HATCH™

Hamilton Conservation Authority

Completion Report

For

Crooks' Hollow Dam Removal and Restoration of Spencer Creek

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Hamilton Conservation Authority
Crooks' Hollow Dam Removal and Restoration of Spencer Creek

Completion Report

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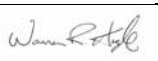
February 26, 2013	1	Final	J. Viscek	W. Hoyle		HCA
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Executive Summary

Crooks' Hollow Dam on Spencer Creek was originally part of a series of older dams that were built near the community of Greensville (within the City of Hamilton) starting in 1798, for the purpose of powering a variety of mills. The dam was situated within the current Crooks' Hollow Conservation Area, a 41-hectare site owned and managed by the Hamilton Conservation Authority (HCA). The site is a nature/wildlife refuge that provides hiking and sightseeing opportunities for the public. Originally constructed in 1916, the dam was used to supply water to the community of Dundas, and later to the Dundas Valley Golf and Curling Club (i.e. between 1959 and 2001).

Several dam condition assessments in recent years identified concerns with respect to the integrity and stability of the dam. A Dam Stability and Assessment Study conducted in 2005 confirmed the need to rehabilitate, modify or remove the dam to ensure safety during major storm events. In 2005 HCA initiated a Class Environmental Assessment, and concluded that the dam should be removed. The Class EA was approved in May 2009 by the Ontario Minister of the Environment, conditional upon the preparation of a Sediment Management Plan. HCA submitted a Sediment Management Plan to the Ministry, which was deemed satisfactory in October 2010 pending further details to be provided through detailed design.

The final Project plan consisted of the decommissioning and removal of the Crooks' Hollow Dam and associated structures, restoration of the dam site and the waterway including the management (i.e. selected removal) of previously deposited river sediments, stabilization of shoreline areas susceptible to erosion and the creation/enhancement of fish habitat. Removal of the dam restored the small reservoir back to its natural (i.e. 'pre-dam') riverine condition.

The construction/dam decommissioning and site restoration activities on site commenced on February 14, 2012, and were completed by May 11, 2012. These activities included (in chronological order)

- lowering the reservoir/ opening the spillway stoplogs
- diverting water around the dam using a constructed channel along the north shore line of the former reservoir
- draining the reservoir/ recovering stranded fish
- excavating deposited sediment from the creek bed
- removing mercury-impacted sediment from the creek for disposal offsite
- removing the dam
- restoring stream channel/installing bank protection

- in-filling diversion channel; spreading reservoir sediments on north flood plain area and above the flood plain where possible
- constructing pedestrian bridge/walkways
- site restoration/vegetative plantings.

Figure E-1 includes a map that shows the restored Crooks' Hollow Conservation Area following dam removal, highlighting significant features.

Restoration activities on site included (i) the construction of three separate riffle areas within the creek to enhance fish habitat, (ii) the planting of vegetation according to a 1:1 ratio for any vegetation lost during construction using a combination of native plant species and seed, and (iii) the creation of several wetland areas within the creek floodplain to provide a diversity of plant/wildlife habitat on site (Figure E-1).

A number of cultural heritage elements at the site were also preserved following construction/dam decommissioning activities, including (i) a portion of the south dam abutment which was left in place, (ii) public viewing areas (with steel railings re-utilized from the dam structure) atop both the north and south creek banks of the former dam site, (iii) hiking trails (i.e., re-created using materials from on site), (iv) a section of exposed water pipe along the north creek bank, (v) a decommissioned well atop the north creek bank near the former dam site, and (vi) several remnants of the dam structure (e.g. control valve) for use as display pieces at a later date (Figure E-1).

As a follow up to the dam removal and restoration of Spencer Creek, a 5-year Surface Water Monitoring Program was proposed by HCA. On a semi-annual basis, a representative water sample from Spencer Creek will be collected from a point upstream and downstream of the project site to monitor water quality. HCA is also preparing an Adaptive Management Plan which will be implemented approximately one year following the completion of construction at the site. Information associated with this plan will also be included in an annual monitoring report.

It is expected that water quality (e.g. stream temperature, dissolved oxygen, etc.) will improve along this reach of Spencer Creek, as well as downstream to Cootes Paradise and Hamilton Harbour. Natural sediment transport will also be restored to downstream reaches of Spencer Creek, which will serve to improve aquatic habitat by aiding in natural channel formation, controlling channel and bank erosion as well as restoring critical ecological interactions. Improvements to fish habitat include restoration of habitat, fish-passage for fish and other aquatic species, establishing riparian vegetation which will create refuge habitat for various juvenile fish species, and maintaining stream temperature regimes.

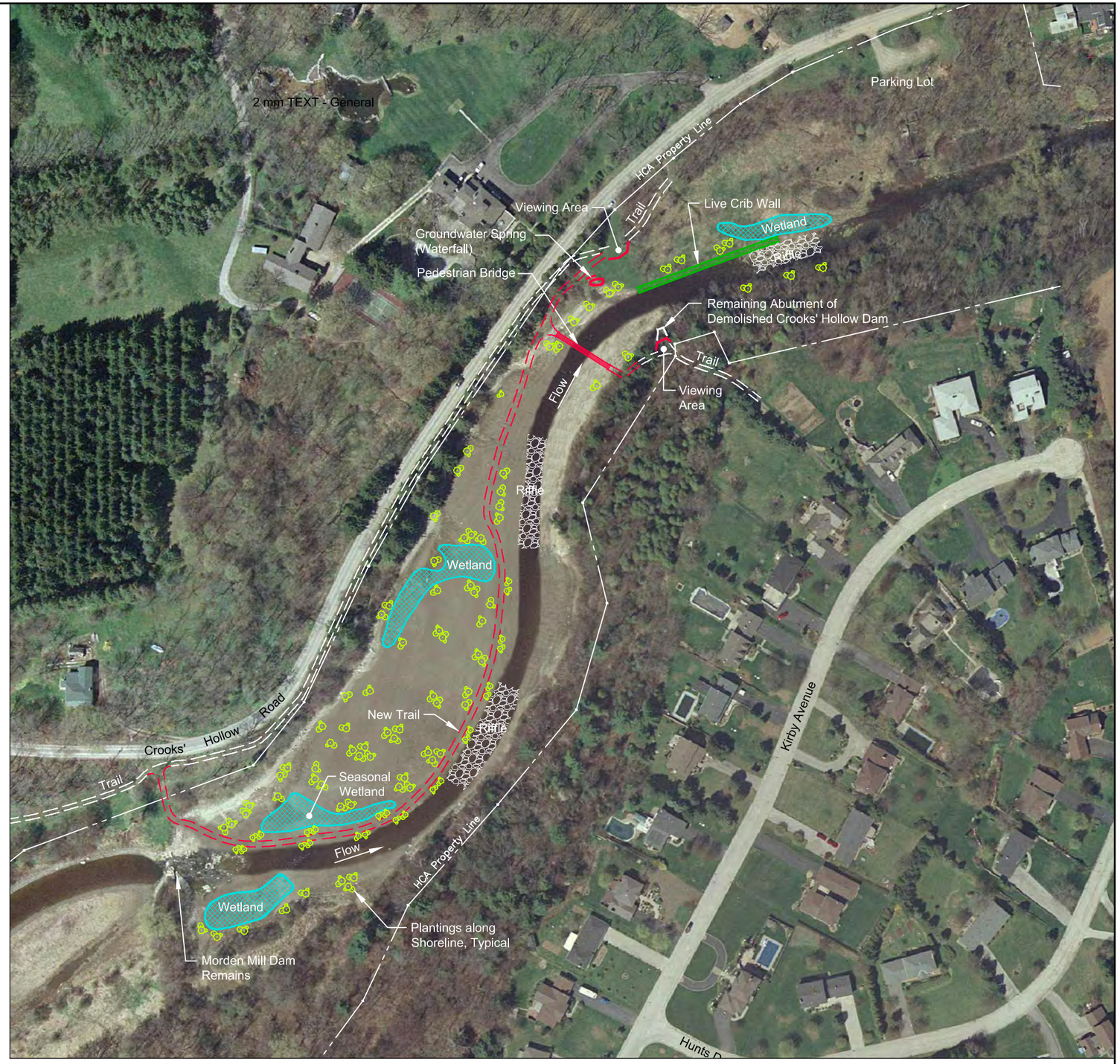
Overall, the removal of Crooks' Hollow dam and the restoration of Spencer Creek will provide significant benefits within the Crooks' Hollow Conservation Area and the larger Spencer Creek watershed, while at the same time offering enhanced recreational opportunities to the public, and preserving cultural heritage features.

