Explanatory Note – WLU Centre for Urban Watershed Research (CUWR)

Recognizing the need for sound science to guide management decisions that will preserve the integrity of our watersheds, Wilfrid Laurier University is partnering with Conservation Halton to establish a Centre for Urban Watershed Research (CUWR). While monitoring of existing watershed features are informative, these non-experimental approaches are only able to establish correlations between water quality and management practices. To establish cause and effect relationships between water quality and management practices, experimental approaches, where conditions can be manipulated and replicated are essential. The CUWR will consist of an on campus mesocosm facility to conduct tightly controlled short-term benchtop scale studies and a series of experimental ponds for mid to long-term exposure studies to examine contaminant effects on wetland biota and wetland processes. Two additional features will be unique to this facility: 1) a series of wetland cells integrated into the functional stormwater management ponds to compare how various designs and operating parameters affect contaminant removal and SWM function, and 2) multiple outlet structures discharging to independent stretches of stream to assess the impact of outlet structures on stream biota and physical characteristics.

Since the publication of the 2003 Stormwater Management Plan and SWMP design manual there has been increased recognition that our climate has and continues to change. Researchers at the CUWR will utilize SWMF – 2 to assess how effective current design recommendations are given our changing climate, evaluate modifications to existing recommendations and develop and test the utility of comprehensive monitoring approaches using real-time smart technologies. In addition, public outreach activities will be developed and assessed to highlight research and our connections to water and the environment.

Specific questions that may be addressed include:

1) When are SWM ponds sources or sinks of contaminants (i.e chloride, phosphorus)? What are effective and economic removal strategies?
2) What are interactions among water quality parameters (i.e. pH and phosphorus).
3) When do sediment bound contaminants become available and where in the water column does this occur?
4) Are current monitoring requirements (three grab samples/year) sufficient to base long term decisions upon? Are more comprehensive monitoring strategies needed to guide future decisions?
5) How can real-time monitoring contribute to adaptive management? If a problem or deficiency were detected – what could be done to remedy this and how do climate change predictions contribute to these decisions?
6) Do new technologies such as drone systems with sensors (e.g. chlorophyll, C, surface temperature and water column temperature) offer opportunities for monitoring with informed adaptive management processes?
7) How does the choice of vegetation and planting approaches (seeds, plugs, density) affect SWM function? How do vegetation planting approaches impact maintenance schedules?

8) How does the frequency and duration of flooding in fringe areas impact vegetation and their capacity to contribute to SWMP function?
9) What are the effects of outflow structures on stream integrity and aquatic biota?
10) How do removal processes differ in ponds designed following minimum vs. preferred criteria?
11) How can SWMP outfall design be integrated into the natural environment, and can additional benefits such as polishing or cooling of SWMP effluent be built into outfall design?
12) How do conventional SWMP compare to LIDs in Southern Ontario's climate?
13) What impact does shading have on water temperatures within a SWMF?