BRITISH COLUMBIA

May 23, 2017

Files: 35050-20/Mailout
35050-20/IOD Dike Files

To: British Columbia Diking Authorities

Re: Annual Dike Inspection Reporting, Mobile Applications, 2017 Snowpack & Spring Freshet, Flood Preparedness Planning, and *Dike Maintenance Act* Approvals

To help reduce the risk of dike failure and impacts of flooding in British Columbia, every diking authority is required to submit an annual dike inspection report to the Inspector of Dikes. The contents and attachments of this letter provide the information on:

A. Dike Inspection Reporting
B. 2017 Snowpack and Freshet Flood Potential
C. Requirements for Flood Preparedness Planning
D. *Dike Maintenance Act* Approvals for Changes to Dikes

A. DIKE INSPECTION REPORTING

In previous years some diking authorities have only sent the Dike Inspection Checklist provided as their dike inspection report. This is considered an inadequate submission and may result in the further reporting requirements or auditing by the Office of the Inspector of Dikes. Please review the **report quality** section below.

By **October 31, 2017,** please email a **color PDF file** of the **comprehensive inspection report** to floodsafety@gov.bc.ca or mail a hardcopy (please include a CD with a PDF version) to the address below The inspection report must**:**

a. Use the official dike names and GPS Numbers – to obtain this information please visit http://www.env.gov.bc.ca/wsd/public_safety/flood/pdfs_word/dikes_listed_by_authority-2013.pdf
b. Provide a summary of maintenance work completed in the past 12 months;
c. Provide a summary of maintenance work proposed for the next 12 months;
d. Include a photo record of typical dike sections;
e. Include detailed descriptions, photos, sketches, etc. of maintenance issues and remedial measures;
f. Provide a copy of dike crest survey, consultant reports, etc completed in the past year.
g. Include mobile application output (if utilized)

Ministry of Forests, Lands & Natural Resource Operations
Resource Stewardship Division
Water Management Branch
Flood Safety Section
Mailing Address:
PO Box 9340 Stn Prov Govt
Victoria BC V8W 9M1
Telephone: 250-952-6790
Facsimile: 250-356-0605
Location:
3rd Floor, 395 Waterfront Cres
Victoria BC V8T 5K7

h. Include the attached Dike Inspection Check List (if mobile application not used)

There are several dike safety publications such as the Flood Protection Works Inspection Guide 2000 ,the Dike Inspection Checklist, and the Dike Inspection Mobile Application for Apple products that are available online to help assist with completing the dike inspection report. These documents are available at the following website:

http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/dike-management/inspections

If your dike protects against freshet flooding, please ensure that any outstanding dike inspections, maintenance, emergency planning, and reporting be completed prior to the freshet period.

Report Quality

A comprehensive annual dike inspection report is the primary tool to manage and monitor dike safety. Your dike inspection report will evaluated via qualitative scoring criteria. If the submitted inspection report provides insufficient information to assess the adequacy of the maintenance program and the safety of the dikes, the Office of the Inspector of Dikes (per the *Dike Maintenance Act*) may, "require a diking authority to provide routine or special reports on the construction or maintenance of dikes for which the diking authority is responsible", or "carry out an audit of a diking authority's program of construction and maintenance if dikes for which the diking authority is responsible".

Your regional Deputy Inspectors of Dikes (see attached contact list) are also available for information and advice on inspections and dike safety.

Mobile Application

The Flood Safety Section has a mobile application for Apple smart devices that can assist in the preparation of a dike inspection report including photos and other relevant information. Once the inspection is completed via the application, please email the file(s) to yourselves. **The output from this app is not considered to be a comprehensive report on its own and does not constitute a satisfactory submission.**

The comprehensive report is to include items (a) through (g) above and is to be e-mailed as a .pdf document to floodsafety@gov.bc.ca.

The following sections describe how to install and utilize the application.

Apple Devices

a. Visit http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/dike-management/inspections and download the "Dike Inspection App guide for iOS v2.1" onto your iPad or iPhone.
b. Download the "Filemaker Go 13" app on your iPad/iPhone (it's free from App store/iTunes)
c. Visit http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/dike-management/inspections and download the Dike Inspection .fmp file to your iPad or iPhone.
d. On the iPad/iPhone, tap once on the .fmp file
    - Sometimes when you tap on the file, it will take a few seconds before the popup with your options shows up.
e. Open the .fmp file via the "Filemaker Go 13" app
    - If you can't immediately see the FileMaker Go app icon in the popup, you might have to try tapping on other options like the "Open in…" icon
f. The "dike_inspection.fmp" file will open with a splash screen where you can get started.
g. The username and password are case sensitive
    - Username: flood
    - Password: safety

Android Devices

The Android version is no longer supported and the existing application has been reported to not function with more recent Android OS updates. The app has been removed for the time being from the flood hazard management website.

