

Channel design at road crossings: design constraints and the consideration of fluvial geomorphic processes

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As development pressures have necessitated road improvements, road widenings are one such improvement that often requires the replacement or construction of crossing structures at watercourses. Major advancements have been made in the development of these crossings with common design procedures evolving from solely addressing hydraulic requirements to a corridor-based approach incorporating considerations of fish passage, terrestrial movement, floodplain connectivity, and natural channel function. While these components are interconnected, this presentation will focus on efforts to promote natural geomorphic processes through the selection of bed and bank treatments for channel designs at road crossings.

It is widely acknowledged that an understanding of local channel form and process is essential to ensure a design that promotes continuity. Numerous guiding documents are available to support channel design activities associated with crossings (e.g. stream simulation design). Agencies now require the consideration of fluvial geomorphology (i.e. meander belt/ erosion hazard assessments) in the determination of structure sizing and siting, facilitating the application of stream simulation-style design practices. However, each site is unique based on local constraints and the design process typically requires a challenging balance between objectives of promoting natural geomorphic processes and ensuring channel “stability” (i.e. static channels). Structure type and size, corridor conditions, and other controls may limit the ability to simply replicate channel characteristics observed upstream and downstream or from a reference reach.

This presentation provides a review of channel treatments applied by the authors in the design of stream realignments at road crossings. The treatments range from classic stone-lined channels to the introduction of compacted clay/gravel mix banks, buried stone, and vegetative measures in an effort to encourage natural processes and adjustments. The presentation will include a discussion of construction considerations and monitoring results from designs constructed in the past 10 years. The results, while preliminary, can provide practitioners and agencies with an improved understanding of the observed successes and failures of a variety of treatments.

Biography

Mark Wojda is a Water Resources Engineer at Matrix Solutions Inc. based out of the Guelph office. Mark completed his master's research at the University of New Brunswick investigating bank erosion in the Petitcodiac River estuary. Over the past five years with Parish Geomorphic and Matrix Solutions, Mark has applied his knowledge of fluvial geomorphic processes in support of a variety of projects, including over 20 channel designs, including numerous realignments at roadway crossings and stabilization designs of degraded urban channels throughout the Greater Toronto Area.