Key Plan N.T.S.

Project Location

0 500 1000 Metres

Scale 1 : 20 000



Spencer Creek Restoration Features

0 50 100 Metres

Scale 1 : 2000

Figure E-1

Hamilton Conservation Authority

Crooks' Hollow Dam Removal and Restoration of Spencer Creek

Project Completion Report - Project Location and Spencer Creek Restoration Features

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1. Introduction

Crooks' Hollow Dam was located on Spencer Creek, near the community of Greensville within the City of Hamilton. The former dam site is situated within the Crooks' Hollow Conservation Area, a 41-hectare site owned and managed by the Hamilton Conservation Authority (HCA) with facilities for hiking and some historical interpretation.

1.1 Background

The Crooks' Hollow Dam was amidst a series of older dams that were built, starting in 1798, for the purpose of providing water power to run a number of grist mills, sawmills and paper mills (Figure 1-1). The Crooks' Hollow Dam was constructed in 1916 for the purpose of supplying water to the community of Dundas. This use ceased after an alternate supply of water was established. Between 1959 and 2001, the Dundas Valley Golf and Curling Club used the small reservoir as a source for irrigation water. In 1972, the Christie Lake Dam and reservoir were constructed upstream of the Crooks' Hollow Dam to provide flood protection for the community of Dundas, water related recreation activities and low flow augmentation. In 2000, ownership of the Crooks' Hollow Dam along with 9.9 hectares of land was transferred to HCA.

Figure 1-1 A View of Crooks' Hollow Dam from Downstream Side Prior to Decommissioning

1.2 Dam Removal Project

1.2.1 Overview

Over the years, several dam condition assessments have identified concerns for the integrity and stability of the dam. These studies, along with a Dam Stability and Assessment Study conducted in 2005, further confirmed the need to rehabilitate, modify or remove the dam to ensure safety during major storm events. In 2005 HCA initiated a Class Environmental Assessment (Class EA) to review all options for the dam. The Class EA concluded that the dam should be removed. The Class EA was approved in May 2009 by the Ontario Minister of the Environment (MOE) with conditions that included a Sediment Management Plan be developed to show how sediment should be managed during and after the dam removal. The MOE received the Sediment Management Plan and indicated in October 2010 that it was satisfactory pending further details to be provided through detailed design.

The Crooks' Hollow Dam Removal and Restoration of Spencer Creek Project has been of considerable interest to the Greensville and greater Hamilton Region community due to the site's rich history, cultural significance, recreational offerings and wildlife habitat features. A compilation of news and media articles related to the project has been provided in Appendix M.

1.2.2 Dam Removal Process

Following the successful completion of the Class EA for the project to remove the Crooks' Hollow Dam on Spencer Creek, Hatch Ltd. (Hatch) was retained by HCA in 2011 to complete the detailed design, preparation of tender documents, and construction supervision for the complete removal of the Crooks' Hollow Dam, restoration of Spencer Creek and provision of pedestrian bridge to provide access across the creek.

The process of the dam removal was as follows:

- Environmental studies, including baseline monitoring.
- Permitting and approvals process.
- Detailed design.
- Decommissioning and construction.
- Post construction monitoring.

1.2.3 Dam Decommissioning and Creek Restoration

The dam decommissioning commenced on February 14, 2012, and was completed on May 11, 2012. The main steps in the dam decommissioning and stream restoration (i.e., in chronological order) were as follows:

- Lowering the reservoir by opening the spillway stoplogs.
- Diverting water in a constructed open channel along the north shore line around the former reservoir and past the dam.

- Draining the reservoir and recovering stranded fish.
- Removing deposited sediment from the reservoir area.
- Removing mercury-impacted sediment from the creek for disposal offsite.
- Removing the dam.
- Restoring stream channel and installing bank protection.
- In-filling of diversion channel; and spreading of reservoir sediments on north flood plain area.
- Constructing pedestrian bridge and walkways.
- Establishing historic cultural heritage features and lookout areas.

1.3 Project Team

The Crooks' Hollow project team was a diverse group of individuals embodying a wide range of professional expertise. Hatch has been involved with the project since HCA retained Hatch as the owner's engineer in May 2005. Hatch provided design, engineering, field sampling, and construction/environmental monitoring services to the project. Parish Geomorphic Ltd. (Parish Geomorphic) was retained as a sub-consultant to Hatch in order to design the horizontal and vertical planform of the new channel, including erosion protection structures. In addition, Parish Geomorphic oversaw the construction of the riffle areas of the creek, and restoration of the creek banks. HCA also retained the services of Kidd Consulting to act as a public facilitator to provide information and obtain feedback from the local community on the design and construction of the project. D.R. Poulton & Associates Inc. were retained by HCA to carry out archaeological assessments (Appendix E) and Golder Associates Limited were retained to carry out a cultural heritage assessment of the dam site (Appendix D). R & M Construction was retained by HCA as the construction contractor, and oversaw all construction activities on site. A detailed breakdown of key project personnel is provided in Table 1-1.

Table 1-1 Summary of Key Project Team Members

Organization	Description	Team Members
Hamilton Conservation Authority	Project Proponent/ Owner	Hazel Breton (Lead Project Manager) Patrick Ragaz (Project Manager) Lisa Jennings (Aquatic Biologist)
Hatch Ltd.	Owner's Engineer	Alfred Breland (Project Manager) Paul Holmes (Permitting and Approvals) Warren Hoyle (Senior Hydrogeologist) Jordan Black (Geotechnical Engineer) Joe Viscek (Construction Environmental Monitor) Hooman Ghassemi (Structural Engineer)

Organization	Description	Team Members
Parish Geomorphic Ltd.	Creek Restoration Consultant	John Parish (Senior Fluvial Geomorphologist) Chris Cummings (On-site Fluvial Geomorphologist)
R & M Construction	Construction Contractor	Dean Vuyk (Construction Engineer/Administration) Harry Reinders (Construction Project Manager) Fred Reinders (Construction Foreman) Nick Kuipery (Construction Foreman) Scott Hansma (Construction Lead Hand)

2. Environmental Assessment and Sediment Management Plan

2.1 Previous Investigations

Condition assessments of the dam carried out in 1968 and 1976 (William L. Sears) identified enough concern about the integrity/stability of the dam that the normal operating water level was lowered to reduce the loads on the structure during major storm events. Subsequent assessments in 1993 (Peto MacCallum Ltd.) identified the poor condition of the concrete and notably, the spillway piers, which exhibited severe concrete delamination and cracking (see Figure 2-1). The dam was considered to be stable under current operating conditions, and for short-term increases in water levels up to 1.5 m above spillway Numbers 1, 3 and 4 (elev. ±218.82 m) in the event of a major storm event. However, the dam was not considered to be able to withstand the force of a major storm event if the normal operating water level was maintained at its original design operating level of 1.8 m above the top of spillways Numbers 1, 3 and 4 (elev. ±219.12 m).

