



Lake Simcoe
Region
Conservation
Authority

Young Professionals Committee and
Student Design Competition Sub-Committee

In collaboration with

Lake Simcoe Conservation Authority

WEAO STUDENT DESIGN COMPETITION 2014

PROJECT STATEMENT

UPGRADE OF THE COLONY TRAIL STORM WATER MANAGEMENT POND AND EXPANSION OF STORM WATER MANAGEMENT IN THE EAST HOLLAND SUBWATERSHED

October 2013

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BACKGROUND

Lake Simcoe Region Conservation Authority (LSRCA) addresses watershed management issues in the Lake Simcoe watershed, which encompasses 20 municipal from the Oak Ridges Moraine in the south to the Oro Moraine in the north, through York and Durham regions, Simcoe County and the cities of Kawartha Lakes, Barrie and Orillia.. There are over 400,000 residents living within the Lake Simcoe Watershed, which consists of 18 major river systems, 4,225 kilometers of creek, stream and tributary channels. The watershed is also home to 75 species of fish, with over 50 in Lake Simcoe alone. All rivers within the Lake Simcoe Watershed ultimately drain to Lake Simcoe, which provides a source of safe drinking water to seven municipalities.

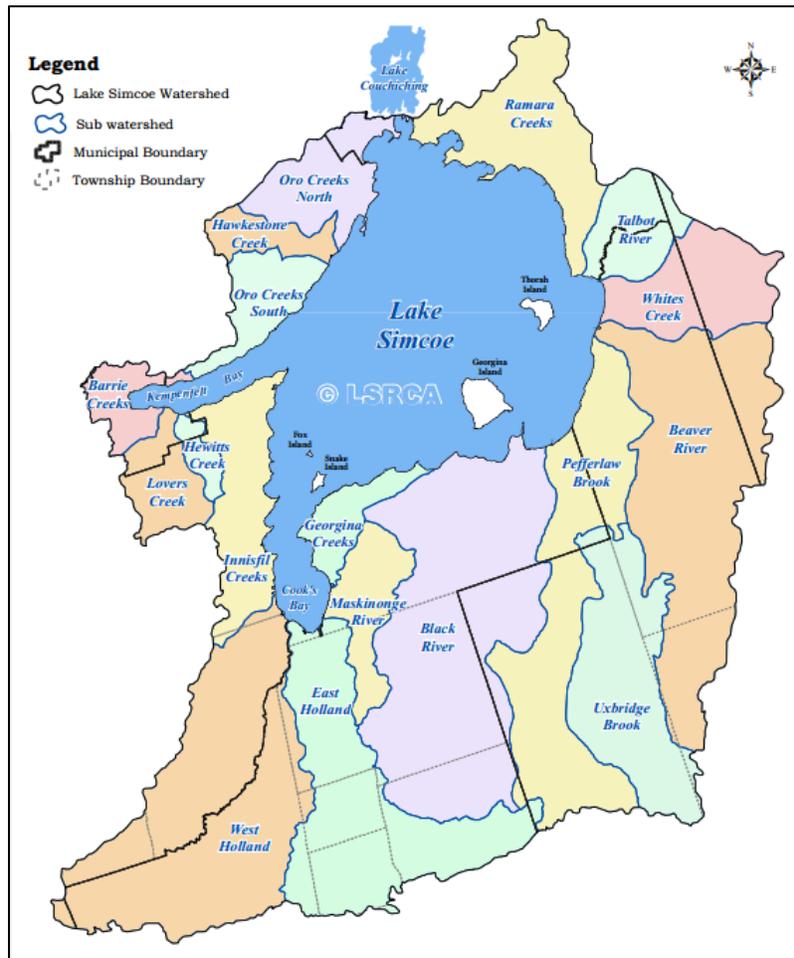


Figure 1. Map showing LSCRA's sub-watersheds in relation to Lake Simcoe.

Within the Lake Simcoe Watershed, the East Holland River Subwatershed is the most urbanized. Table 1 below lists current and projected population growth within the East Holland River Subwatershed. Due to high urbanization within the subwatershed, especially in the Towns of Aurora and Newmarket, storm water runoff is one of the main reasons that the East Holland is the most degraded system¹ and contributes to the phosphorous loading observed in Lake Simcoe.

In 2001, the LSRCA completed the East Holland River Subwatershed Management Plan which included a comprehensive survey of all existing storm water outfalls within the subwatershed. The study concluded that a significant proportion of the urban area within the East Holland River Subwatershed, in the context of storm water management, is either uncontrolled or quantity controlled only with minimal water quality control.

