Hamilton Harbour Overview, Implications & Work to Date

- Bayfront Beach Study Overview

In February 2016, shortly after initiation of the study, Public Health Services (PHS) advised Council (Report BOH16008 - Suitability of Bayfront Beach as a Public Beach) that Bayfront Beach should be closed until action is taken to improve the water quality and that prior to reopening, a consistent improvement in water quality needs to be verified. The beach has since been closed to swimming.

In May 2018, staff reported to the Board of Health on the beach study outcomes and preliminary recommendations (Report BOH16008b). The study findings confirmed the following factors are adversely affecting the water quality at Bayfront Beach:

- physical characteristics of the beach, e.g. beach slope, sand moisture and grain size, and water circulation near the beach;
- sources of pollution near the beach (predominantly waterfowl feces) and within the general watershed of Hamilton Harbour, and;
- the occurrence of cyanobacteria blooms (also referred to as Blue-Green Algae and / or Harmful Algal Blooms)*

    * for the purposes of this report the term cyanobacteria and/or Harmful Algal Blooms (shortened to HABs) will be used for the remainder of this report

A range of options were reviewed that included major physical changes to the beach area aimed at improving water circulation, alternative uses of the beach, and enhancements to bird control efforts. Through computer modelling it was found that water circulation is satisfactory with the beach’s current configuration; however, its primarily the volume of bird feces that can’t be moved out of the embayment quickly enough. Computer modelling showed that major, albeit costly, physical changes to the beach would improve circulation, but with so many variables wouldn’t guarantee a reduction in the volume of feces to meet water quality standards. The study team concluded the best approach was to start with low cost interventions to improve water quality, via monitoring the implementation of each intervention and tracking water quality to measure changes. Interventions were also implemented at Pier 4 beach work due to its proximity to Bayfront Beach and similar water quality issues.

Recommended measure(s) included the continued use of bird control (with enhancements and new methods) and beach sand management strategies (including increased grooming and cleaning) as the best and most cost effective way to manage water quality related to E.coli contamination. For HABs, options are limited to non-existent; however, as a test it was recommended to try ultrasound technology to reduce its impact at the beach.

Through the 2017 season the study team was able to implement and measure the effect of bird control measures, but with high water levels, increased beach grooming was not possible as the beaches were under water. Despite implementing these measures throughout the swimming season, there was a modest improvement in water quality

related to E.coli while the ultrasound treatment of HABs had no effect at all, except adverse effects to other species (fish and zooplankton) were noted. Another method explored involved treating beach sand with hydrogen peroxide tested and found to be ineffective at reducing contaminants.

Overall, efforts to improve water quality at the beach failed and published results in the 2017 Beach Monitoring Report indicate that HABs continue to be the predominant factor in closing the Harbour beaches to swimming (in recent years HABs have been responsible for beach closing greater than 50% of the available swimming days in the season). This is important in that without a practical way to control the blooms it is unlikely that there will be a consistent and verifiable improvement in water quality even with significant reduction in E.coli contamination of the beaches.

Without a solution, the Study Team recommended against any further remedial efforts to restore the Bayfront Beach for swimming at this time with the intent to reconvene the Study Team to discuss the following opportunities:

1) Re-visit previous options for Bayfront Beach - e.g. converting the space to a wetland or for other recreational activities;
2) Consider new options for Bayfront Beach – e.g. deep water swimming opportunities in the harbour that could be linked to Hamilton Harbour’s RAP targets;
3) Consider expanding or relocating Pier 4 Beach;
4) Conduct a broader harbour-wide detailed analysis of cyanobacteria dynamics and treatment opportunities through a coordinated effort of key stakeholders. This analysis along with a thorough investigation of active management techniques will help understand whether or not management could be effective; and
5) Consult with the Hamilton Harbour RAP Office regarding the need to consider a review of RAP criteria for swimmable beaches since the criteria are based on the performance of the two harbour beaches.

In addition to the above opportunities it was recommended in the study that Pier 4 Park still has a swimmable beach and there is a need to continue to address E.coli levels and find ways to improve its performance.

- Hamilton Harbour RAP – Implications to Delisting

HABs have not only affected water quality to the extent that provincial targets aren’t met to permit swimming at the beaches, but the problem directly affects the Hamilton Harbour Remedial Action Plan (RAP). Hamilton Harbour is an Area of Concern (AOC) on the Great Lakes where environmental degradation has led to the decline of ecosystem health. The Hamilton Harbour RAP is a watershed based stakeholder supported cleanup plan whereby government, community, and industry partners have committed to restore environmental health in their local areas. In the Hamilton RAP “Beach Closings” is one of 14 criteria (referred to as Beneficial Use Impairments) that

are used to assess the status of Areas of Concern. The status of the Beach Closings Beneficial Use Impairment will be considered not impaired when Hamilton Harbour public beaches (Bayfront Park and Pier 4 Park) meet the provincial beach management protocol 80% or more of the swimming season for a minimum of three consecutive years.

As a note, in 2012 when the last RAP public forum was held, the participants were very firm on keeping the beaches target in the RAP. So while the interests are different they are aligned - the public’s goal is for swimming and RAP’s goal is to delist the beaches.