B. 2016 SNOWPACK AND FRESHET FLOOD POTENTIAL

Full details on the snow bulletin, including the snow basin index map and snow survey data can be found at: http://bcrfc.env.gov.bc.ca/bulletins/watersupply/current.htm

Weather

April weather was dominated by prolonged periods of cool and moist unstable conditions particularly in southern British Columbia. Drier and warmer conditions prevailed in the northern half of the province.

For the month of April, temperatures were slightly below normal in most of southern BC (0.5 to 1.5˚C below normal) and slightly above normal in northern BC (1 to 2˚C above normal). Monthly precipitation was extreme through southern BC, particularly in the Central Interior, South Interior, Okanagan and Kootenay. In these regions precipitation was typically 150-300% of normal for April, and regionally one of the wettest Aprils on record. This follows on a trend of wetter conditions in southern BC since February. In the north-west, precipitation was generally drier than normal in April.

Snowpack

Cool and wet weather through April has led to a significant increase in snowpack conditions across the province, with the biggest increases being observed in south and south-east BC. This has been pronounced by a delay in the onset of the snow melt season by about two weeks in most regions of the province.

Snow basin indices for May 1st 2017 range from a low of 58% of normal in the Northwest to a high of 147% of normal in the Okanagan (Table 1 and Figure 1). Below-normal snowpack (65-80%) is present in the Upper Fraser and Peace, and well below-normal (<65%) in the Stikine, Liard and Northwest. Slightly elevated snowpacks (110-120%) are present in the Middle Fraser, North Thompson, South Thompson, Upper Columbia and Skagit, and elevated (>120%) in the Lower Fraser, West Kootenay, East Kootenay, Okanagan, Boundary, Similkameen and South Coast. Other areas of the province have near-normal May 1st snow basin indices. The May 1st basin index for the entire Fraser Basin is 108% of normal. Provincially, snow measurements have increased significantly, with the provincial average for all May 1st snow measurements at 118% of normal. This has increased from the average of 98% for April 1st.

Table 1 - BC Snow Basin Indices – May 1, 2017

Basin	% of Normal	Basin	% of Normal
Upper Fraser West	96	Boundary	121
Upper Fraser East	78	Similkameen	146
Nechako	109	South Coast	132
Middle Fraser	110	Vancouver Island	108
Lower Fraser	139	Central Coast	60
North Thompson	112	Skagit	114
South Thompson	115	Peace	76
Upper Columbia	115	Skeena-Nass	83
West Kootenay	134	Stikine	63
East Kootenay	137	Liard	64
Okanagan	147	Northwest	58

Streamflow

With extremely wet weather through the spring in southern BC, most rivers are flowing well above normal for early May, including extreme flows and flood conditions in areas of the Middle Fraser, South Thompson, Okanagan, Similkameen, and Boundary. Snowmelt and rainfall in the north-east has also led to much higher

than normal flows than normal for early-May. Other areas of the province have near-normal flow conditions for this time of year.

Outlook

Neutral El Niño (ENSO) conditions are now present in the Pacific Ocean, and the Climate Prediction Centre (CPC) at the U.S. National Weather Service/NOAA is forecasting that neutral conditions are favoured to persist through the spring of 2017, with increasing chances for El Niño development into summer and fall period. Negative sea surface temperature anomalies are present in the North Pacific Ocean west of British Columbia. Seasonal forecasts from Environment and Climate Change Canada indicate an increased likelihood of above-normal temperatures over both the medium (second half of May) and long (May-July) range periods.

Seasonal volume runoff forecasts (see below) are near normal for most basins across the province. Well-above normal seasonal runoff (>120%) is forecasted in the Nicola, Similkameen and Okanagan basins.

This year the onset of the melt season has been delayed by about 2 weeks, with most regions firmly transitioned into the melting as of the first week of May. At low to mid-elevations (below 1500 m) much of the snow has melted, with significant snow still remaining higher up. Melt rates of 10-30 mm/day were observed last week at mid-elevation areas, and 5-15 mm/day at higher elevations.

