

**BROOKHILL NEIGHBOURHOOD
SUBWATERSHED STUDY**

DRAFT FINAL REPORT

Report prepared for:
**THE MUNICIPALITY OF
CLARINGTON**

Prepared by:
AQUAFOR BEECH LIMITED
14 Abacus Road
Brampton, Ontario
L6T 5B7

September, 2005
Aquafor Reference: 64060

EXECUTIVE SUMMARY

The Municipality of Clarington, together with the Central Lake Ontario Conservation Authority (CLOCA) have undertaken a Subwatershed Planning Study for the “Brookhill Neighbourhood”. The study goal was defined as: “development of a management plan which is designed to allow environmentally responsible resource management and municipal planning decisions to be made as land use changes occur within the subwatershed.” The study included four general phases:

- Establish existing environmental conditions;
- Evaluate alternative subwatershed management strategies;
- Select a recommended Subwatershed Plan; and
- Develop an implementation plan.

Phase 1 - Establish Existing Environmental Conditions

The existing environmental resources within the study area were defined in order to identify key features and functions, to establish baseline conditions for the assessment of potential impacts from future urban development, and to identify development constraints and potential future opportunities. A summary of the key environmental features and functions to be considered is provided below:

- The geology of the study area is highly variable, with areas of thick sand and gravel at the northern limits, to areas of clay and till in the central and southern portions of the study area. Given its function as both a drinking water aquifer, and contributor of baseflow to regional coldwater streams such as Bowmanville Creek, the recharge potential of the sand and gravel of the Iroquois Beach feature in the northwest portion of the study area should be protected from future urban development. The sand plains within the central portion of the study area also act as a drinking water aquifer. It is therefore recommended that stormwater management planning for future development incorporate infiltration measures to maintain the existing, moderate rates of groundwater recharge, and the existing groundwater quality.

- The hydrologic response of the Brookhill Tributary was assessed for existing and ultimate landuse scenarios. Future flood controls are necessary to prevent significant increases in peak flow rates within the watercourse. Flood controls are not required for lands draining directly to Bowmanville Creek, however. For lands along Highway No. 2 draining to West Side Creek, flood control is provided within downstream stormwater ponds, however, future commercial developments will require on-site flood controls to meet existing storm sewer capacities.
- The Regulatory floodplain limits of the Brookhill Tributary and of Bowmanville Creek were identified as constraints to future development. It is noted that recent grading works near the diversion channel and remnant channel may have remove the remnant channel from the Regulatory storm floodplain in this area.
- Given the existing fish communities of the Brookhill Tributary (warmwater) and of Bowmanville Creek (coldwater), future urban development within the study area should incorporate "Level 1" or "enhanced" water quality controls, including measures to control runoff temperature. Lower suspended solids loadings would also be expected with erosion control/stabilization works on Bowmanville Creek and the Brookhill Tributary.
- The existing stream morphology of the watercourses were characterized. The Brookhill Tributary is relatively stable within its upstream reaches, with erosion and instability increasing in the downstream reaches towards the confluence with Bowmanville Creek. Due to the failure of Vanstone Dam, various adjustments, particularly downcutting/incision, have been occurring at the confluence. As such, future urban development should include erosion controls so that natural rates of erosion are not exacerbated. Further rehabilitation/stabilization opportunities were also identified.
- The existing fish communities of the study area include a warmwater community within the Main Branch of the Brookhill Tributary and a coldwater community in Bowmanville Creek. Stream reaches of the Brookhill Tributary to the east of Green Road were identified for protection as they either contribute to, or provide downstream fish habitat.

Aquatic habitat buffers/setbacks for Bowmanville Creek and the Brookhill Tributary were established as 30 metres, and 15 metres (both sides), respectively. Stormwater management requirements, in terms of water quality controls and erosion controls were also identified for future urban development. Other potential opportunities to improve fish habitat were also identified, including stream rehabilitation/stabilization works, baseflow enhancement, and improved riparian cover,

- The existing terrestrial features within the study area were inventoried and classified. Class 1 features, including the Maple Grove wetland, the headwater communities of the Brookhill Tributary and the Bowmanville Creek valley communities, were identified for protection. These forests are among the highest quality in the study area, covering an extensive area, and represent potentially significant habitat for breeding birds. Other features, including a thicket swamp, plantations, and features within the Brookhill Tributary were defined as Class 2 features. Some level of development may be permitted to alter the size and physical form of a Class 2 area, provided that ecological functions are protected and maintained. An environmental impact study (EIS) is recommended for alterations to these features and for lands within 50 metres of Class 1 features, and within 120 metres of the Maple Grove PSW. Class 3 features represent preservation opportunities.
- The environmental corridors of the Brookhill Tributary and Bowmanville Creek were identified as constraints to future development. These lands encompass erosion hazard lands (i.e. meander belts, erosion and slope stability allowances), aquatic buffers/setbacks, valley features, and an additional 5 metre setback for valley access.

Phase 2 - Evaluate Alternative Subwatershed Management Strategies

Subwatershed goals and objectives were defined for the various environmental resources within the study area and alternative best management practices (BMP's) to meet these objectives were reviewed. Based on the potential BMP's, a set of four alternative management strategies were formulated for evaluation and discussion.

