Item 8.3

Section I – Items for Authority Action

TO: Chair and Members of the Authority
Meeting #5/18, Friday, June 22, 2018

FROM: Nick Saccone, Senior Director, Restoration and Infrastructure

RE: **PICKERING AND AJAX SPECIAL POLICY AREAS TWO DIMENSIONAL HYDRAULIC MODEL AND DYKES ASSESSMENT STUDY**

KEY ISSUE

Overview of the updated flood modeling and the comprehensive assessment of the dykes for this area, including next steps and implementation considerations.

RECOMMENDATION

THAT Toronto and Region Conservation Authority (TRCA) be directed to disseminate the information from the Pickering and Ajax Special Policy Areas Two Dimensional Hydraulic Model and Dykes Study to Engineering and Planning staff at the City of Pickering, Town of Ajax and Region of Durham;

THAT TRCA utilize the 2D hydraulic model and results from the floodplain mapping report to regulate development and to inform land use planning, flood emergency response and flood mitigation planning activities;

THAT TRCA immediately undertake general repairs and maintenance to the Pickering and Ajax flood protection Dykes;

THAT TRCA, in consultation with the City of Pickering, Town of Ajax and Region of Durham undertake an Environmental Assessment study in 2019 to develop a detailed dyke rehabilitation plan which balances flood protection requirements, social and environmental needs as well as cost and constructability;

THAT TRCA make a funding request to the National Disaster Mitigation Program and Region of Durham to undertake the above-mentioned study;

THAT TRCA report back upon completion of the Environmental Assessment study;

AND FURTHER THAT the City of Pickering, Town of Ajax and Region of Durham be so advised.

BACKGROUND

The Village East and the Notion Road Pickering Village communities in the City of Pickering (Ward 3) and Town of Ajax (Ward 3) are located within the regulatory floodplain of the Duffins Creek watershed. This area has a long history of flooding with 634 flood buildings susceptible to flooding during a Regional Storm event. Due to the flood vulnerability of the community, the area was designated as a Special Policy Area (SPA) to provide for the continued viability of existing uses and address the significant social and economic hardships to the community that would result from strict adherence to provincial policies concerning development in a floodplain. In addition, flood protection measures were constructed in the 1980's to provide flood protection up to and including the 500 year storm flow. The flood protection measures consisted of two flood

protection dykes, one in each municipality. The Pickering Dyke constructed in 1985 extends for approximately 1,150 m north of Kingston Road West near Notion Road and west to Brock Road. The Ajax Dyke constructed in 1984 extends for approximately 325 m west of Church Street South near Mill Street and north to the west side of Church Street South in the vicinity of Christena Crescent (Attachment 1).

The flood protection dykes have been successful at mitigating flooding within the SPA with no recorded flooding or overtopping since their construction. As part of TRCA's flood control program, these dykes have been inspected annually and after every significant rain event. In 2007, a major erosion scar was identified and temporarily fixed with rip rap in 2008. In 2009, TRCA undertook a detailed fluvial geomorphic assessment and level of service study of the channel and dyke systems as part of the development of a permanent solution to the erosion. One of the key recommendations from the 2009 study was to undertake a detailed geotechnical assessment, including the construction of boreholes within the dyke systems to quantify the structural competence of the materials used when the dykes were originally constructed.

In response to the recommendations from the 2009 study and to update the flood modelling for the area which was last updated in 2004, TRCA commissioned the Pickering and Ajax Special Policy Areas Two Dimensional Hydraulic Model and Dykes Assessment Study. The intent of the study was to characterize flood conditions within the SPA, as well as asses the level of service, structural competency, and develop a preliminary restoration strategy for the Pickering and Ajax flood control dykes. Key project deliverables included:

- The development of a 2D hydraulic model for the area using the MIKE Flood hydraulic modelling platform;
- Three updated Regulatory Floodplain maps for the Village East and the Notion Road/Pickering Village Special Policy Areas;
- MIKE Flood 1D-2D Development and Regulatory Floodplain Mapping summary report;
- Flood Characterization and Preliminary Remediation Investigation summary report; and
- Dyke Level of Service and Rehabilitation summary report.

Study Process

In July 2017 as part of a comprehensive procurement process, TRCA retained Valdor Engineering to undertake the Pickering and Ajax Special Policy Areas Two Dimensional Hydraulic Model and Dykes Assessment Study. The Request for Proposal for the project prepared by TRCA as well as the proposal provided by Valdor outlined key goals and objectives including a detailed work plan and schedules. Key components of the study work plan included:

1. Development of a coupled 1 Dimensional and 2 Dimensional (1D-2D) flood hydraulic model for the study area and Regulatory floodplain mapping;
2. Geotechnical field investigations and assessment of the stability of the Pickering and Ajax Dykes under a number of loading conditions/failure modes in order to identify materials used to construct the dykes and provide input into the rehabilitation requirements; and
3. A detailed characterization of the flooding within the study area including the identification of flood zones and the mechanisms of flooding and preliminary flood remediation options.

The components of the overall study were completed and presented in three summary reports titled:

- MIKE Flood 1D-2D Model Development and Regulatory Floodplain Mapping (Valdor, 2018);
- Dyke Level of Service and Rehabilitation Report (Valdor, 2018); and
- Flood Characterization and Preliminary Remediation Investigations (Valdor, 2018).

