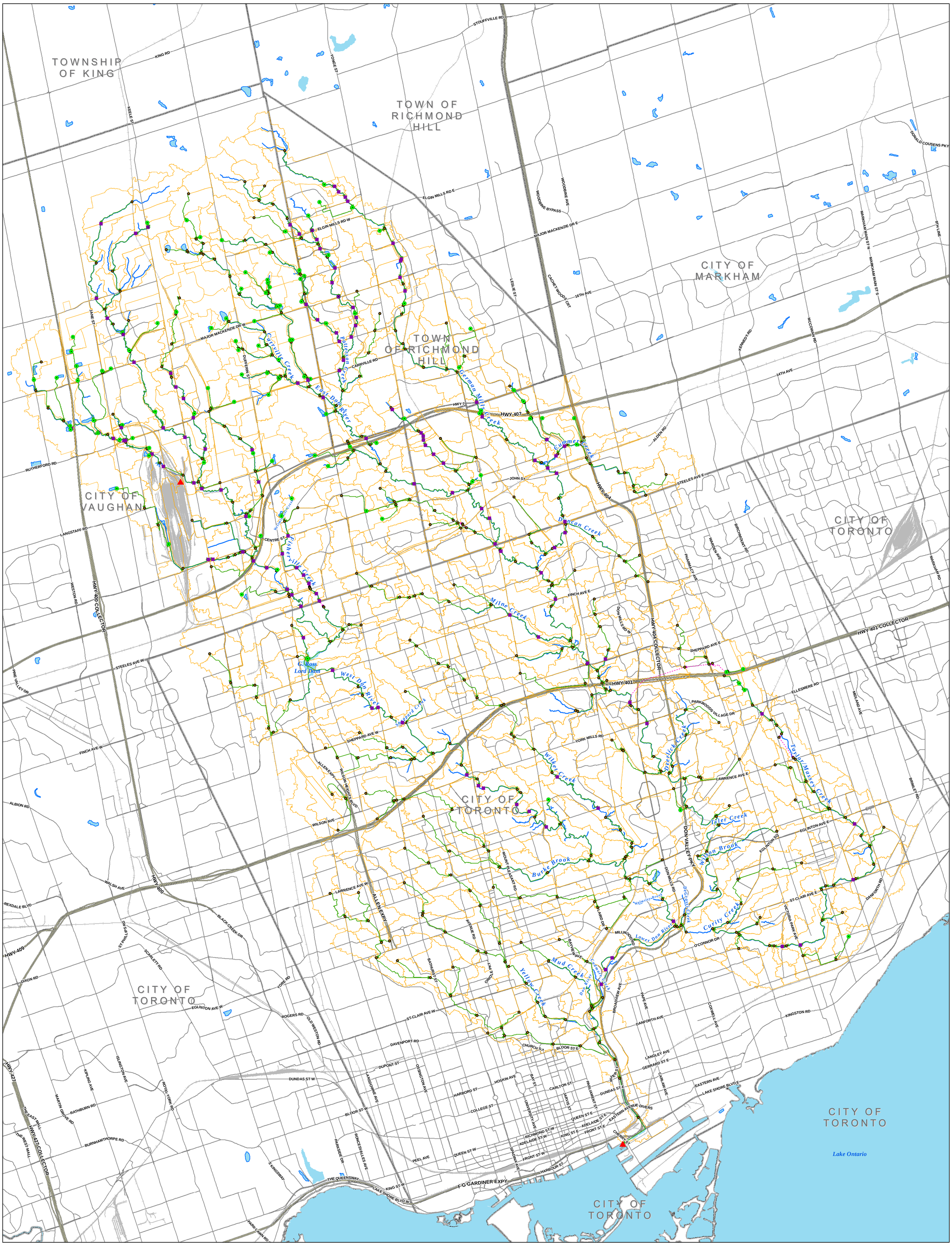
APPENDIX A5

2017 DON RIVER HYDROLOGY UPDATE AECOM

Last saved by: CHUNGO (2018-04-12) Last Plotted: Thu Apr 12, 2018
Filename: X:\60528844_DON\GIS\MXDS\60528844_MODEL ELEMENTS.MXD
Project Management Initials: Designer: levesquei Checked: Approved: ANSI D 558.8mm x 863.6mm



N
W E
S

1:50,000
NAD 1983 UTM Zone 17N

0 625 1,250 2,500 3,750 5,000 m

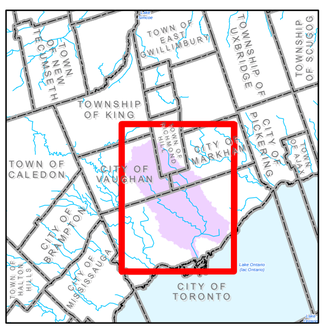
Basemap: Ontario Ministry of Natural Resources & City of Toronto
Additional Sources:
Ortho-Imagery:

Legend

- Freeway
- Major Road
- Major Railways
- Municipalities
- Waterbodies
- Watercourses
- Junctions
- Crossings
- Storages
- Outfalls

Conduits

- Natural Conduits
- Sewer
- Subcatchments



Key Map

2017 DON RIVER HYDROLOGY UPDATE

Toronto and Region Conservation Authority, Ontario
Project No.: 60528844 Date: April 2018

