Statement of Cultural Resource Impact Analysis

March 10/19

RECOMMENDATION to the FUS

We recommend that you approve the implementation of these mitigation measures.

☑ I concur As per attached Director comments
___ I do not concur
___ for discussion

Jewel Cunningham, Director, Ontario Waterways Unit, Trent-Severn Waterway National Historic Site & Rideau Canal National Historic Site, jewel.cunningham@canada.ca

For: Rehabilitation of Burleigh Falls Dam at Lock 28, TSW, ON (RPA 1224)
Date: January 17th 2019

Prepared by:
Nathalie Desrosiers, Senior Policy Advisor, Cultural Heritage Policies Branch, IACHD, nathalie.desrosiers2@canada.ca

Project overview
The project scope entails the rehabilitation of Burleigh Falls Dam, improvements to public and operator safety, and reliability at the site. The existing dam is composed of the following main structures: South Gravity Dam Section; Spillway Section composed of 12 Sluices; North Retaining wall; and North Closure wall.

Heritage Value
The Burleigh Falls Dam is a cultural resource of other heritage value (OHV) for its role in in-land water transportation, water management and the evolutionary development of the TSW. The landscape and lock are not cultural resources (NCR). The designation NCR is used to indicate that the resources were evaluated under the CRM Policy but were not considered to meet the criteria to be recognized as a cultural resources for Parks Canada's management purposes.

The following aspects of the proposal respect or enhance the heritage value of the cultural resource for the following reasons:
The rehabilitation of Burleigh Falls Dam ensures the continued operation of the TSW as an operational system for through-navigation and water management, a key defining element of the system.

The following aspects of the proposal could detrimentally impact on heritage significance. The reasons are explained as well as the mitigation measures to be taken to minimise impacts:
The existing dam (manually operated) is of reinforced concrete dating from the first construction period of the TSW (1912). Burleigh Falls Dam is a large concrete dam that is 241m long and 12.8m high. The dam was repaired in 1947-48, 1963-64 and 1973-74 and partially rehabilitated (re-facing the piers) in the early 1990s (PCA 2015c). Originally, two timber crib dams were built at the same location (Figure 23CA 2015f, Appendix II, AOA). The rehabilitation of the dam will impact character-defining elements that connects the engineering work to the TSW NHS.

For these reasons, the primary recommended conservation approach based on the Standards and Guidelines for the Conservation of Historic Places in Canada is rehabilitation with an emphasis on minimal intervention. As such, the application of Standards 1-12 is recommended, including the relevant Guidelines on Cultural Landscapes (Section 4.1), Archeological Sites (Section 4.2), Engineering Works (Section 4.4) and Materials (Section 4.5).

The following solutions have been considered and discounted for the following reasons:
Only moderate repairs have been undertaken on this structure to date. The dam is in poor condition and was included in the High Risk Mitigating Measures Study and Report. A Dam Safety Review was subsequently initiated due to its poor condition and "High A" Hazard Classification. Preliminary results of the DSR identified serious deficiencies at this structure. Specifically there are large voids under the dam piers. Rehabilitation of Burleigh Falls Dam is inevitable due to the repair requirements. There were initial discussions about replacing the historic dam, but financial considerations have reoriented the scope of the project.

Recommendations:
- ☐ The project should be aligned with the recommendations provided in the Conservation Guidance 2016-2021 Capital Works Program TSW.
- ☐ Document the existing features that will be removed (photos before, during, after construction).

- ☐ The work on the dam should correspond to the heritage value of the TSW by preserving the character-defining elements (as identified in the CG and SoHV) that connect the engineering work to the historic dams on the TSW NHS.
- ☐ Repair / rehabilitate deteriorated parts of features using recognized conservation methods. Repair may also include limited replacement in kind of those extensively deteriorated parts of features. Repairs should match the existing work as closely as possible, both physically and visually based on the original drawings, plans and photos.
- ☐ Minimize additions and intrusions to the landscape, and ensure colours chosen blend with the setting of the Lockstation. Each element added to the site should be assessed and integrated (colour, finish, and material) as much as possible to the structure in the landscape. Cohesion, consistency and visual relationship between each component should dictate all interventions (including future plans and structures for this site, ex. ancillary building, hydro components, etc.).
- ☐ Coordinate/conceal location of equipment and associated elements out of the public eye as much as possible. Design strategies should be reviewed by CRM, maintenance and operational staff.
- ☐ Show the locations, dimensions, materials and details of railings, mechanical and electrical components on the drawings.
- ☐ Show the locations, dimensions, materials and details of all concrete elements on the drawings.
- ☐ Drawings should include a landscaping plan. Clarify how the dam / railing will anchor itself in the landscape and how the landscaping is addressed around the structure in its periphery and overall site. The plan should show all above ground elements and should be prepared by a qualified Landscape Architect.
- ☐ Reinstate a well-ordered and minimal landscape treatment with the use of indigenous trees and turfgrass sod.
- ☐ Railing: consistency along the TSW is important to ensure a holistic approach on the NHS. Every effort should be made to limit the addition of railings on this site (Lock, Dam and surrounding).
  - ☐ Employ railings of a single design language.
  - ☐ Avoid as much as possible superposing railings on this location to minimise "visual walls" that could potentially obstruct the viewscape and waterscape (a third railing on the dam is not recommended as it will greatly impact the viewscape on the site).
  - ☐ Efforts should be made to harmonise the railings to the natural lines of the landscape and edges of the engineering work.
  - ☐ Review mounting details and support posts.
  - ☐ Review anchoring details and consider cleaner and minimal intervention approach.
  - ☐ New railings should be consistent in height and positioning across the site.
  - ☐ Galvanised steel railing: Burleigh Falls Lockstation landscape offers a direct visual connection between the Lock, Dam, waterscape and viewscape. A visual disconnection between the two engineering works would greatly impact the landscape. Ensuring the architectural and visual compatibility between the two structures is essential. Within the parameters of safety requirements, the railings should be subordinate to and harmonious with the character of the Lockstation and surrounding area.
- ☐ Concrete: concrete colour should not have a strong blue-ish white undertone. Minimise the width of any joint in the concrete. Colour of joins to match concrete color.
- ☐ Horizontal surfaces finish: following discussion on November 28th (ONWIOC), the Record of Decision is that anti-slip pattern for horizontal surfaces on dams would be light broom finish with minimal edging in order to avoid the look of a sidewalk. As discussed in previous projects and based on IACHD functional experts recommendations, CRM does not recommend broom finish on dams as it is not compatible with the TSW heritage setting, character-defining elements and concrete finish on locks. However, if moving forward with broom finish, multiple joints and edges around and on the surfaces should be reduced to their minimum. Include drawings that show extent of the proposed finish, including the location of the rounded bullnoses, joins and edges.

- ☐ Vertical surfaces finish: the vertical surfaces should have a smooth finish.
- ☐ Edges: implement the rounded bullnose of 75 mm radius (vertical and horizontal edges). Edges should have smooth finish. Consultant to provide close-up detail in drawings set for review.

- ☐ Upstream piers: oval or oblong concrete pier nosing plated with stainless steel (rough) (e.g. Mississauga Lake Dam) is acceptable.
- ☐ Rehabilitation of the downstream piers: in contrast with the dams that will be replaced and will mark the 2016-2020 FII Program on the TSW, CRM recommends replacing in kind the stepped piers on Burleigh Falls Dam (OHV, ref. Character-Defining Elements, SoHV, Appendix I) based on the original drawings and plans. New work should be aesthetically and physically compatible with the heritage character of the historic dam. Submit to CRM the proposed design for review and comment.
- ☐ Clarify how the separation of the public and operational spaces will be integrated on the deck.
- ☐ If an ancillary building is required, it should be designed in a manner that respects the overall approach on the TSW for buildings. The new building should follow the Record of decisions, approved SCRIA and recommendations provided on ancillary buildings on ONWIOC (document will be provided shortly by Wes Little). Submit to CRM the proposed design and location for review and comment.
- ☐ Any modification to the proposed scope of work and/or conservation measures must be submitted to CRM for review and approval for compliance with the Parks Canada Policies.
- ☐ If an opportunity arises to address or correct past interventions that are no longer considered best conservation practice or that seriously impact heritage value, CRM advice should be sought to determine whether it makes sense to address this as a part of this project.
- ☐ If, in the course of work, a cultural resource or character-defining element is damaged, the project lead should take photos and consult with CRM immediately for advice on how to proceed.
- ☐ Archaeological Overview Assessment (AOA) will be required for this project (previous AOA covered the geotechnical investigation, see Appendix II).
- ☐ Notify Parks Canada staff upon discovery of any archaeological resources. If features are encountered, leave in place, mark the location and contact Parks Canada staff to take photographs and, if possible, depth measurements. The Parks Canada representative must provide the information immediately to Archaeology team for advice and assessment of significance, which will in turn determine what will be required to mitigate the find. Work in the area can resume when the Archaeology section has provided clearance.

Appendices

Appendix I - Statements of Heritage Value – Burleigh Falls Dam

Appendix II - Archeological Overview Assessment, TSW, Rehabilitation of Dams 19, 22, 23, 24, 25, 28, Proposed Geotechnical Investigations

Appendix III - Built Heritage Preliminary Site Observations Report and Recommendations, Issued 27/10/2017

References:

Beahen, William, Manuscript Report Number 283, Historic Structures of the Trent-Severn Waterway, Parks Canada, National Historic Parks and Sites Branch, Department of Indian and Northern Affairs, 1978.

Conservation Guidance 2016-2021 Capital Works Program on the Trent-Severn Waterway National Historic Site, Ontario Waterways and IACHD, Parks Canada, 2016.

Desrosiers, Nathalie, Character-Defining Elements: Step Pier Nosing, Key Elements Contributing to The Heritage Value of The Dams on The TSW, April 2016.

Parks Canada, Cultural Resource Management Policy, 2013.

Parks Canada National Best Management Practices; Works In and Around Waterbodies; Draft February 22, 2017.

Parks Canada, Statement of Requirements Ontario Waterways, Burleigh Falls Dam Reconstruction, Burleigh Falls (at Lock 28), 2015.

Passfield, Robert W., The Heritage Canals: Status and Significance, Parks Canada. Unpublished Report, 1987.
SNC-Lavalin, Technical Memo, Central Bundle: Dam at Lock 28 Burleigh Falls, Rehabilitation scope of work, 2018-09-14.

