements of a transport system in Central Ontario for agricultural goods, coal and other industrial products as illustrated in Fig. 1. [1]

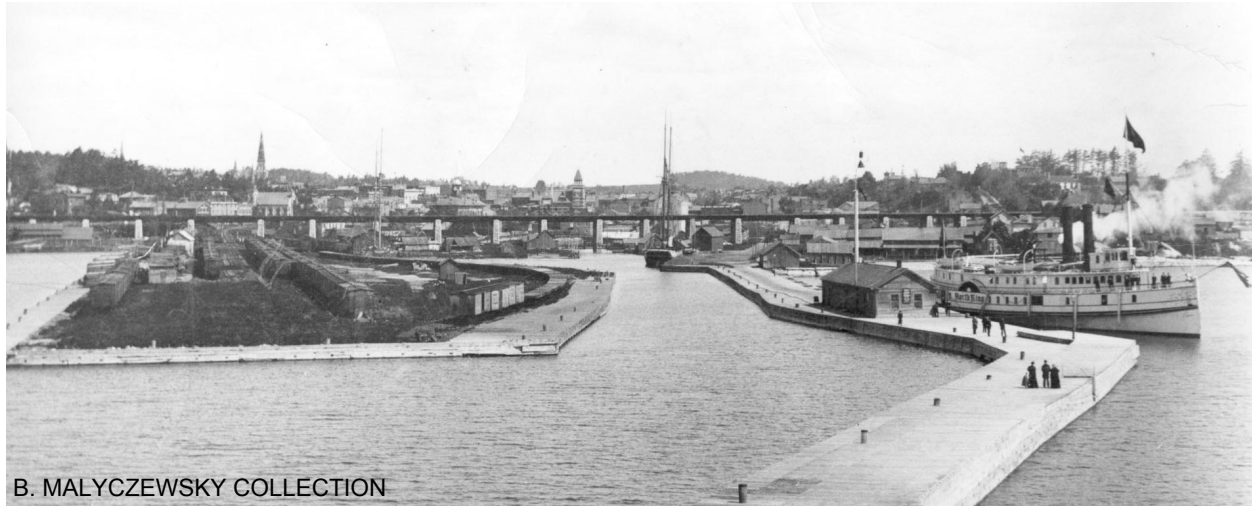


Fig. 1: Centre Pier and Port Hope Harbour late 1800s.

In the early 1900s, major industry also established itself on Centre Pier with Sanitary Ideal (later the Port Hope Crane Company) developing major enameling, brass and plumbing fixture manufacture operations on the Pier. Factory buildings occupied the majority of the Pier with rail spurs servicing both sides of the site. The last of the former marsh area at the north end of the Pier was filled in the 1930s resulting in the current shape of the Pier as shown in Fig. 2. [1]

