Stormwater Database Report: Phase II

2018

Lake Simcoe Region
conservation authority

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Executive Summary

The urban areas of Lake Simcoe watershed are expected to grow 50 percent within the next 20 years, and the population in these areas is expected to double. Additionally, it has been determined that the extent of impervious features in the Lake Simcoe watershed has increased over the last 15 years (i.e. pavements and roads). This combination of population growth and urban expansion means that proper management, inspection and maintenance of stormwater features will be very crucial to the health of the Lake Simcoe watershed.

Lake Simcoe Region Conservation Authority received a grant from the MECP to conduct a study to investigate ways of improving the ability of municipalities to adopt best practices for stormwater management works inspection, maintenance, and record keeping (GHD, 2017). In order to achieve this, Lake Simcoe Region Conservation Authority partnered with five municipalities: Town of Bradford West Gwillimbury, Town of East Gwillimbury, Township of King, Town of Innisfil, and Town of Whitchurch-Stouffville. The City of Barrie also provided data on their stormwater management ponds, but due to time constraints these were added to the database without being visited.

Phosphorous has been determined to be a contributing factor to the degradation of water quality in the Lake Simcoe watershed. This nutrient, along with other pollutants, enters the waterways through runoff from impermeable surfaces during heavy rainfall or snowmelt events. If not properly managed, these pollutants cause unfavorable conditions to develop that lead to deteriorating health of the watershed. One of these unfavorable conditions includes algal blooms which are produced from excess phosphorous and which consume and deplete the oxygen in the water for other aquatic life. The Lake Simcoe Protection Plan and the Lake Simcoe Phosphorous Offset Program are two of the ways in which excess phosphorous is being controlled and reduced in the Lake Simcoe watershed.

Building on existing Lake Simcoe Region Conservation Authority stormwater infrastructure data from previous years, Lake Simcoe Region Conservation Authority staff compiled data from participating municipalities and took an inventory of their stormwater features in the watershed. This included not only stormwater ponds, but also oil and grit separators and low impact development features. Spatial data was collected for these stormwater management features in the field to create a map and GIS layer, and supplementary data was obtained from design drawings and Access Environment.

The resulting dataset included 355 stormwater ponds (169 ponds from this project plus 186 ponds provided by City of Barrie), 106 oil and grit separators and 75 low impact developments features. The database being used to house this information is CityWide, and will be available to all municipalities in the watershed. It will also include work orders for maintenance and inspection tools to assist municipalities with best management practices and regular upkeep of their stormwater management facilities.

Introduction

The Lake Simcoe Watershed boundary begins from the Oak Ridges Moraine in the south to the Oro Moraine in the north and extends over 3,400 square kilometers. Although approximately 10 percent of the watershed is composed of urban areas, more than 40 percent is covered with forests, wetlands and scrublands, and the lake provides a source of safe drinking water to seven municipalities. Figure 1 shows the extent of the Lake Simcoe watershed.