SNC Lavalin, Design Development Report, Site F, Dam at Lock 28 Burleigh Falls, 2019-01-16

Standards and Guidelines for the Conservation of Historic Places in Canada, 2010.

Trent-Severn Waterway National Historic Site Commemorative Integrity Statement.

Appendix I

Statement of Heritage Value (DRAFT September 1, 2017)
Burleigh Falls Dam at Lock 28
Trent-Severn Waterway National Historic Site

Context

What is a Statement of Heritage Value?
A Statement of Heritage Value is a record that confirms that a Parks Canada asset, or collection of assets, meets the Agency's requirements to be a cultural resource. It provides a summary history of the cultural resource, its heritage value (why it is important), and its character-defining elements (aspects of the resource that express its heritage value).

Approvals
The statement of heritage value requires approval by the Field Unit Superintendent and the Director of Cultural Heritage Policies and is designed to support decision-making about management of a cultural resource.

Interpretation
Assistance to interpret the Statement of Heritage Value can be sought from a Cultural Resource Management (CRM) Advisor or a CRM specialist.

Assessments of Impacts
When changes or interventions are proposed to cultural resources, the proposed changes and interventions are subject to an assessment of impacts using the *Standards and Guidelines for the Conservation of Historic Places in Canada*. This is not to preclude changes or interventions, but rather to reduce possible negative impacts to the heritage value of the cultural resources.

Flexibility of Implementation of Changes and Interventions
Sustainable conservation calls for a flexible and integrated approach that balances CRM with other Agency objectives. If negative impacts are expected to the heritage value of a cultural resource, these can often be reduced or eliminated through mitigations developed in consultation with the CRM Advisor. If mitigation is not possible, alternate approaches to certain aspects of a project, or alternative means of preserving heritage value, can be recommended (for example, preservation through heritage recording and subsequent interpretation).

Responsibility for Decision-Making
Decision-making about an intervention on the cultural resource remains with the Field Unit Superintendent.

Description

Landscape

Burleigh Falls Dam at Lock 28 is located Trent River between Lovesick Lake and Stoney Lake in the town of Burleigh Falls, ON. The lockstation landscape at Burleigh Falls, also once known as "Peninsula Falls", includes a lock (1967), dam (1912), and Perry's Creek dams - dam #1 (1932), dam #2 (1955), and dam #3 (1971) upstream of Burleigh Falls lock and dam. The historic built features of this site include form, mass and scale of the 1890's lock and canal which has been replaced in between the granite outcrop. Although the canal and lock have been significantly altered from two to one, the narrow form of the channel and its linearity remains.

Not visible on this site is the timber slide which is submerged and considered archeological. The timber slide was constructed in 1850 to assist the log drives and is representative of one of the key economic drivers that built the Trent-Severn system. As well, there are archaeological remains of the lockmaster's residence in the landscape.

Lock

The Burleigh Falls lock is number 28 on the canal. This lock was originally a flight lock of two, but then was constructed into one. The original former locks were built from 1882-1887. The lock had a combined lift of 14ft and was 45ft long between gates with a width of 33ft. The original walls of the flight locks were constructed of masonry. The proposal of the new single concrete lock was introduced during 1910 and was then completed during 1967. The new lock was constructed mostly of concrete and the gates were made of steel. Some of the character of the former locks was preserved when the old masonry lock was built into the face of the lower entrance walls. This lock currently measures at 124 feet (37.8m) in length, 32 feet (9.7m) in width and an average lift of 24 feet (7.3m).

Burleigh Falls Dam

Burleigh Falls Dam is a concrete gravity dam built in 1912. The original plan of the dam was to be measured at 318 feet of its length and consisted of 12 sluices 20 feet wide separated by piers which were 6 feet wide; reinforced concrete platforms were to be built over the sluice openings. The remaining 480 feet of the dam's length consists of a solid wall with a pipe rail along the downstream edge of the tip of the wall at the southern end of the structure.

The current dam consists of twelve stoplog sluices and a gravity section, a concrete retaining wall/ earthfill embankment and a concrete closure wall. The stoplog sluices are operated with a hydraulic log lifter mounted on rails.

Repairs were made in 1947-48, 1963-65 and again in 1973-74. The dam was partially rehabilitated in the early 1990's by re-facing the piers. A few of the piers nosings were not rehabilitated as the PCA capital work crew was disbanded before all of the originally intended rehabilitation work was completed.

Perry's Creek Dams

In addition to the main dam at Burleigh Falls, the water level is also controlled by Perry's Creek dams which are located west of the Lock 28 and also contribute to the water control of the upper reach (Lovesick Lake). Perry's Creek Dam #1 is a concrete gravity dam with three 4.6 wide stop log weirs, which are hand operated by travelling winches on rails. Perry's Creek also has two core wall dams.

Perry's Creek dam was renewed in 1908 and then rebuilt in 1910. The old dam at this location also served as a bridge which was eventually replaced with a concrete stop-log dam in 1931.The blind dam at this location was also replaced by reinforced concrete during 1965, in addition to an earth-filled, timber crib, blind dam that was replaced by a concrete dam.

Heritage Value

Landscape

The Historic Sites and Monuments Board of Canada identified the Waterway as being of national significance because it is part of Canada's national canal system. As such, the Waterway has associative value as a component of the country's inland water transportation system.

More specifically, the evolutionary development and construction of the Waterway with particular emphasis on changing construction and transportation technologies from 1833 to the present is valued in the overall landscape and individually engineered landscapes.

Additionally, the current value of aboriginal sites lies in their association with the Waterway corridor, revealing aboriginal activities extending back to the Laurentian Archaic period, though sites may possess a high level of intrinsic value in their own right.

Burleigh Falls Dam

The Burleigh Falls dam is a *cultural resource of other heritage value* for its role in in-land water transportation, water management and the evolutionary development of the Trent-Severn Waterway. The dam contributes to the working assemblage of engineering structures that make the TSW an operational system of through-navigation.

The engineering structures on the Trent-Severn Waterway that are *cultural resources of other heritage value* are valued for:

- their historic association with Canada's national canal system, the evolutionary construction and operation of the Waterway and, aspects of local/community development;
- their design and/or functional qualities including the integrity of their original form, fabric and function and;
- their environmental qualities which include landmark status and the integrity of the historic character of the landscape.

Character-Defining Elements

Landscape

Key elements in the landscape at Burleigh Falls that contribute to the heritage value of the Trent-Severn Waterway National Historic Site include:

- its in-situ location on the Trent-Severn Waterway;
- its continued functional use as one of the lockstations that complete the Waterway;
- visual evidence of the evolutionary development and construction of the Waterway with particular emphasis on changing construction and transportation technologies from 1833 to the present, such as:
    - the canal cut,
    - the evolved shorelines since 1886,
    - the 4 area dams,
    - the 1850 timber slide, an archaeological site that is a cultural resource of other heritage value.
- Known and potential terrestrial and submerged archaeological resources pertaining to both Indigenous and historical occupations, and evidence of economic and industrial activity on the Waterway, such as:
    - Potential remains of the lockmaster's house, lock office, and carpenter's shop, and
    - Potential remains of the wooden swing bridge near the Lovesick Lake entrance to the lock.

Burleigh Falls Dam

Key elements contributing to the heritage value of the Burleigh Falls dam include:

- its in-situ location on the Trent-Severn Waterway connected to Lock 28 by the earth embankment;
- its continued functional use;
- its hydraulic mode of operation;

- the form, dimensions, design and functional qualities and materials of the dam, for example:
    - its concrete construction;
    - its overall design, massing and low profile silhouette;
    - the number (12) and form of sluices and piers, rounded on the upstream side and stepped on the downstream side with 4 steps each;
    - the log-lifting mechanism, including its associated mobile log hoist, and steel track system with wooden planks between; and
    - the wooden stop-logs to control water flow;
    - the extant remains of the previous 1850 timber slide directly adjacent to the dam;
- its contribution to the integrity of the Waterway's cultural landscape as a component of the working assemblage of engineering structures, for example:
    - circulation and land patterns related to the dam, such as the road alignment in relation to the dam, and evolution of shorelines;
    - predominance of grey-brown due to concrete and green due to surrounding vegetation; and
    - its profile in the landscape.
- Known and potential terrestrial and submerged archaeological resources pertaining to both Indigenous and historical occupations, and evidence of economic and industrial activity on the Waterway, such as:
    - The 1850 timber slide, a cultural resource of other heritage value, and
    - Potential remains of previous dams in the same location.

Approved on _____ by A/Director Cultural Heritage Policies

Approved on _____ by Ontario Waterways Field Unit Superintendent

Photos and Map

Google Maps Dam Location 2017

Figure 1 - Burleigh Falls lock. March 2004

Figure 2 - Burleigh Falls Steel Gates. June 2007

Figure 3 - Burleigh Falls dam aerial photos. Dates unknown

Figure 4 - Burleigh Falls Dam. Date unknown

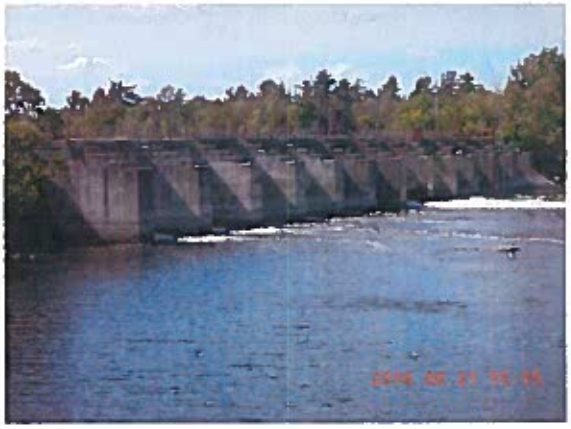


Figure 5 - Burleigh Falls Dam. June 2016

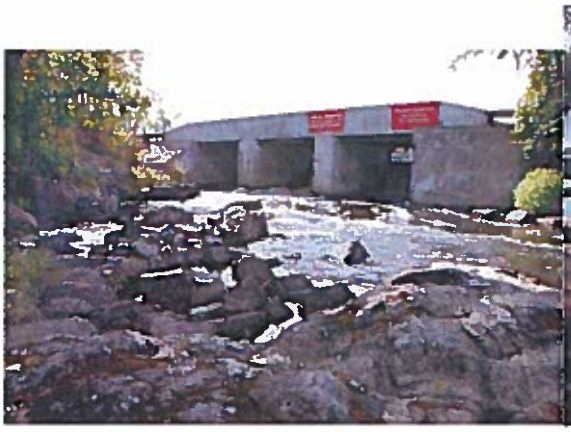


Figure 6 -Perry's Creek Dam #1. Date unknown unknown

Figure 7 - Perry's Creek Dam #2. Date

Figure 8 - Perry's Creek Dam #3. Date unknown.

