

Culvert Controlled Morphology in a Constrained Urban River: A Case Study in Geomorphic Analysis for Asset Management Decisions

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The Don Mills Channel in Markham, Ontario was realigned in the 1960s to facilitate development of industrial lands. It is now a series of channelized reaches segmented by culverts. This watercourse is flood prone and has been designated by the City's asset management department as a priority area for flood risk abatement and remediation. Flooding is primarily due to undersized culverts unable to convey the frequent floods caused by a lack of stormwater management controls (development occurred before current stormwater practices). Flood mitigation alternatives are currently being investigated, including culvert removal or enlargement.

The removal or modification of culverts may destabilize this highly impacted urban river, which already exhibits common symptoms of channel response associated with channelization and urbanization. This presentation documents a study that investigated the geomorphic processes acting on the Don Mills Channel. Specifically, the study examined the role of culverts in mitigating the excess erosion potential caused by frequent flooding. It also looked at opportunities for improving channel stability; work that could be undertaken in concert with conveyance improvement activities.

A series of hydrogeomorphic and sediment transport modelling trials were undertaken to estimate the impact culverts have on controlling morphologic change in this system. This case study highlights a practical example of how geomorphic assessment and modelling can be integrated with asset management decisions to provide sustainable long-term solutions for both flooding and channel stability.

Biography

Jeff Hirvonen is a principal at GeoProcess Research Associates Inc. and fluvial geomorphologist with seventeen years of experience in the fields of stream assessment and restoration. He has extensive experience in fluvial audits, geomorphic assessments, sediment transport studies and detailed stream restoration design and implementation methods; including managing and designing large-scale restoration and rehabilitation projects across Canada and internationally. Jeff has authored papers to several professional forums including the Natural Channel Systems conferences. Most recently, Jeff co-chaired the 5th International Conference on Natural Channel Systems in September 2016 in Niagara Falls.