Fraser Basin Council

LOWER FRASER COMMUNITIES AT RISK FROM FRASER RIVER FLOODING

The Fraser Basin Council (FBC) and the BC Ministry of Environment initiated a multi-year study in 2003 to develop a hydraulic model of the lower Fraser River to update the design flood profile (predicted flood water levels). Key findings from this study released by FBC indicate that widespread dike overtopping and dike failures would occur throughout the Lower Fraser River in the event of a re-occurrence of the 1894 flood of record.

More than 20 Fraser Valley communities, including First Nations, are protected by over 300 km of Fraser River diking between Agassiz and Delta (including the sea dikes). Almost 250 km of these dikes were reconstructed by the federal/provincial Fraser River Flood Control Program between 1968 and 1994. The dike design levels (estimated flood water level plus 0.6 m of freeboard) for reconstruction used the flood profile established in 1969 by the federal Inland Waters Directorate, based on the two largest floods on record, which occurred in 1894 and 1948. Other flood management plans and decisions have also used the 1969 profile.

The study, managed by the Fraser Basin Council, was designed to develop an up-to-date design flood profile based on (a) the 1894 Fraser River freshet flood combined with spring high tide conditions (Fraser freshet profile), and (b) a one in 200-year winter storm surge flood with winter high tide conditions combined with a Fraser River winter flow (the winter storm surge profile).

The flood profile that has been computed by the 2006 hydraulic model is higher than the original 1969 flood profile in almost every location from Richmond to Chilliwack. Engineers in 1969 simply did not have access to the sophisticated data gathering and analytical tools that are available today and could not adequately deal with the changes caused by dikes constructed after 1894.

Diking systems from Chilliwack and Kent to Surrey and Coquitlam would be overtopped at one or more locations; the Delta dike at Fraser Shore would be overtopped at one location; and freeboard for a winter storm surge flood would be inadequate in Delta and Richmond.

“We encourage all orders of government to take these results into consideration and initiate dialogue about how this flood risk can be addressed in a collaborative way.” said Steve Litke, Program Manager, FBC. “No single authority is responsible. There are shared responsibilities and there is a need for multiple lines of defense from diking to land use planning to emergency preparedness.”

The Fraser Basin Council is a non-profit society dedicated to sustainability. Established in 1997, the FBC brings people together to find solutions to longstanding issues and conflicts, and take advantage of opportunities to advance sustainability in the Fraser River Basin, the geographical area drained by the Fraser River and its 13 main watersheds. The FBC advocates for a sustainable Basin in an impartial, independent and non-political way to ensure the decisions British Columbians make about the Basin today will advance the social, economic and environmental dimensions of sustainability into the future.

- 30 -

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BACKGROUNDER - LOWER FRASER RIVER HYDRAULIC MODEL

HISTORY

- Since 1998, the Fraser Basin Council (FBC) has chaired the Joint Program Committee (JPC) for Integrated Flood Hazard Management to facilitate dialogue, share information, and build consensus on ways to advance and improve flood management in the Fraser Basin.

- In 2003, under the auspices of the JPC, the FBC and the BC Ministry of Environment initiated a multi-year project to develop a hydraulic model of the lower Fraser River to update the design flood profile that was originally established in 1969.

- In September 2005, the FBC retained Northwest Hydraulic Consultants Ltd. to undertake a program of one-dimensional hydraulic modeling on the lower Fraser River using the MIKE 11 software developed by the Danish Hydraulic Institute.

- The project has been supported by financial and in-kind contributions from the BC Ministry of the Environment, Canadian Coast Guard, Public Works and Government Services Canada, Fraser River Port Authority, the Greater Vancouver Regional District, Surrey, Richmond, Delta, Abbotsford, Township of Langley, Maple Ridge and Pitt Meadows.

THE STUDY

- The overall objective was to develop an up-to-date design flood profile (predicted water levels) based on the following two scenarios: (a) the 1894 Fraser River freshet flood combined with spring high tide conditions (Fraser freshet profile) and (b) the 1 in 200-year winter storm surge flood with winter high tide conditions combined with a Fraser River winter flow (the winter storm surge profile).

- This information can be used to manage flood protection works such as diking systems, to inform land use decisions and floodproofing practices, and to assist with emergency planning, preparedness and response efforts.

- The study area includes the lower Fraser River from the mouth of the Harrison River to the Strait of Georgia, encompassing the North, Middle and South Arms, including Canoe Pass, as well as Pitt River to the Pitt Lake inlet.

RESULTS

- The winter storm surge profile exceeds the Fraser freshet profile in the lower 28 km of the river, or downstream of the Alex Fraser Bridge, while upstream, the Fraser River freshet flood profile is the dominant flood hazard.

- Downstream of the Alex Fraser Bridge the 2006 profile is about 0.3 m higher than the water levels predicted in 1969. Upstream of New Westminster the updated profile becomes increasingly higher to a maximum of 1 m higher than the 1969 profile at Mission and the Township of Langley.

- The increase in predicted water levels suggests that dikes from Chilliwack and Kent to Surrey and Coquitlam would be overtopped at one or more locations and freeboard would be compromised in other locations with potential dike failures.

- For the winter storm surge flood, the Delta dike at Fraser Shore would be overtopped at one location and freeboard would be inadequate in other locations in Delta and Richmond.

CONCLUSIONS

- Despite recent improvements in analytical tools, current studies also remain subject to sources of uncertainty. The hydrometric network on the river must be maintained to provide data for flood forecasting and future model calibration and improvement.

- The Ministry of Environment under the *Dike Maintenance Act,* and through the office of the Inspector of Dikes, establishes standards for dike design, operation and maintenance. Design criteria for dikes are updated from time to time based on the best available information. The Inspector of Dikes has advised that the study results and the new profile from Richmond to Chilliwack will now be adopted as the provincial standard for the lower Fraser River dikes.

- Significant further work is required before a major dike upgrading program is undertaken. This work would include comprehensive studies of flood magnitudes and climate change, flood damage potential, costs and benefits.

- High priority should also be given to assessing all appropriate flood management strategies on the floodplain of the Fraser River and the institutional framework for implementation of those strategies. This should include the costs and benefits of both non-structural (land use planning, floodproofing practices, and emergency planning) and structural (flood protection dikes, erosion protection, river training structures, upstream storage, and dredging) flood management strategies.

- Federal, provincial, First Nations and local governments are advised to work collaboratively to examine the findings of this study as well as management options to help mitigate the Fraser River flood hazard.