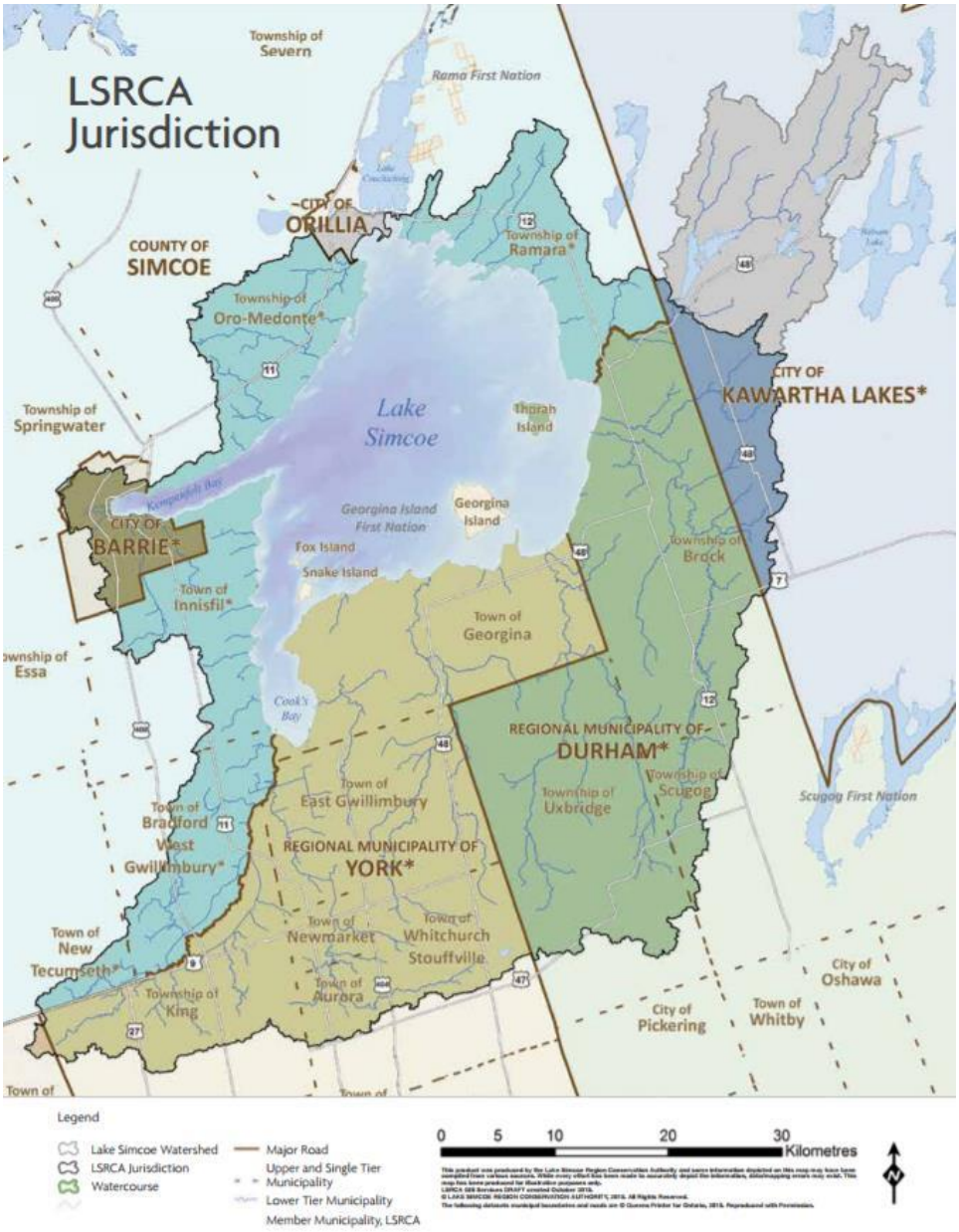

Figure 1: Map of Lake Simcoe Region Conservation Authority watershed

Importance of Urban Stormwater Management

Over the last four decades, the Lake Simcoe watershed has experienced a wide range of pressures and threats, one of which is degraded water quality due to excessive nutrients, such as phosphorus. When present in abundance in the water, phosphorous leads to excessive growth of plants which then decay and take up oxygen in the water that is required for survival of fish and other aquatic species. This is why

phosphorus is considered to be a key water quality concern in Lake Simcoe (Government of Ontario, 2009).

Urban stormwater within the Lake Simcoe watershed represents approximately 31 percent of the phosphorous entering Lake Simcoe (MECP, 2016). Therefore, it is a priority for Lake Simcoe Region Conservation Authority and the Ministry of the Environment, Conservation and Parks to properly manage and reduce phosphorous within the Lake Simcoe watershed (MECP, 2016). The Lake Simcoe Protection Plan and the Lake Simcoe Phosphorous Offset Program are two of the ways in which excess phosphorous is being controlled and reduced in the Lake Simcoe watershed.

The basis of the Lake Simcoe Phosphorus Offset Program is to protect and improve the water quality of Lake Simcoe from impacts of phosphorous. It includes a wide range of strategies including market-based mechanisms and direct trade-offs between phosphorous sources in the Lake Simcoe watershed. Phase 1 of the Lake Simcoe Phosphorus Offset Program aims to offset any residual phosphorous loads from urban stormwater resulting from development, through such measures as retrofitting "existing stormwater discharges elsewhere in the subwatershed or adjacent subwatersheds" (XCG Consultants Ltd & Kieser & Associates, 2014). In order to ensure that offsets achieved through stormwater retrofits are retained over the long term, municipalities who receive funding to implement such projects will need to demonstrate that any Lake Simcoe Phosphorus Offset Program-funded facilities continue to be maintained. When complete, this stormwater facility database will allow tracking of the installation and on-going maintenance of these facilities.

Despite this focus on phosphorus reduction, the extent of impervious area within the Lake Simcoe watershed has increased from 3.4 percent in 2003 to 4.3 percent in 2013. This increase is the most significant in subwatersheds in municipalities that are experiencing rapid growth, such as Hewitts and Lovers Creek near Barrie, West Holland near Bradford West Gwillimbury, and the East Holland which includes parts of Newmarket, Aurora, and East Gwillimbury (LSRCA, 2018).