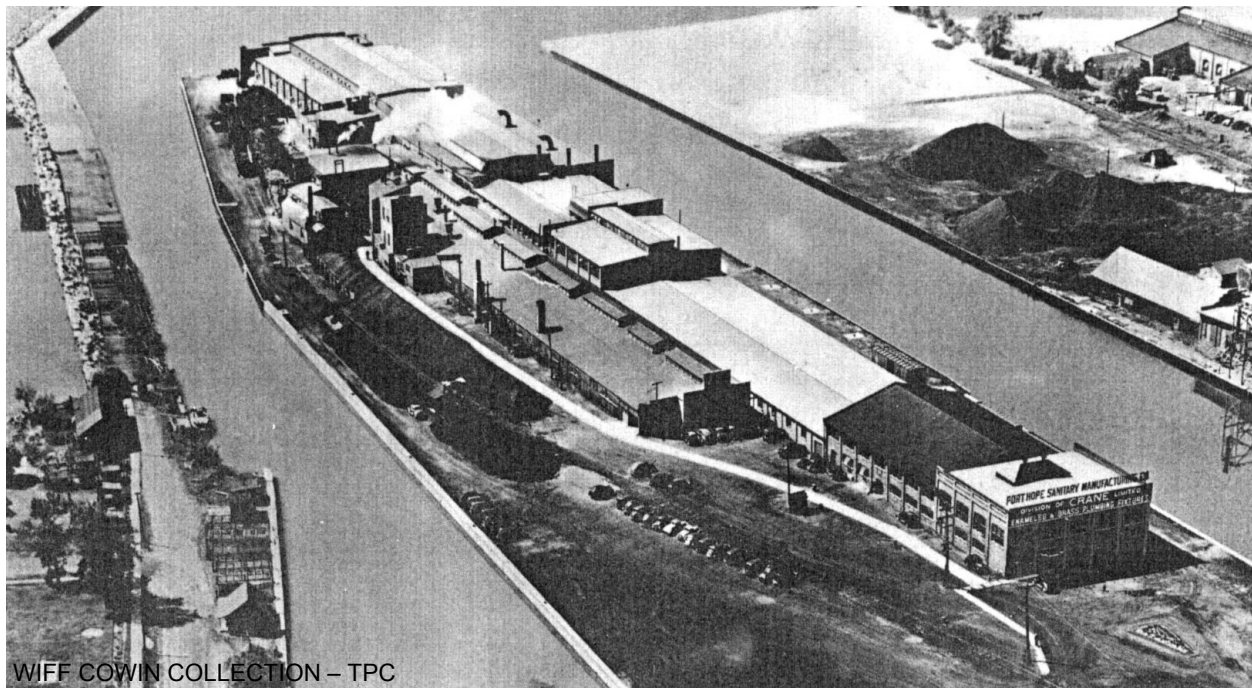


Fig. 2: Centre Pier and Port Hope Harbour circa 1950.

On the western side of the Harbour, opposite Centre Pier, Eldorado Gold Mines Ltd. established operations in 1933. Initially a radium refinery, it expanded to include uranium refining in 1942. The Canadian Federal Government took control in 1944 and the name was changed to Eldorado Mining and Refining Ltd. After World War II, production shifted to ceramic grade uranium dioxide powder

for reactor fuel. The privately held Cameco Corporation which purchased the assets of Eldorado in 1988 continues to operate a uranium conversion facility on this site.

Over the years as industrial production changed, buildings were demolished and the remaining buildings serve as facility storage for Cameco. During the remediation at the Port Hope Water Treatment Plant, a temporary storage site (TSS) containing 19,754 m<sup>3</sup> of low-level radioactive waste (LLRW) was developed on Centre Pier. A current photo of Centre Pier is presented as Fig. 3.



Fig. 3: Centre Pier present day.

A variety of construction techniques and materials were used to construct Centre Pier. The Pier walls consist of a combination of timber crib with concrete cap and sheet pile construction both of which have required repair following storm damage or normal deterioration over the years. The fill within the walls that makes up the bulk of the Pier resulted from harbour dredging operations and waste from surrounding industries.

This development history has led to the remediation now required as part of the Port Hope Project. The stratigraphy at Centre Pier includes variable fill near the surface underlain by cinder fill material with discontinuous sand and gravel. Peat from the former marsh is encountered at depth at the northern end of the Pier. Soil impacts include radiological, metals and petroleum hydrocarbons. Radiological impacts in soil resulting from radium and uranium refining extend across most of the site. Typically these impacts are limited to the upper 0.6 m (i.e., within the fill layer). However, in some areas, notably the areas where radiological material has historically been stored, the radiological contamination extends to a depth of 1.2 m. Metals-contaminated soil resulting from enameling and associated processes is present across the entire site in the fill material. The metals-contaminated fill extends to a maximum depth of 2.0 m below grade at the north end of the site which is underlain by peat. However, the metals-contaminated soil is assumed to extend to the top of the bedrock at a depth of 5.6 m or 6.5 m below existing grade on the remainder of the site. Petroleum-contaminated soil is present on the east side of the Pier where a storage tank farm was previously located.



The adjacent Port Hope Harbour also requires remediation as part of the Port Hope Project. The combined requirements of both Harbour and Centre Pier remediation have been considered in developing plans for rehabilitation of the Pier walls. Rehabilitation on the Harbour side will be more extensive to maintain wall stability during sediment removal and will include the installation of new steel sheet pile walls and associated tie backs and toe pins. On the Ganaraska River side, the rehabilitation will include new tiebacks and anchors, the addition of new granular material to protect the timber crib sections and new riprap revetment and shoreline rehabilitation at the north end of the Pier where no formal wall structure exists.

## **STAKEHOLDER COORDINATION AND LOGISTICS**

As noted above, the Centre Pier is owned by the Commissioners of the Port Hope Harbour with easements to the Municipality of Port Hope and is currently leased to Cameco. The site is currently used by Cameco for drummed facility waste storage in two of the onsite buildings and, as such, is licensed under their Conversion Facility licence. Through Cameco's long standing lease and Port Hope Project agreements, they are responsible for the demolition of the four onsite buildings prior to the initiation of remediation activities both on Centre Pier and within the Port Hope Harbour. The Port Hope Project agreement also provides 150,000 m<sup>3</sup> of space in the new Port Hope Long-Term Waste Management Facility (LTWMF) for Cameco decommissioning wastes that are attributable to the former Eldorado operations that took place prior to 1988. Specific areas within the LTWMF have been designed to accommodate the drummed waste. Cameco is also responsible for the LLRW portion of the waste on Centre Pier which generally overlies the industrial waste. However, through a cooperative arrangement, the removal of the LLRW will be completed at the same time as the removal of the industrial waste by the contractor retained for the Port Hope Project.