APPENDIX II

PARKS CANADA AGENCY
ARCHAEOLOGY AND HISTORY BRANCH
INDIGENOUS AFFAIRS AND CULTURAL HERITAGE DIRECTORATE

ARCHAEOLOGICAL OVERVIEW ASSESSMENT TRENT-SEVERN WATERWAY NATIONAL HISTORIC SITE REHABILITATION OF DAMS AT LOCKS 19, 22, 23, 24, 25, 28. PROPOSED GEOTECHNICAL INVESTIGATIONS – FII 345

Barbara LESKOVEC and André MILLER
Terrestrial Archaeologists, IAHCD
National Office, Gatineau

ABSTRACT

Parks Canada Agency (PCA) has proposed to rehabilitate the Kawartha Sector Dam sites between Peterborough and Burleigh Falls on the Trent-Severn Waterway. Geotechnical investigations are required to target the areas of dams or embankments, where rehabilitation measures are currently proposed; address new areas of concern that were detected during the initial site visit and obtain sufficient information to evaluate rehabilitation options and complete final design. This Archaeological Overview Assessment (AOA) will evaluate the archaeological potential of the Project Areas and determine if an Archaeological Impact Assessment and/or mitigation measures are required.

PROJECT OVERVIEW

Many of the concrete structures along the Trent-Severn Waterway are in poor condition and require extensive repairs and replacements (PCA 2015a). Parks Canada Agency (PCA) has proposed to rehabilitate the dams along the Kawartha Sector, including dams at Lock 19 (Scott`s Mills), Lock 22 (Nassau Mills), Lock 23 (Otonabee), Lock 24 (Douro), Lock 25 (Sawer Creek near Primrose Lake), Burleigh Falls Dam and Perry's Creek Dam 1 at Lock 28 (Burleigh Falls) (Figure 1). Geotechnical investigations are required to target the areas of dams or embankments, where rehabilitation measures are currently proposed to address new areas of concern that were detected during the initial site visit and obtain sufficient information to evaluate rehabilitation options and complete final design. The geotechnical information will also assess the state of the dam structures, the soil composition of the embankments, and in-water conditions (Figures 2 to 8).

The preliminary geotechnical plans note the following: the actual final depth of boreholes may vary depending on site condition; the drilling will be laid out every ten meters upstream and downstream of the dams, drilling through overburden will include SPT every 5ft, if applicable; HQ (2.5") cores will be advanced vertically through concrete into bedrock and a 4" diameter masonry bit will be utilized for the horizontal short cores; the piezometer will consist of a slotted pipe with sand filter, bentonite seal and protective casing with caps; water depths are approximately 20 ft. upstream and downstream of the dam; the lock and dam shall be in operation during the investigations; the drilling contractor is responsible for access to all borehole locations; and the drilling contractor will supply trailer(s) on site and any additional equipment as required for the work and the health and safety of workers.

HISTORICAL BACKGROUND

As part of Canada's national canal system, the Trent-Severn Waterway was designated as a national historic site in 1929. "Initial survey and early construction efforts began at Bobcaygeon and on the Trent River section in the mid-1830s," whereas majority of the locks and canal walls in the Kawartha Sector were constructed between the 1890s and 1930s (TSW MP: 67; Table 1). Prior to 1896, the stone masonry and timber structures built on the Waterway were

of a conventional construction. In 1896, a major innovation was made with the introduction of concrete in the construction of locks, dams and bridge substructures, as well as cut-off walls in earth embankments (HSMBC 1988). The first concrete structures were erected in the Peterborough-Lakefield Division of the Waterway, commencing in 1896 with the Otonabee lock and the Douro dam. These early dams were composite structures comprising a traditional timber crib structures with the addition of a face wall of mass or plain concrete (Passfield 1987).

Lock 19 (Scott's Mills)

Scotts Mills Dam at Lock 19 is located in the city of Peterborough, just South of Lansdowne Street Bridge, on the Otonabee River section of the Waterway. Scotts Mills Dam is a concrete structure with seven spillways and one log chute (Figures 9 and 10). Built in 1904 replacing an earlier dam, the Scotts Mills Dam is largely unchanged except for minor surface repairs (Figure 18; PCA 2015b). As one of the four earliest locks on the Trent-Severn Waterway, the Scotts Mills Dam was classified as a PCA Level 2 Cultural Resource.

Dam	Year of Construction
Lock 19	1904
Lock 22	1922
Lock 23	1926
Lock 24	1928
Lock 25	1932
Burleigh Falls Dam	1912
Perry's Creek Dam	1932

Table 1: Construction Dates of Kawartha-Section Dams

The adjacent Scott's Mills Lock 19 is the only remaining lock on the Waterway to retain its cut-masonry construction, dating from 1843 (PCA 2015c). The lock operating mechanism dates from 1900 (PCA 2015c). The "lock (including the canoe slide), boom crib and valve operating mechanism (one of two such original types on the TSW, the other at Bolsover) are cultural resources of other heritage value for their role in in-land water transportation, water management and the evolutionary development of the Trent-Severn Waterway" (PCA 2015c). Together, "these structures contribute to the working assemblage of engineering structures that make the Waterway an operational system of through-navigation" (PCA 2015c).

Both the dam and lock are founded on soil and not bedrock (PCA 2015b). The soils comprise "extremely dense glacial till consisting of a heterogeneous mixture of sand, silt, gravel and clay with silty sand being predominant" (PCA 2015b). During its lifetime, the dam has experienced problems with regard to erosion and undercutting, which are still of concern presently.

Lock 22 (Nassau Mills)

Nassau Mills Dam at Lock 22 is located approximately 9 km north of the city of Peterborough on the Otonabee River. The concrete dam, set on bedrock, consists of eight stoplog weirs and one log chute, and is a regulating dam, operated to maintain the navigation water levels on the Waterway, and provide water control of the watershed for the Robert G. Lake Generating station, located adjacent to Lock 22 and 23 (Figures 11 and 12; PCA 2015d). This hydroelectric station, owned by the Trent Rapids Power Corporation (TRPC) and operated by Peterborough Utilities Inc., was opened in 2009 replacing an earlier hydrogenation station. Power generation commenced at Nassau Mills in the early 20th century, when Edward Lennox commissioned a building for the west bank by the present-day dam (Figure 19; PCA 2015d; Clifford 2011).

The concrete gravity dam was built in 1922 replacing an earlier dam (Figure 19). Rehabilitated in the 1980s, a visual inspection suggests that the rehab work only included resurfacing of concrete piers and the deck (PCA 2015d). Since the work was done internally by Parks Canada's concrete crew, there are no detailed repair drawings available for review (PCA 2015d). Nassau Mills Dam was classified as a PCA Level 2 Cultural Resource.

Lock 23 (Otonabee)

Otonabee Dam at Lock 23 is located approximately 10 km north of the city of Peterborough on the Otonabee River. Employed as a regulating dam to maintain navigation water levels on the Waterway, and provide water control for the Robert G. Lake Generating station adjacent to Lock 22 and 23, Otonabee Dam consists of eight stoplog weirs, each

6.1 m in width, and one log chute, 2.4 m in width (Figure 13; PCA 2015e). The stoplog weirs are operated by a hydraulic log lifter mounted on rails (Figure 14).

The concrete gravity dam was constructed in 1926 replacing an earlier dam located upstream (Figure 20). No known repairs have occurred to this dam. Otonabee Dam was classified as a PCA Level 2 Cultural Resource.

Lock 24 (Douro)

As with the dams at Nassau Mills, Otanabee and Sawer Creek, Douro Dam is a manually-operated concrete gravity dam structure featuring nine sluices with wooden stop logs and a wooden deck (Figure 15; PCA 2015c). The concrete dam was constructed in 1928 replacing an earlier dam situated immediately upstream (Figure 21). The earlier waste weir dam was a composite structure comprising a timber crib faced with concrete (HSMBC 1988). Douro Dam was classified as a PCA Level 2 Cultural Resource.

During the early 20th-century, the Canada Cement Company developed a hydrogeneration plant at Douro (Figure 21; OPG 2017). It operated in parallel with the company's developments at Youngs Point and Lakefield (OPG 2017). In 1936, the plants were purchased by the Hydro-Electric Power Commission of Ontario as part of a general cleanup of several franchises and privately-owned developments in the Trent Valley (OPG 2017). The generating station at Douro was decommissioned 1 July 1943.

Lock 25 (Sawyer Creek)

Sawyer Creek is a manually-operated concrete gravity dam structure featuring nine sluices with wooden stop logs and a wooden deck (Figure 16; PCA 2015c). The concrete dam was constructed in 1932 replacing an earlier dam situated immediately upstream (Figure 22). Sawyer Creek Dam was classified as a PCA Level 2 Cultural Resource.

Burleigh Falls Dam and Perry's Creek Dam 1 at Lock 28 (Burleigh Falls)

Burleigh Falls Dam and Perry's Creek Dam 1 are located on the Trent River between Lovesick Lake and Stoney Lake in the town of Burleigh Falls and are part of the Trent-Severn Waterway. The dams and lock provide navigation along the Waterway and are owned and operated by PCA. Burleigh Falls Dam is a concrete gravity dam comprising twelve 6.1m wide stoplog sluices operated with a hydraulic log lifter mounted on rails (PCA 2015f). The dam has a total height of approximately 12.8 m and retains a reservoir height of about 10 m (PCA 2015f). Perry's Creek Dam 1 is a combined vehicular bridge and concrete gravity dam with three 4.6 m wide stop log weirs, which are hand operated by travelling winches on rails (PCA 2015f). Two non-regulating dams are located further north: Perry's Creek Dam 2 and Perry's Creek Dam 3.

Built in 1912, Burleigh Falls Dam was repaired in 1947-48, 1963-64 and 1973-74 and partially rehabilitated (re-facing the piers) in the early 1990s (PCA 2015c). Originally, two timber crib dams were built at the same location (Figure 23CA 2015f). Perry's Creek Dam 1 was constructed in 1932. Burleigh Falls Dam was classified as a PCA Level 2 Cultural Resource, whereas Perry's Creek Dam 1 was classified as retaining other cultural heritage value.