MODEL ELEMENTS

AECOM

Figure: E1

APPENDIX A6

STORMWATER MANAGEMENT POND 4

CITY OF VAUGHAN
OCTOBER, 2013

STORMWATER MANAGEMENT POND 4
FINAL REPORT

ANDRIDGE HOMES, MAJOR BOB FARMS INC. & LINDSTONE DEVELOPMENTS, BLOCK 12

CITY OF VAUGHAN

Project: 2004 – 2644
REF: 1822

October 2013

SCHAEFFERS
CONSULTING ENGINEERS
6 Ronrose Drive
Concord, Ontario L4K 4R3

Table of Contents

List of Tables

List of Figures

Appendices

1 INTRODUCTION

1.1 Study Objectives and Location

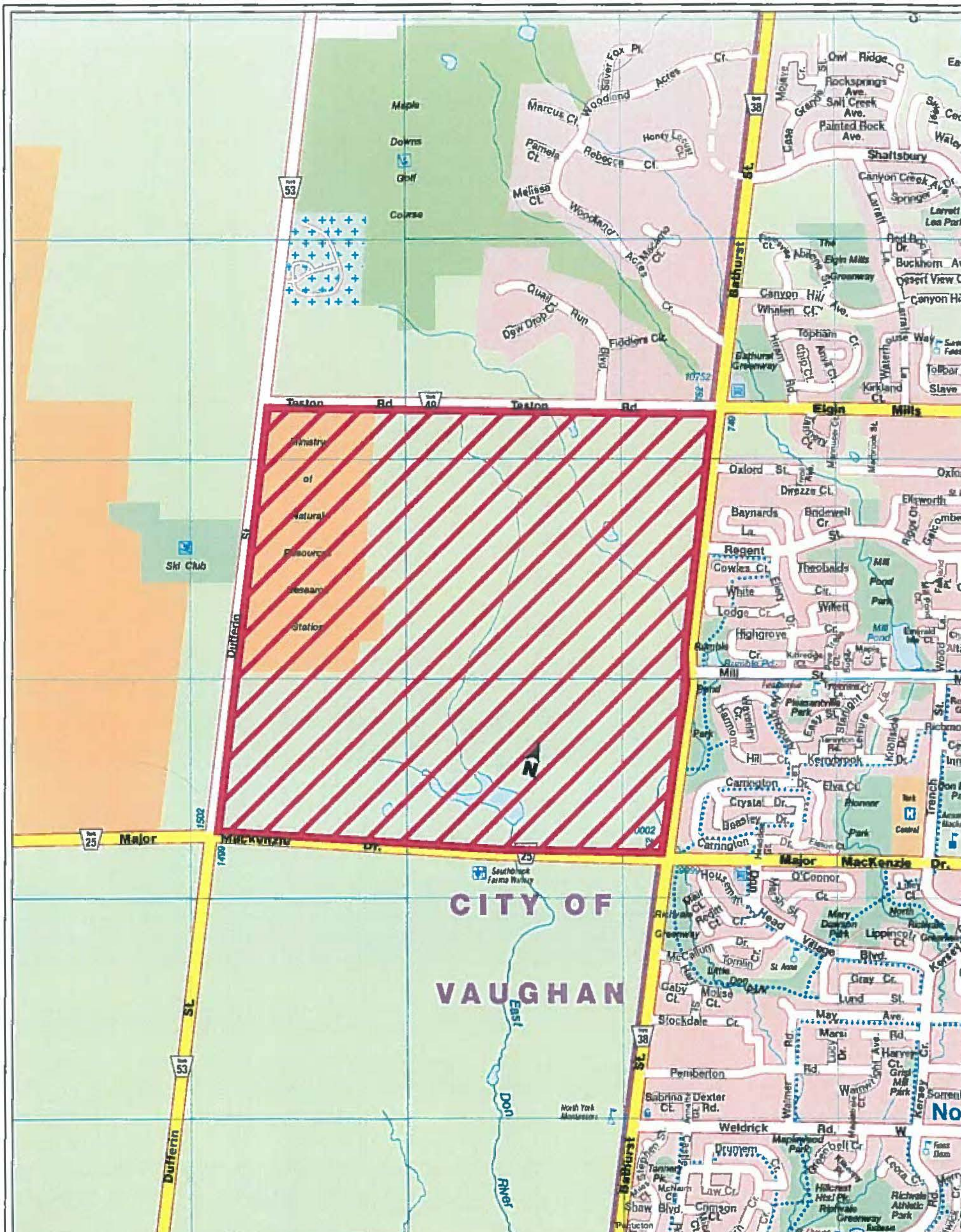
This report is provided in support of the final submission for stormwater management (SWM) Pond 4, servicing the Andridge Homes, Major Bob Farms Inc., and Lindstone Developments parcels within Block 12 in the City of Vaughan. The report demonstrates that the constructed pond will operate as designed and will provide erosion water quality and quantity controls according to the City of Vaughan stormwater management design criteria.

SWM Pond 4 is located at the east part of Block 12 (Figure 1.1). Block 12 is bounded by Teston Road to the north, Bathurst Street to the east, Major Mackenzie Drive to the south and Dufferin Street to the west. The Andridge Homes parcels 1C, 1D and 1E, Major Bob Farms Inc. parcel, and Lindstone Developments parcel, as well as the non-participating 1143264 Ontario Ltd. Parcel and a portion of the non-participating Kreiner lands (Figure 1.2 and Figure 1.3) with contributing drainage area to SWM Pond 4 are composed of single family residential units, a place of worship, and a neighbourhood commercial block.