The Lake Simcoe watershed is one of the fastest growing regions in Canada. According to Ontario's Places to Grow Plan and municipal official plans, it's projected that the urban area in the Lake Simcoe watershed "will increase by approximately 50 percent by the year 2041 and the watershed population will almost double" (LSRCA, 2016). This watershed wide growth will ultimately result in growth in the number of stormwater management facilities, which is why the proper management of these facilities is extremely important.

Importance of Stormwater Facility Maintenance

In order to manage these urban stormwater pressures, it has been a requirement in the Lake Simcoe watershed since 1995 that all new developments must include Level 1 stormwater management facilities for the treatment of stormwater run-off, which are the most stringent type of quality control.

A study and accompanying report titled "Stormwater Pond Maintenance and Anoxic Conditions Investigation" was completed in 2011 in order to assess the current level of efficiency of stormwater ponds and to examine the prevalence and extent of low oxygen conditions in stormwater ponds in the Lake Simcoe watershed.

In terms of pond efficiency, it was discovered that 56 of the 98 ponds studied had dropped by 1 or more levels of efficiency, 12 of which had dropped below Level 4, which is the lowest level of efficiency. This translates to a phosphorous loading increase of 0.81 tonnes to receiving water courses. This highlighted the need for improved monitoring and maintenance of stormwater ponds and as a result, a series of recommendations were provided to address these issues. These included further monitoring and testing

of stormwater ponds and implementation of alternative approaches to stormwater management (including low impact development approaches) (LSRCA, 2011).

Methodology

Municipality Selection

At the end of the first phase of the project, a workshop was held with municipal stormwater and information management staff. They were asked to provide feedback on the results through a smartphone based survey to determine if they see value in a database, and have the resources to create and maintain a database. The results of this survey indicated that most municipalities:

- Have electronic or hardcopy filing of documents with a range of adequacy
- Have daily logbooks
- Do not have a GIS system and/or have a GIS system but only store stormwater management land parcel information
- Wish to use GIS for stormwater management works inspection, operations and maintenance record management

From these results as well as conversations following the initial meeting and discussions with the Lake Simcoe Stormwater Technical Working Group, it became clear that midsize municipalities were those experiencing the greatest gap between the ability to build a database and the ability to maintain one. In order to maximize time in completing this project, those midsize and rapidly growing municipalities were approached to participate in this project. Table 1 describes the level of participation in this phase from each of these municipalities.

Table 1: Municipal participation in Phase II of stormwater database development

Municipality	Partnership status
Aurora	Have existing database, will provide data to be included in watershed database
Barrie	Have existing database, will provide data to be included in watershed database
Bradford	Data gathered and field verified
Brock	Not approached
East Gwilimbury	Data gathered and field verified
Georgina	Did not participate
Innisfil	Data gathered and field verified
King	Data gathered and field verified
Newmarket	Have existing database, will provide data to be included in watershed database
Oro Medonte	Did not participate
Ramara	Not approached
Uxbridge	Not approached
Whitchurch	Data gathered and field verified
York Region	Have existing database, will provide data to be included in watershed database

Pre-existing State of Stormwater Infrastructure Data

There were two existing data sets (in the form of GIS layers) completed in previous years that were used in this project to cross reference Lake Simcoe Region Conservation Authority's existing data to the new municipal data.

1. The Landcover GIS layer, which contained information on stormwater ponds in the Lake Simcoe watershed. The layer was developed to describe land cover throughout the watershed, and where wet stormwater ponds were evident in air photos, they were documented as such.
2. The Stormwater Pond GIS layer was a result of the 2007 stormwater retrofit study, and was populated through field inspection of stormwater ponds in the Lake Simcoe watershed. These ponds were categorized as either Level 1 Pond (80% phosphorus reduction), Level 2 Pond (69% phosphorus reduction), Level 3 Pond (54% phosphorus reduction), Level 4 Pond (40% phosphorus reduction), Quantity Pond, Uncontrolled Pond, or Unknown.

Categorization of Ponds

At the beginning stages of the project, participating municipalities provided information on stormwater ponds and oil and grit separators in the form of a geodatabase. These were then cross referenced with existing Lake Simcoe Region Conservation Authority stormwater infrastructure data to create a complete list, which was then used as a basis for data collection and inventory. Some of the stormwater facilities provided by the municipalities were not in the Lake Simcoe Region Conservation Authority watershed, and therefore, were removed from the list prior to field inspection.