Archaeological Potential

The Trent-Severn Waterway has been an important transportation route, water source and food source for Indigenous peoples for thousands of years. Evidence of Indigenous occupation has been uncovered along the waterway, including fish weirs at Mnjikaning and Lovesick Lake, petroglyphs at Stoney Lake and near Peterborough, and a complete ceramic pot, dating between ca. 900 and 1300 A.D. (Jamieson 2013:13), which was recovered from underwater within proximity of Burleigh Falls. This ceramic vessel is currently on loan to and on display at the Peterborough Centennial Museum & Archives (UW 2000-10). Archaeological documentation also indicates that other pre-contact archaeological sites have been registered with the Province of Ontario along the Trent-Severn Waterway (MTCS 2017).

During the 19th century, the waterway became increasingly important in the settlement and economy of Upper Canada. The vast timber resources were transported through log chutes and timber slides from the upper reaches of the watershed to Trenton and other centres, for shipment to Great Britain and later to American markets (PCA 2007). Hydro power initiatives began and several generation stations were established along the Trent Waterway (Figures 19 and 21)

Limited archaeological work has been completed in the Kawartha Sector of the Trent-Severna Waterway on lands under the jurisdiction of PCA. In 1999, a Stage 1 archaeological background study was completed by D.R. Poulton and Associates Inc. for Locks 24 and 25, and included lands under PCA jurisdiction. The Stage 1 assessment recommended that a Stage 2 testing survey be completed for these lands. In 2012, as part of a proposed hydro facility at Sawer Dam, Stantec undertook a Stage 1-2 archaeological assessment on PCA lands. From limited records at PCA disposal, this Stage 1-2 assessment uncovered 10 features and several artifacts, including wire nails, chain links, ferrous rods and coke/clinker. No further archaeological intervention has occurred at the seven sites identified on lands under Parks Canada jurisdiction. In 2015 and 2016, archaeological recording of the approach walls at Nassau Mills (Lock 22) and Douro Lock (Lock 24) was undertaken by Parks Canada Terrestrial Archaeology section during construction activities.

There is potential for as-yet undiscovered archaeological resources pertaining to Indigenous occupation and historic settlements. Additionally, evidence of the construction of the present-day dams and locks, as well as, archaeological remains of features affiliated with early water control efforts and powerhouses from early 20th-century hydro generation endeavors likely exist on submerged lands and below surface, in areas relatively free from modern development.

Assessment of Proposed Development Impact and Archaeological Requirements

Given that archaeological resources may exist beneath and/or within proximity of the dams, locks and embankments, the following mitigation measures are required to minimize impacts from the geotechnical investigations:

1. Ensure equipment is set up to have minimal ground disturbance during geotechnical activities.

2. If any obstructions are encountered during sampling activities on land, the Consultant shall attempt to determine the cause of the obstruction (i.e. bedrock, cut-off masonry, structural remains) and add findings to the geotechnical investigation report.

3. The Consultant will not willfully damage or destroy any submerged cultural resources during investigations. Geotechnical samples proposed upstream at Nassau Mills and Sawer Creek are in line with the location of the historic dams. Boreholes will be placed so that any remains of these historic dams are avoided.

4. If unrecorded archaeological resources (e.g. structural features or artifact concentrations) are encountered during the geotechnical investigations, work will cease in the immediate area and the Parks Canada Project Manager will be informed. The Project Manager should then contact Parks Canada's Terrestrial Archaeology section for advice and assessment of significance, which will in turn determine what will be required to mitigate the find.

5. PCA's Terrestrial Archaeology section will be provided with a copy of the final geotechnical investigation report(s).

6. Site restoration activities are restricted to the limits of borehole. If landscaping is required beyond the excavation limits, consult with PCA's Terrestrial Archaeology section to determine if an AOA is required for these activities. Based on the AOA, an AIA and/or additional mitigation measures may be required prior to geotechnical activities.

7. Forward future project details to Parks Canada's Terrestrial and Underwater Archaeology sections for review.

Other Considerations

Archaeological remains of features affiliated with early water control efforts and powerhouses from early 20th-century hydro generation efforts likely exist below surface and on submerged lands, particularly in areas relatively free from modern development. There is also potential for as-yet undiscovered archaeological resources pertaining to Indigenous occupation and evidence of the construction of the present-day dams and locks in areas to be impacted by future rehabilitation efforts. Given that aactivities pertaining to the rehabilitation of the Kawartha Section Dams may impact potential archaeological resources, archaeological impact assessments on both land and in water will likely be required for the future rehabilitation projects.

References

Clifford, Dale. 2011. Power Station Turns 100. Online article last accessed February 20, 2017: http://www.thepeterboroughexaminer.com/2011/06/19/power-station-turns-100.

Historic Site and Monuments Board of Canada. 1988. Assessment of Canal Structures: The Trent-Severn Waterway.

Jamieson, Susan. 2013. Archaeological Field School BdGn-8 (Clark's Bay Site) & BdGn-7 (Tate Site), Peterborough County, Township of North Kawartha (Formerly Township of Burleigh), Lot 3, Concession 1, Plan 45R-6224. Report online last accessed February 20, 2017: http://www.northkawartha.on.ca/en/buildingandproperty/resources/17.-BdGn-8-Field-Notes.pdf.

MTCS. 2017. Ontario Archaeological Sites Database, Ministry of Tourism, Culture and Sport (MTCS). Online Database consulted January 12, 2017.

Ontario Power Generation (OPG). 2017. *Lakefield Generating Station*. Website last accessed February 22, 2017: http://www.opg.com/generating-power/hydro/central-ontario/Pages/lakefield-station.aspx

Parks Canada. 2007. Panel on the Future of the Trent-Severn Waterway: Discussion Paper #2: Cultural Resources. On File at Parks Canada Terrestrial Archaeology Office, Gatineau.

-2015a. Request for Project Approval (RPA), Trent-Severn Waterway NHS Kawartha Sector Concrete Rehabilitation. On File at Parks Canada Trent-Severn Waterway Office, Peterborough.

-2015b. Statement of Requirements, Ontario Waterways, Scotts Mills Dam Reconstruction and Lock 19 Rehabilitation Project. On File at Parks Canada Trent-Severn Waterway Office, Peterborough.

-2015c. Projects, Peterborough to Burleigh Falls (Kawartha Sector, Central). On File at Parks Canada Trent-Severn Waterway Office, Peterborough.

-2015d. Statement of Requirements, Ontario Waterways, Nassau Mills Dam Reconstruction. On File at Parks Canada Trent-Severn Waterway Office, Peterborough.

-2015e. Statement of Requirements, Ontario Waterways, Otonabee Dam Reconstruction. On File at Parks Canada Trent-Severn Waterway Office, Peterborough.

-2015f. Statement of Requirements, Ontario Waterways, Burleigh Falls Dam Reconstruction. On File at Parks Canada Trent-Severn Waterway Office, Peterborough.

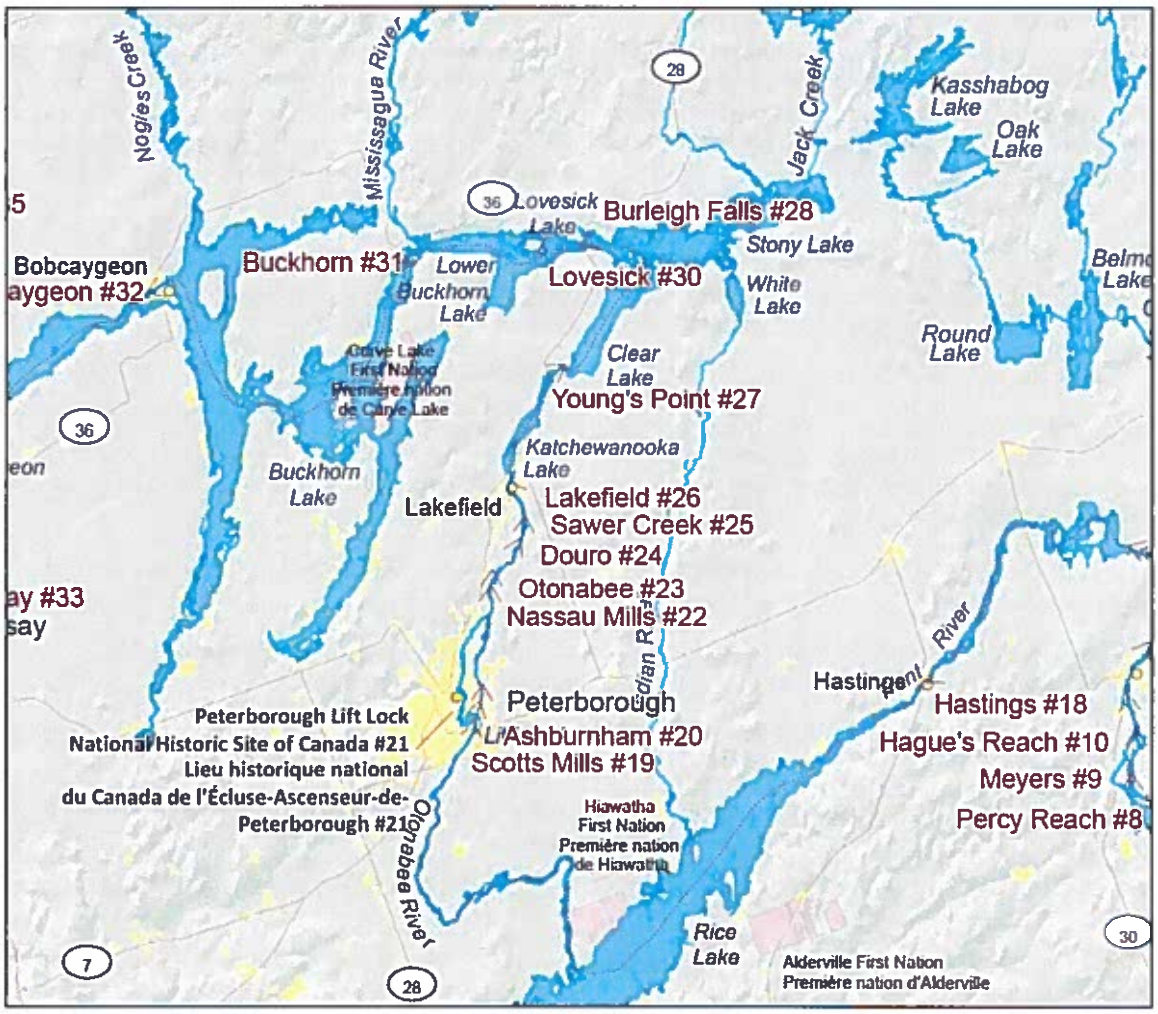


Figure 1. Location of Dams in Kawartha Sector (PCA files).