1.2 Background

The approved "Stormwater Management Pond 4 Design Report" was prepared by Schaeffers Consulting Engineers in January 2005. This report is consistent with the Block 12 MESP/EIS, Addendum and other Block Plan reports and takes into consideration discussions with the City of Vaughan and the Toronto and Region Conservation Authority (TRCA). The design of SWM Pond 4 has complied with the MESP/EIS and Addendum reports which specify target release rates and storage requirements and other environmental protection measures for the SWM pond. Details of these requirements and measures are presented in later sections. The Block 12 supporting documentation includes:

- *Unit Flow Rates for Stormwater Control, Upper Don River Watershed*, By Marshall Macklin Monaghan Limited, 1994;



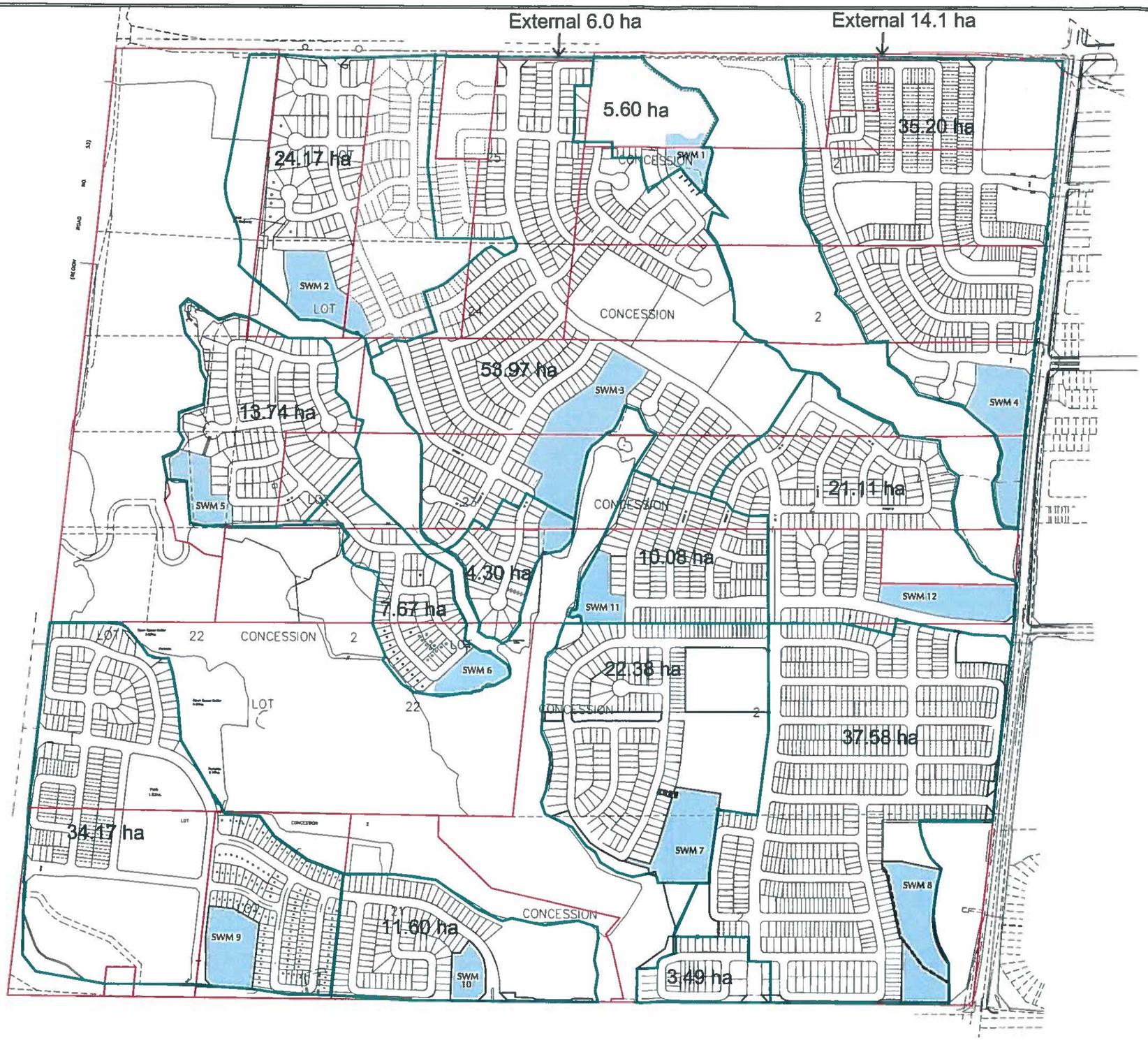
SCHAEFFERS
CONSULTING ENGINEERS

LEGEND

BLOCK 12

FIGURE 1.1
BLOCK 12
LOCATION PLAN

2004-2644	OCTOBER 2013	SCALE: N.T.S.