A comparison of data was done among Lake Simcoe's current Stormwater Pond layer, Landcover layer, and the data obtained from municipalities. As a result, stormwater ponds were placed into one of three categories, "A", "B" or "C". Category "A" represented the ponds that exhibited strong characteristics of a stormwater pond and both the municipality and the authority were in agreement of this. Category "B" represented the ponds that were very likely stormwater ponds but required confirmation through in field reconnaissance. Finally, category "C" represented ponds that were unlikely to be stormwater ponds, as they were in an area that was not typical of a stormwater pond, or did not show any characteristics of a stormwater pond. The types of stormwater pond facilities studied in this project were wet ponds, dry ponds and wetlands.

Data Collection

Oil and grit separator data was collected from both the oil and grit separators manufacturers and municipalities. Four oil and grit separators manufacturers were contacted (Imbrium, Minotaur, Echelon Environmental, and Armtec), but unfortunately only one (Echelon Environmental) provided data. The data provided from Echelon Environmental included the entire Contech oil and grit separators inventory throughout the watershed.

Prior to in-field data collection, the features to be studied were identified and location maps were created for these features. Any new ponds were identified prior to field inspection by analyzing aerial images on the GIS software, and through searching the Access Environment database. There were also instances where new ponds were found while in the field.

Data collection for all stormwater features was completed in the field using a cell phone app called "Survey123" and a handheld GPS unit. The Survey123 app collected some specific information on stormwater ponds (i.e. whether the pond was online or offline, wet or dry, information pertaining to the inlets and outlets, etc.), oil and grit separators, and low impact developments; and the GPS unit collected location information for all stormwater features.

In cases where facilities were encountered that were in fact not stormwater facilities, or were no longer utilized as such, they were removed from the database. This was first reviewed by a manager as well as the municipal staff in order to confirm that is was not a stormwater pond.

Supplementary Data

For stormwater management ponds As Built drawings, stormwater management reports, and Environmental Compliance Approvals were collected from municipalities and used to populate the database. If not available through these sources, Access Environment (via Ministry of the Environment, Conservation and Parks website) was also used to search for Environmental Compliance Approvals in order to gather supplementary data required for the database. For each municipality, the Environmental Compliance Approvals were searched for by each facility's lot and concession number. Additional information that was extracted for stormwater ponds includes such details as:

- Drainage area
- Permanent pool volume
- Extended detention volume
- Total storage volume
- Inlet/Outlet (Size, pipe type, elevation, etc.)
- Control structure specifications

In terms of oil and grit separators, the Environmental Compliance Approvals contains information on model name, drainage area, sediment storage capacity, oil storage capacity and total storage capacity.

In cases where discrepancies existed between the design drawings and the Environmental Compliance Approvals for permanent pool volumes, the volume calculated in the design drawing has been considered as the representative of the permanent pool volume while the volume mentioned in the Environmental Compliance Approvals has also been noted. Likewise, in cases where there were discrepancies between inlet structures for various storm events, the pipe size for All Storm Events has been considered as the representative of the inlet pipe size. For the inlet/outlet pipe invert elevations, the invert elevation where the pipe meets the pond's forebays (for inlet) and permanent pool (for outlet) were noted as the representative invert elevations.

Data Analysis

Once the in-field data collection was complete, spatial data collected in the field was converted to a geodatabase file by a GIS Technician at Lake Simcoe Region Conservation Authority. There were four resulting layers: "StormWMPond" which captured stormwater management ponds, "StormWMInletOutlet" which captured inlets and outlets of stormwater ponds, "StormOilGritSeparator", which captured oil and grit separators and "StormWMLID" which captured low impact developments. The stormwater ponds and low impact developments features were captured as polygons and the oil and grit separators were captured as points in GIS.

Results

Number of Facilities

From Table 1 it is evident that obtaining a complete inventory of all stormwater features in the watershed required gathering data from multiple sources. These sources included the municipalities, manufacturers (for oil and grit separator information), Ministry of the Environment, Conservation and Parks, and also from existing Lake Simcoe Region Conservation Authority databases.

Table 2: A summary of the total number of stormwater facilities (ponds, oil and grit separators, and low impact developments) in the Lake Simcoe watershed that were provided by municipalities, manufacturers, or Ministry of the Environment, Conservation and Parks, and the number of facilities that were added by Lake Simcoe Region Conservation Authority.