Figure 2. Proposed lines of Geotechnical Investigations at dam at Lock 19 (Scott`s Mills), Kawartha Sector (PCA files).

Figure 3. Proposed lines of Geotechnical Investigations at dam at Lock 22 (Nassau Mills), Kawartha Sector (PCA files).

Figure 4. Proposed lines of Geotechnical Investigations at dam at Lock 23 (Otonabee), Kawartha Sector (PCA files).

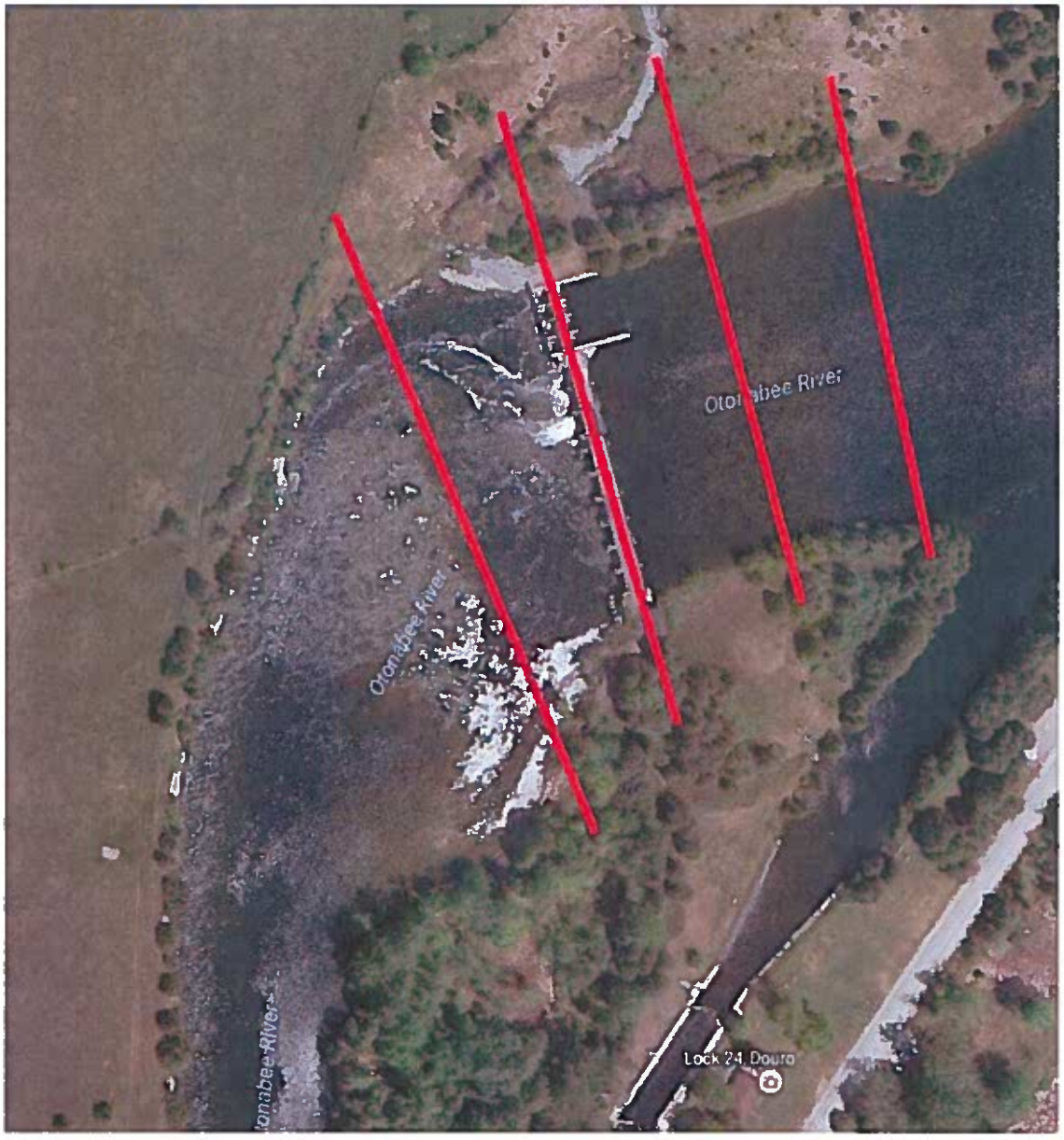


Figure 5. Proposed lines of Geotechnical Investigations at dam at Lock 24 (Douro), Kawartha Sector (PCA files).

Figure 6. Proposed lines of Geotechnical Investigations at dam at Lock 25 (Sawer Creek near Primrose Lake), Kawartha Sector (PCA files).

Figure 7. Proposed lines of Geotechnical Investigations at Burleigh Falls Dam at Lock 28 (Burleigh Falls), Kawartha Sector (PCA files).

Figure 8. Proposed lines of Geotechnical Investigations Perry's Creek Dam 1 at Lock 28 (Burleigh Falls), Kawartha Sector (PCA files).

Figure 9. Scotts Mills Dam, Main Dam (PCA 2015b).

Figure 10. Scotts Mills Dam, Side Dam and Approach Wall to Lock 19 (PCA 2015b).

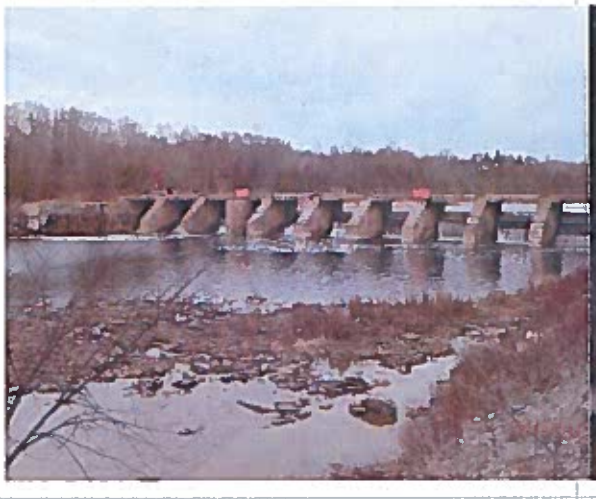


Figure 11. Nassau Mills Dam, Downstream View (PCA 2015c).

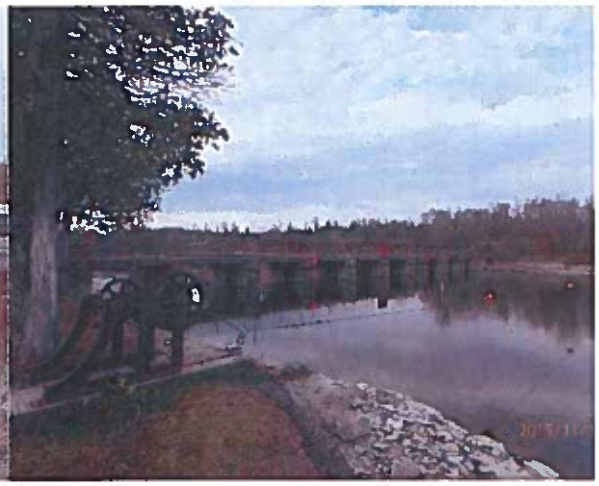


Figure 12. Nassau Mills Dam, Upstream View (PCA 2015c)

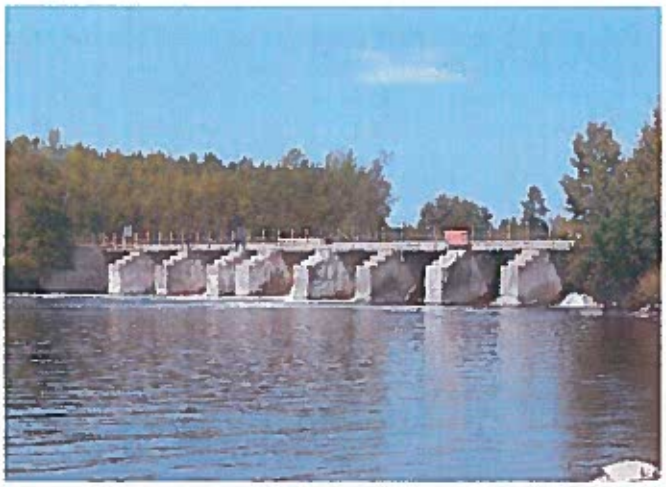


Figure 13. Otonabee Dam, Downstream View (PCA 2015d).

Figure 14. Otonabee Dam with a hydraulic log lifter mounted on rails to right (PCA 2015d).

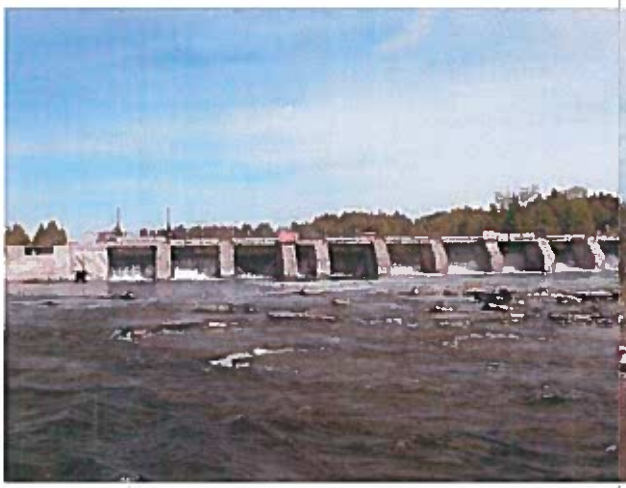


Figure 15. Douro Dam, Downstream View (PCA 2015c).

