

**Performance and Operation of Partial Infiltration Permeable Pavement
Systems in the Ontario Climate**

by

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ABSTRACT

PERFORMANCE AND OPERATION OF PARTIAL-INFILTRATION PERMEABLE PAVEMENT SYSTEMS IN THE ONTARIO CLIMATE

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Partial-infiltration permeable pavement (PP) systems provide environmental benefits by increasing infiltration, attenuating storm flows and improving stormwater quality. This thesis focuses on the performance and operation of partial-infiltration PP systems over low permeability soil in Ontario. Three PP, AquaPave®, Eco-Optiloc® and Hydromedia® Pervious Concrete were monitored over two years and their performance was evaluated relative to an impermeable Asphalt control. Field data was collected from the Kortright PP pilot parking lot in Vaughan, Ontario. Through the use of restrictor valves on underdrains the PP systems were shown to provide substantial hydrologic benefits by eliminating stormwater outflow for rain events less than 7mm, reducing peak flows by 91% and reducing total stormwater volume by 43%. Stormwater quality was analyzed for winter and non-winter seasons. The PP were shown to greatly reduce the concentration and total loading of suspended solids, nutrients, hydrocarbons and most heavy metals. Some water quality data, such as pH, K, or Sr levels, indicate that the quality of PP effluent will change as the system ages. Study of PP sample boxes at the University of

Guelph highlighted the role that construction materials have on effluent quality and showed that pollutants introduced by the pavement and aggregate are almost entirely in a dissolved form and decline very rapidly after a season of exposure to rainfall. Benefits to water quality were sustained during winter months. The partial-infiltration PP systems were shown to provide buffering of Na and Cl concentrations. Small and large-scale maintenance practices for PP systems were investigated. Small-sized equipment testing found that vacuum cleaning and pressure-washing have good potential to improve infiltration capacity. Testing of full-sized streetsweeping trucks demonstrated that permeability can be partially restored on PICP by suction-based sweeping. Vacuum-sweeping was beneficial on a PC pavement which had experienced large permeability losses. Results of this study indicate that partial-infiltration PP systems can be effective measures for maintaining or restoring infiltration functions on parking lots and other low volume traffic areas, even in areas with low permeability soils.