Significant snow accumulation over the past month has led to an increase in seasonal flood risk across most of the province. Elevated seasonal flood risk is present through the West Kootenay, East Kootenay, Similkameen, Okanagan and Boundary. Decreased seasonal flood risk is present in the Upper Fraser, Peace, Stikine, Liard and Northwest. Other areas of the province are entering into the spring freshet with normal levels of seasonal flood risk. In the Lower Fraser and South Coast, tributary watersheds typically experience flooding due to fall-winter storms; however they can experience high freshet flows that can cause flood issues. Due to high snowpacks in the Lower Fraser (>120%), areas such as the Lillooet River and tributaries have an increased likelihood of higher than normal freshet flows this season.

Normal seasonal flood risk is present for the Fraser River through the Fraser Valley and Lower Mainland. The expected peak flow for the Fraser River at Hope is 8500-9500 m^3/s, or slightly above mean annual flood level; higher or lower flows are possible depending on weather conditions.

While snowpack is an important factor in seasonal flooding, weather during the melt season, particularly extreme rainfall events can also create flood risk even in years with low or average snowpack. Extremely wet seasonal weather, particularly in southern BC, has led to saturated ground conditions, and rivers are much more responsive to water inputs, such as rainfall or rapid snowmelt, than normal. Cold winter temperatures and healthy seasonal accumulations of low and mid elevation snow earlier this year are also contributing to these conditions.

Well-below normal snowpack in the Stikine and Liard, and below normal snowpack in the Upper Fraser indicate the potential for increased risk of low flows this summer. Summer weather is also an important factor in summer low flows, particularly on Vancouver Island and northeast BC, and wet or dry weather through the summer period can affect the risk of low streamflow regardless of snowpack.

Current advisories, warnings, freshet information, hydrometric monitoring, river modelling and snow data are available on the River Forecast Centre website: http://bcrfc.env.gov.bc.ca/.

The River Forecast Centre will continue to monitor snowpack conditions and will provide an updated seasonal flood risk forecast in the May 15th 2017 bulletin, which is scheduled for release on May 23rd.

BC River Forecast Centre
May 8, 2017

C. Requirements for Flood Preparedness Planning

Local governments are responsible under the *Emergency Program Act* for emergency preparedness as well as initial and continuing response.

All diking authorities (even if they are not a local government) **are required to prepare an emergency preparedness plan for the diked area** in cooperation with their respective local government(s) and/or the Provincial Emergency Program**.** Such plans must include, amongst other things, provisions for flood patrols, flood-fighting personnel and equipment, materials, communications, and evacuation planning.

More specifically, preparedness activities should include:

- Completing inspections, maintenance and repairs,
- Ensuring access to dikes for flood fighting equipment,
- Ensuring dike patrols and flood fighting personnel are familiar with the diking system,
- Installing flood level monitoring gauges,
- Stockpiling riprap and other materials that may be needed.

D. *Dike Maintenance Act* Approvals for Changes to Dikes

Routine maintenance of a dike by a diking authority does not require an Approval but major repairs or changes as listed below would require an Approval per Section 2(4) of *the Dike Maintenance Act* (DMA).

- Changes or alterations to the cross section or crest elevation of a dike;
- Installation of culverts, pipes, flood-boxes, utility lines, pump stations, or any structure through, on or over a dike;
- Construction of any works on or over a dike or dike right of way, including structures, excavations and placement of fill or other materials;
- Alteration of the foreshore or stream channel where the work could impact the integrity of a dike such as dredging, construction of erosion protection and other in-stream works; and
- Construction of a new dike.

DMA Approval application forms, approval requirements, design guidelines, and general information are available at:

http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/dike-management/approvals

The DMA Approval process is critical for establishing and confirming dike design criteria and the acceptability of the design in meeting dike safety and regulatory requirements.

If you have any questions or comments relating to the completion of the annual dike inspection reports, flood preparedness, or the DMA approval process, please contact your regional Deputy Inspector of Dikes.

Sincerely,

Mitchell Hahn, P.Eng.
Inspector of Dikes

List of Attachments

1. 2017 Dike Inspection Checklist
2. 2017 Dike Safety Program Contact List

pc: Deputy Inspectors of Dikes, Water Management Branch, FLNR
Valerie Cameron, P.Geo., Water Stewardship Manager, Water Management Branch, FLNR
Chris Duffy, Executive Director, Emergency Coordination, Emergency Management BC
Jesal Shah, P.Eng., Director, Disaster Mitigation Program, Emergency Management BC