BLOCK 12
CITY OF VAUGHAN

LEGEND

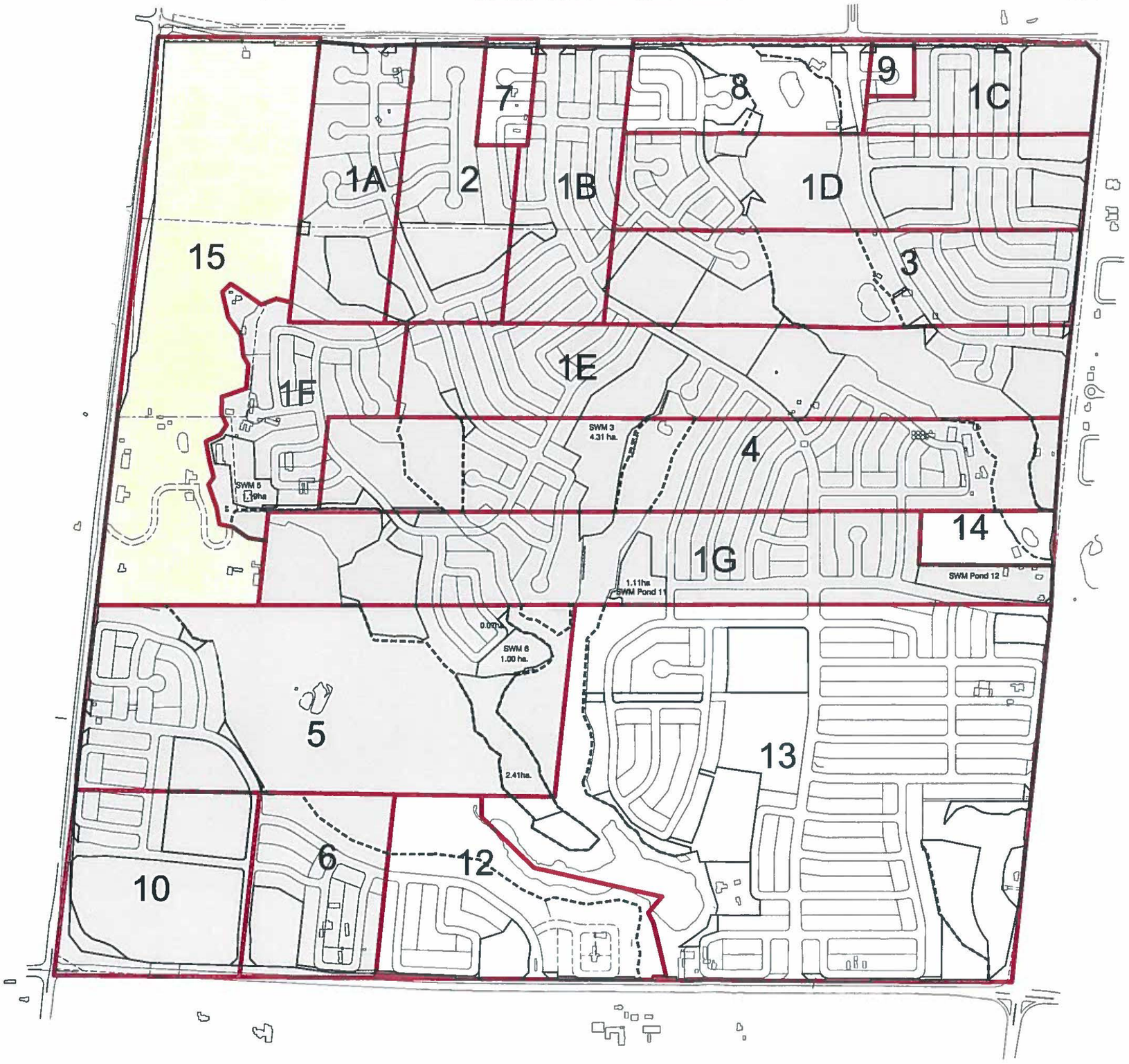
STORMWATER MANAGEMENT PONDS

TRIBUTARY AREA BOUNDARIES

SCHAEFFERS
CONSULTING ENGINEERS

FIGURE 1.2
STORMWATER MANAGEMENT PLAN

2004-2644	OCTOBER 2013	SCALE: N.T.S.



BLOCK 12
CITY OF VAUGHAN

LEGEND

Participating Owners

1A ANDRIDGE HOMES (FOUR)
1B ANDRIDGE HOMES (FOUR)
1C ANDRIDGE HOMES (FIVE)
1D ANDRIDGE HOMES (FIVE)
1E ANDRIDGE HOMES (THREE)
1F ANDRIDGE HOMES (TWO)
1G ANDRIDGE HOMES
2 MIDVALE ESATES INC
3 MAJOR BOB FARMS INC.
4 LINDSTONE DEVELOPMENTS
5 MAYVON INV.
6 ROYAL GARDEN HOMES
10 FERNBROOK et al.

Non-Participating Owners

7 ANDERSON
8 KREINER
9 1143264 ONTARIO LTD.
12 SENANG INV. LTD.
13 HELMHORST INV.
14 FIRST KOREAN PRES. CHURCH

Others (Not Developable)

15 CITY OF VAUGHAN

SCHAEFFERS
CONSULTING ENGINEERS

FIGURE 1.3
BLOCK 12 OWNERSHIP PLAN

2004-2644	OCTOBER 2013	SCALE: N.T.S.

