

# REPORT

## *Engineering Services*

**To:** Mayor Johnstone and Members of Council  
**Date:** May 8, 2023

**From:** Lisa Leblanc  
Director of Engineering Services  
**File:** 005.1035.10  
(Doc#2267238v1)

**Item #:** 2023-293

**Subject:** **2023 Spring Freshet and Snow Pack Level – April 1st update**

---

### **RECOMMENDATION**

That Council receive this report for information.

---

### **PURPOSE**

To provide Council with background information and details on the snowpack conditions as of April 1st, 2023 in the Fraser River Basin and related preparation efforts for the annual freshet for 2023.

### **SUMMARY**

The April 1st, 2023 snowpack throughout British Columbia is slightly below normal. The average of all measurements across the province is **88%**. The average of all snow measurements for the entire Fraser River basin (e.g., upstream of the Lower Mainland and inclusive of Upper Fraser West, Upper Fraser East, Nechako, Middle Fraser, Lower Fraser, North Thompson and South Thompson) is **87%**. The River Forecast Centre (RFC) calculates an additional snow measurement for the Fraser River at Hope based on each basin's contribution to the total annual flow of the river. The Upper Fraser East contributes approximately 30% of the total flow for the Fraser River at Hope, the North Thompson about 16%, the South Thompson about 11% and the Quesnel approximately 9%. The average of snow measurements for the Fraser River at Hope is normal at **100%**.

By April 15th, on average, 100% of the total seasonal snowpack has accumulated in a typical year. The Fraser River basin snowpack, as of April 15th, remained steady at 88% of normal.

## **BACKGROUND**

The waterfront portions of the New Westminster mainland and all of Queensborough are located within the floodplain of the Fraser River. Only Queensborough has a permanent dyke system for protection against flooding from the Fraser River. The Engineering Department has a High Water Response Plan which is implemented annually to ensure that the risk of flooding in vulnerable areas in the floodplain is reduced through a series of temporary mitigation measures.

The British Columbia River Forecast Centre analyzes provincial snowpack levels, assesses seasonal water supply and flood risk, and predicts flows in British Columbia's rivers and streams. It produces a range of bulletins, maps and warnings to inform emergency managers and the public about current and upcoming streamflow conditions. Snow Survey Bulletins provide analysis of current snow conditions at BC's automated snow weather stations and manual snow survey sites, and forecasts of flood and low streamflow risk. Snow bulletins are published monthly between January and June.

## **ANALYSIS**

The Climate Prediction Center (CPC) shows that La Niña conditions have ended, and El Niño-Southern Oscillation (ENSO) neutral conditions are expected to continue through the spring and early summer of 2023. La Niña conditions existed during the fall and winter of 2022-23. Typically, La Niña years lead to increased late-season snowfalls and the delayed onset of snowmelt.

Seasonal weather forecasts from late-March by Environment and Climate Change Canada (ECCC) indicate a greater likelihood of above-normal temperatures for northwestern sections of B.C. from April through June and below-normal temperatures for some areas in the South Interior. There is a higher probability of above-normal precipitation in the northeastern regions of the province.

The Fraser River Snow Basin Index for April 1st, 2023 is slightly below normal at 87%. By mid-April 100% of the annual B.C. snowpack has typically accumulated. The provincial average for all snow measurements across the province is 88% of normal. The critical weather factors that result in an increased risk of flooding are a period of persistent cool temperatures and wet weather into the late spring, followed by a sudden heat wave for at least five or more days or a significant frontal rainstorm near the peak time of snowmelt. In general, the snowpack factor produces about 20-40% of the flood risk, while weather factors produce about 60-80%. For context:

- 5-6 days of hot weather (greater than 25 degrees Celsius) during the snowmelt peak (mid-June) will produce very high flows (but not flood flows), whereas greater than 8 days of hot weather during the snowmelt peak may produce flows that approach those of 1948 (second largest flood recorded in the lower mainland with greatest damage ever recorded);

- Rainfall of 70+ mm over 48 hours occurring widespread near the time of snowmelt peak can produce very high flows in the Fraser River.

Atmospheric rivers tend to affect the province primarily between September and January. It is less likely that these events will occur from April to June.

The River Forecast Centre will continue to monitor snowpack conditions and will provide an updated seasonal flood risk forecast in the May 1st, 2023 bulletin. Subsequently, the City will provide the next update on snowpack conditions to Council in mid to late May.

## **DISCUSSION**

### **Existing Policy and Practice**

Beginning in March each year, the Engineering Department meets with the City's Emergency Management Office to discuss the ongoing development of the freshet. Beginning in mid-May until the conclusion of the freshet, the City meets with Emergency Management BC (EMBC) in a weekly, coordinated, regional conference call to further inform ongoing City preparations and the execution of the High Water Response Plan.