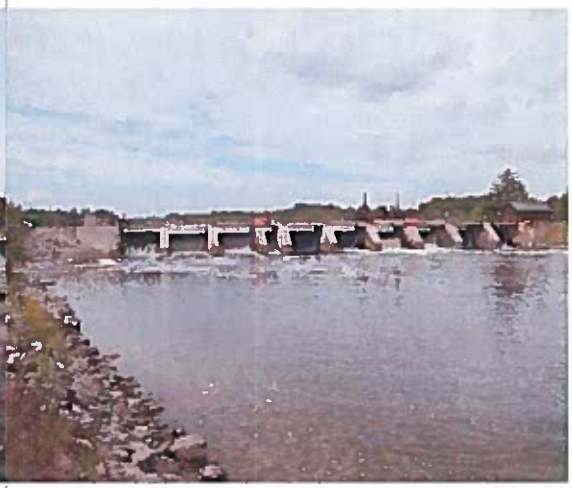


Figure 16. Sawer Creek Dam, Downstream View (PCA 2015c)

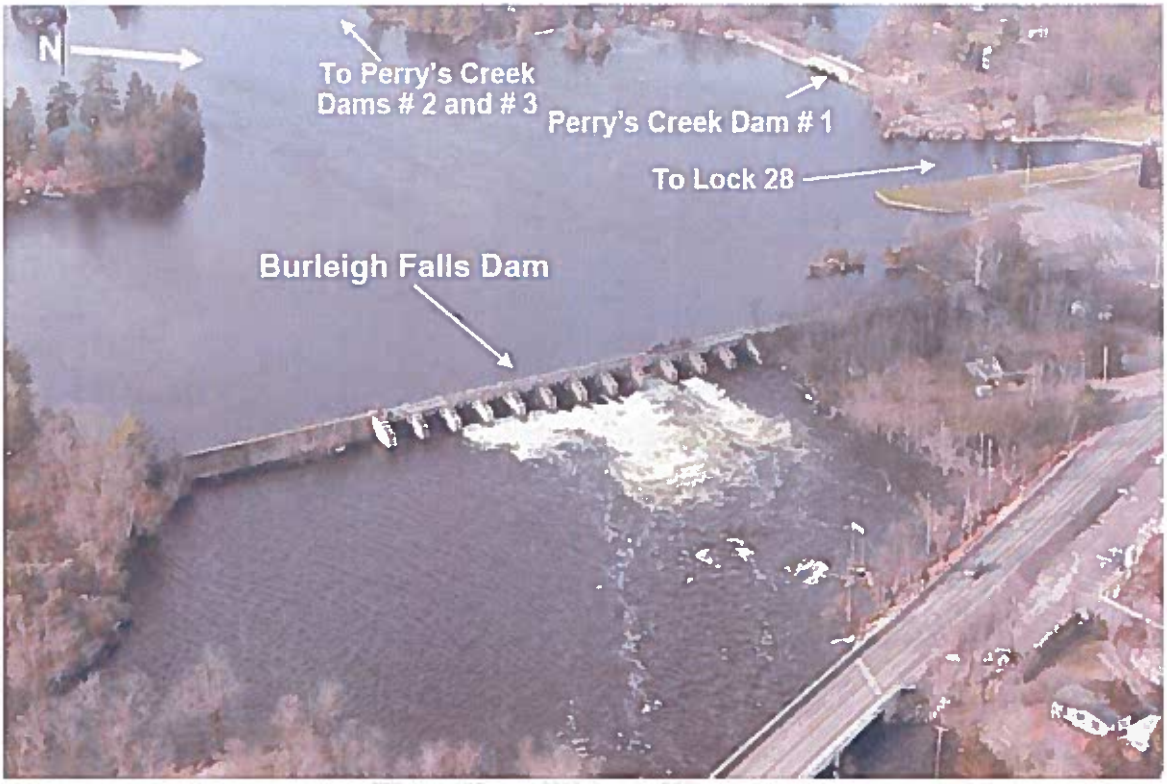


Figure 17. Burleigh Falls Dam, Perry's Creek Dam 1 and Lock 28 (Burleigh Falls) (PCA 2015c).

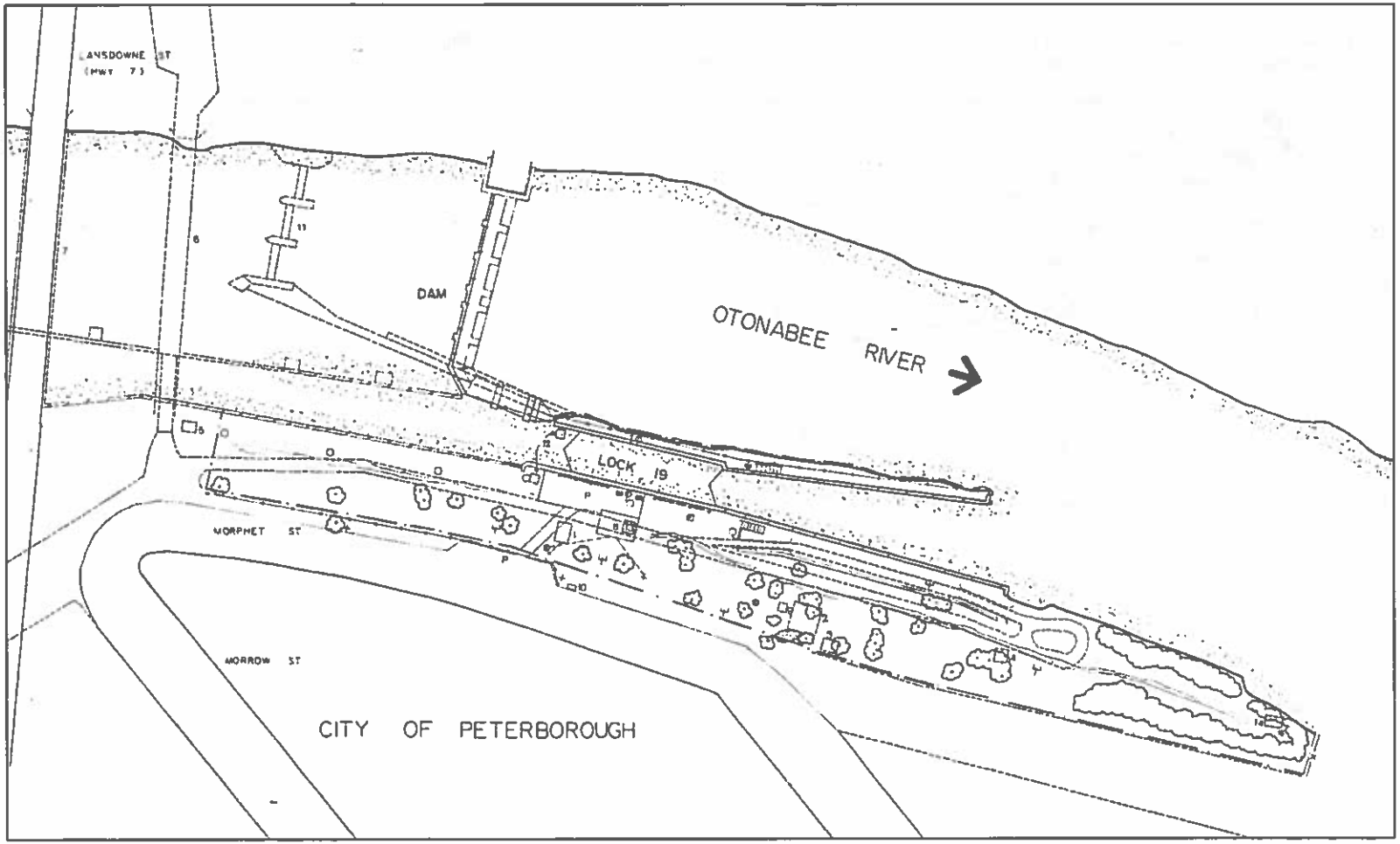


Figure 18. Archaeological Resource Evaluation – Scott's Mills Lock Station Composite 1844-1987 (PCA 65H-87-9998-3). Location of former dam depicted in hatched lines upstream of present dam.