- *Block 12 Master Environmental Servicing Plan (MESP) and Environmental Impact Statement (EIS), City of Vaughan*, by Gartner Lee Limited, Malone Given Parsons Ltd, Schaeffers Consulting Engineers, iTrans Consulting Inc. and Paul Cosburn Associates Limited, September, 1999;
- *Block 12 Master Environmental Servicing Plan and Environmental Impact Statement, Volumes I & II, City of Vaughan*, by Gartner Lee Limited, Malone Given Parsons Ltd, Schaeffers Consulting Engineers and Paul Cosburn Associates Limited, Revised October, 2001;
- *Block 12 Block Plan and Urban Design Guidelines*, By Malone Given Parsons Ltd, Gartner Lee Limited, Schaeffers Consulting Engineers, J.H. Stevens, Paul Cosburn Associates, iTrans Consulting Inc., Valcoustics Canada Ltd and Archaeological Services Inc., November, 2001;
- *Block 12 MESP Addendum Attachments, City of Vaughan*, By Schaeffers Consulting Engineers, November, 2002;
- *Erosion Analysis Report, East Don River, Blocks 11, 12 & 18, City of Vaughan*, By Schaeffers Consulting Engineers, Revised July, 2003;
- *Block 12 Block Plan Report*, By Malone Given Parsons Ltd, Gartner Lee Limited, Schaeffers Consulting Engineers, Paul Cosburn Associates, J.H. Stevens, iTrans Consulting Inc., Poulos & Chung Limited, Archaeological Services Inc., and Valcoustics Canada Ltd, August, 2003;
- *Block 12, Master Environmental Servicing Plan and Environmental Impact Statement Addendum, City of Vaughan*, By Gartner Lee Limited, Malone Given Parsons Ltd and Schaeffers Consulting Engineers, August, 2003;
- *Block 12 Oak Ridges Moraine Conservation Plan Conformity Report*, By Malone Given Parsons Ltd, August, 2003;
- *Block 12 Urban Design Guidelines*, By Paul Cosburn Associates Limited, August, 2003;
- *Response to Comments on Revised Block 12 Plan MESP*, Prepared for City of Vaughan, By Schaeffers Consulting Engineers, August, 2003;

- *Supplementary Information, Block 12 Urban Village 2, Don River Watershed, City of Vaughan*, Submitted to TRCA, By Schaeffers Consulting Engineers, August, 2003;
- *Supplementary Information, Block 12 Urban Village 2, Don River Watershed, City of Vaughan*, Submitted to TRCA, By Schaeffers Consulting Engineers, February, 2004;
- *Block 12 Landscape Masterplan & Urban Design Guidelines*, By Paul Cosburn Associates Limited, April 2004;
- *Terrestrial Resources Edge Management Plan – Phase 1, Block 12, City of Vaughan*, By Aboud & Associates Inc., September 2004.