Figure 2-1 A View of the Upstream Face of Crooks' Hollow Dam Showing Concrete Wear and Cracking

As a result, to ensure the integrity of the dam, the HCA modified the operating procedure by reducing the normal (summer) operating level to elev. ±216.58 m. Various repairs to the dam were completed since the 1970s including concrete repairs in 1977, shotcrete resurfacing in

1987-88, installation of an upstream membrane in 1994 and repairs to the catwalk decking in 1995.

No major rehabilitations to the structure were conducted after 1995 and HCA continued to operate the dam at the lowered normal (summer) level since 1993. In summer 2005, Hatch initiated a dam stability and condition assessment study of the dam. The condition of the dam was considered to be fair. Noted deficiencies included the poor condition of the concrete surface on the below-water upstream side and on portions of the downstream spillway end wall, fill settlement associated with the north abutment, dislodgement of the downstream spillway wall and seepage. Based on stability calculations, the dam's concrete structures did not meet current stability criteria for the load cases when the original design water level was applied. The structure was however, considered to meet criteria for the reduced water levels (Hatch, 2007).

In 2011, the Crooks' Hollow Dam was over 95 years old and although minor repairs were periodically carried out over the years, no significant rehabilitation work had been done. The dam was nearing its useful life expectancy and was in substandard condition. Recent engineering studies confirmed that the dam would require corrective rehabilitation to ensure its safe operation under major storm events or it should be decommissioned and either removed or modified into an overflow weir.

2.2 Project Plan

The Project Plan was prepared pursuant to the requirements of Conservation Ontario's (CO's) Class Environmental Assessment (Class EA) for Remedial Flood and Erosion Control Projects (Conservation Ontario, 2002). The CO's Class EA is an 'approved' Class EA under the Environmental Assessment Act (EAA), which allows Conservation Authorities (CAs) to undertake remedial flood and erosion control projects without applying for formal approval under the EAA.

This Project Plan forms part of the overall Class EA Project File and serves to document the environmental assessment planning process that was followed. That process resulted in the selection of the preferred alternative (i.e., 'the undertaking') to remove the Crooks' Hollow Dam. HCA was the proponent of the undertaking.

This Project Plan was made available for public and agency review as part of a 30-day review period. The implementation phase of the project involved the preparation of detailed plans and specifications, contractor selection and construction.

The undertaking consisted of the decommissioning and removal of the existing Crooks' Hollow Dam and associated structures, restoration of the dam site and the waterway including the management (i.e., selected removal) of previously deposited river sediments, stabilization of shoreline areas susceptible to erosion and the creation/enhancement of fish habitat. Removal of the dam restored the small reservoir back to its natural (i.e., 'pre-dam') riverine condition.

2.3 Baseline Sampling and Sediment Management Plan

HCA retained Hatch to prepare the Sediment Management Plan (SMP) as per an MOE requirement (see Appendix B). In developing the SMP, Hatch carried out a bulk sediment, sediment pore water and surface water sampling program at the Crooks' Hollow site between November and December, 2011. Surface water samples were collected upstream and downstream of the proposed creek restoration area, respectively, to establish baseline conditions. Baseline sediment sampling and geotechnical investigations were carried out to determine the extent and the volume of the sediment deposition in the reservoir (Appendix B). A preferred option was selected and conceptual layout sketches of sediment removal and disposal were prepared. The Spencer Creek Restoration Plan incorporated a natural channel design approach. This preliminary plan was completed in August 2010 and the general approach was accepted by MOE in December 2010 subject to receipt of additional details.

The preferred Sediment Management Plan option outlined in the August 2010 SMP was to remove materials in a dewatered condition and place most of the sediments in a designated area within the creek floodplain (former reservoir area). Some materials (localized and in limited quantities) would require special handling and disposal off site based on testing during construction. It was suggested that these suspect sediments (i.e., sediment locations where metal concentrations exceeded the 2004 Soil Standards) be handled under these special requirements (see Appendix B).

Subsequent to the completion of the SMP new Soil and Sediment Standards were established in the amended O. Reg. 153/04, effective July 1, 2011. As a consequence of the lowering of some metal concentrations in the generic sediment standards, a revised approach for the SMP was developed (see Appendix B). This involved an enhanced sampling program that included testing both sediment samples as well as soil samples within the floodplain area. Results from this sampling indicated that the floodplain soils were of similar composition to the deposited sediments. As such, after discussion with MOE it was determined that (i) sediment could be deposited directly on floodplain soils, (ii) an area of sediment with elevated mercury (Hg) would be removed off site for disposal at a MOE-licensed landfill facility, (iii) the remaining sediment would be placed on the banks of the creek, maximizing the amount of sediment placed above the 100 year flood line, while recognizing that there are only small areas available at the site which are above the 100 year flood line and therefore, most of the excavated sediment would be placed within the 100 year floodplain in areas requiring fill as part of the creek restoration and (iv) stabilizing the sediment using erosion control measures (silt fences and coir mats) as prescribed in the construction drawings (see Appendix A). Surface water was directed into a secondary channel along Spencer Creek to minimize infiltration of water through the sediment management area during the construction period.

3. Project Design

3.1 Water Control and Diversion

During the decommissioning of Crooks' Hollow Dam, water from Spencer Creek was diverted through the construction site and discharged downstream of the dam. Approximate flows in the creek were calculated using flow data from the previous 10 years. It was calculated that Spencer Creek would have an average flow of 1.22 cubic meters per second (CMS), and the1:2 year flow would have an approximate flow of 4.22 CMS (see Appendix L).

An open diversion channel design was selected for diverting water flow during construction activities. The diversion channel was constructed along the north bank of Spencer Creek. This channel was fortified with elevated embankments, as necessary, to handle high or unexpected flows of water. A dyke was constructed across the upstream end of the main channel of the former reservoir to block the water flow from entering the creek basin during construction activities. Upon completion of the dam removal and creek restoration work, the creek was re-opened to water flow, and the diversion channel was blocked off and filled.

3.2 Dam Removal

The Crooks' Hollow Dam and associated structures were demolished, with the exception of a section of the east abutment and base of the valve chamber. Due to the poor concrete and minor amounts of rebar, the dam was demolished by conventional construction techniques (i.e. hoe-ramming). The concrete was broken down into re-useable fill, which was re-used onsite, including

- approach ramps and roadway for construction vehicles (later used as a base for on-site pathway along creek)
- pedestrian bridge approach ramps.

3.3 Spencer Creek Restoration

There were several significant benefits to the restoration of Spencer Creek within the Crooks' Hollow Conservation Area and the larger Spencer Creek watershed with the removal of Crooks' Hollow Dam. The removal of this impoundment will serve to improve water quality (e.g. stream temperature, dissolved oxygen, etc.) along this reach of Spencer Creek, as well as downstream to Cootes Paradise and Hamilton Harbour. The dam removal will also re-establish natural sediment transport to downstream reaches of Spencer Creek to improve aquatic habitat by aiding in natural channel formation, controlling channel and bank erosion as well as restoring critical ecological interactions. Improvements to fish habitat include restoration of habitat, fish-passage for fish and other aquatic species, establishing riparian vegetation which will create refuge habitat for various juvenile fish species, and maintaining stream temperature regimes.

This reach of Spencer Creek historically functioned as a coolwater fishery, supporting fish species such as Brook trout (*Salvelinus fontinalis*), Northern hog sucker (*Hypentelium nigricans*), River chub (*Nocomis micropogon*), Blackside darter (*Percina maculata*) and

Finescale dace (*Phoxinus neogaeus*). While the dam was present the aquatic system consisted of warm water habitat due to the lake ecosystem behind the dam which was favourable to nuisance non-native fish species such as Common carp (*Cyprinus carpio*) and Goldfish (*Carassius auratus*). The warm water and eutrophic conditions also supported the production of algae, which depletes dissolved oxygen in the water column that further contributed to undesirable conditions downstream.