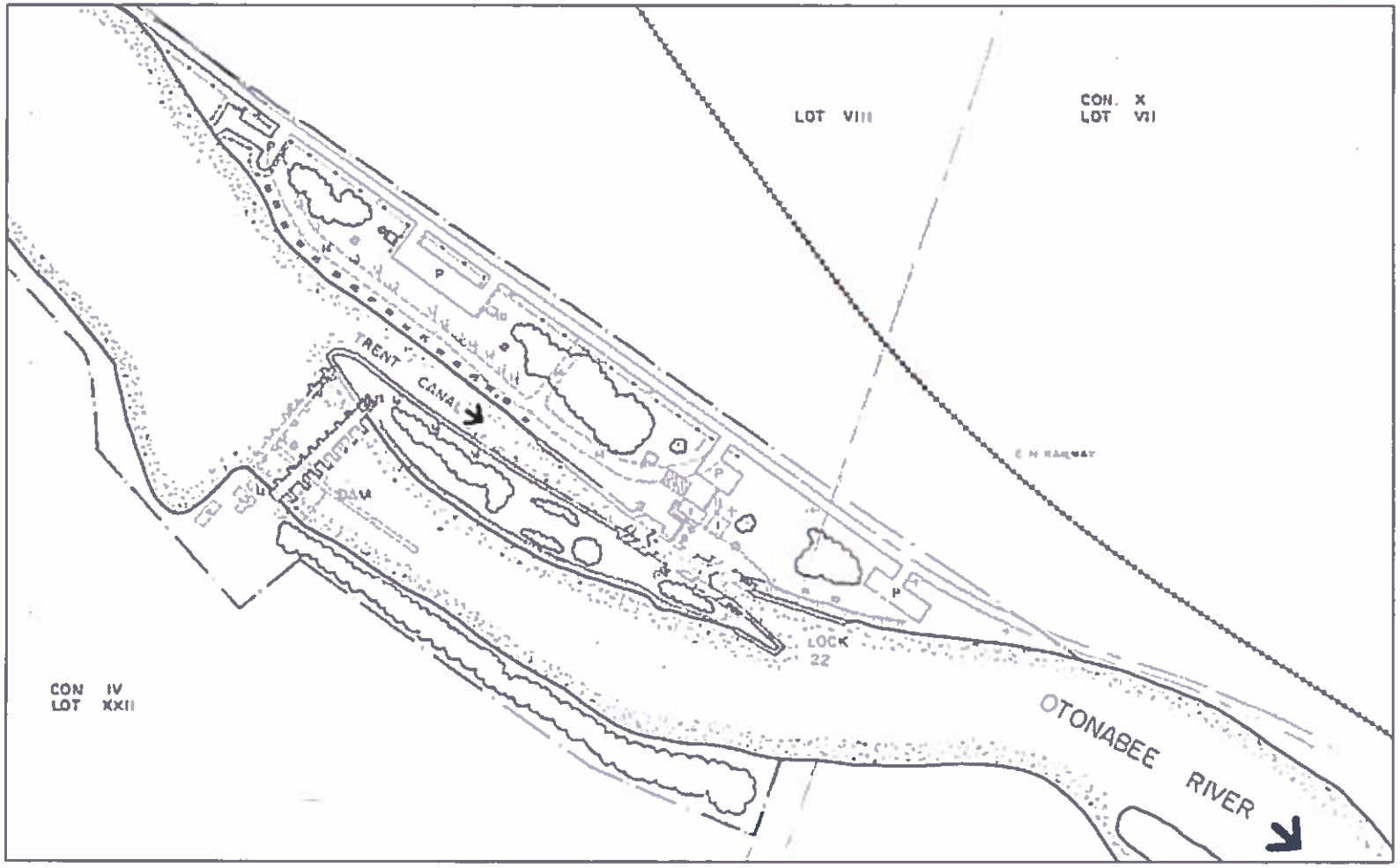


Figure 19. Archaeological Resource Evaluation – Nassau Mills Lock Station Composite 1897-1987 (PCA 67H-87-9998-3). Location of former dam depicted in hatched lines immediately upstream of present dam. Buildings identified as follows: 2: Otonabee Power Plant; 3: Power Plant residence; 4: Power Plant related building; 12: construction shed.

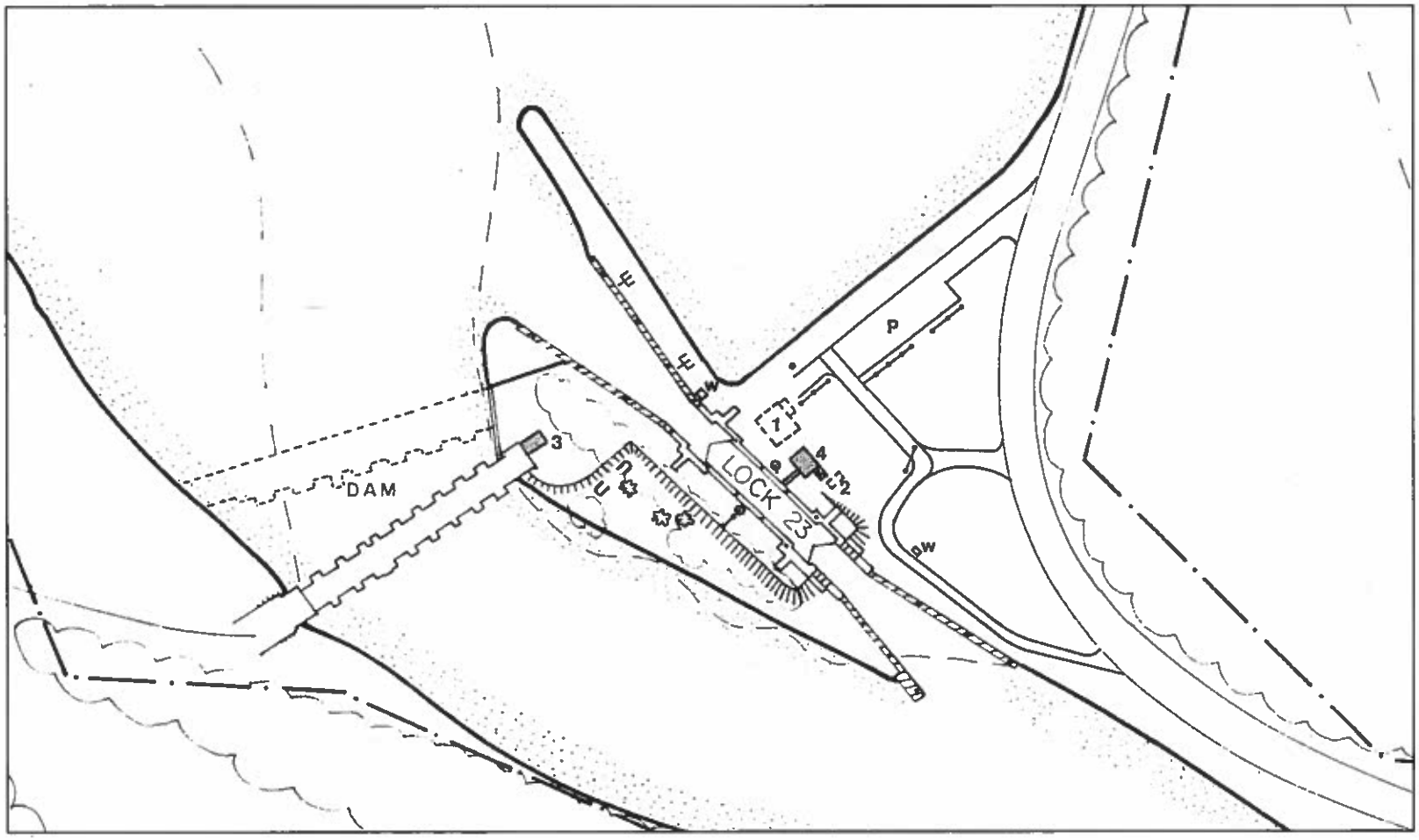


Figure 20. Archaeological Resource Evaluation – Otonabee Lock Station Composite (PCA 68H-89-9998-2). Location of former dam depicted in hatched lines immediately upstream of present dam. Buildings identified as 3 is Gaugehouse.

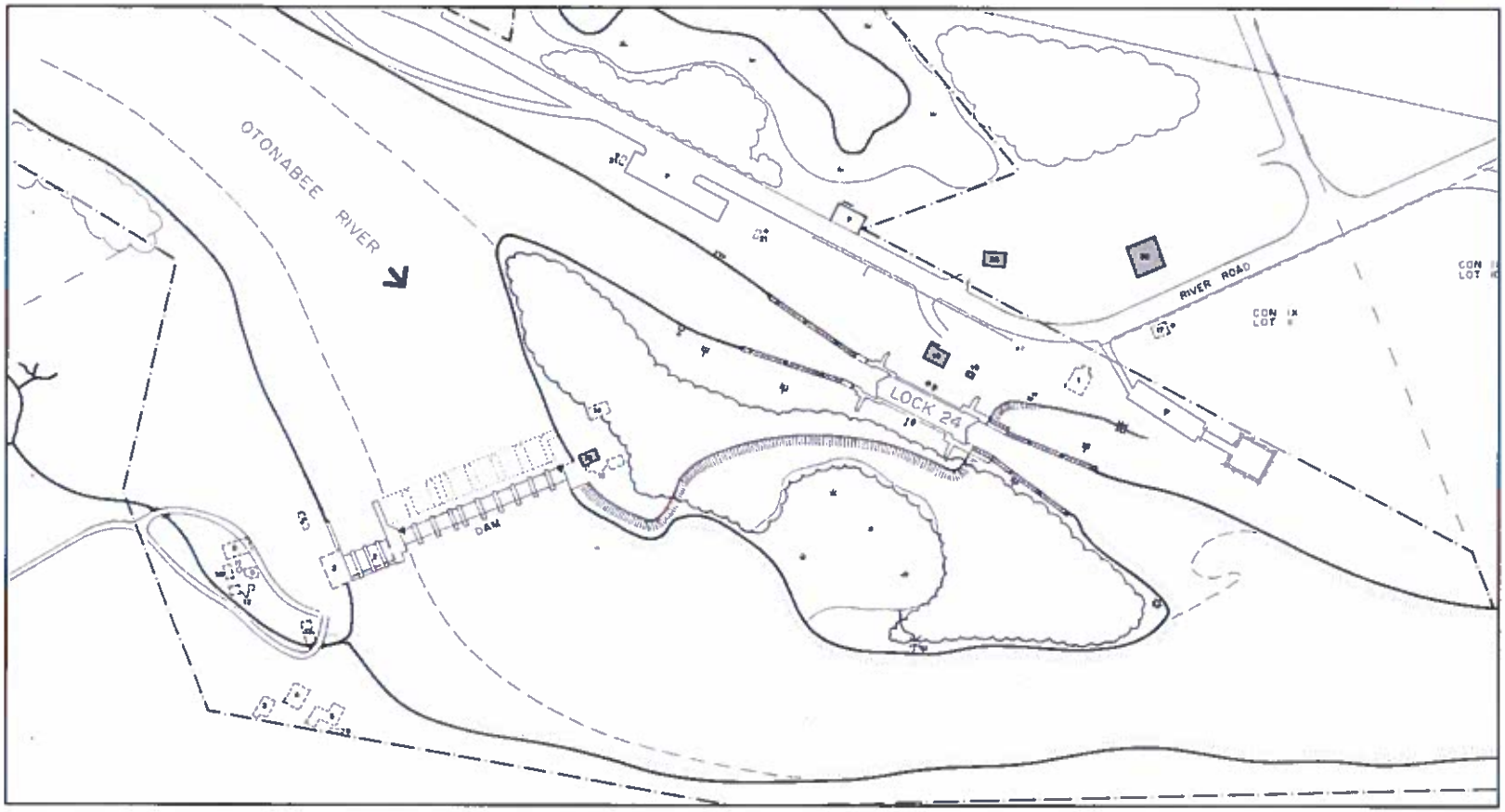


Figure 21. Archaeological Resource Evaluation – Douro Lock Station Composite 1897-1987 (PCA 69H-89-9998-2). Location of former dam depicted in hatched lines immediately upstream of present dam. Buildings identified as follows: 2: Canada Cement Co. Power House; 15: Derrick; 16: Dam House.

