

Avonhead Creek Daylighting Project: field monitoring techniques to understand watershed hydrology

Jayeeta Barua¹, Karen Chisholme².

^{1,2} *Credit Valley Conservation Authority, Mississauga, Canada*

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Abstract

Through the Lake Ontario Integrated Shoreline Study (LOISS), approximately 400 m of Avonhead Creek draining to Lake Ontario was identified for daylighting to create a natural channel system with a wetland feature. The project will expose all of the flows of a previously buried reach of the creek to restore and rehabilitate important natural processes.

Flow diversion structures, channelization and land use changes due to urbanization makes characterizing stream flow conditions difficult to estimate. The four controlling flows considered for the daylighting project included:

- Baseflow or Habitat Flow;
- Bankfull Flow (1.1 - 1.8 years in Ontario);
- Riparian / Floodplain Flow;
- Regional / 100 year Flood flow (regulatory).

In September 2015, a field monitoring study was initiated to characterize baseflow and bankfull flows to support Avonhead Creek daylighting, through the installation of continuous flow loggers. Two existing precipitation gauges, located near the upper and lower regions of the watershed was utilized to help understand the flow response to different rainfall distributions. A trail camera captures time-lapse images to help ground truth measured water levels and record periods of low flow, not detected by the flow monitoring equipment. Software such as WISKI (Water Information System KISTERS) was utilized to develop a stage-discharge relationship to analyze the hydrology of the creek.

To characterize the various flow conditions, an existing hydrology model (Visual-OTTHYMO) was calibrated using observed precipitation and flow measurements from monitoring data. This combination of field testing and modeling exercise assisted with the characterization of existing and future conditions to support the design of the new channel and wetland complex under various scenarios as well as assessing suitability and performance of habitats for fish and wildlife.

This study will highlight lessons learned in characterizing the flow regime for an urban watershed to provide parameters for a natural channel design. Recommendations will be provided on how to implement a cost effective monitoring program with an applied focus. The trail cam images were converted into a time-lapse video and paired with recorded flow data to shed light into the complex hydrology/hydraulics of an urban creek. The monitoring program will continue throughout 2016 and provide insight into how flow characteristics vary from season to season.