2 STORMWATER MANAGEMENT POND DESIGN

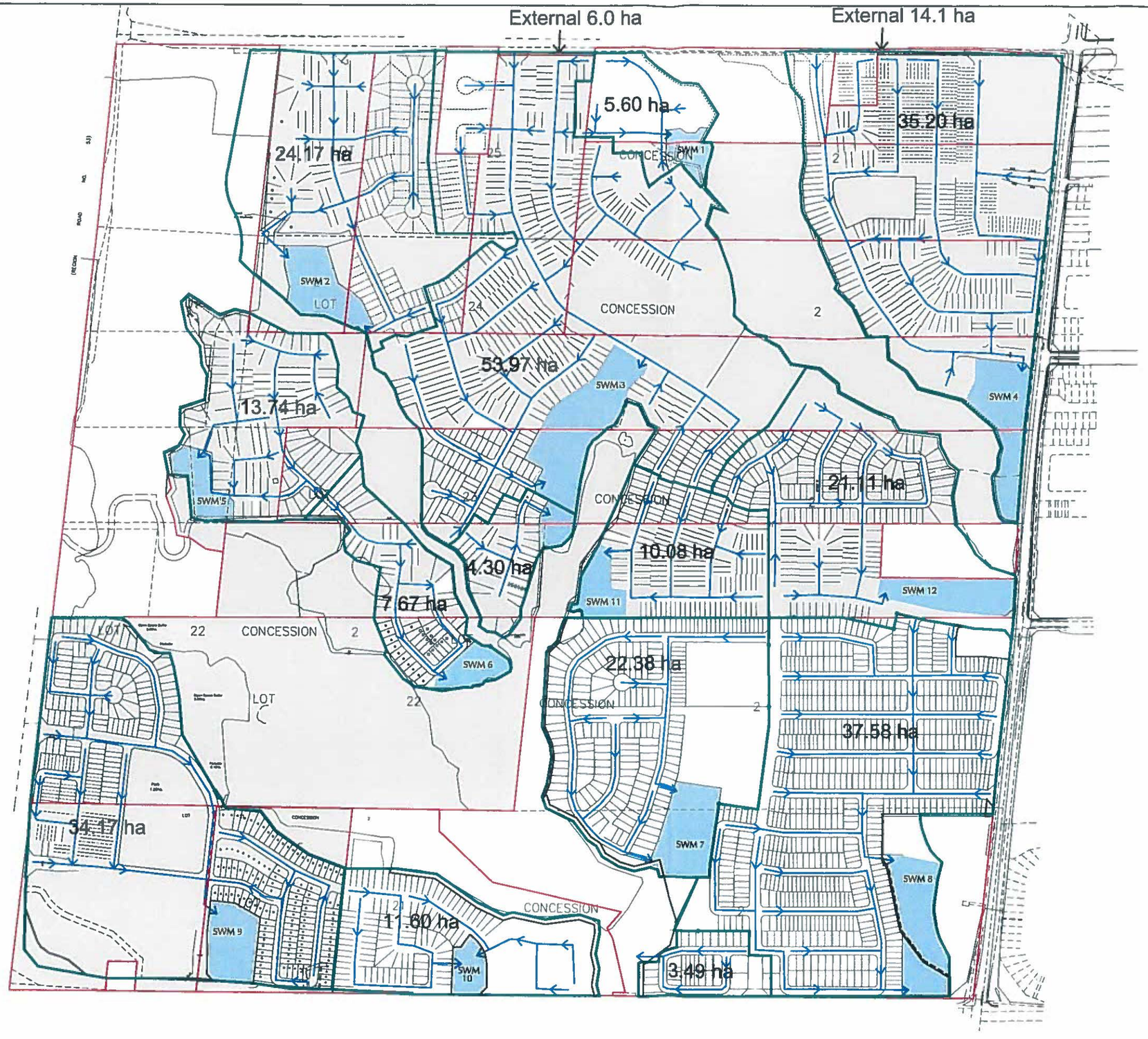
2.1 Stormwater Management Plan

The stormwater management plan for the Andridge Homes, Major Bob Farms Inc., and Lindstone Developments parcels within the SWM Pond 4 drainage area involves water quality and water quantity control via the SWM facility. The SWM facility is located adjacent to valley land and is integrated into the natural environment. It has been designed to encourage safe public access and has been integrated into the natural and trail system. The stormwater drainage plan for SWM Pond 4 is illustrated in Figure 2.1 and Figure 2.2 for reference. The SWM pond has two storm inlets to a provided forebay (Figure 2.1 and drawings in Appendix D). The SWM pond discharges to McNair Creek, southwest of the pond. Simulations of post-development release rates and storage volumes were prepared using the computer model Visual OTTHYMO to demonstrate that post-development runoff would be controlled to pre-development target flows during the 2-year through 100-year storm events. The design criteria and operational details of the constructed SWM Pond 4 are provided in the following sections and accompanying Engineering Drawings No. SWM4-1 to SWM 4-6 in Appendix D.

2.2 Design Criteria

The SWM Pond 4 was designed based on MOE Stormwater Management Planning and Design (SWMPD) Manual (March 2003). Additional SWM design criteria as recommended by the City of Vaughan and the Toronto and Region Conservation Authority (TRCA) have been integrated into the overall design. A summary of the stormwater management design criteria is as follows:

- *Enhanced* water quality protection is required. The permanent pool storage should have a maximum depth of 2.0 m and be calculated using Table 3.2 from the MOE SWMPD Manual (March 2003);