The naturalization works will facilitate ongoing restoration efforts downstream, as well as aid in the conservation and recovery of rare and at-risk flora and fauna, such as Eastern milk snake (*Lampropeltis triangulum*), Black redhorse (*Moxostoma duquesnei*), Snapping turtle (*Chelydra serpentina*) and American chestnut (*Castanea dentate*), that have been historically documented in this ecosystem.

3.4 Tree Protection and Replacement Plan

During construction activities, it was necessary for some vegetation to be removed on site to accommodate the construction activities. To plan for the minimal removal of trees and replanting, the Crooks' Hollow Tree Preservation and Planting Plan (see Appendix C), formulated by Hatch, outlined various protection/mitigation measures to minimize the impact of vegetation removal. A summary of the major provisions is provided below.

- The vegetation in the area of the existing site access points (both north and south sides) along Crooks' Hollow Road were maintained; some minor trimming was required associated with clearance for construction equipment.
- Branches and logs, including trimmed branches were left in place to provide wildlife habitat.
- Vegetation along the east side of the former dam (i.e., along the existing path) was maintained.
- Vegetation in the area east of the new pedestrian bridge was maintained.
- Transplanted stock was restricted to specimens under 200mm (millimetres) dbh (diameter at breast height) and was only considered for locally native, non-invasive species Invasive species were not considered suitable for transplanting. During construction no specimens were identified suitable for transplanting.
- Where woody vegetation was proposed to be removed adjacent to the creek, rooting systems were left as much as possible in the ground to maintain the soil cohesion provided by the trees and instream habitat potentially provided by instream roots.
- Monitoring by HCA during construction was carried out to identify if any existing or new tree related problems arose during the construction. It was recognized that further monitoring would likely be required post construction.
- Trees that were selected to be removed or preserved were labelled on the plans.

- Protection fencing and sediment controls were removed from the site once construction was complete and the site had stabilized.
- Trees that were removed within the creek restoration area were identified to species (inventory completed by HCA).
- Identification of any species at risk (e.g., Butternut - one noted onsite, American chestnut). The single Butternut tree at the site was protected by a fence-barrier and signage at a distance of 25 m around the tree.

Within the Crooks' Hollow Tree Preservation and Planting Plan report (see Appendix C), a tree replacement plan was proposed as a follow up to the detailed inventory of tree species on site. The General Principles for Planting (As per the City of Hamilton Tree Preservation Guidelines) were applied for this tree replacement plan.

A 1:1 planting ratio was planned and incorporated into the restoration plan (i.e., every tree removed was replaced with at least one native species considered to be flood line fringe/wet riparian moisture zone tolerant, and have variable/moist soil regimes). The main restoration area included an area adjacent to the downstream wetland as well as adjacent areas that were suitable for the recommended species.

Only native plant species were planted in the restoration area. The use of non-native, invasive plant species was not permitted adjacent to Core Areas in the Natural Heritage System. Plantings adjacent to high quality natural habitat included species

- representative of the existing native vegetation
- that were drought-resistant
- consisted of plant material that would conserve water and reduce long term maintenance.

Landscape Guidelines included

- transplanted stock that were restricted to specimens under 20 mm dbh
- minimum caliper for deciduous planting stock was 50 mm dbh
- a mix of tree species (no monocultures).

3.5 Cultural Heritage

From the onset of the project at Crooks' Hollow, the preservation of items/landmarks containing cultural heritage value was made a priority by HCA. The area has a long, rich history, and it was the intent of the project team to respect and uphold this history. The initial cultural heritage assessment on the site was carried out by Golder Associates Ltd. in 2011 (see Appendix D).

Cultural heritage features were incorporated into the final restoration of the site, wherever possible, or salvaged for later use (Section 5.10). A follow up cultural heritage assessment was carried out in July of 2012, after construction activities were finalized (see Appendix D).

3.6 Pedestrian Bridge

Crooks' Hollow dam has long been utilized by local residents and public visitors as a walkway crossing over Spencer Creek. One of the major concerns of the residents/public during the project design and consultation process was that this integral crossway would be lost. In an effort to incorporate public ideas and concerns into the final project design, and to maintain the existing amenities on the site, HCA committed to purchasing and installing a new pedestrian bridge on the site. The new bridge was installed approximately 30 m upstream from the former dam location after major construction activities were finalized. The bridge connects to the public walking trail that was also incorporated into the final project design (Section 5.8).

4. Environmental Permitting and Approvals

A summary of the permits/approvals (i.e., federal, provincial and other) received for the project is presented in Table 4-1. Copies of all permitting documentation have been provided in Appendix F.

Table 4-1 Summary of Project Permits/Approvals Received

Agency	Description of Permit/Approval	Date Received
Department of Fisheries and Oceans (Federal)	Letter of Advice – not likely to result in impacts to fish or fish habitat.	July 11, 2011
Transport Canada (Federal)	Navigable Water Protection Act Approval	January 9, 2012
Ministry of Natural Resources (Provincial)	Work permit under the Lakes and Rivers Improvement Act.	October 27, 2011
Ministry of Natural Resources (Provincial)	License to Collect Fish For Scientific Purposes	January 9, 2012
Ministry of Environment (Provincial)	Permit to Take Water	August 5, 2011
Ministry of Environment (Provincial)	Clearance of Environmental Assessment Conditions	March 21, 2012
Niagara Escarpment Commission	Development Permit	July 15, 2011
Ministry of Tourism and Culture	Approval letter and recommendations with respect to cultural heritage features.	July 19, 2011

5. Summary of Construction Activities

The following sections provide a summary of the major construction phases of the Project. The mobilization and staging of the construction workforce/equipment commenced on February 14, 2012. Construction activities were finalized, and the workforce/equipment demobilized by May 11, 2012 – for a total construction duration of approximately three months. A schedule of major construction activities is provided in Table 5-1. For detailed, weekly reporting and photographs of construction activities, please refer to Appendix G.

Throughout the construction period, weekly meetings were held with Project team members (Section 1.3) to recap construction activities and discuss relevant issues. Construction meeting summary reports are provided in Appendix H.

Table 5-1 Schedule of Major Construction Activities

Activity	Date
Mobilization and Staging	February 14, 2012
Excavation and Opening of Diversion Channel	February 14 to February 17, 2012
Creek Bed Sediment Removal	February 23 to March 12, 2012
Mercury-Impacted Sediment Removal	February 28 to February 29, 2012
Dam Demolition	March 2 to March 9, 2012
Crib Wall Construction	March 13 to March 15, 2012
Riffle Construction	February 28 to March 14, 2012
Closing of Diversion Channel; Re-opening Creek to Water Flow	March 20, 2012
Grading Activities Finalized	March 21, 2012
Bridge Installation	May 7, 2012
Tree and Vegetation Planting	April to May, 2012
Site Cleanup, Restoration, Construction Demobilization	May 2012

5.1 Water Diversion

The construction workforce began excavating the diversion channel from the northern end of the site (upstream of Crooks' Hollow Dam) during the first week of construction (i.e., February 2012) as an alternative approach to the original piped water diversion plan. The shallow bedrock along the channel area was broken in fragments using a hoe-ram attachment on an excavator to the appropriate depth (as outlined in the construction

drawings). This excavated rock was kept on site for re-use in construction access roads/creek channel embankments. The diversion channel was left unopened to the creek's water flow until excavations were completed. Large, steel sheet platforms were brought on site and assembled side-by-side to form a water crossing over the diversion channel for the construction workforce and equipment.