Since then, a total of 279 locations have been identified where storm water management ponds (SWMP) can be constructed or existing ponds can be retrofitted. The Colony Trail SWMP is an example of a SWMP that was recently retrofitted to maximize phosphorus reduction. Figure 2 shows an aerial view of the location of the Colony Trail SWMP.



Figure 2. Aerial View of the location of the Colony Trail Stormwater Management Pond.

¹ "Lake Simcoe Basin Stormwater Management and Retrofit Opportunities 2007",
http://www.lsrca.on.ca/pdf/reports/stormwater_reetrofit.pdf. Accessed September 2013.

Table 1: Current and projected future population for East Holland River Municipalities (Lake Simcoe Region Conservation Authority, 2010)

Municipality	Current	Future (to 2031)
East Gwillimbury	22,930 Total <ul style="list-style-type: none"> • 13,530 Urban area (Sharon, Queensville, Holland Landing) • 3,400 Mt. Albert • 6,000 Rural Area 	88,000 Total <ul style="list-style-type: none"> • 76,100 Urban Area • 5,900 Mt. Albert • 6,000 Rural Area
Aurora	49,7000	70,400
Newmarket	77,600	97,300
Whitchurch-Stouffville*	25,500	60,800

*Only a small percentage of this population falls within the East Holland River subwatershed

Urban storm runoff contains harmful products washed from roads, parking lots and other impermeable surfaces due to rain or melting snow. Storm water in this region has traditionally been only flow-controlled and directed to the nearest water body. However, recent initiatives focused on storm water treatment before it reaches receiving bodies in order to minimize nutrient loading. Growth in population and commercial/industrial use increased impermeable surface areas and reduced the natural capacity of soils to attenuate and treat storm water before it reaches water courses. Table 2 below shows the proportion of impervious surfaces areas within the East Holland River Subwatershed compared to the overall Lake Simcoe Watershed.

Table 2: Comparison of impervious land cover within the Lake Simcoe Watershed and the East Holland River Subwatershed (Lake Simcoe Region Conservation Authority, 2010)

	Area (km ²)	Impervious Area (km ²)	Impervious (%)
Lake Simcoe Watershed	2,601*	238	9.2
East Holland River Subwatershed	247	54	21.9
Impervious areas within the build boundaries of select municipalities	Aurora		48.9
	Newmarket		60.0
	Sharon		63.9
	Holland Landing		39.5

* Area does not include the surface of Lake Simcoe

SWMPs treat flows by reducing levels of suspended solids and nutrients in run off. The existing SWMP at Colony Trail was completed in 2013 and was a retrofit of an existing pond constructed in the 1980s. It consists of:

- A permanent pool with a volume of 360 m³ and a depth of 300 mm;
- Two (2) 1.0 m deep micropool pockets, with extended detention volume of 690 m³ in addition to the permanent volume;
- Total Storage volume of 1,440 m³ at depth of 1.29 m under 25-year design storm conditions with a maximum discharge flow rate of 0.964 m³/s via controlled outlets ;
- Phosphorus Control Facility consisting of a proprietary filtering and sorptive material;
- High Flow and Emergency outlet; and
- A 450 mm diameter outfall pipe into an existing tributary of the Holland River.

Influent and Effluent characteristics will be made available in an addendum at a later date.

OBJECTIVES

The design team is required to provide the following:

- Preliminary design for the a future retrofit of the existing Colony Creek SWP to account for a wider range of pollutants and other concerns as outlined in the Scope of Work.
- Outline of at least two (2) other priority areas within the Lake Simcoe Watershed that would benefit from a SWP and conceptual designs for those sites.

The upgraded pond must be constructed within the limits of the existing site and meet effluent objectives described in the design criteria.

DESIGN CRITERIA

The proposed Phase I design must meet Level 1 Protection as defined by the Ministry of Natural Resources Fish Habitat Protection Guidelines for Developing Areas (1994) and comply with Provincial Water Quality Objectives (PWQO) as summarized in Table 3 below.

