# Checking the math: a review of MIKEFlood modelling following the recent flooding in the Lower Cowichan Valley, British Columbia

Category: Modelling and Analysis

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In 2007, the Cowichan Valley Regional District, in partnership with Cowichan Tribes, the City of Duncan and the District of North Cowichan initiated the development of an Integrated Flood Management Plan for the Lower Cowichan Valley with the goal of reducing the flood risk to all communities, while protecting aquatic and riparian habitat and addressing the cultural values of the rivers. This study was completed by Northwest Hydraulic Consultants (NHC) in September 2009 and included development of a hydrodynamic numerical model and updated floodplain mapping.

The complex river-floodplain system covering an area of 22 km² was modelled using DHI's MIKEFlood modelling package which combines 1D and 2D hydrodynamic flood modelling. Through the use of lateral links, MIKEFlood connects the channel cross-sections (1D model) to the computation grid (2D model) representing the floodplain thereby allowing transfer of water from one domain to the other. This approach is particularly suitable for representing complex spills over floodplains and dike breach scenarios, and for illustrating flood inundation extents. The model was calibrated and validated to limited data and observations available from flood events in 2007 and 2006.

In late November 2009, a series of frontal systems hit coastal British Columbia. Flood warnings were issued across Vancouver Island as several rivers experienced very high flows. Following more than a week of rain, the Cowichan and Koksilah Rivers and several creeks overflowed their banks. The worst flooding occurred in the Cowichan Valley on Friday, November 20. Over 50 homes were flooded in North Cowichan and the City of Duncan; with dozens of homes flooded "up to the doorknobs". Residents were evacuated, roads and schools were flooded and closed, and property damage was extensive.

NHC along with several partners surveyed and documented the flood extents and elevations in the immediate aftermath of the flood. Extensive use was made of videos and photos taken at the height of the flood. This comprehensive database was then used to validate the numerical models, which showed excellent agreement between modelled and observed water levels and extents.

The recent flood event provided a unique opportunity to assess the model's performance by comparing computed flood profiles and flooding extents with actual flood extents and observed water levels. The event confirmed the value of having a numerical modelling tool in place for emergency management and preparedness as well as for long-term flood management planning.