During the second week of construction, the diversion channel was opened to the creek flow. The inlet to the channel was opened slowly and gradually, so as to minimize the flush of soil/sediment downstream and preserve water quality. Following the opening of the diversion channel, the creek channel was blocked off from water flow by building a dyke embankment on the eastern portion of the site. With the diversion channel accepting increasing water flows, the crest of the dyke embankments were elevated and reinforced with rock debris/fill material. As the original creek basin was drained (with excess water pumped out), several fish rescues were carried out by HCA ecologists and MNR biologists via electrofishing and seine netting, to collect stranded fish and transfer them back into the creek downstream of the dam.

The first stage of the diversion channel passed flowing water in front of the dam and through the dam spillway, to allow for (i) upstream excavation work, (ii) riffle construction and (iii) creek bank restoration. A later second stage of the diversion channel re-routed the creek flow around the north side of the dam once the northern wing-wall was removed, allowing for (i) dam demolition, (ii) downstream excavations, riffle construction and bank restoration activities to ensue (see Figure 5-1).

Figure 5-1 Diversion Channel (Right Side) Created to Facilitate Construction and Dam Decommissioning Activities

In week six (i.e., March 2012), following dam demolition (Section 5.7), the creek basin was re-opened to water flow. Excavators were used on the southwestern end of the site to slowly breach the dyke that had previously blocked water from entering the creek. Water was allowed to re-enter the creek channel slowly and gradually to minimize silt movement to the greatest extent possible. Once the creek basin filled with water, the diversion channel was blocked off on the west end with rock-fill and soil material.

HCA biologists carried out a comprehensive fish rescue in the diversion channel after water flow into the channel was stopped. Water was able to drain out along the majority the length of the temporary channel, with several shallow areas that needed to be pumped out.

Water flow rates were monitored by HCA on a daily basis during the operational use of the diversion channel (i.e., February 22 to March 20, 2012). These daily flow readings are provided in Appendix J.

5.2 Fish Rescue and Relocation

As part of the Crooks' Hollow Dam Removal project, fish rescues were conducted, as necessary, to remove fish both upstream and downstream of the dam to help mitigate impacts on fish behaviour and physiology. The diversion channel was constructed adjacent to the existing creek to allow the in-water construction activities to take place in a dry environment; this allowed HCA staff to safely recover fish residing within the construction work area. This diversion channel also acted as a temporary barrier to immigration/emigration of fish species which also helped to mitigate any impacts on the fish population.

A License to Collect Fish for Scientific Purposes (License Number 1066705) was obtained from the MNR (Issue date 2012/01/09) – see Appendix F to conduct the transfer of fish species downstream of the construction site. All species (except for common carp – an invasive species) were released, approximately 40 m downstream from the construction area.

There were a total of four rescues completed for this project. The first rescue was conducted on February 21, 2012, upstream of the dam, the second rescue was completed on February 22, 2012, upstream of the dam, the third rescue was conducted on February 27, 2012, located downstream of the dam (in the plunge pool) and the fourth rescue occurred in the diversion channel post creek restoration. These rescues were conducted by HCA Ecology staff in conjunction with staff from the MNR.

The fish rescues were conducted with a backpack electrofishing unit (see Figure 5-2). The electrofishing unit was set on pulse power to the requirements of the decommissioning site (between 250 to 350 volts, frequency 60hz.). A seine net was used to collect fish where a backpack electrofishing unit could not be used due to low conductivity levels and depth. A seine net was utilized to collect fish from the plunge pool downstream of the dam.

Figure 5-2 HCA and MNR Biologists Conducting a Fish Rescue Upstream of the Dam Site

The total number of fish recovered during the rescues was approximately 550; the most abundant fish species caught during the rescues was Common carp, with approximately 200 individuals captured. The additional species captured included; White sucker (*Catostomus commersonii*), Longnose dace (*Rhinichthys cataractae*), Blacknose dace (Rhinichthys atratulus), Rainbow darter (*Etheostoma caeruleum*), Blackside darter (*Percina maculate*), Creek chub (*Semotilus atromaculatus*), Pumpkinseed (*Lepomis gibbosus*), Northern pike (*Esox lucius*) (1) and Bluntnose minnow (*Pimephales notatus*).

5.3 Sediment Excavation and Placement

Prior to any excavations on site, sediment and erosion control measures (i.e., silt fencing) were established around the site, as prescribed by the SMP and construction drawings (Appendix A). Sediment and erosion control measures continued to be monitored and/or adjusted throughout construction, as necessary, to ensure their effectiveness. The excavation of sediment within the creek bed commenced during the second week of construction (i.e., once water was fully diverted through the diversion channel, and the creek basin was drained/fished out), and continued up until week five. Excavations began on the southwestern end of the creek bed, gradually moving in a downstream, northeast direction towards the dam.

Excess water from rain events was frequently pumped out of the creek bed and into the diversion channel, to allow for excavation work in the bottom of the creek channel. Excavators utilized large, steel platforms to maintain stability and navigate across poorly drained soil/sediment. A laser level was used to ensure that excavation depths were consistent with the construction drawings, and maintained an appropriate gradient. The

creek banks were carved out and fashioned to match the natural channel design alignment of the creek, as prescribed by the construction drawings. The proposed wetland area at the southeastern portion of the site was shaped as a shallow basin at the onset of excavation work, with the well-drained clay material being used in the construction of the new creek banks. Shale rock-debris from on-site (leftover from excavating the diversion channel) was also used in helping to stabilize the creek banks.

Figure 5-3 Sediment Being Excavated from the Creek Bed During Construction Activities

Excavated sediment from the creek bed was spread and stockpiled in the central portion of the site between the creek and diversion channel—so that it could drain/evaporate water and be used as fill material on-site at a later time. With the exception of one small area of mercury-impacted sediment which was removed from the site for safe disposal (Section 5.4), all sediment was retained and re-used on site as part of the creek restoration. Per the SMP that was formulated by Hatch, and approved by the MOE, the intent was to place as much sediment as possible above the 100-year high water mark during restoration. To the extent possible, the construction workforce used the excavated sediment for bank construction, and for grading the area of high elevation northwest of the former dam site. Dried sediment was also utilized during the final stages of construction (i.e., April through May, 2012) for final grading of the site, and filling of the diversion channel. In total, approximately 2,000 cubic metres of excavated creek sediment was redistributed on site during restoration activities.

A visual representation of the final sediment dispersal at the site is shown in Figure 5-4, including approximate volumes per specific placement area.

Legend

- Sediment Placement Area
- 100 yr. Flood Level
- Regional Flood Level

Approximate Sediment Volume

Area	m³	Comments
A	1000	
B	400	
C	600	Above 100yr. Flood Level

0 20 40 60 80 100 Metres

1:1000

Figure 5-4

Hamilton Conservation Authority

Crooks' Hollow Dam Removal and Restoration of Spencer Creek

Project Completion Report - Sediment Placement Areas

HATCH™

Jan 31 , 2013 , 2:30pm Login name: pont110733 Layout: Channel Works
Drawing Name: P:\HCA\337415\CAD\C\MOE\Project Completion Report\337415_PCR_Figure_5-4.dwg

5.4 Mercury-Impacted Sediment Removal and Off-site Disposal

The results of a comprehensive sampling program carried out on site by Hatch provided a delineation of sediment in exceedance of MOE standards for mercury. It was determined that the mercury-impacted (Hg-impacted) sediment was restricted to an approximate 20 by 25 m area on the central portion of the site, where the creek-path bends north. Specifically, the sediment from the middle of the creek to just along the inside bank (i.e., northern) was found to contain higher than acceptable levels of mercury (see Appendix A Construction Drawings).

Excavation and removal of the Hg-impacted sediment commenced on Tuesday, February 28, 2012 and was finalized on Wednesday February 29, 2012. Prior to any excavations, the Hg-impacted area on site was carefully delineated by the construction workforce, with guidance from detailed Hatch drawings and an onsite, Hatch environmental representative. Several Panda Environmental, tri-axel dump trucks were retained by the contractor for transport of the Hg-impacted sediment off-site, for final disposal at Newalta Landfill in Stoney Creek, Ontario (see Figure 5-5). Trucks were kept in rotation until all Hg-impacted sediment was removed from the site.