The following sequence of 18 activities is currently envisaged to complete the remediation of the Port Hope Harbour and Centre Pier Properties.

1. LTWMF becomes available for receipt of offsite material;
2. Port Hope Project removes stockpile of 19,754 m<sup>3</sup> of LLRW and transports to the LTWMF;
3. Cameco removes inventory of barrels in storage within Centre Pier buildings and transports to LTWMF;
4. Cameco conducts necessary decontamination of Centre Pier buildings prior to demolition;
5. Cameco conducts demolition and removal of Centre Pier buildings;
6. Cameco closes lease for Centre Pier Property with the Commissioners of the Port Hope Harbour;
7. Port Hope Project relocates Port Hope Yacht Club boats to alternate venue to permit closure of the Harbour for remediation;
8. Port Hope Project removes public access to Centre Pier and restricts access to only authorized personnel;
9. Port Hope Project conducts rehabilitation of steel sheet pile walls around perimeter of Centre Pier;

10. Port Hope Project isolates the Port Hope Harbour from the Ganaraska River and Lake Ontario through installation of fixed structural barrier (cellular steel sheet pile temporary wave attenuator in Outer Harbour);
11. Port Hope Project installs lined sediment dewatering areas and water treatment system on Centre Pier;
12. Port Hope Project conducts dredging operation with estimated 120,000 m<sup>3</sup> of dredged material pumped into sediment containment/dewatering tubes on Centre Pier;
13. Port Hope Project transfers dewatered contaminated sediment to the LTWMF;
14. Port Hope Project conducts verification of successful sediment removal;
15. Port Hope Project removes harbour isolation system from Outer Harbour;
16. Port Hope Project returns Port Hope Yacht Club boats to Port Hope;
17. Port Hope Project conducts cleanup on Centre Pier of historic LLRW and industrially contaminated fill from across entire Centre Pier property. Supported by Risk Assessment and site-specific cleanup criteria, the anticipated depth of remediation is 1.5 m below current grade; and
18. Port Hope Project completes restoration of Centre Pier Property.

## **REMEDIATION THROUGH RISK ASSESSMENT**

Extensive investigations on Centre Pier have concluded that the majority of the fill used to construct the Pier is contaminated and extends down to bedrock. Therefore, if a full remediation was undertaken, it would result in the complete removal of Centre Pier. The intended more practical solution is to undertake a Risk Assessment and develop site-specific cleanup criteria and management measures (e.g., soil cap) to permit some contamination to be left in place. The current design assumption is that fill below 1.5 m below grade will remain in place with possible small areas of deeper excavation to remove all LLRW. More current data is required to support the risk calculations and the complex contaminant distribution may provide challenges in determining appropriate risk management measures. Efforts are underway to collect the required data and ensure that the Risk Assessment can be completed in accordance with provincial regulations well in advance of remediation. Upon completion of the Risk Assessment, if the depth of remediation is different than 1.5 m, design modifications may be required.

## **SITE END USE**

Following remediation, Centre Pier will be turned back over to the Commissioners of the Port Hope Harbour and the Municipality of Port Hope. There have been extensive discussions regarding what the final end use for the site will be and its role in the larger waterfront improvement plans. Potential end uses include passive recreation, facilities for farmers' markets and other community events and facilities related to fishing and boating activities. As the end use has not been determined, the current restoration plans provide a "blank canvas" for future development.

## **CONCLUSION**

The long and complex history of Centre Pier has resulted in an interesting and complex remediation site with numerous technical challenges. Multiple remediation elements as well as stakeholders both directly and indirectly involved in the remediation will require special attention during implementation to ensure all of the pieces fall in the correct order at the correct time. The site is expected to be a key element of the waterfront revitalization plans currently being developed by the Municipality. Centre Pier has long played an important role in Port Hope's history and it is hoped that it will serve as a community focal point following remediation and long into the future.

## **REFERENCES**

1. Marshall Macklin Monaghan Ltd. 2002. Port Hope Harbour A Compendium of Historical Information.