Municipality	Stormwater Facility Type	Number of Facilities Provided*	Number of Facilities Added by Lake Simcoe Region Conservation Authority**	Total Number of Facilities
City of Barrie	Ponds	185	0	185
City of Barrie	Oil and Grit Separators	0	0	0
City of Barrie	Low Impact Developments	0	0	0
Town of Aurora	Ponds	0	0	0
Town of Aurora	Oil and Grit Separators	21	0	21
Town of Aurora	Low Impact Developments	0	3	3
Town of Bradford West Gwillimbury	Ponds	22	0	22
Town of Bradford West Gwillimbury	Oil and Grit Separators	5	7	12
Town of Bradford West Gwillimbury	Low Impact Developments	0	1	1
Town of East Gwillimbury	Ponds	45	4	49
Town of East Gwillimbury	Oil and Grit Separators	2	4	6
Town of East Gwillimbury	Low Impact Developments	0	1	1
Town of Innisfil	Ponds	55	5	60
Town of Innisfil	Oil and Grit Separators	22	0	22
Town of Innisfil	Low Impact Developments	0	1	1
Township of King	Ponds	7	2	9
Township of King	Oil and Grit Separators	3	2	5
Township of King	Low Impact Developments	0	0	0
Town of Newmarket	Ponds	87	0	87
Town of Newmarket	Oil and Grit Separators	17	0	17
Town of Newmarket	Low Impact Developments	12	14	26

Municipality	Stormwater Facility Type	Number of Facilities Provided*	Number of Facilities Added by Lake Simcoe Region Conservation Authority**	Total Number of Facilities
Town of Whitchurch-Stouffville	Ponds	26	0	26
Town of Whitchurch-Stouffville	Oil and Grit Separators	0	3	3
Town of Whitchurch-Stouffville	Low Impact Developments	17	1	18
York Region	Ponds	1	0	0
York Region	Oil and Grit Separators	0	0	0
York Region	Low Impact Developments	0	0	0

*Oil and grit separator data provided by manufacturer (Contech), ponds and low impact developments data provided by respective municipalities

**From existing database, Access Environment (Ministry of the Environment, Conservation and Parks) air photos and/or in field

After thoroughly reviewing the data provided by municipalities, Ministry of the Environment, Conservation and Parks, and Access Environment, it became clear that there were various common data gaps that existed across many of the municipalities. Table 3 summarizes which information was provided by municipalities, either partially or full (signified by a "✓"), which information was added by Lake Simcoe Region Conservation Authority (signified by a "+"), and which information was not provided by municipalities nor added by Lake Simcoe Region Conservation Authority (signified by a "-") because it was not available.

Table 3: A summary of the number of features that were either provided by the municipality (indicated by a ✓ symbol), added by Lake Simcoe Region Conservation Authority (indicated by a + symbol), or not provided by the municipality nor added by Lake Simcoe Region Conservation Authority (indicated by a – symbol).

Stormwater Management Facility: Stormwater Ponds

Feature	King	Bradford	East Gwillimbury	Innisfil	Whitchurch-Stouffville
Environmental Compliance Approvals/Certificate of Approval	+	✓	✓	+	+
Catchment Area	+	+	+	+	+
Ownership	-	-	✓	✓	-
Managed by	-	-	-	✓	✓
Assumption Status	-	✓	✓	✓	✓
Subwatershed	+	+	✓	+	+
Subdivision	-	✓	✓	✓	-

Feature	King	Bradford	East Gwillimbury	Innisfil	Whitchurch-Stouffville
Northing UTM	+	+	+	+	+
Easting UTM	+	+	+	+	+
Certificate of Completion ID	-	-	-	-	-
Online/Offline	+	+	✓	+	+
Permanent pool Volume	+	+	+	+	+
Extended Detention Volume	+	+	+	+	+
Total Storage Volume	+	+	+	+	+
Inlet/Outlet Specifications	+	+	+	+	+
Control Structure Specifications	+	+	+	+	+
Facility Type	+	+	✓	✓	✓
Installation date	-	✓	-	✓	-
Year Built	-	-	-	-	✓
Year Assumed	-	-	-	-	✓
Year Inspected	-	-	-	-	-
Year Cleaned	-	-	-	-	-
GIS Data - Last Edit Date	-	-	-	✓	✓
GIS Data - Last Editor	-	-	-	✓	✓

Stormwater Management Facility: Oil and Grit Separators

Feature	King	Bradford	East Gwillimbury	Innisfil	Whitchurch-Stouffville
Environmental Compliance Approvals/Certificate of Approval	+	+	+	+	+
Certificate of Completion ID	-	-	-	-	-
Model	✓	✓	✓	✓	✓
Total Volume	+	+	+	+	+
Catchment Area	+	+	+	+	+
Upstream/Downstream Invert	-	-	-	-	-
Depth	-	-	-	-	-
Year Built	+	+	+	+	+
Year Assumed	-	-	-	-	-
Year Inspected	-	-	-	-	-
Year Cleaned	-	-	-	-	-
GIS Data - Last Edit Date	-	-	-	-	-
GIS Data - Last Editor	-	-	-	-	-