Figure 5-5 Mercury-Impacted Sediment Being Excavated from Creek Bed and Taken Offsite for Safe Disposal

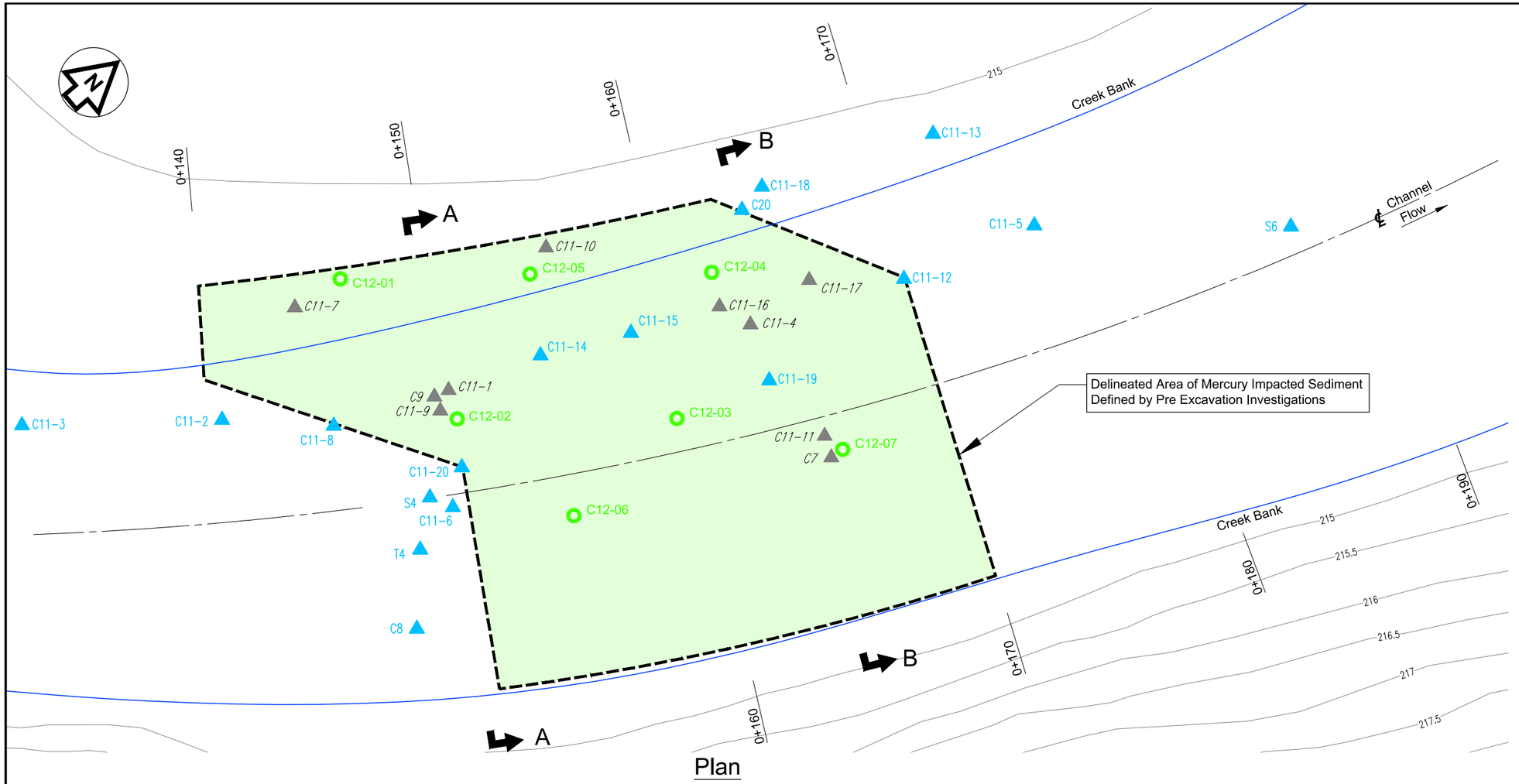
Hg-impacted sediment from the south side of the creek was excavated to a depth of approximately 0.5 m, where there was a hard till layer composed of silt, sand, gravel and cobble. The Hg-impacted area from the centre of the creek towards the north bank was excavated to a depth of approximately 1 m, and terminated at the till layer. Excavations along the northern creek bank of the delineated Hg-impacted area concluded at a depth of approximately 1.5 m. The sediment material in this area was composed of silty-sand, with

high levels of organics. The Hg-impacted sediment that was excavated was dry enough that it did not exhibit significant slumping; and it was deemed acceptable for safe transport off-site.

Seven representative sediment samples were collected within the excavated creek basin and along the northern bank by the onsite, Hatch environmental representative following the removal of Hg-impacted sediment. These samples were taken as part of a due diligence program—to confirm that all Hg-impacted sediment was removed from the creek channel. The results of these sediment samples indicated that all Hg-impacted sediment within the creek channel was successfully removed from the site. One sample, taken in the edge of the creek along the northeastern limits of the excavation area, revealed the presence of Hg-impacted soil/sediment above provincial standards, however, this sample was collected several meters into the flood plain zone, where excavation/disturbance was not deemed to be necessary as this area was not disturbed. Nonetheless, this area of the creek bank was fortified with large armour stone as part of riffle creation, making soil erosion unlikely. As such, it was determined that this finding was consistent with the generally elevated heavy metal concentrations that occur in the study area and is not anticipated to result in any additional adverse environmental effects as a result of the creek restoration.

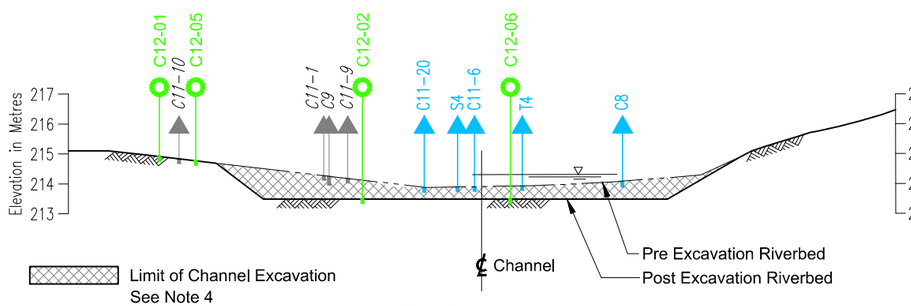
Overall, 15 tri-axle truckloads of sediment weighing a total of approximately 313.35 tonnes were transported offsite for safe disposal at the Newalta Landfill on Green Mountain Road, in Stoney Creek, Ontario (see trucking/disposal receipts, Appendix I).

Figure 5-6 includes a detailed drawing and cross-section of the Hg-impacted sediment area that was excavated at the site. Pre and post excavation sampling locations with associated mercury concentrations are included in the drawing.