Several measures which are common within all four strategies including:

- no development within the Lake Iroquois Beach;
- no development within the floodplain or stream/environmental corridors as defined by:
 - erosion/slope stability hazards (confined reaches);
 - meander belt width (unconfined reaches);
 - aquatic habitat buffers/setbacks;
 - top-of bank;
 - municipal environmental/access setback.
- on-site flood controls for developments draining to West Side Creek;
- Level 1 water quality control, including temperature controls;
- preservation of existing groundwater recharge rates;
- erosion/stabilization works to mitigate on-going erosion at identified sites, improve bank stability, and remove a barrier to fish migration at the mouth of the Brookhill Tributary;
- stream rehabilitation to create more stable instream habitat conditions within the Brookhill Tributary, including the removal of existing pipe/tile drainage to restore a riffle-pool morphology, and riparian planting to improve stream shading and contribute to bank stability;
- protection of Class 1 terrestrial features including the Maple Grove provincially significant wetland (PSW), and woodlots within the Bowmanville Creek valley and Brookhill Tributary corridor;
- assessment of Class 2 areas with future Environmental Impact Studies (EIS's);
- establishing wildlife corridor linkages between the Maple Grove wetland complex and the Bowmanville Creek valley at the following locations:
 - the future Longworth Avenue extension (min. width 60 to 100m);
 - the south side of Nash Road (min.. width 100m); and
 - along the Brookhill Creek stream/environmental corridor.

Alternative Strategy No.1

In general, this strategy is characterized by traditional stormwater management practices. In addition to the measures listed above which are common to all of the alternative strategies, the components of this strategy include the following:

- basic lot-level source controls to maintain groundwater recharge;
- stormwater management ponds for water quality control;
- stormwater management ponds for erosion control;
- stormwater management ponds for flood (quantity) control (Brookhill Tributary only).

Alternative Strategy No. 2

This strategy is very similar to Strategy No.1 in that stormwater management ponds would be used to provide erosion control and flood (quantity) controls. However, this strategy would employ centralized infiltration facilities such as exfiltration systems and/or infiltration basins to provide both groundwater recharge *and* water quality control. The use of such infiltration measures would result in moderately smaller stormwater ponds due to the reduced volume requirements.

Alternative Strategy No. 3

This strategy is similar to Strategy No. 2 in that centralized infiltration facilities such as exfiltration systems and/or infiltration basins would be used to provide both groundwater recharge *and* water quality control. However, this strategy is intended to significantly reduce the storage requirements for future stormwater management ponds. To do so, the goals of groundwater recharge protection, surface water quality protection, *and* erosion control would be integrated using *enhanced* infiltration targets for the centralized infiltration facilities. This would significantly reduce the erosion control storage requirements within future stormwater management ponds. Further, the Regional Road 57 culvert structure would be replaced in order to forego flood (quantity) control requirements within the Brookhill Tributary.

Alternative Strategy No. 4

The intent of this strategy would be to enhance the existing aquatic habitat conditions and eliminate the need for stormwater ponds. This strategy consists of the following measures:

- provision of enhanced infiltration measures for water quality control, groundwater recharge and baseflow enhancement, and to reduce future runoff volumes and erosion stresses;

- stream restoration **within the Brookhill Tributary to create a riffle-pool stream morphology capable of conveying the flow regime associated with the future urban setting and provides aquatic habitat enhancement features;** and
- replacement of the Regional Road 57 culvert structure in order to forego flood (quantity) control requirements within the Brookhill Tributary and to remove a barrier to fish migration.

Provided that construction of these measures would result in a stream corridor with sufficient capacity to accommodate the future flow regime, stormwater management ponds (i.e. for erosion and flood control) would not be required with Strategy No. 4.

Phase 3 - Select A Recommended Subwatershed Plan

Following a Public Information Centre and a series of meetings between Municipal staff, CLOCA staff, local residents, and representatives of the development community, alternative Strategy No. 4 was initially selected to form the proposed Subwatershed Management Plan.

However, subsequent geotechnical investigations on behalf of the landowners groups recommended that centralized infiltration facilities not be used for stormwater management. This recommendation was due in part to low permeability and percolation rates in some parts of the study area, and also due to the fact that sandy soils which were suitable for infiltration were found to be localized in nature and sometimes underlain with less permeable soils.

Therefore, Alternative Strategy No. 1, which does not include the use of centralized infiltration facilities, was selected to form the Recommended Subwatershed Plan.

Phase 4 - Develop an Implementation Plan

Implementation of the Recommended Subwatershed Plan will require the combined efforts of landowners, developers, the Municipality, the Conservation Authority, and public/special interest groups. Implementation considerations for the Subwatershed Management Plan were reviewed with respect to the following:

- future study requirements, including stormwater management plans, environmental impact studies, environmental assessments, hydraulics and floodplain mapping, and tree preservation plans;
- prioritization/phasing considerations, including inter-dependencies of several components of the Subwatershed Plan, and the necessary works to be completed:
 - first, at a broad draft plan level; and
 - subsequently, at the more detailed subdivision/site plan level.
- costs estimates for various components of the Subwatershed Plan, and funding responsibilities between the Municipality and development community, including those which may require cost-sharing agreements;
- approval requirements for the various studies and works recommended in the Subwatershed Plan; and
- recommendations with respect to future monitoring requirements, including:
 - stormwater facility monitoring;
 - erosion monitoring; and
 - stream restoration and fisheries monitoring.