Notwithstanding efforts to improve beach water quality, the Beach Closings status remains impaired. It is difficult to make an accurate prognosis given that HABs are thought to have increased in frequency and intensity over the past decade to the degree they have become a significant impediment to the ability of delisting the harbour. In that respect the interest of key stakeholders to find a solution to HABs is high.

- Summary of Work completed since May 2018

Subsequent to Council direction May 2018, the Study Team reached out to subject matter experts in provincial and federal ministries and key staff to discuss the scope of work generated from recommendations of the Beach Study. In particular, the intention was to get insights and support on options given the worsening trends related to cyanobacteria and HABs and discuss inputs required to begin to develop a strategy to potentially manage them such that water quality could be improved and become suitable for swimming at the harbour beaches.

On November 29, 2018 City staff hosted a meeting to discuss issues affecting recreational uses of Hamilton Harbour with key stakeholders including staff from Public Health and Public Works. Key stakeholders included:

- Ministry of Environment, Conservation, and Parks
- Hamilton Harbour Remedial Action Plan Office
- Environment and Climate Change Canada
- Bay Area Restoration Council
- Hamilton Waterfront Trust

The session consisted of two main components:

1) to seek general information about the harbour and harbour programs from key stakeholders; and

2) to open a discussion that can reflect on the current progress of improving the health of the harbour to identify opportunities regarding HABs and swimming that will improve the likelihood of success in the future in meeting the goals for swimmable beaches and delisting the harbour. The discussion was framed around the following themes:
   - What are we doing right and need to keep doing?

- What is happening that does not help our direction?
- What should we start doing or initiate to improve our ability to meet goals?

The following summarizes the input and discussion with staff and stakeholders.

- Current Status, What’s Working and What Isn’t

a) Bird Control

- Enhanced bird control with monitoring and reporting is shown to be working.
- Beach grooming throughout the summer is successful at reducing E.coli closures. More bird control could be done in the winter months which may help open the beaches earlier in spring.
- E.coli could be reduced further with the incorporation of plantings around beaches to block pathways for birds.
- Removal of the land-based arms of Bayfront Beach were identified to improve circulation but considered too costly for limited benefit and no guarantee of success.

b) Cyanobacteria and HABs

- A limited level of cyanobacteria is expected, but there is a current imbalance in the harbour.
- Triggers for excessive cyanobacteria growth are diverse, complex, and not fully understood.
- Ecological conditions are changing making it difficult to predict outcomes.
- HAB’s are more frequently the reason (>50%) for beach closings over E.coli.
- HAB’s are an emerging issue impacting health of the harbour and ability to delist.
- A technology (method of mass control or prevention) has not been identified for HABs.
- Localized management of algae along the shoreline in areas of the marinas, where accessible by equipment, is working. Migrating algae is “pushed away” using in-water bubblers and can be removed with water surface vacuuming.
- In season, algae migrates to the shorelines and is a detriment to the enjoyment of the City’s public spaces and amenities; e.g. boating.
- May need to consider removing “public” from Bayfront beach to reclassify it as something other than a beach.
- Needs to be continued focus on improvement plans that reduce Total Phosphorous loadings in the harbour; e.g. Low Impact Development.

c) Swimming

- Environment and Climate Change Canada have data to show that E.coli concentrations are lower offshore.
- BARC advises that water quality data shows that swimming offshore is safe

with respect to E.coli.

- The safety of swimming offshore is subject to the presence of HABs.
- In deeper water humans tend to ingest more water, increasing exposure when E.coli or other contaminants are present.

d) What’s needed to Improve Ability to meet Goals for Swimming and Delisting

- Need to change perception about progress toward better water quality in the harbour; i.e. significant gains have been made since the RAP started as continual effort is leading to progressive change in conditions.
- Need to change the view of success from a checked off box and move toward one of long-term stewardship recognizing there will be ups and downs; e.g. emergence of HABs.
- Environmental remediation is not a quick process. It took over 100 years to degrade, it will take time to repair.
- Historic data would help with the public perception, by showing them that cyanobacteria and HABs has always been present and that it is also prevalent throughout Canada / US.
- Provide public access to deeper water and be aware that there are different guidelines with respect to offshore E.coli levels (secondary use).
- A monitoring program to provide advanced notice of impending algae blooms should be considered to enable mobilization of response to protect recreational piers.
- An operational quick response strategy should be developed to remove nuisance algae blooms as quickly as possible in the marinas.
- An odour control assessment should be done to identify what could mitigate the odour from the decomposing algae.
- New funding for programs to collect algae data is needed as funding support for field programs has decreased in recent years.
- Tracking and trending HABs annually would provide valuable data to help determine what is normal. We would also be able to determine if efforts were decreasing the number of occurrences.
- In-water sensors can be installed to provide online data at strategic locations. Remote equipment and sensors will require intensive maintenance to keep online instruments accurate and useful (cleaning and calibrating). Fouling of sensors is common in the harbor conditions.
- Impellers and bubblers should be installed in recreational areas to maintain circulation and agitate the water column.