UPPER THAMES RIVER
CONSERVATION AUTHORITY

Upper Thames River Conservation Authority

Operational Plan for Dykes and Floodwall

November 16, 2024

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1. Purpose of Operational Plan

Ontario Regulation 686/21 requires that a Conservation Authority (CA) provide programs and services that support the operation, maintenance, repair, and decommissioning of the following types of infrastructure the CA owns or manages:

- Any water control infrastructure, the purpose of which is to mitigate risks to life and damage to property resulting from flooding or to assist in flow augmentation,
- Any erosion control infrastructure.

Programs and services provided shall include the development and implementation of an operational plan on or before December 31, 2024.

Some water control infrastructure in the Upper Thames River Conservation Authority (UTRCA) watershed is not owned by the CA but is managed through an agreement with the owner. These structures also require operational plans.

2. Purpose of Structures

The dykes and floodwall (collectively referred to as dykes) were built for the purpose of reducing the risk of flooding for the homes and businesses behind the structures. These dykes are effective at reducing risks associated with riverine flooding. However, they do not eliminate the risk of flooding from more severe floods than the dyke is designed to protect against, nor do they protect against local flooding from various sources behind the dykes.

2.1. London Dykes

Early settlements within London were established close to the Thames River and, therefore, frequently subjected to flooding. A formalized dyke system was established following flooding in 1883. The flood of 1937 overtopped the dykes and destroyed approximately 1100 properties resulting in the reconstruction and raising of some of the dykes.

This system of dykes includes the following areas:

- West London
- Ada-Jacqueline
- Broughdale
- Byron
- Coves
- Front Street
- Nelson-Clarence
- Riverview-Evergreen

The largest dyke, West London Dyke, will be discussed separately in the section below.

A feasibility study completed in 2018 looked at alternatives to bring the earthen dykes up to standards, including which dykes may no longer be needed. From this study, Environmental Assessments (EAs) were initiated on Broughdale and Riverview-Evergreen. No work has resulted from the Riverview-Evergreen EA and the Broughdale EA is discussed below. Alternatives for the other dykes remain to be considered through EAs.

In 1990, a project was undertaken by the UTRCA in partnership with the City of London to extend the Broughdale Dyke to reduce the risk from flooding for the Broughdale area upstream of Richmond Street. London has recently been successful in securing federal funding to allow for the further upgrade of Broughdale Dyke, building on the EA completed in 2019.

The feasibility study also documented that following the acquisition and clearing of structures previously protected by the Front Street Dyke, the dyke was breached to allow the area behind it to function as natural floodplain.

2.2. West London Dyke

The West London Dyke (WLD) serves a critical function to reduce flood risks within the West London area. It is also an integral component of the City's recreational pathway system and its location at the Forks of the Thames makes it a prominent structure in downtown London.

The WLD was rehabilitated in 1985. More recently, replacement of the section of dyke upstream of Queens Avenue to Rogers Avenue was necessary after structural deficiencies were noted following the initial stages of a concrete repair program initiated in 2006. The concrete-faced earthen dyke was replaced with a near vertical modular blockwall with geogrid reinforcement. A Master Repair Plan was developed, consulted on, and implemented in phases. This Master Repair Plan is expected to be completed in 2028.

Bridges at Queens Ave and Dundas/Riverside (Kensington Bridge) remain below the design elevation of the dyke and require active flood mitigation measures under more extreme floods. Areas on the upstream and downstream ends of the dyke will also require further attention to complete the flood protection to the regulatory flood standard to which the rest of the dyke is constructed. These active measures will be required until more permanent solutions are implemented.

2.3. St Marys Floodwall

Flooding in the Town of St Marys was a longstanding concern. In the 1940s, St Marys proposed a channelization project for the North Thames River but was not able to proceed with much of it as they had committed to their share of the construction of Wildwood Dam. When the St Marys Cement Company agreed to undertake channel

and road improvements to allow for more land to be quarried, the Town also proceeded with clearing and widening about ¾ of a mile of the channel not included in the cement company's work.

Although other options were considered, a floodwall was determined to be the preferred flood mitigation measure to reduce flood risk in downtown St Marys. Wildwood Dam on Trout Creek, together with a proposed dam upstream on the North Thames River (referred to as Glengowan Dam), were also considered. The St Marys Floodwall was constructed in 1990.

Through the Environmental Assessment which led to the construction of the St Marys Floodwall, it was determined that the municipality and its residents did not want a floodwall that would protect to the regulatory flood standard due, in part, to the height and cost. Instead, it was agreed to protect to the 100-year flood level (a flood having a 1% chance of occurring in any year).

Prior to the construction of the St Marys Floodwall, downtown St Marys was subject to regular flooding. Since the floodwall's construction, it has protected downtown St Marys from regularly occurring flooding. The highest flood since the floodwall was constructed was in February 2018.

3. Level of Service

Level of Service (LOS) refers to the ability of an asset or its components to perform the role for which it was designed and to the level or quantity of use for which it was intended. The amount of attention to, and funding for, operation and maintenance must be reflective of the importance of this asset.

