

Inflow Design Flood and Dam Break Analysis for a Small Hydroelectric Project in Ontario

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This presentation describes the calculation of the Inflow Design Flood (IDF), dam break analysis, and optimization of the control structures for a small waterpower project in Northwestern Ontario. The project comprises two run-of-river hydroelectric power plants with a total capacity of 10 MW, a concrete control weir, and an embankment dam. All preliminary studies were completed and the project is currently in an advanced stage of development.

The Canadian Dam Association defines the Inflow Design Flood (IDF) as the most severe inflow flood for which a dam and its associated facilities are designed. The calculation of the IDF described in this paper was conducted by using the new 2011 *Lakes and Rivers Improvement Act* (LRIA) Technical Guidelines issued by the Ontario Ministry of Natural Resources which are consistent with the current engineering practice in Canada and USA. The presentation provides an overview of flow frequency analysis, calculation of the Regional Flood (RF), Probable Maximum Flood (PMF), and of single and simultaneous/cascade dam brake simulations. The Incremental Hazard Evaluation (IHE) methodology that was utilized, showed that incremental losses resulting from the most disadvantageous dam break scenario, when compared to the losses produced by the same flood in pre-development conditions, were acceptable without any significant incremental increases in damages to property and the environment.

Subsequent to the calculation of the IDF, the dam break simulations were repeated with reduced control gates sizes. The environmental impact analysis enabled to determine the size of the gates which, while being safe, are also the most economical.

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