

Wetlands Water Balance Evaluation
Seaton Lands of the North Pickering Area
Region of Durham

File no.: 289-051

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Prepared For:
Ministry of
Municipal Affairs & Housing



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EXECUTIVE SUMMARY

Morrison Environmental Limited (MEL) together with North-South Environmental Inc. (North-South) and Philips Engineering Limited (Philips) were retained by the Ministry of Municipal Affairs and Housing (MMAH) to carry out the necessary work for Wetland Water Balance Evaluations including Groundwater and Surface Water Flow Regimes, at Selected Wetlands on the Seaton Lands of the North Pickering Area.

The overall objective of this study was to better understand the nature of the groundwater and surface water interactions and the ecological features of the selected wetlands within the area. Eight wetlands were selected as representative wetlands by the North Pickering Land Development Consulting Team, OMNR and TRCA.

It was anticipated that the detailed work at the selected wetlands could be used as a model for managing the remaining wetlands within Seaton area. This was to ensure the continued protection and functionality of these wetlands during and following development.

The scope of work for this study included collecting, compiling, reviewing and evaluating existing and published geological, hydrological, hydrogeological and ecological data; site visits, wetland instrumentation, and site specific data collection. The site specific data collection included: shallow groundwater water level, stream water level, stream water temperature, precipitation, and photographic record.

The following is a summary of the major project findings:

- a) The geologic condition at each wetland dictates whether the wetland is sustained by groundwater or surface water. Wetlands A through F are all located on ponded low permeability sediments and are not generally sustained by groundwater. These Type 1 and Type 2 Wetlands are the least susceptible to changes in water flow. Type 1 Wetlands display a small number of wetland functions (Wetlands A, B & C). These wetlands have
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modest environmental significance. Type 2 Wetlands contain depressions, receive surface runoff and are associated with at large number of wetland functions (Wetlands D & E). These wetlands have high environmental significance.

- b) Wetlands G and H are located on sandy soil below the Iroquois shoreline. These Type 3 Wetlands located in Glacial Lake Iroquois foreshore sediments are mainly sustained by groundwater. These wetlands are the most sensitive and the most susceptible to changes in water flow. These wetlands have high environmental significance.
 - c) Groundwater flows at all wetlands except E are towards the wetland. At Wetland E groundwater flow is away from the wetland towards a discharge channel. Groundwater gradients vary from 0.003 m/m to 0.08 m/m in Wetland H and Wetland B respectively.
 - d) Hydraulic conductivity determined by the modified Hazen method ranged from 1.0×10^{-3} cm/sec to 1.8×10^{-6} cm/sec. The permeable materials are generally below the Iroquois Shoreline and the poorly permeable materials are generally in the ponding sediments.
 - e) The catchment areas for the eight study wetlands range from 0.09 km² for Wetland D to 7.82 km² for Wetland G. Ground surface contours and cross-sections in each Wetland Appendix help to define the shape of the wetlands.
 - f) The Water Balances calculated for each of the eight wetlands show the monthly outputs from January 2005 to January 2008. The graphs show the Precipitation, Actual Evapotranspiration, Total Runoff, Surplus, Soil Moisture Changes and Temperature.
 - g) The miniaturization of the instrumentation allowed more sites to be studied; however, the poorly permeable soil, freezing conditions and the shallow water table were problematic.
 - h) The findings reported by North-South Environmental Inc. in Appendix I should be reviewed to understand the Ecological significance of the Wetlands.
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Based on the above the major findings of this study it is recommended that:

- a) In future studies investigators should conduct a brief geologic reconnaissance before choosing wetlands if miniaturized instrumentation is being considered.
 - b) In future studies investigators should predetermine groundwater levels to avoid near surface water levels which result in winter freezing, data loss and equipment damage.
 - c) In future studies, investigators should choose small wetlands with small catchment areas to simplify investigations and to more precisely quantify hydraulic function.
 - d) In future studies, investigators should search for groundwater dependant wetlands (Type 3). These are the most vulnerable wetlands to development pressures.
 - e) In future studies, investigators should locate stilling wells carefully where stream meandering, erosion and changing profiles are not likely to occur.
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