The LOS varies for some of these structures. Factors affecting the LOS include the likelihood of a flood exceeding the flood level to which the dyke offers protection (approximate level of flood protection) and the consequences of the dyke being overtopped or failing (the number of structures protected), as described in the table below.

Dyke	Approximate Level of Flood Protection (recurrence interval in years and annual probability in percent)	Structures Protected	Preliminary Level of Service
Ada - Jacqueline	50 years (2%)	47	High
Broughdale	100 years (1%)	191 (including 7 apartment buildings)	High
Byron	15 years (6.7%)	6 (2 city owned)	Moderate to Low
Coves	225 years (4.4%)	281	High

Dyke	Approximate Level of Flood Protection (recurrence interval in years and annual probability in percent)	Structures Protected	Preliminary Level of Service
Front Street	Not Applicable	0 (breached after purchase and removal of properties protected by the dyke)	Not Applicable
Nelson - Clarence	25 years (4%)	0 (London purchased properties protected by the dyke and cleared the structures to create a park)	Not Applicable
Riverview - Evergreen	80 years (1.25%)	10 (13 lots purchased, cleared of structures, and zoned parkland)	Moderate
West London	250 years (0.4%) plus freeboard (for newly constructed sections)	More than 1000	High
St Marys Floodwall	100 years	52 (48 commercial)	High

Level of Service will be further considered through Asset Management Planning and this section will be updated to reflect that ongoing work.

3.1. Service Life

The service life of dykes, such as these, is difficult to estimate and will depend, among other things, on the type of dyke or floodwall. While some of the London dykes have existed since the late 1800s, most have been upgraded/rehabilitated or are in need of upgrades.

Local experience suggests that the service life of dykes in this area may be much less than that of the earthworks associated with the large dams in the area. For example, the West London Dyke underwent major improvements following the 1937 and/or 1947 floods, rehabilitation in the mid-1980s, and the current phased reconstruction (2005-2028). This might suggest a service life in the order of 30-50 years but it may be as much a function of the previous design, site conditions, materials used, and construction methods. It is expected that the new dyke designed and constructed today should have a longer life than some of the previous dyke sections. Regular inspection will be important to assess the state of each dyke, identify maintenance needed, and further assess service life.

As a comparison, the St Marys Floodwall was constructed in the 1990s and is still performing well and should be expected to continue as such for decades. This might suggest a somewhat longer service life, but it has not been without significant localized repairs.

Service life will be further assessed through Asset Management Planning and this section will be updated to reflect that ongoing work.

4. Stakeholders and Beneficiaries

Each of the dykes provides flood risk reduction to those who live or have businesses in the floodplain behind them. As such, the primary beneficiaries are the landowners, residents, and businesses with property protected by the dykes.

While the dykes provide considerable flood risk reduction to the properties behind them, they do not remove those properties from the floodplain. The existence and continued maintenance of these important flood control structures is reflected in reduced constraints on development behind the dykes, but these properties are still regulated and there are restrictions on development in the areas protected by the dykes. A Special Policy Area (SPA) was established behind the St Marys Floodwall and similar policies are in place behind some of the London dykes.

Most of the dykes also have paths integrated into, over, or adjacent to them, further expanding the stakeholders and beneficiaries to those who use these pathways for recreation or transportation.

Operating and maintenance costs of the flood control dykes are levied against the municipalities in which they are located (beneficiary).

4.1. Communication with Stakeholders

Communication with stakeholders is important to the operation of flood infrastructure. While these structures are not actively operated, flood time communications, including flood forecasts, are undertaken directly by flood control staff. These communications are with municipal flood coordinators consistent with the UTRCA Flood Contingency Plan. It is also important that dyke maintenance be coordinated between the UTRCA and municipalities.

5. Operations

Flood control dykes are not actively operated. These are generally passive flood mitigation measures that work in combination with other water control structures. It is, however, important that the structures are monitored during significant flood events to ensure that they continue to reduce risk from flooding. Monitoring during flood events is an important role for the municipality as failure of the dyke under flood conditions could be catastrophic. Municipalities must be prepared to implement their emergency plans if the dyke could overtop or fail.

Storm sewers often go through the dykes and discharge to the river through flap gates or backflow prevention devices. These flap gates are considered part of the storm water system and are, therefore, maintained by the municipalities. While dykes protect from

riverine flooding, they cannot control localized flooding behind the dykes. Again, this is a function of the storm water systems operated and maintained by municipalities.

While most dykes are passive in nature, some aspects may require active measures to ensure protection to the design levels. Monitoring during flooding is important, especially if there are locations where some active measures may be required. These active measures are discussed in the sections below.

5.1. West London Dyke

As the ongoing WLD reconstruction project nears completion, it will be important that active measures are in place for areas lower than the design level of the dyke. These locations have been described and measures considered in the West London Dyke Feasibility Study prepared for the City by Stantec. Areas where additional active measures will be necessary include:

- The downstream (west) end of the dyke in Cavendish Park,
- The upstream (north) end of the dyke north of Oxford Street at the railway line,
- The bridges across the North Thames River just upstream of the Forks (Queens Avenue and Kensington Bridges).