BLOCK 12
CITY OF VAUGHAN

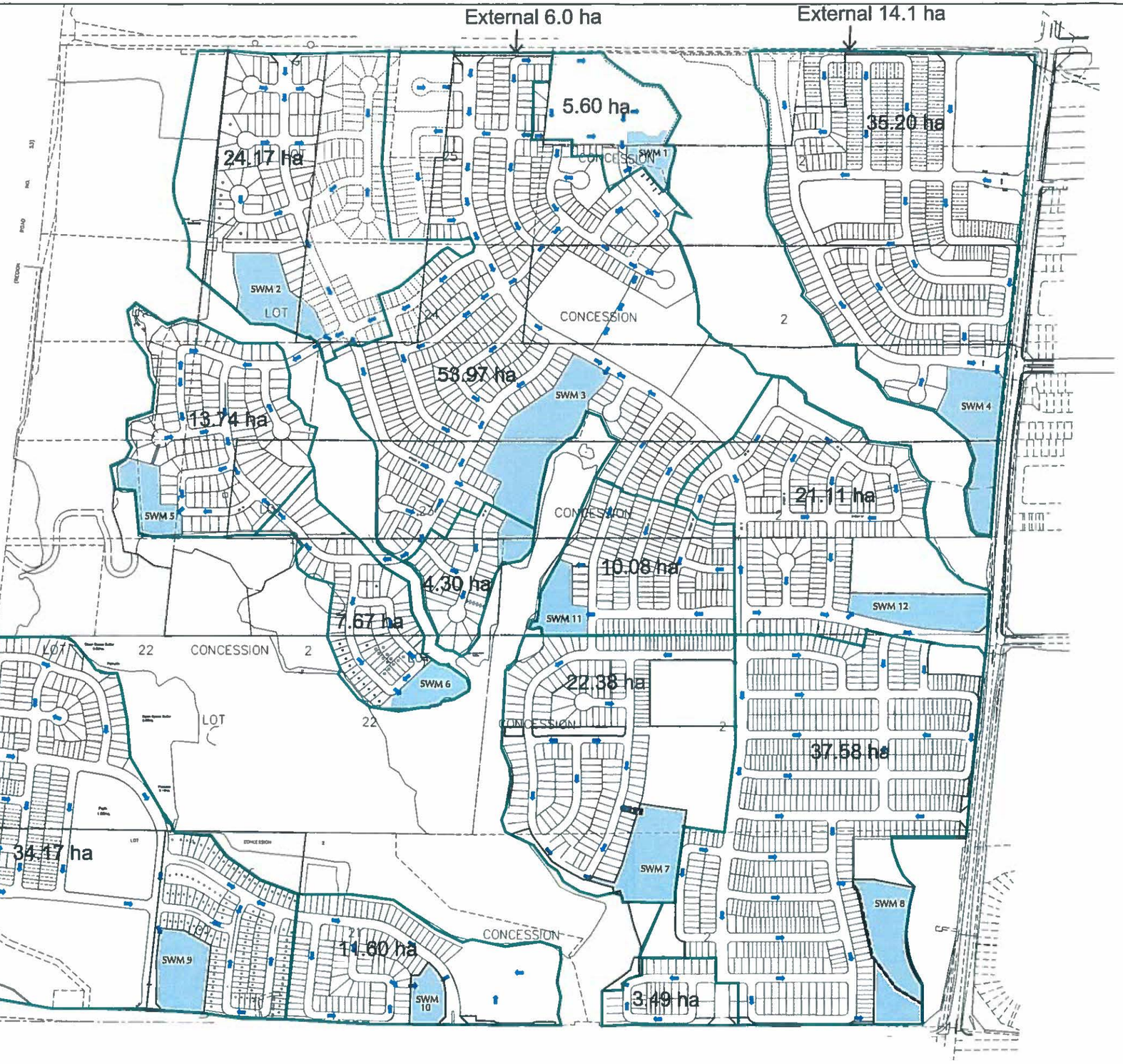
LEGEND

- STORMWATER MANAGEMENT PONDS
- TRIBUTARY AREA BOUNDARIES
- STORM SEWER
- PARTICIPATING OWNERS
- NON-PARTICIPATING OWNERS

SCHAEFFERS
CONSULTING ENGINEERS

FIGURE 2.1
PROPOSED STORMWATER
SERVICING SKELETON

2004-2644	OCTOBER 2013	SCALE: N.T.S.



BLOCK 12
CITY OF VAUGHAN

LEGEND

STORMWATER MANAGEMENT PONDS

TRIBUTARY AREA BOUNDARIES

OVERLAND FLOW

SCHAEFFERS
CONSULTING ENGINEERS

FIGURE 2.2
CONCEPTUAL OVERLAND
FLOW ROUTE PLAN

2004-2644	OCTOBER 2013	SCALE: N.T.S.

- Erosion control (extended detention) is required whereby the runoff volume from the 25 mm design storm event is detained and released over 48 hour period (i.e. as per agreement with TRCA). The maximum extended detention storage above the permanent pool water level should be 1.0 m;
- Water quantity control for the development is required to control the post-development 2-year through 100-year storm events to pre-development target release rates. The maximum quantity control storage above the permanent pool water level should be 2.0. As agreed with the City of Vaughan, a water level more than 2.0 m should be regarded as a special case and should be justified;
- The hydrologic modelling to size the required SWM Pond volumes shall utilize the 12-hour SCS design storm with a 15 minutes time step created from the TRCA Mass Curve;
- The minor system should convey stormwater runoff up to and including the 5-year design storm event;
- An overland flow path should be provided to convey excess major flows from nearby road to the SWM facility;
- Inlet, outlet and emergency spillway structures should be designed to prevent erosion or damage in the vicinity of the structures from maximum design flows;
- A minimum freeboard above maximum water level (100-year level) should be 0.3 m;
- An emergency overflow spillway should be provided to allow storm drainage to safely exit the facility in the event that the outlet fails to function or the storm event is greater than the design return period;
- SWM facility should have curvilinear and natural configuration. To ensure public safety, the land where the permanent pool meets the surrounding landscaped area shall be graded at a minimum slope of 5:1for a minimum distance of 3.0 m on either side of the permanent pool elevation. The remaining area of the facility should have varying side slopes between 3: 1 and 7:1 with an average slope of 5:1;
- The overall facility should have a minimum length to width ratio of 3:1 while the sediment forebay should have a minimum length to width ratio of 2:1;

- The bottom of the sediment forebay should be treated with a hard surface to facilitate future maintenance and the removal of sediments;
- Provisions should be made in the design to allow the pond to be drained down for maintenance purposes. A by-pass maintenance pipe would be a desirable feature;
- Stable maintenance access roads (minimum 4.0 m wide or 6.0 m wide for large trucks) should be provided to inlet, outlet and emergency spillway structures of the SWM facility. They must be designed to support the weight of the maintenance vehicles and should provide for adequate turning radii, if required, and entrance and exit slopes;
- All ponds must be landscaped with ground cover and vegetation;
- Trails/walkways should be 3.0 m wide and constructed above the greater of the extended detention or 5-year ponding elevation. Maintenance access roads may be incorporated into the trail system;
- A minimum setback of the greater of 15.0 m from the 5-year pond water elevation or 3.0 m from the 100-year water should be provided to residential lots and blocks that abut the facility. A 3.0 m wide sodded mow strip should be provided along the perimeter of the facility blocks where they abut residential, commercial or industrial development. A 6.0 to 8.0 m wide urbanized landscape should be provided where the facility abuts a road.

2.3 Contributing Drainage Area

The location of and the contributing drainage area to SWM Pond 4 was illustrated in Figure 1.1. The internal drainage area to the pond is 35.20 ha. There are 12.6 ha of external area from the Woodland Acres subdivision on the north side of Teston Road and approximately 1.5 ha of Teston Road that will contribute flows to the pond. External flows in excess of the 5 year design storm will bypass the subdivision and drain easterly along Teston Road to an existing culvert at Bathurst Street as part of the Region of York's Teston Road Improvement Works. As such, the pond was sized to accommodate the 5 year storm event of the contributing 14.1 ha of external drainage area.

