

Report to Council



Date: June 22, 2020
To: Council
From: City Manager
Subject: Flood Mitigation and Management Project Review
Department: Infrastructure Engineering

Recommendation:

THAT Council receives for information, the report from Infrastructure Engineering dated June 22, 2020, with respect to the Flood Mitigation and Management Project Review.

Purpose:

To advise Council on the completed studies and on-going flood mitigation and management work happening in the City.

Background:

The City has been involved in many initiatives since the severe events in 2017 and 2018 where creek bank inundation and lake flooding impacted many properties and residents. Our work started with simply delivering new flood mapping and conducting flood risk assessments according to Federal guidelines. Through our association with the Okanagan Basin Water Board (OBWB), it was evident that there were significant gaps in the type of information and data needed to properly evaluate the relationship between our climate and creek/lake flooding events. The computer models used for studies in the past were becoming out of date and did not provide the level of precision necessary to properly address how and where infrastructure and emergency funding could be best applied.

We discovered that high quality and accurate data was available for rainfall, temperature, creek flows, creek temperature, snowfall, and other relevant factors; just not everywhere. By partnering with neighbouring communities, we have initiated processes that provide a holistic approach that is now available to address the coordination of resources, expertise and budgets needed to effectively address flood and natural systems management.

Simply put, building an understanding of flood mitigation is similar to a puzzle with many pieces. Each piece can be derived for a different purpose, yet shared by others to meet another outcome. Data now produced are valuable inputs for such projects as the regional Emergency Operations Centre (EOC), environmental flow needs calculations, stormwater quality and development approvals in flood plains.

Exciting new modelling products use spatial data and state-of-the-art tools that support the design of more resilient infrastructure against the impacts of a changing climate.

The following list are recent initiatives either complete or in progress that are pieces to our flood management solutions puzzle. Each piece, whether a new tool, study, data or map, are developed by different partners working with the City. A PowerPoint presentation of some of these tools are appended to this report.

INITIATIVES

- 1. LiDAR:** The City, along with the OBWB, Regional District (RDCO) and other communities throughout the Okanagan and Similkameen obtained a fresh LiDAR survey dataset that covered all watersheds in the Okanagan Basin. This data includes coverage of our larger watersheds and is the primary input to the new computer modelling processes being developed. This data is useful for generating other online mapping layers such as tree inventories, detailed contours, building heights, curb heights, etc. A sample LiDAR map is available on the City of Kelowna Map Viewer.
- 2. Mill Creek Flood Mapping Project:** This recent project completed new flood mapping on Mill Creek. The City coordinated the delivery of flood maps using the LiDAR provided. The work was funded from a \$150k grant from UBCM – Community Emergency Preparedness Fund (CEPF).
New Tools: A modern hydraulic model of Mill Creek (1D-2D HEC-RAS) that can be used for future design and alternatives analysis for the Mill Creek Flood Protection Project.
- 3. Hydrometric Flow Stations:** The City has installed five new flow level monitoring stations at critical locations in the City. The data is collected internally, reviewed and will soon be available for public use. The Okanagan Nation Alliance (ONA) are contracted to manage the stations and their installation. The data is also downloaded to the EOC Dashboard.
New Tools: 5 new permanent flow measurement stations: Mill Creek/Downtown, Mill Creek at Fenwick, Mill Creek at RDCO Park, Scotty Creek at Old Vernon Road and Brandts Creek outlet.
- 4. Kelowna Flood Risk Assessment:** The City was awarded \$250,000 in Federal and Provincial funding from the National Disaster Mitigation Program (NDMP) Intake 4 to conduct a Major Systems Flood Risk Assessment. The objective was to confirm, identify, inspect and document all hazards and observed field conditions that contribute to flooding and other adverse effects to public and private property, including the local environment (i.e. erosion, slope failure and/or instability, excessive sedimentation, debris flows, etc.).
New Tools: New computer hydraulic models (1D-2D HEC-RAS and PCSWMM) models for Mill Creek, Gopher Creek, Brandts Creek and Bellevue Creek. These will be useful in future erosion and flood scenario development, as well as minimum building elevation needs.
- 5. YLW Stormwater Management Plan:** This project, led by Kelowna Airport staff, provides an on-site plan to manage stormwater volume and quality on airport land, and how it plans to discharge safely to Mill Creek during storm events consistent with Bylaw 7900 and Transport Canada

standards. The study included existing airport operations areas, future development areas, and flooding of downstream areas off-site from Mill, Whelan and Scotty Creeks.

New Tool: A very detailed hydraulic model (2D PCSWMM) of Mill Creek between Old Vernon Road and Edwards Road near the airport. This will be used to develop capital budgets for flood mitigation in the Mill Creek basin.

6. **Area Based Water Management Plan** – This holistic strategic plan examines stormwater and flood management in context of all other water-based sectors that rely on Okanagan Lake. The Plan includes a review of internal sectors and their operations, addressing water supply, water quality and treatment (source water protection), Wastewater, Stormwater, Environmental Flow Needs and management of natural assets. The plan investigates internal activities related to water and the risks associated both within and external to the City.

