



INFORMATION REPORT

TO:	Chair and Members Public Works Committee
COMMITTEE DATE:	November 18, 2019
SUBJECT/REPORT NO:	Emergency Shoreline Protection Works - Inventory & Assessments (PW19095) (Wards 1, 2, 5 and 10) (Outstanding Business List Item)
WARD(S) AFFECTED:	Wards 1, 2, 5 and 10
PREPARED BY:	Wes Kindree (905) 546-2424 Extension 2347
SUBMITTED BY: SIGNATURE:	Craig Murdoch Director, Environmental Services Public Works Department

COUNCIL DIRECTION

At its meeting of May 9, 2018, Council approved Public Works Committee Report PW18-006 that included the following recommendation:

- (c) Staff to undertake a comprehensive study of the Lake Ontario and Hamilton Harbour shorelines, from the lift bridge to the City-owned lands east of Confederation Park, and the shoreline from Bayfront Park to Coote's, to determine options (including hard protection measures), and costs to protect City lands and residents from extreme storm events, and that the costs to undertake the study, estimated at \$340,000, be funded from the unallocated capital reserve.
- (d) That staff report to the Public Works Committee in regard to the alignment of the projects that emerge from the comprehensive study of the Lake Ontario and Hamilton Harbour shorelines, from the lift bridge to the eastern boundary of Confederation Park, and the shoreline from Bayfront Park to Coote's, to the Green Infrastructure stream; and

OUR Vision: To be the best place to raise a child and age successfully.

OUR Mission: To provide high quality cost conscious public services that contribute to a healthy, safe and prosperous community, in a sustainable manner.

OUR Culture: Collective Ownership, Steadfast Integrity, Courageous Change, Sensational Service, Engaged Empowered Employees.

- (e) That staff report back on options and costs for item (c) and possible external funding sources, such as the Green Infrastructure Stream.

INFORMATION

In 2017 and 2018 the City of Hamilton experienced significant weather events that resulted in substantial damage to the shorelines of the City of Hamilton. The areas that experienced extensive damage during this period were the Hamilton Harbour Waterfront Trail (commonly known as Bayfront Trail), Beachfront Trail, Confederation Beach Park and Fifty Road Parkette. Extreme weather events are becoming increasingly common, and the resulting damages have brought into focus the changing environmental conditions that continue to negatively impact City of Hamilton shorelines.

In response to these unstable conditions and resulting damages, staff began to seek out third party funding partners and programs to help assist with the costs associated with improving shoreline protection measures within city owned shoreline assets. In June 2018, staff submitted an Expression of Interest followed by a full application in January 2019 to Infrastructure Canada as part of the Disaster Mitigation and Adaptation Funding (DMAF) cost sharing program. In April 2019, the City of Hamilton was selected as a successful applicant to the program and subsequently secured the City's portion of funding through Report FCS19038. This DMAF program is intended to help fund the implementation of shoreline protection measures to the sites noted within Report FCS19038 approved by Council on May 9, 2018 with all works being completed within an 8-year timeframe (2027).

In 2019, the Great Lakes reached record setting high water levels collectively, with Lake Ontario reaching 76.03m. International Great Lake Datum (IGLD) as measured at the Burlington and Toronto monitoring stations, was approximately 50cm higher than that of 2018. These extremely high-water levels remained constant throughout the Spring/Summer and started to slowly recede in the late Summer/Fall. At the time of preparation of Report PW19095, water levels had receded to 75.17m, approximately 70cm higher than the same time period in 2018. Figures 1 and 2 as shown in Appendix "A" attached to Report PW19095 shows the maximum elevation of Lake Ontario over the past 11 and 57 years respectively based on Fisheries and Oceans Canada monitoring stations located in Toronto, Port Weller and Burlington (2009-2019).

Early in 2019, staff engaged coastal engineer SNC-Lavalin, through a competitive bid process, to complete an inventory and assessment of City owned waterfront assets. This study consisted of 33 properties along the shores of Lake Ontario from the Burlington Canal lift bridge to Windermere Road, as well as, within the Hamilton Harbour from the Desjardins Canal to the limits of Pier 4 Park. Figures 1 through 5 of Appendix "B" attached to Report PW19095 shows the location of these assets. The properties within the shoreline study area are comprised of road rights-of-way, storm

water outfalls, developed parkland, open space and trail systems. Typically, these assets have some form of existing shoreline protection that has failed or showing signs of deterioration. A final version of SNC-Lavalin's Shoreline Inventory and Assessment of City of Hamilton Owned Assets report attached to Report PW19095 as Appendix "C". The Hamilton Harbour Waterfront Trail, Asset 29, commonly known as Bayfront Trail was removed from this study as this area had previously been reviewed by a coastal engineer after the initial damage from the 2017 weather events. As this area has specific design challenges related to adjacent land uses and lack of space for trail movement, a site-specific report for this location will be brought forward to committee early in 2020.

In preparing the Shoreline Inventory and Assessment of City of Hamilton Owned Assets report, the consultant completed field work in the Spring of 2019 that consisted of three days of site review by a coastal engineer, followed by five days of gathering site specific information, such as, topographic information, bathymetry, photos and drone aerial imagery. During this field work, the water levels of Lake Ontario were approximately 35 cm lower than the maximum height reached in 2019.

Following the completion of the field work, a desktop review was completed that included the gathering of historical wind and water level data available through local monitoring stations. This information combined with the site-specific data collected was used to run wave modelling on a site by site basis. This wave modelling provides an accurate overview of how a given water elevation combined with a specific wind speed/direction would generate a wave of what height and how it would impact the shorelines for the properties studied.