It is expected that active measures will be necessary until such a time as more permanent passive measures are implemented.

5.2. St Marys Floodwall

The Water Street bridge is a low point that can allow flood waters to flow into downtown. As floodwaters approach this level, it may be necessary to close the bridge and install sandbags or other materials to prevent the flow of water down the approach to this bridge.

6. Routine Maintenance

Routine inspection and maintenance are important to ensure the dykes are able to meet their purposes. Annual inspections are generally undertaken by UTRCA engineering staff. An external engineering inspection should be undertaken every five to 10 years.

Vegetation assessments are conducted every few years and controls implemented as appropriate. Vegetation management plans have been developed for the London dykes and are reviewed and updated as appropriate.

Surveillance during significant events is also important and undertaken by municipal staff as part of their flood watch.

7. Emergency Planning

Emergencies associated with flood control dykes are similar to dams in many ways. As these structures hold back considerable depths of water during a flood, emergency planning and surveillance is important. Forecasts of flooding would be communicated, similar to flooding elsewhere, through flood bulletins to municipal flood coordinators who then implement municipal emergency plans.

Emergency Preparedness Plans and Emergency Response Plans are being developed for flood control dams as part of the UTRCA Dam Safety Program. Similar plans should also be developed for the dykes.

Municipal Emergency Plans should include consideration of failure including options for topping up the structures and evacuating those behind the structures. Even if the structures perform as intended, flood events that surpass the capacity of the dyke are possible.

8. Roles and Responsibilities

The operation and maintenance of water control structures owned or built by the UTRCA are generally the responsibility of the UTRCA. The St Marys Floodwall falls into this category as a project of the UTRCA. The London dykes, however, were largely constructed by the City of London before UTRCA was formed and, as such, their operation and maintenance responsibilities are shared as outlined in various agreements described below.

Water control structures owned, operated, or maintained by the UTRCA are eligible for provincial funding (such as Section 39 operations and maintenance funding and Water and Erosion Control Infrastructure (WECI) funding for major maintenance). UTRCA involvement in the operation and maintenance of structures owned by municipalities also allows the involvement of staff familiar with dam and dyke design and maintenance as well as being part of a broader natural hazard reduction program (including interrelated operation and maintenance of other flood control structures, flood forecasting and warning, and natural hazard regulation).

As passive flood control structures, there are generally no physical operations required for most dykes.

Flood conditions are communicated to municipal flood coordinators through flood bulletins, as per the UTRCA Flood Contingency Plan. Municipal flood coordinators are responsible for engaging municipal emergency plans as appropriate. An important role of the municipal staff is surveillance of the dykes during major flood events and being prepared to respond or evacuate as appropriate.

8.1. St Marys Floodwall

As a passive flood control structure, no physical operations are required for the St Marys Floodwall. The floodwall, however, is located on top of, and adjacent to, features that pre-date the floodwall and remain the municipality's responsibility. Those features include stoplogs in the millrace, the weir across the North Thames River, and the stone channel walls of the millrace, island, and downstream channel. The inter-relationship of these features requires close cooperation between the Town and UTRCA.

As a project of the UTRCA, the maintenance of floodwall rests with the UTRCA. Maintenance activities undertaken by the UTRCA include routine inspection and preventative and capital maintenance. As the benefiting municipality, St Marys is responsible for the local share of these operation and maintenance costs, through the UTRCA levy.

8.2. London Dykes

A 1985 agreement is the basis for the shared responsibilities related to the London dykes. This agreement respects the City of London as the owner, the importance of integration within the flood control system, and the UTRCA's programs. It also notes the relationship established for the rehabilitation of the dyke in 1985. This agreement is relied upon today for the ongoing rehabilitation works funded by the federal government. It identifies that the title to works created by the construction belongs to the City, and that the City is to perform first line or minor maintenance, repair, and service. It places responsibility for major maintenance on the UTRCA but limits the responsibility to those works necessary to maintain the dykes' structural integrity.

In June 2017, a Memorandum of Understanding (MOU) was signed between London and UTRCA which further speaks to the shared responsibilities related to the operation and maintenance of the London dykes. This agreement was intended to facilitate and define the cooperative efforts, consider infrastructure owned by the City, document responsibilities, operationalize the other agreements and contracts, document the intent to add other structures, and provide administrative procedures. It documents background and supporting information to ensure that both parties have a shared understanding. This agreement allows the City and UTRCA to best utilize funding available for the continued operation and maintenance of the structures. It identifies that operation and routine maintenance are managed and planned by the UTRCA and maximizes the use of both UTRCA and City resources. It specifies a level of cooperation when it comes to major/capital maintenance.

These agreements speak to both the earth dykes and the West London Dyke.

As the benefiting municipality, London is responsible for the local share of these operation and maintenance costs, through the UTRCA levy. It is, however, important that these costs are invoiced as the work is undertaken so that it may be appropriately capitalized.