Stormwater Management Facility: Low Impact Development

Feature	King	Bradford	East Gwillimbury	Innisfil	Whitchurch-Stouffville
Environmental Compliance Approvals/Certificate of Approval	N/A	-	-	-	-
Certificate of Completion ID	N/A	-	-	-	-
Year Built	N/A	+	+	+	+
Year Assumed	N/A	-	-	-	-
Year Inspected	N/A	-	-	-	-
Year Cleaned	N/A	-	-	-	-
GIS Data - Last Edit Date	N/A	-	-	-	✓
GIS Data - Last Editor	N/A	-	-	-	✓

Figure 2 shows the location of all the stormwater management features collected and documented within the Lake Simcoe watershed in 2018 for the five participating municipalities. Each feature is represented by a different color for clarity (i.e. ponds are represented in blue, oil and grit separators are represented in orange, and low impact developments are represented in green).

It should be noted that the features represented as triangles in the map in Figure 2 are stormwater management facilities that were added to the database but not visited by field staff. This was due to various reasons such as lack of access to fenced facilities, active construction sites, health and safety issues, or time constraints.

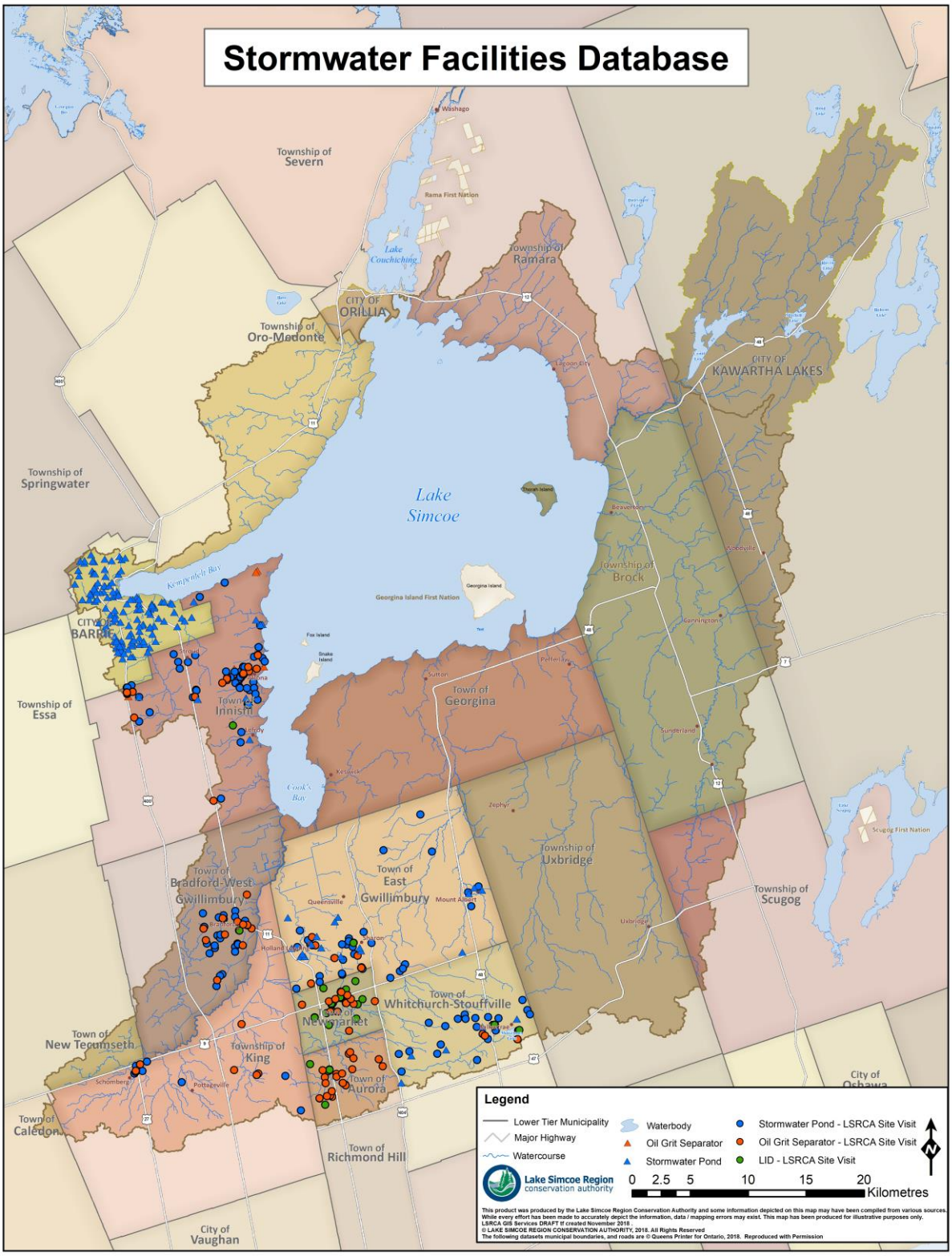

Figure 2: Location of stormwater management features (ponds, oil and grit separators and low impact developments) in selected municipalities in the Lake Simcoe watershed

The 2011 “Stormwater Pond Maintenance and Anoxic Conditions Investigation” report documented 135 wet ponds and 142 dry ponds in the Lake Simcoe watershed. There are now 355 documented and mapped stormwater ponds in the watershed; however, not all municipalities have participated yet, so this remains an incomplete number.

In addition to the ponds, there were 262 inlets and outlets added to GIS and the database, as well as 106 oil and grit separators (the first mapped dataset of oil and grit separators in the Lake Simcoe watershed). It should be noted that this dataset only includes oil and grit separators within the watershed from one manufacturer and therefore there may be opportunities to add more from other manufacturers in the future. There were also 75 low impact developments features added to GIS and the database.