Study Outcomes

Duffins Creek Floodplain Map Sheets 4, 5 and 6 were updated using the new modeling for the Regional storm. The updated modeling was found to be similar to the current approved floodplain maps, however, spill areas including overland floodplain areas are now much better defined including the delineation of new areas of flood risk found west of Bainbridge Drive and south of Kingston Road, in the vicinity of Betts Road and Annie Crescent, and at the intersection of Finch Avenue and Brock Road (Attachment 1).

Based on the results of the hydraulic model, it was determined that the requisite level of flood protection to the 500 year event is not provided by the existing flood control dykes. The Pickering Dyke provides flood protection for the 100-yr storm and the Ajax Dyke provides flood protection for the 50-yr storm. Factors contributing to the reduced level of flood protection afforded by the Pickering and Ajax Dykes include reduced dyke elevations compared to the design elevations due to settlement and less sophisticated hydraulic modeling methods used as part of the original design process. The MIKE Flood 1D-2D Model Development and Regulatory Floodplain Mapping report recommended that options to rehabilitate the existing dykes and reinstate the 500-yr level of flood protection should be investigated for future consideration and implementation.

The Dyke Level of Service and Rehabilitation Report identified a number of deficiencies for both the Ajax and Pickering Dykes based on the field investigations and the geotechnical investigations. The deficiencies included excessive vegetation, erosion, deteriorating dyke toe protection, improper dyke construction materials, blocked flap gates, sediment and debris in culverts, slope stability issue, and settlement / low areas on top of the dykes. The results of the geotechnical stability analysis indicate that the current dykes do not meet current engineering design standards. This is largely due to the materials used in the construction of the Pickering and Ajax Dykes which consist primarily of non-cohesive soil (i.e. sand/sandy gravel) that is not suitable for this type of flood control facility. As such there is a high potential of dyke failure under an extreme storm event. Unfortunately, there is lack of documentation to explain why these construction deficiencies exist, but mostly likely can be attributed to a lack of quality control and quality assurance during the time of construction.

The report also identified that the elevations for the Pickering Dyke is lower than the design elevations by up to 10 cm and that the Ajax Dyke is lower than the design elevations by up to 33 cm. This is primarily as a result of poor compaction during construction and a lack of freeboard for settlement incorporated into the original design.

The Dyke Level of Service and Rehabilitation Report examined nine options to rehabilitate the dykes to address all the deficiencies described. The preferred option consisted of installing a steel sheet pile wall part way down the existing wet side of the dyke. The retrofit of the Pickering and Ajax dykes based on this option would enable construction to be completed within the existing dyke footprint and would not require the acquisition of private property or easements. The estimated cost of the proposed construction works to rehabilitate the flood dykes to maintain the current level of protection is approximately $6,200,000 for the Pickering Dyke and approximately $2,400,000 for the Ajax Dyke. In order to move forward on the rehabilitation plans, the report recommended that further study be undertaken by TRCA in accordance with the Conservation

Authority Class EA for Remedial Flood and Erosion Control Projects. Prior to the completion of the Class Environmental Assessment (EA) study, the report also recommended that TRCA undertake general repairs and maintenance immediately including erosion protection and flap gate maintenance at a cost of approximately $30,000.

The final component of the study included the completion of a flood characterization and preliminary remediation investigation to characterize the mechanisms within the system which cause flooding to occur and the development of preliminary flood mitigation solutions for the study area. The Flood Characterization and Preliminary Remediation Investigations report identified 400 residential buildings and 12 industrial/commercial buildings that are within the zone of high risk flooding in Pickering and 23 residential buildings and 25 industrial/commercial buildings in Ajax. A number of hydraulic constraints were identified that contribute to flooding within the study area including confined channels, low points along the existing flood control dykes and low lying areas located throughout the study area. The updated floodplain mapping and characterization will also help inform a future comprehensive update to the Special Policy Areas, as per provincial requirements.

The Flood Characterization and Preliminary Remediation Investigations report concluded that the existing flood control dykes provide a measure of flood mitigation for Pickering and Ajax and that the TRCA should undertake a Conservation Authority Class EA for Remedial Flood and Erosion Control Projects to refine options for the rehabilitation of the dykes and to develop detailed plans to be implemented. Other flood remediation options were ruled out due to excessive costs and land requirements.

FINANCIAL DETAILS

Operating accounts 108-01 (Flood Infrastructure Operation, Maintenance and Supervision) and Capital Account 107-03 (Flood Control Infrastructure Maintenance) will be used to undertake the immediate repairs and maintenance as recommended in the report at a cost of approximately $30,000. The estimated cost to complete the Conservation Authority Class EA for Remedial Flood and Erosion Control Projects is $400,000. This type of study is eligible for funding under the National Disaster Mitigation Program (NDMP). Funding for 50 percent of the EA ($200,000) will be pursued through the NDMP program and the remaining funds ($200,000) have been committed by the Region of Durham provided TRCA staff can secure NDMP funding to undertake the EA. Once the EA is completed, TRCA will pursue funding for final design and construction from the Town of Ajax, City of Pickering, Region of Durham and provincial and federal infrastructure funds.

NEXT STEPS

TRCA will begin implementing the general repairs and maintenance of the dykes immediately and will also set up a number of meetings with representatives from the City of Pickering, Town of Ajax and Region of Durham to present the study process and results. TRCA staff will also submit a proposal to the NDMP to undertake an Environmental Assessment as per the study recommendations this fall.

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Attachments: 1