Ecohydrological Study of the Muskakoski Natural Area, Edmonton, Alberta

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Like other fast-expanding municipalities, Edmonton's growth has consumed and encroached on wooded areas and wetlands. Within the context of a mid-1990s municipal conservation policy, the Muskakoski Natural Area was identified to protect a tamarack-black spruce bog located on the western fringe of Edmonton. With existing residential subdivisions nearby and proposed encroaching development including bordering transit-oriented development (TOD) bus terminal, the City of Edmonton initiated an ecohydrological study of the Muskakoski Natural Area in July 2008, with a completion in mid-2009. This paper presents the objectives, assessment approach, methodologies and interim findings of the study to-date.

The primary objectives of the ecohydrological study is to assist municipal planners to achieve a balance between natural area protection and municipal development, identifying potential constraints and opportunities for integration with the TOD, and identifying protective strategies for the most sensitive ecohydrological features of the Muskakoski Natural Area. To address these objectives, a study was developed to characterize the water inputs, throughputs and outputs currently influencing the Natural Area wetland, with the aim of providing information for drainage management by the City of Edmonton and, if reasonable, to protect the ecohydrological integrity of the Natural Area.

The study approach involved the implementation of a comprehensive surface and groundwater data collection program to develop a coupled conceptual site model and coarse water balance for the Muskakoski Natural Area in terms of its hydrodynamics and relationship to the surrounding lands. Vegetative communities and soil types were also examined to identify possible successional trends. Field methodologies included the construction of a network of small-diameter, paired groundwater monitoring wells across the Natural Area, for dual water level measurements. Vertical and horizontal groundwater gradients were derived spatially across the Natural Area. Key on-site surface water bodies were provided with surveyed stage rods and rain gauges were installed to measure on-site and local background precipitation, supplemented by hourly meteorological station data.

Paired groundwater monitoring wells were constructed to respond specifically to water levels within the Natural Area organic materials and the underlying mineral soil. The water-saturated organic material thickness was spatially analyzed to determine the volume of water exchanging and its relative role in the overall water balance. The saturated thickness findings were coupled to spatial and temporal analyses of vertical groundwater gradients to gain an insight as to whether the Natural Area was dependent, assisted or independent of groundwater for its sustainability. Field activities are continuing through the spring recharge event, to collect almost a full year of data; the complete study findings and conclusions will be reported in July 2009.

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