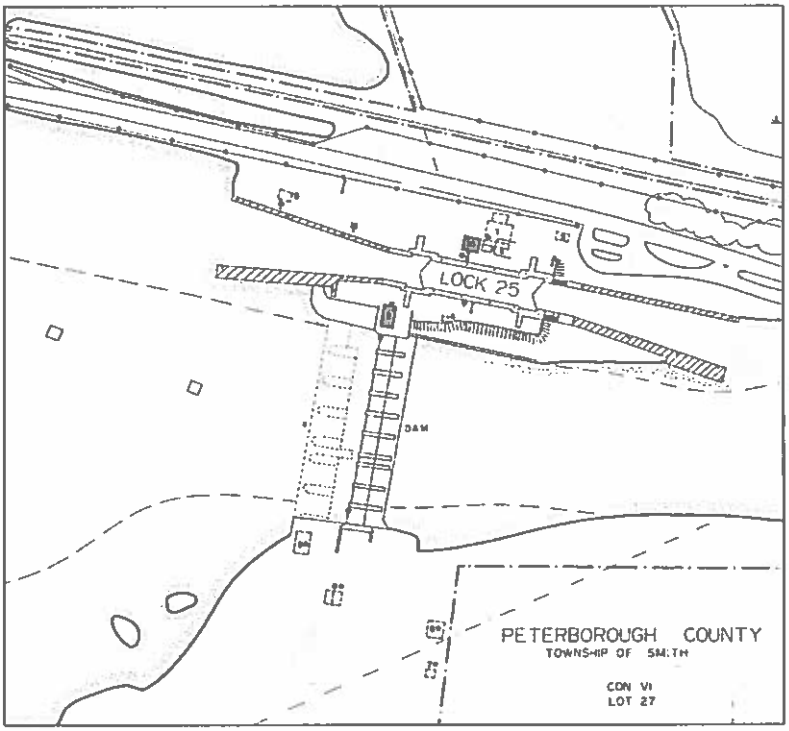


Figure 22. Archaeological Resource Evaluation – Sawer Creek Lock Station Composite (PCA 69H-89-9998-2). Location of former dam depicted in hatched lines immediately upstream of present dam. Buildings identified as follows: 2: framed storage building; 5: large shed; 6: small shed; 7: outhouse; 8: large shed.

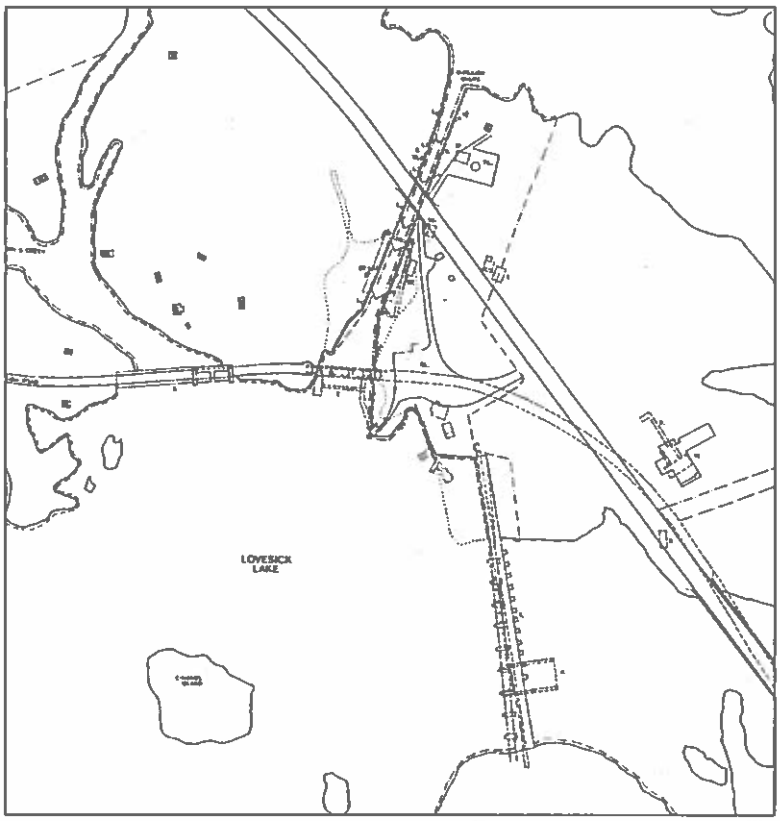


Figure 23. Archaeological Resource Evaluation – Burleigh Falls Lock Station Composite (PCA 73H-90-9998-1). Location of former dam depicted in hatched lines by present dam. Features identified as follows: 4: dam and timberslide; 5: Perry's Creek Dam; 7: wooden swingbridge.

Appendix III

Built Heritage Preliminary Site Observations Report and Recommendations: Issued 27/10/2017

Trent Severn Waterway National Historic Site
Burleigh Falls Lock #28

[illegible] Column 1 [illegible] October 10, 2017. [illegible] Thursday October 12, 2017 [illegible]

[illegible] October [illegible] 2017
[illegible]
[illegible]

Comments on "Column 2" are provided by [illegible], Manager of Architectural and Engineering Services, [illegible] Monday October 16, 2017 [illegible] Thursday October 12, 2017 [illegible]

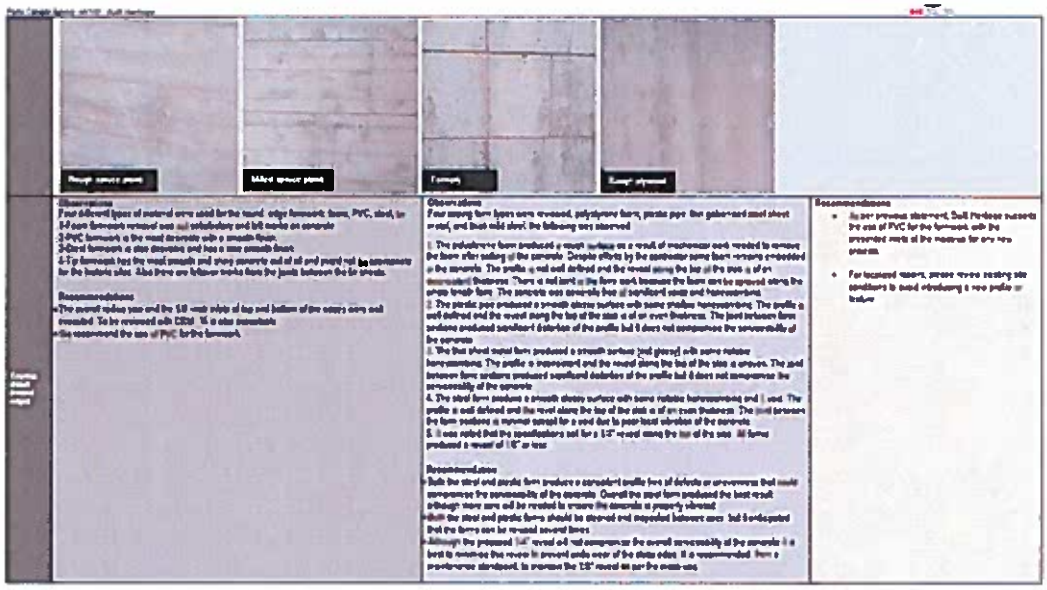
Comments on "Column 3" are built Heritage's response to [illegible]

	Column 1 Built Heritage – Visit on Tuesday October 10th, 2017	Column 2 Architectural and Engineering Services – Following visit on Thursday October 12th, Issued on Monday October 16th, 2017	Column 3 Built Heritage Response – Wednesday October 25, 2017
[illegible]	Observation [illegible] Recommendation [illegible]	Observation [illegible]	Recommendations [illegible]

Sanded finish
Floated finish

[illegible]	Observation [illegible] Recommendation [illegible]	Observation [illegible] Recommendation [illegible]	Recommendations [illegible]

Rough spruce plank
Milled spruce plank
Formply
Rough plywood



[illegible]	[illegible] during visit on Tuesday October [illegible], 2017	We have reviewed standards and codes that apply to similar structures including NBCC, CSA B651 and the Ontario Integrated Accessibility Standard. Although NBCC does not specifically apply to your situation we are of the opinion, because TBS mandates CSA B651, that the stairs should include slip resistance, contrasting nosing and also a tactile surface indication at the top of the flight. Note that there is specific description of what constitutes a visual contrast or a non-slip surface. NBCC: The surfaces of ramps, and landings and treads shall have a finish that is slip resistant, and if accessible to the public, shall have either a colour contrast or a distinctive pattern to demarcate the leading edge of the tread and the leading edge of the landing, as well as the beginning and end of a ramp. In addition the top of the nosing of stair treads shall have a rounded or bevelled edge extending not less than 6 mm and not more than 13 mm measured horizontally from the front of the nosing. CSA B651 exterior treads and nosing requirements: Have treads that are slip resistant; Have a horizontal strip at the edge of the tread that is 50 + 10mm deep, is colour-contrasted with the tread and riser and extends the full width of the tread. Ontario Integrated Accessibility standards: stair must be equipped with tactile walking surface indicators that are built in or applied to the walking surface and a tactile surface indicators should and have a raised tactile profile with a high tonal contrast with the adjacent surface and be located at the top of all flights of stairs which extends the full tread width to min 610 depth	Observations • We raise a word of caution in regards to the use of the Ontario Integrated Accessible Standards. As we are a Federal Agency, we are required to use federal codes, policies and legislation. • The National Building Code of Canada is for the design of buildings; locks and dams are fundamentally an engineering work by their nature. • If the TSB would apply CSA B651 for new construction • Also review the Standards and Guidelines' recommendations for accessibility at heritage places Recommendations We would need to review the following in greater details to find most appropriate approach. See below: *Treasury Board Policy on the Management of Real Property* (2006) The Treasury Board *Policy on the Management of Real Property* holds Canada Parks responsible for providing barrier-free access to, use of and exit from real property in accordance with the standard. This standard establishes minimum requirements for the accessibility of real property to meet the objectives of the policy. *Standards & Guidelines for the Conservation of the Historic Places in Canada* (2nd edition, 2010): Based on the Guidelines for Engineering Works (4.4), it is recommended to work with accessibility and conservation specialists and users to determine the most appropriate solution to accessibility issues with the least impact on the character-defining elements and overall heritage value of the engineering work. It is NOT recommended to alter character-defining constituted elements without consulting the appropriate specialist and users
Others	Mock-up assembly: - We discussed the opportunity to use set pieces of the mock-up assembly for future references and one which could be helpful tool to set standard for the project. Everyone seemed to be amenable to the idea - In terms of size, a maximum 2' x 3' would be ideal, or at least sufficient area to grab key details such as joints, etc. - Location would need to be confirmed. - Another document would be desirable to address some of the unresolved document points.		