Deliverables (Future): A Strategic Plan that looks holistically at water and related policy initiatives.

7. **Okanagan Basin Hydrology and Flood Routing Project (OBWB)**: A new and improved RAVEN hydrologic modelling process is now available through the OBWB for nineteen Okanagan Basin watersheds. This tool will initially be used to analyze provincial operations, improve decision-making and ultimately lead to processes that improve drought management support and tools for climate change adaptation development, environmental flow needs investigations, channel restoration and management and other water management activities.

Deliverable: This process produced the latest design flood parameters for the Mill Creek Flood mapping and the major creek flood risk assessment.

8. **Okanagan Mainstem Floodplain Mapping (OBWB)**: This project provided comprehensive floodplain mapping for the Okanagan River from Penticton to the U.S. Border and the Okanagan mainstem lakes: Ellison/Duck, Wood-Kalamalka, Okanagan, Skaha, Vaseux and Osoyoos. The floodplain maps include flood inundation extents, with and without freeboard, as well as flood hazard mapping for 20, 100, 200 and 500 year recurrence interval flooding.

New Tool: A new hydrologic model of the Okanagan River Basin. This work will form the basis of new initiatives throughout the Okanagan.

9. **Mission Creek Flood Mapping Project (RDCO)**: This study generated flood mapping for Mission Creek using similar processes to the Mill Creek Flood Mapping project above. The City worked with RDCO staff to coordinate the delivery of the project, which was funded through the RDCO and a \$150k grant from UBCM (CEPF).

New Tool: A new river computer model of Mission Creek has been developed (1D-2D HEC-RAS) using the new LiDAR and revised Hydrology from the RAVEN model. These tools will be immediately useful in understanding the latest high-water marks throughout the creek, and help with minimum bridge elevations at KLO Road.

10. **The Okanagan Flood Story Web Portal (OBWB)**: This new website was developed by the OBWB to present a single web portal for flood mapping, flood history, perspective and best management practices. The City will supply formatted data, mapping, photos and stories to this site on a regular basis.

New Tool: A public website managed by the OBWB. This website is intended to be the base for public communication and flood mapping information and will be developed further over the next few years.

11. **Data Access Portals and Dashboards (EOC, RDCO, OBWB):** – The EOC digital “dashboard” allows users associated with the RDCO Emergency Operations Centre to receive timely information from a variety of data collection sites. These sites measure creek levels, lake levels, snow levels and temperature. The City has helped coordinate standardized data parameters with assistance of the OBWB and other partners. We are now starting to allow access to historical and live data.
New Tools: A new computer dashboard and information site for active flooding and river flow information for the EOC. This project includes new database structures and portals through the City Kelowna.ca website to access live and historical time series data. Much of the generic weather information collected by the City will ultimately be made available on this site in the future.
12. **Syilx Okanagan Flood and Debris Flow Risk Assessment (Okanagan Nation Alliance):** The Okanagan Nation Alliance Chief’s Executive Council wished to better understand flood and debris flow phenomena to help communities adapt and reduce their risk. This region-wide project involved 22 municipalities, regional districts, provincial agencies, industry, and Syilx communities to look at impacts such as erosion, slope failure and/or instability, excessive sedimentation and debris flows. The City participated in identifying issues and known impacts in our area and developed a better understanding of issues facing First Nations communities in the Okanagan and Similkameen watersheds.

Next Steps

Over the next couple of years:

- the City will expand its data network and making more data available for public consumption. We look to collaborations with UBCO and other organizations;
- the City will look for opportunities to give our creeks the room they need to naturally operate as Natural Assets. This means re-developing riparian and flood extents beyond just the channel and requiring access to both public and private lands. This also creates a better environment for fish, wildlife, parks and improved water quality;
- the City will be leveraging federal funding to construct projects that mitigate some of the flooding that typically occurs along Mill Creek. Many of the old structures simply do not allow the higher flows we have been witnessing recently;
- the City is currently in the design phase of two flood related projects: one a refurbishment of the existing Mission Creek Diversion at Leckie Road to allow better operation during both high flow and low flow events; the second is a temporary diversion option of flow peaks along the Clement corridor.

Internal Circulation:

Communications Department Manager
Financial Planning Manager
Infrastructure Delivery Department Manager
Infrastructure Engineering Manager

Infrastructure Operations Department Manager
Utility Services Manager
Wastewater Manager
Wastewater Operations Supervisor

Considerations not applicable to this report:

Alternate Recommendation
Communications Comments
Existing Policy
External Agency/Public Comments
Financial/Budgetary Considerations
Legal/Statutory Authority:
Legal/Statutory Procedural Requirements
Personnel Implication

Submitted by:

Rod MacLean, P.Eng., Utility Planning Manager

Approved for inclusion:



A. Newcombe, Divisional Director, Infrastructure

Attachment 1 - Flood Risk and Mapping Initiatives 2020 Presentation

cc: Deputy City Manager
Divisional Director, Corporate Strategic Services
Divisional Director, Infrastructure
Divisional Director, Planning & Development Services
Infrastructure Operations Department Manager