General Observations

After having the opportunity to visit many ponds and low impact developments features in the Lake Simcoe watershed, the field staff were able to assess and provide a general qualitative overview of their overall condition. See Figures 3-15 for examples of good and poor conditions of stormwater ponds and low impact developments features.

Stormwater Ponds

Most of the ponds visited appear to be in good condition with a clear inlet and outlet and an easily accessible route around the perimeter of the pond. These ponds tended to be newer, more recently constructed ponds and didn’t seem to have any evident deficiencies (Figures 3-6).

Figure 3: Stormwater pond in good condition

Figure 4: Stormwater pond in good condition

Figure 5: Stormwater pond in good condition

Figure 6: Stormwater pond outlet in good condition

There were some ponds that were in poor condition with severe erosion around the perimeter (Figure 7), very heavily vegetated inlets/outlets (Figure 8), material obstructing the inlets/outlets (Figure 9), and significant silt/sediment buildup around the inlets (Figure 10). These ponds seemed to be older and were not well maintained and as a result appeared not to be functioning efficiently.

Figure 7: An inlet experiencing erosion/runoff from adjacent parking lot

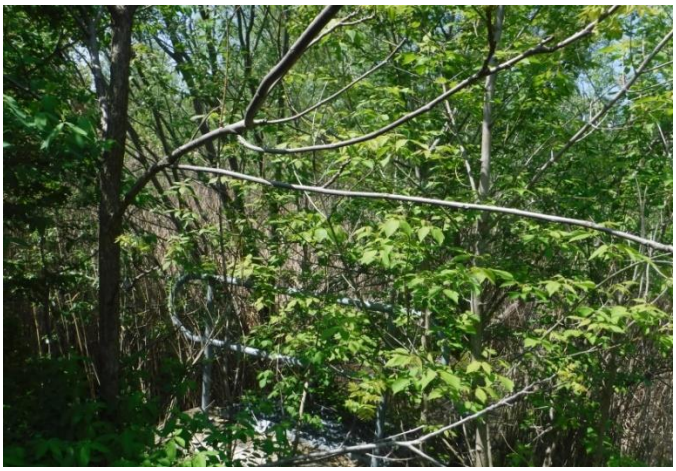

Figure 8: An outlet in heavily vegetated, not well maintained area

Figure 9: Sediment build-up/siltation in inlet of stormwater pond

Figure 10: Debris in inlet obstructing flow

Low Impact Developments

The low impact development features were generally in good condition, meaning there was little to no erosion or sediment build up, and the rain gardens and permeable pavements were clean and appeared to be functioning properly (Figures 11-13). These were also relatively new low impact developments features.

Figure 11: Rain garden and permeable pavement

Figure 12: Rain garden

Figure 13: Rain garden

There were also some low impact developments features that were in poor condition. Some of these deficiencies that were noted include erosion, exposed bio filters, and sediment build-up/siltation (Figures 14-15).