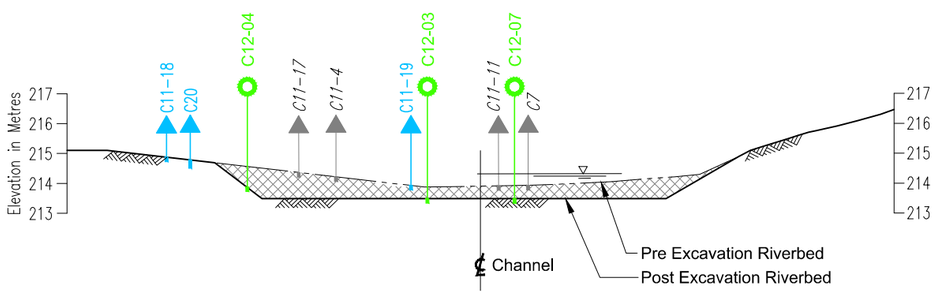


Plan

Key Plan



Section A-A



Section B-B

0 4 8 12 16 20 Metres

1:200

Legend

Sample Type	Sample ID	Hg Concentration (mg/kg)
Pre Excavation	▲	<0.27
	▲	>0.27
Post Excavation	C12-01	0.3
	C12-02	0.2
	C12-03	<0.1
	C12-04	<0.1
	C12-05	<0.1
	C12-06	<0.1
	C12-07	<0.1

Contaminated Sediment Removal Sequence:

1. Sediment from the south side of the creek was excavated to a depth of approximately 0.5 m to a Till layer composed of silt, sand, gravel and cobble.
2. Sediment from the center of the creek towards the north bank was excavated to a depth of approximately 1 m to a Till layer.
3. Sediment along the northern creek bank of the delineated contamination area was excavated to a depth of approximately 1.5 m to a Till layer.
4. Approximately 313 Tonnes of Sediment was removed off-site to Newalta Landfill.

Figure 5-6

Hamilton Conservation Authority

Crooks' Hollow Dam Removal and Restoration of Spencer Creek

Project Completion Report - Mercury (Hg) Impacted Sediment Removal

HATCH

5.5 Riffle Construction

The construction of the three individual riffle areas along the restored creek was overseen by Parish Geomorphic. The first stage of riffle construction involved removing sediment from the creek bed (Section 5.3), to the appropriate depth as outlined in the construction drawings (see Appendix A). Armour stone (i.e., boulders) to be used for riffle construction began to be trucked on-site early in the project (during the first week of construction) and continued for several weeks thereafter. The armour stone was stockpiled on the central portion of the site until it was needed. The intent was to stockpile as much material on-site before the municipally-designated, half-load trucking season for the roadways came into effect (March 1 to April 30). Several tri-axle dump trucks were kept in rotation on a daily basis to transport armour stone to the site. Several days of trucking armour stone on-site were necessary during the half-load season, for completing the final riffle section downstream of the dam.

The construction of the respective riffle sections using armour stone was carried out in a southwest to northeast direction (i.e., upstream to downstream) between weeks three and five. For each riffle section, armour stone was placed within the excavated creek bed via an articulated dump truck, or tri-axle dump truck where/when appropriate. Excavators were used to compact the boulders, and spread them along the creek bed and banks, per the construction drawings and Parish Geomorphic instruction. The boulders were orientated so as to provide appropriate riffle habitat while preserving the desired gradient/fall of the creek bed (see Figure 5-7).

Figure 5-7 Construction of a Riffle Area Upstream of Former Dam Site

5.6 Crib Wall Construction

The crib wall was constructed along the northern creek bank (immediately downstream of the dam) as an erosion protection measure that would help withstand higher flows in the absence of the dam structure. The assembly of the crib wall took place during week five of construction (March, 2012), following the demolition of the dam. Wooden poles approximately 6 feet long, with a six inch diameter were hammered together by the construction workforce with 12 inch-long nails to form a long, rectangular prism frame. Soil, filter cloth and natively-harvested live willow stakes were piled in-between the lattice structure to promote vegetative growth, and ensure stability (see Figure 5-8).

Figure 5-8 Construction of Crib Wall Downstream of Former Dam Site

5.7 Dam Removal

By the end of the third week of construction activities (early March, 2012), work focused on preparing for the dam demolition. The railings along the top of the dam were previously dismantled from the structure, and stored to be re-used at the site (Section 5.10). The northern wing-wall area of the dam was removed (and retained as a cultural heritage piece [Section 5.10]), and the diversion channel was re-routed to pass around the remaining dam structure. Fractured bedrock that was excavated in this area was re-used on site to help stabilize the new creek banks. Removal of the northern wing-wall of the dam revealed a cross-section of the dam interior, which included concrete and rebar encasing the valve chamber. The remainder of the dam structure did not contain rebar.

The demolition of the greater dam structure took place between March 6 and 7, 2012, during the fourth week of construction. The dam was demolished by means of a backhoe outfitted with a hoe-ram. The majority of the concrete dam structure crumbled apart easily using a

hoe-ram, with the exception of the rebar-reinforced valve chamber on the north end, which required some additional care to dismantle (see Figure 5-9).

Figure 5-9 Excavator Breaking Up Dam Structure with Hoe-Ram

Overall, the dam was taken down to just below the sediment layer. The hoe-ram was used to break-up large pieces of concrete following dam demolition. Steel and rebar was salvaged from the rubble, and stockpiled on site until it could be recycled as scrap. Also, a steel valve-piece from the valve chamber was salvaged for cultural heritage purposes (Section 5.10). A mini-excavator was brought on site to assist with the demolition/ clean-up of debris. Two flume pipes were utilized to allow draining water to bypass the fallen rubble/concrete. The broken-up rock and concrete was recovered to be used for trails/ embankments on site.

A small, tapered portion of the dam pier on the south bank was left in place for cultural heritage purposes (Section 5.10). An engineering structural assessment of this remaining pier concluded that it would be stable and safe to leave in place (Appendix K).

HCA biologists were called upon to conduct a fish rescue following dam demolition, to relocate fish that had accumulated in the plunge pool downstream of the demolished dam. This water was subsequently pumped out of the creek basin and into the wetland area to the north, in order to allow excavations to continue downstream of the dam demolition site.

5.8 Pedestrian Bridge Construction

The pedestrian bridge was erected approximately 30 m upstream of the former dam site. Bridge construction began with the forming of the footings. The footings were constructed by first assembling a rebar structure, and then pouring concrete into wooden forms using an excavator clutching a large steel container. Loose stone/fill material was used to build up the ground level around the footing to match the grade of the surrounding land. The bridge footing on the southern bank of the creek was created in week six (late March 2012), just

before re-opening the creek to water flow, while construction of the northern bridge footing was carried out just prior to the bridge being installed in May 2012.

The bridge was installed on May 7, 2012—outside of the major construction window, as it took several weeks for it to be fabricated to project specifications and delivered to the site. Two excavators were used to lift the bridge into position and make final adjustments to its placement. Concrete anchor bolts were used to fasten the bridge to the footings (see Figure 5-10). The bridge is approximately 30 m long and 2 m wide, with pressure-treated wood deck planking. The fabricated steel truss is composed of self-weathering steel, so as to exude a rustic look and blend into the natural setting. The bridge's railings rise to a height of approximately 1.5 m, with vertical support-bars on the outside that serve as a safety measure. The elevation of the bridge is such that it sits above the estimated 100-year flood level of the creek. The bridge was designed to connect to the public walking trails that were subsequently created on the site (Section 5.9).

Figure 5-10 Construction Workforce Finalizing Pedestrian Bridge Installation

5.9 Site Restoration and Naturalization

The restoration and naturalization of the site occurred during various stages throughout construction. As creek banks were restored and finalized, they were reseeded with native grass species, and covered with jute fabric to promote growth. Upon construction completion, the entire site was re-seeded with native vegetation. In addition, trees and shrubs were purchased and planted throughout the site per the Tree Preservation and Planting Plan (see Appendix C), to restore the creek area to a naturalized condition (see Figure 5-11).

Figure 5-11 A View of the Restored / Naturalized Site Following Construction Activities

Three wetland areas, located on the southwest, north-central and northeast portions of the site, respectively, were excavated as part of construction activities. These wetland areas were replanted with native vegetation once construction activities were completed. Logs from felled trees on site were recycled by depositing them into these wetland areas, so as to enhance their habitat characteristics (Figure 5-12).