Key components of the City's High Water Response Plan in preparation for freshet include:

1. Review historical information and update the Freshet Preparation Work Plan and High Water Response Plan.
  - a. *Status: The City has an up-to-date High Water Response Plan that has been refreshed as a result of the recent update of the City's Floodplain Management Strategy;*
2. Monitor snowpack information to assess risk.
  - a. *Status: The City's Engineering Department is actively in contact with the Emergency Management Office and closely monitoring the developing risk;*
3. Complete a dike inspection and crest survey to identify potential areas where either permanent or temporary works may be necessary.
  - a. *Status: Dike Inspections scheduled for April, 28<sup>th</sup>, 2023;*
4. Start the process of updating contact lists of local suppliers and contractors and potential emergency measures.
  - a. *Status: The City has over 40,000 burlap sandbags with another 12,000 on standby order. The City also has in stock of 500 large sandbags which would protect high priority low elevation areas in the Braid Industrial area, as well as 300m of poly-liner that would wrap large sandbags to prevent water permeation in the event of a significant freshet event. Furthermore, the City has in stock approximately 600m of Aqua-dams that can be rapidly deployed in the Waterfront area and other high priority low elevation areas in the event of a significant freshet;*
5. Coordinate with adjacent municipalities to develop joint work plans where inter boundary concerns exist.
  - a. *Status: Ongoing;*

- 6. Evaluate new flood protection techniques developed since 2022 that could be used for permanent or temporary mitigation measures.
  - a. *Status: Completed;*
- 7. Inspect the condition of existing City fast-deployment water dams (Aqua-dams) and have a supplier complete a refresher training for staff.
  - a. *Status: Completed.*

The City’s freshet monitoring and associated tasks have historically been referenced to the water level at the Mission gauge, which is not influenced by tidal effects. Certain tasks of the High Water Response Plan are activated when the gauge readings reach the levels indicated in the following table:

<b>Tasks / Historical References</b>	<b>Mission Gauge Water Level</b>
CNW Starts Weekly Dyke Patrols	6.0 m
CNW Starts Daily Dyke Patrols	6.5 m
CNW Starts 24hr Continuous Patrol and installs temporary protection measures in certain locations	7.0 m
1948 Flood levels (June 8th)	7.56 m
1894 Flood Levels	7.92 m
Top of Dykes at Mission Gauge	8.53 m

**SUSTAINABILITY IMPLICATIONS**

The Engineering Department has recently completed an update of the City’s Long-Term Floodplain Management Strategy, which will be presented to Council in June 2023. The City’s Floodplain Management Strategy recommends future permanent dike protection measures to adapt to future sea level rise and climate change.

The City also continues to liaise and work with the province in the development of the BC Flood Strategy. The BC Flood Strategy’s objective is to align with UN Sendai Framework for Disaster Risk Reduction, the United Nations Declaration of the Rights of Indigenous Peoples Act and the BC Declaration on the Rights of Indigenous Peoples Act by focusing on the following priority areas:

- Understanding Flood Risks in the face of a changing climate;
- Strengthening Flood Risk Governance, including improving First Nations’ involvement in flood resilience decision-making;
- Enhancing Flood Preparedness, Response and Recovery;
- Investing for Flood Resilience (Funding).

## **FINANCIAL IMPLICATIONS**

The 2023 Approved Operating Budget includes between \$10K - \$30K (dependent on the freshet severity) and is funded from the sewer utility reserve fund. These funds cover the operating costs required for the actions mentioned in the High Water Response Plan, i.e. dike inspections, deployment of water dams, etc.

The City's Long-Term Floodplain Management Strategy that was recently completed was funded from the "Flood Management Strategy Update" 2022 Capital Project under BU #12314 for \$139,930. The results of this review and financial implications will be presented to council in June 2023.

Staff will follow the City's Emergency Operation Centre procedures and Purchasing Exemption Policies should any emergency work be required as freshet levels change.

## **INTERDEPARTMENTAL LIAISON**

Interdepartmental liaison to date has included coordination with the City's Emergency Management Office and the Engineering department. Liaison with other departments such as Police, Electrical and Finance will be conducted if the City & the Province activate their respective Emergency Operations Centers.

## **OPTIONS**

The following options are presented for Council's consideration:

1. That Council receive this report for information; or
2. That Council provide alternative direction to staff.

Staff recommends Option 1.

## **CONCLUSION**

The April 1st, 2023, snowpack throughout British Columbia is slightly below normal. However, the average of all measurements across the province increased to 88% in the past month. The average of all snow measurements for the entire Fraser River basin is 87%, whereas the Fraser River basin at Hope is at 100%.

The combination of slightly below normal April 1st snowpack and La Niña conditions over the winter potentially leading to cooler April & May temperatures means there is a **moderate risk** for freshet-related flooding. The City's High Water Response Plan is implemented annually to ensure that the risk of flooding in vulnerable areas in the floodplain is reduced through a series of temporary mitigation measures.

Staff will continue with ongoing preparations and execution of the High Water Response Plan and provide another Freshet update to Council in Mid-May following further correspondence from the BC River Forecast Centre and Emergency Management BC.

## **ATTACHMENTS**

Attachment 1 – Snow Survey & Water Supply Bulletin – April 1<sup>st</sup>, 2023

Attachment 2 – New Westminster Flood Plain Areas

## **APPROVALS**

This report was prepared by:

George Otieno, P.Eng, PMP, Infrastructure Engineer

This report was reviewed by:

Kwaku Agyare-Manu, P.Eng, PMP, Senior Manager, Engineering Services

This report was approved by:

Lisa Leblanc, Director of Engineering Services

Lisa Spitale, Chief Administrative Officer