Figure 14: A bioswale with exposed bio filter and significant erosion of the top soil layer

Figure 15: A bioswale with sediment build up/siltation

Conclusions

Overall, the interaction with municipal stormwater staff, the field data collection, data entry, and gathering of supplemental data went smoothly. There were, however, some barriers to note as well as lessons learned and next steps for the next phases of the project.

Barriers

There were some stormwater features that were located on private property, including industrial, commercial and residential properties. It was challenging to gain access to these facilities as permission was required from the property owner. Lake Simcoe Region Conservation Authority staff crafted letters to these property owners detailing the project and the reasons for needing access to the facility on their property. However, there were very few property owners who granted access and therefore, most of these private facilities were unable to be visited and therefore no data was collected for these facilities.

There were also issues with accessing the stormwater ponds for some municipalities. The question of access was posed at the introductory meetings between Lake Simcoe Region Conservation Authority field staff and municipal staff, but field staff encountered many fenced ponds that required a key in order to access. Once a key was obtained, the data was able to be collected for these ponds.

This project began with the understanding that municipalities varied in their stormwater management data storage and availability, which was why this project proved necessary. While some municipalities had advanced since the first phase of this project, others still do not have the resources for proper management or digitizing of data. Another difficulty was in the design drawings themselves; older design drawings were not legible and therefore staff were unable to extract any data from them.

The oil and grit separator location descriptions that were provided by the manufacturer Contech were not always complete or accurate. Additional time is required for the field staff to successfully locate and map the oil and grit separators, which may involve revisiting the same sites several times.

Lessons Learned

There were many lessons learned throughout the duration of the project and some aspects which, if the project was repeated, staff would do differently. These include:

- Add access type and fence to the Survey123 app so that field staff can note this in the field rather than try to recall post field inspection
- Add “Rain Garden” and “Curb Cut” to drop down menu options for low impact developments type in the Survey123 app as these were the most encountered low impact developments types
- Collect of points with the GPS unit and Survey123 app of any fences or other non-stormwater features that were present on site at time of data collection
- Receive permission in advance from property owners (residential/commercial) for field staff to inspect private stormwater management facilities on their property
- Obtain keys from municipal staff prior to field collection
- In terms of the data model, it is recommended that the unavailable data or data that was more time consuming and difficult to find (i.e. from Table 2), be made optional. This would allow for higher prioritization of the important/critical data and more time spent focusing on locating these.

Next Steps

Due to time constraints, there were municipalities that were unable to be visited and assessed. The next phase of the project could consist of repeating the same methodology from this phase with the remainder of the municipalities in the watershed. These would include Oro-Medonte, Georgina, Orillia, Uxbridge, Aurora and Barrie. The data collection would again include all stormwater ponds, oil and grit separators, and low impact developments features in the watershed.

In terms of the private stormwater management facilities, it would be beneficial for the next phase of the project to budget time for personally contacting each landowner in order to gain access. This could consist of contacting them over the telephone, visiting their property, or setting up a meeting to discuss our methodology and reasons for needing access.

There still remain data gaps in existing facilities that staff were not able to locate or find with the information provided by municipalities or from Access Environment. It would be beneficial to receive more support from the Ministry of the Environment, Conservation and Parks in terms of locating this information and working with Lake Simcoe Region Conservation Authority more closely to fill in these data gaps.

In order to ensure that this database is used, and that municipalities are encouraged to conduct inspection, maintenance and monitoring activities in accordance with best practices, a series of training sessions will be provided. These sessions will be for municipal staff that are responsible for inspecting, maintaining or monitoring stormwater management facilities.

References

GHD. (2017). *Lake Simcoe Region Conservation Authority: Stormwater Inspection and Record Management Best Practices, Data Model Design, and Comprehensive Report*

Government of Ontario. (2009). *Lake Simcoe Protection Plan.* Queen's Printer for Ontario.

Lake Simcoe Region Conservation Authority (LSRCA). (2007). *Lake Simcoe Basin Stormwater Management and Retrofit Opportunities.*

Lake Simcoe Region Conservation Authority (LSRCA). (2011). *Stormwater Pond Maintenance and Anoxic Conditions Investigation Report.*

Lake Simcoe Region Conservation Authority (LSRCA). (2016). *2016-2020 Strategic Plan.*

Lake Simcoe Region Conservation Authority (LSRCA). (2017). *Distribution And Change In Impervious Cover In The Lake Simcoe Watershed, 2002 to 2013.*

Ministry of Environment, Conservation and Parks (MECP). (2016). *Lake Simcoe Phosphorus Reduction Strategy.*

XCG Consultants Ltd & Kieser & Associates, LLC. (2014). *Lake Simcoe Phosphorous Offsetting Program.*