Table 3: Removal Efficiencies and Provincial Water Quality Objectives for Phase I Design

Parameter	Percentage Removal	PWQO	
TSS	80%	-	
Total Phosphorus	80%	-	
Ammonia (un-ionized)	-	20 µg/L	
Copper	-	5 µg/L	
Zinc	-	30 µg/L	
Lead	-	Hardness as CaCO ₃ (mg/L)	
		< 30	PWQO (µg/L) 1
		30 to 80	3
		> 80	5
Chromium	-	1 µg/L (Cr VI) 8.9 µg/L (Cr III)	

Cadmium	-	0.2 µg/L
Oil and Grease	-	Should not be present in concentrations that: <ul style="list-style-type: none"> • can be detected as a visible film, sheen or discolouration on the surface • can be detected by odour • can cause tainting of edible aquatic organisms • can form deposits on shorelines and bottom sediments that are detectable by sight or odour, or are deleterious to resident aquatic organisms
Chlorine	-	2 µg/L
<i>Escherichia coli</i>	-	100 <i>E. coli</i> per 100 mL

Other pollutants not specifically mentioned in Table 3 such as pesticides and solvents can be addressed in a qualitative manner.

SCOPE OF WORK

The project documents should address the following elements:

Phase I

Provide a proposal to retrofit the Colony Trail SWMP to address the following pollutants:

- Nitrogen and ammonia
- Phosphorus
- Oil and gas run-off from roads and driveways
- Pesticides
- Cleaning products
- Solvents
- Heavy Metals

The proposal must include a review of the latest developments in treatment technologies for the above pollutants and the engineering feasibility of implementing them.

Other topics that must be addressed in the report are:

- changes to the watershed due to projected loss of permeable ground
- the effects of climate change on quantities of storm water flows
- steps taken to avoid pond anoxia
- temperature increase mitigation

In addition to the technical components of this phase, plans must be submitted for a value-added component that will provide some service or use to the community. Examples of such projects include educational pavilions, bike/hike trails, or enhanced land use such as park land.

Phase II

Identify at least two (2) potentially sensitive areas within the East Holland River Subwatershed that would benefit from implementing various stormwater management technologies and provide preliminary design of these installations.

DESIGN REPORT REQUIREMENTS

The design team is challenged to provide a design report for the proposed expansion. Please refer to the WEAO SDC Guidelines for the acceptable format of the report. The design report should address the following points:

- Population analysis to determine design flow rates up until 2031;
- The resultant run-off coefficient from population and landscape change over that period;
- Storm water and expected effluent characteristics;
- Description of a suitable sampling and monitoring program;
- Comparative discussion of alternative treatment processes;
- Selection of the preferred treatment process (including a decision matrix);
- Preliminary sizing of major equipment or installations;
- Minimizing environmental impact during construction;
- Preliminary capital cost estimate for Phase I upgrades;
- Operating and Maintenance Cost for Phase I expansion; and
- Implementation schedule for Phase I expansion.

There is no limit for the number of appendices attached to the design report. However, the appendices must contain, as a minimum, the following:

- Calculations indicating the expected reduction of pollutants listed in the Phase I requirements achieved by the proposed design. Include all calculation spreadsheets;
- Manufacturer data sheets and catalogues of all major equipment; and
- Design drawings (see below for details).

Design teams may use modeling software, although it is *not required* for the project. If used, the input data and output of modeling software must be included as an appendix and attached to the design report.

DESIGN DRAWINGS REQUIREMENTS

Design drawings must be provided that clearly show the layout of the SWMP retrofit. As a minimum, the following three drawings must be included:

1. Site Plan for the Phase I retrofit including value added component;
2. Hydraulic profile the Phase I retrofit; and
3. A drawing identifying Phase II sites and preliminary layouts;

The drawings must be printed on 11" x 17" landscape sheets, folded and included as an appendix in the design report.

SUPPORTING INFORMATION

The following documents are provided by the Lake Simcoe Region Conservation Authority to aid in the preparation of the design report:

- East Holland River Subwatershed Plan, Lake Simcoe Region Conservation Authority, 2010.
- State of the Watershed Report – East Holland River Subwatershed, Lake Simcoe Region Conservation Authority, 2000
- Environmental Compliance Approval # 4745-8VAPSQ – SWM facility at Colony Trail Boulevard and Stonehill Boulevard
- Integrated Watershed Management Plan, Lake Simcoe Region Conservation Authority, June 2008.
- LSRCA Technical Guidelines for Stormwater Management Submissions, Lake Simcoe Region Conservation Authority, 2013
- Summary of Colony Trail SWM Retrofit (Existing), Lake Simcoe Region Conservation Authority
- Colony Trail SWM Retrofit Drawings (Existing)