Figure 5-12 Constructed Wetland Feature Opposite Northern Creek Bank, Upstream of Former Dam Site

The construction access roads on site provided the base for the new walking trail in the restored area (see Figure 5-11). Upon finalizing construction activities, the access road (which consisted of rock fill as well as rock/concrete fragments from the demolished dam), were refashioned and graded to restore public access to the site. Sand-sized rock screenings were added to the top of the road base to provide a finished level surface on the trail. This trail system included a lead-up to the pedestrian bridge on site, as well as to a public parking lot along Crooks Hollow Road to the northwest.

Furthermore, mulch, which had been produced and stored on site from chipping the trees/branches that were felled at the onset of construction, was re-used to construct a trail that leads from the pedestrian bridge, up the bank and into the woods (to the remaining dam abutment and lookout area [Section 5.10]) on the south side of the creek.

5.10 Cultural Heritage Items

A follow-up cultural heritage assessment (see Appendix D) was conducted in July 2012 after all construction activities were finalized. Cultural heritage items that were preserved during/following construction activities are outlined below:

- A portion of the southern abutment of the dam was left in place during demolition. The abutment was transformed into a lookout point for the public by reuse of the old dam deck railings, and fashioning them together atop the abutment (see Figure 5-13). A trail leading up to the lookout point from the pedestrian bridge was created using mulch from wood chipped trees/branches that were removed during construction activities on site.
- The remaining walkway railing materials from the demolished dam were also utilized to create a lookout area atop the northern bank – across the creek from the southern abutment that was left in place (see Figure 5-13). These lookout areas were positioned along the alignment of the former dam.
- The new trail that was created on the site incorporated rock/concrete fragments from the demolished dam.
- Several large slabs of concrete that were part of the northern wing wall of the demolished dam were preserved. These sections of the dam were aligned in the former location of the wing wall to show the extent of the former reservoir for cultural heritage display purposes and for use as a soil retaining feature (see Figure 5-14).
- An old, sealed well on the northern bank of the creek (adjacent to the dam site) was left in place, in its original condition (see Figure 5-15).
- A small waterfall feature consisting of groundwater seeping along the surface bedrock and discharging at a vertical bedrock face was created as a result of diversion channel excavation near the north lookout area. This aesthetic feature was left in place following construction activities (see Figure 5-15).
- A section of rusted iron water pipe that was previously connected to the dam, and extends north of the creek, was preserved. This pipe was exposed during construction,

and the workforce used due care to leave the pipe intact and in place. Portions of the pipe were left exposed upon the conclusion of construction activities. This pipe was formerly used to convey water from the creek (i.e., at the dam) to the Town of Dundas and later to Dundas Valley Golf and Curling Club for irrigation purposes, between 1959 and 2001.

- During dam demolition, the dam valve that was present in the valve chamber on the north end of the dam (i.e., controlling water-flow to the pipe leading to the Dundas Valley Golf and Curling Club) was salvaged for future cultural heritage display purposes by HCA.

Figure 5-13 Remaining Dam Abutment and Lookout Areas Created to Preserve Cultural Heritage (View from Northern Bank, Opposite Crooks' Hollow Road)

Figure 5-14 Small Waterfall Feature Left in Place Adjacent to North Lookout Area, with Sealed Well in the Background

6. Monitoring

6.1 Flood Plain Mapping

A Crooks' Hollow Flood Plain Mapping report was prepared by HCA in July 2012, following the completion of construction and site restoration activities (Appendix L). This report contains hydraulic analyses (and associated mapping) that identify and compare both the existing and "as built" regulatory flood elevations.

The objective of the hydraulic analysis was to calculate water surface elevations at selected points (cross sections) along Spencer Creek for a range of flow rates. Water surface elevations were calculated with the aid of a computer program called HEC - RAS. Version 4.1 of the HEC - RAS model was developed and is supported by the U.S. Army Corps of Engineers.

The HEC - RAS program calculates water surface profiles for steady, gradually varied flow for both sub-critical and supercritical flow conditions. Algorithms to calculate the effect of bridges, culverts, dams and weirs are included in the program. HEC - RAS has been widely used for flood plain mapping studies throughout Ontario.

6.2 Surface Water Monitoring

As a follow up to the dam removal and restoration of Spencer Creek, a 5-year Surface Water Monitoring Program was proposed by HCA. On a semi-annual basis, a representative sample of Spencer Creek will be collected from a point upstream and downstream of the project site. These two surface water samples will be submitted to an accredited chemical laboratory for analysis of pH, alkalinity, hardness, metals and hydrides (unfiltered samples for analysis of aluminum, antimony, arsenic, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium and zinc). Temperature, conductivity, dissolved oxygen, and pH will be measured in the field. The test results will be compared against the MOE July 1994 Provincial Water Quality Objectives (PWQO).

An annual monitoring report will be prepared to summarize the results from the Surface Water Monitoring Program, ongoing monitoring of the permanent erosion protection measures (monthly during the first year following construction followed by a recommendation for decreased monitoring frequency following a period of stability) and monitoring carried out in accordance with general Department of Fisheries and Oceans effectiveness monitoring protocols (bank stability and health of planted materials). This information will be documented in the annual monitoring report and submitted to the MOE Hamilton District Office.

6.3 Adaptive Management

HCA is preparing an Adaptive Management Plan which will be implemented approximately one year following the completion of construction at the site. Information associated with this plan will also be included in the annual monitoring report.

If, after 5 years of monitoring, the results of the Surface Water Monitoring Program can demonstrate that surface water quality shows no significant difference or deterioration from pre-construction samples or between the upstream and downstream sampling stations, the monitoring program will be terminated by HCA.

Should the results from a sampling event differ significantly from the baseline conditions then re-sampling and testing will be carried out to determine if there was a sampling or analytical issue with the initial sample. Should the second sampling event confirm the results from the initial event, an investigation program will be carried out to determine the extent and source of the impacted water.

7. Schedule

The Crooks' Hollow Dam Removal and Restoration of Spencer Creek project was initiated in 2005 with preliminary investigations, and finalized in 2012. Table 7-1 below provides a timeline of significant events/milestones throughout the lifespan of the project.

Table 7-1 Project Timeline

Activity / Milestone	Date
Preliminary Meetings, Planning and Investigations	2005-2009
Project Environmental Assessment Approval Notice of Filing (beginning of comment period) Notice of Filing (end of comment period) Minister's Decision	 January 23, 2009 February 23, 2009 May 13, 2009
HCA Board Endorsement Notice of Project Approval	 August 2009
Initial Sediment Management Plan (dredging and disposal) Preparation of SMP SMP review and approval by MOE	 August 2009 September 2009
Cultural Heritage Assessment	June 2011
Sediment Management Plan (Final)	September 2011
Tree Preservation and Planting Plan	December 2011
Construction Mobilization and Staging Diversion Channel Opened Creek Bed Sediment Excavation Mercury-Impacted Sediment Removed Dam Demolition Crib Wall Constructed Riffle Construction Finalized Diversion Channel Closed ; Creek Re-Opened to Water Flow Grading Activities Finalized Bridge Installation Tree and Vegetation Planting Site Cleanup, Restoration, Construction Demobilization	February 2012 February 2012 February-March 2012 February 2012 March 2012 March 2012 March 2012 March 2012 April - May 2012 May 7, 2012 May 2012 May 2012
Follow Up Cultural Heritage Assessment	July 2012
Project Completion Report	October-December 2012
Follow-up Monitoring Over 5 Years	2013 - 2017

8. References

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Suite 500, 4342 Queen Street
Niagara Falls, Ontario, Canada L2E 7J7
Tel 905 374 5200 ◆ Fax 905 374 1157

Suite 500, 4342 Queen Street
Niagara Falls, Ontario, Canada L2E 7J7
Tel 905 374 5200 ◆ Fax 905 374 1157