Upon review of the wave modelling for the 33 sites, the findings illustrated that the properties showed various levels of deterioration, and that most sites were susceptible to wave overtopping of some degree. Overtopping is the result of the wave runoff carrying such force that when it reaches the shoreline structure, it is forced upwards and over the crest (top) of the shoreline protection. This overtopping action results in waves reaching the surface beyond the shoreline, and if the area being hit with the overtopping water is not adequately reinforced, erosion and scouring beyond the shoreline structure on the inland side will occur. Over time this erosion will continue to undermine the shoreline structure and eventually lead to the overall failure of the shoreline protection from the inland side.

The SNC-Lavalin inventory evaluated the 33 existing shoreline structures and ranked them using a 5-tiered scale system. The lowest ranking being very poor which represents high levels of deterioration with serious concern about the reliability of the existing structure. The highest ranking being very good which represents protection that has little to no visible deterioration and doesn't pose any concerns about

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withstanding a 100-year storm event coupled with a 100-year wind event. Figure 1 as shown in Appendix “C” attached to Report PW19095 outlines the 5-tiered scale system. Staff has prepared a prioritization list for the implementation of shoreline protection measures among the 33 sites. This priority ranking takes into consideration the findings of the inventory, but also considers the current land-usage, infrastructure within the property and any public safety concerns. This prioritization may need to be adjusted over time if storm damages changes conditions on any of the sites. Sites have been reviewed and prioritized as being:

High Priority:

Sites that have been ranked as being in poor and very poor condition, have a significant land use and potentially have health and safety implications. Sites rated as high priority will be reviewed in greater detail and will have shoreline protection works developed and implemented within a 3-year timing window.

Secondary Priority:

Sites that have been ranked as being poor to fair and because of the current land use, do not pose any immediate health and safety concerns to the public. These sites will require ongoing monitoring but anticipate shoreline protection measures being implemented in a post 3-year window.

Low Priority:

Sites that have been ranked as being fair to very good and typically have shoreline protection measures in place that are working. These sites do not currently pose any health and safety concerns nor is their concern for lands to be significantly impacted if a 100-year storm or wind event were to occur. These sites will require ongoing monitoring during and after significant weather events to assess any future deterioration. It is anticipated that shoreline improvement within these locations will be improved or modified within a 5 to 8-year window.

The following sites have been identified by staff as being the highest priority and anticipate shoreline improvements being implemented within a 3-year window.

Site 27 -	Confederation Beach Park
Site 28 -	Hamilton Beach
Site 7 & 8	1135 and 1137 North Service Road and Lewis Rd. right of way
Site 30 -	Macassa Bay Marina
Site 1 -	Windermere Road

Refer to Figure 2 as shown in Appendix “D” attached to Report PW19095 for the full prioritization list.

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There are sites identified within with the SNC-Lavalin Shoreline Inventory and Assessment Report that have not been included in staff's prioritization of shoreline improvement implementation. These are described below.

Site 2, Fifty Road Parkette - This site is currently being redeveloped through tender C15-42-19 and includes shoreline protective measures designed by a coastal engineer. This project was started prior to the initiation of the shoreline inventory project but was included in the analysis for consistency with all of the other shoreline properties.

Site 9, 12 & 14 Trillium Ave. – This site is being circulated for sale by City of Hamilton Real Estate; and therefore, the City will not be implementing any shoreline works at this location.

Site 15, Jones Rd – This location is being developed into a parkette as part of the “Waves” development and includes shoreline protective measures designed by a coastal engineer. This project was started prior to the initiation of the shoreline inventory project but was included in the analysis for consistency with all the other shoreline properties.

Site 18, 33 Lakeview Drive - This site is currently being improved by Hamilton Water under a separate contract and includes shoreline protective measures designed by a coastal engineer. This project was started prior to the initiation of the shoreline inventory project but was included in the analysis for consistency with all the other shoreline properties.

Site 29, Hamilton Harbour Waterfront Trail – This site was severely impacted in 2017 when the westerly shores of the Hamilton Harbour experienced record breaking high-water levels coupled with strong easterly wind events. The resulting damage caused the trail to be closed for an extended period while the water levels receded, and temporary repairs to the trail could be completed. A study was done at that time to evaluate the wave and water level conditions in the area. Since then, the trail experienced high-water levels again, but not the wave action it experienced in 2017. This resulted in localized flooding and large amounts of debris washing up onto the trail which lead to its short-term closure during the summer of 2019.

The current elevation and shoreline protection for the trail is inadequate for its location. As a result, this site is being evaluated in greater detail under a separate contract. A subsequent council report regarding this site will follow early in 2020 that will look at the raising of the trail and improving its resiliency to future weather events.

Site 31, Desjardins Canal – Due to the nature of this location, typical coastal engineering practices do not impact this location. This site will require a slope

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stabilization review by a geotechnical engineer if future erosion of the embankments is of a concern

Site 33, Woodland Cemetery - Due to the orientation of the site and nature of this location, typical coastal effects do not impact this location. This site will require a slope stabilization review by a geotechnical engineer if future erosion of the embankments is of a concern.

Ongoing monitoring of the city's shorelines will be required on a routine basis to ensure the existing protective measures are maintained, and that any future weather events does not compromise these structures. The prioritization of implementing shoreline improvements as part of the DMAF program will be reviewed on a yearly basis as a result of the ever-changing climate conditions, and the unknown impacts they may have on a year-by-year basis.

APPENDICES AND SCHEDULES ATTACHED

Appendix A to Report PW19095 - Maximum High-Water Levels of Lake Ontario

Appendix B to Report PW19095 - Waterfront Asset Mapping

Appendix C to Report PW19095 – Shoreline Inventory and Assessment of City of Hamilton Owned Assets prepared by SNC-Lavalin.

Appendix D to Report PW19095 - City of Hamilton Waterfront Assets – Prioritization for Shoreline Improvements