2.4 Water Quality Storage (Permanent Pool)

Water quality storage requirements for the permanent pool have been determined in accordance with the City of Vaughan design criteria and Table 3.2 of the MOE SWMPD Manual (March, 2003) for *Enhanced* control. The required and provided permanent pool volumes are summarized in Table 2.1. Permanent pool storage calculations are provided in Appendix B. The design of SWM Pond 4 is provided on **Error! Reference source not found.** and engineering drawings in Appendix D.

Table 2.1: Permanent Pool and Erosion Control Requirements

Type of Facility	Wet Pond
Level of Protection	*Enhanced*
Drainage Area	49.30 ha
Weighted Imperviousness	51 %
Total Storage Volume Requirement	180.0 m^3/ha
Active Storage Volume Requirement	40 m^3/ha = 2,008 m^3
Permanent Pool Requirement	140.0 m^3/ha
Required Permanent Pool Storage Volume	6,902 m^3
Provided Permanent Pool Storage Volume	10,505 m^3
Required Erosion Control Storage Volume	6,286 m^3
Provided Erosion Control Storage Volume	6,320m^3
Peak Release Rate for Erosion Control	0.01 m^3/s

Note: Extended detention volume is selected as greater of active storage volume (40 m^3/ha) and erosion control volume

2.5 Erosion Control Storage (Extended Detention)

Extended detention storage was sized to provide a minimum of 48-hour detention of the 25 mm storm event runoff, at a peak release rate of 0.01 m^3/s. The required release rate will be satisfied through the implementation of a reverse slope pipe and orifice plate at the outlet. Outlet details are provided in Section 2.5. The required and provided extended detention volumes for the proposed SWM Pond 4 are summarized in Table 2.1. Extended detention storage calculations are provided in Appendix B. The design of SWM Pond 4 is illustrated in drawings provided in Appendix D.

2.6 Water Quantity Control and Storage

2.6.1 Target Release Rates

The 2-year through 100-year target (pre-development) release rates for SWM Pond 4 were based on Don River Unit Flows published in *Unit Flow Rates for Stormwater Control, Upper Don River Watershed* (Marshall Macklin Monaghan Limited, 1994). As per the agreement with TRCA, the target release flows based on Don River Unit Flows were adopted because they were more conservative than the flows based on pre-development Visual OTTHYMO modelling of the drainage areas to SWM Pond 4 (Refer to MESP/EIS and Addendum reports). As part of the Region of York's Teston Road Improvement Works, the external area from the Woodland Acres subdivision a portion of Teston Road that will contribute flows to the pond up to the 5 year design storm. As this area will now be post-development runoff, the target release flows based on Don River Unit Flows were adopted for this external contributing area as well. The adjusted final SWM Pond 4 target release flows are summarized in Table 2.2 and the calculations are provided in Appendix B. Figure 1.2 shows the total SWM Pond 4 drainage area of 49.30 ha (35.2 ha internal and 14.1 ha external) which was used to calculate the new target release rates.

Table 2.2: Target Release Rates

Storm Event	Flow (m^3/s)
2-Year Storm Event	0.163
5-Year Storm Event	0.262
10-Year Storm Event	0.318
25-Year Storm Event	0.357
50-Year Storm Event	0.483
100-Year Storm Event	0.578

2.6.2 On-site Detention

The planned land use of the study area is predominantly residential. However, 3.81 ha block of land in the northeast corner of the Block 12 is commercial land that is to be controlled to 180 l/s/ha. On-site detention of storm flows to SWM Pond 4 is required to control the site to a total of 685.8 l/s. However, Pond 4 was sized based on this land contributing uncontrolled storm runoff.

2.7 Sediment Forebay Design

The function of the sediment forebay is to facilitate maintenance and improve pollutant removal by trapping larger particles from stormwater runoff near the inlet of the pond. The sizing of the sediment forebay is based on the settling length and dispersion length calculations provided in the MOE SWMPD Manual (March 2003). The forebay length should be greater than or equal to the larger of the settling and dispersion lengths.

SWM Pond 4's forebay receives storm flows from the northern portion of the drainage area (Figure 2.1 and Drawing SWM 4-1 in Appendix D). Sediment forebay sizing calculations are provided in Appendix E and summarized in Table 2.3. Table 2.3 demonstrates that SWM Pond 4 has provided a forebay of sufficient length, with length to width ratio of at least 2:1 and a permanent pool depth of 1.56 m.

Table 2.3: Sediment Forebay Details

Description	Forebay
Provided Length-to-Width Ratio	2.5:1
Provided Permanent Pool Depth	1.56
Required Settling Length	9 m
Required Dispersion Length	60 m
Provided Forebay Length	92 m

2.8 Outlet Control Structure Design

The water quality control structure consists of a reverse slope 250 mm diameter pipe submerged within the permanent pool of the pond (see Drawings SWM 4-1 and SWM 4-6 Appendix D). The submerged end of the pipe will be installed with a Hickenbottom (perforated) pipe (with 117, 25 mm diameter holes) and surrounded with a gravel jacket to prevent blockage of the perforated pipe. The reverse slope 250 mm diameter pipe outlets to a manhole under pressure. Through the use of an 82 mm diameter orifice plate with an invert elevation of 241.06 m, the required extended detention peak release rate of $0.03m^3/s$ over 48 hours during the 25 mm storm event will be achieved. The proposed extended detention structure details are summarized in Table 2.4 and shown on Drawing SWM 4-6 in Appendix D.

As the level in the pond exceeds the extended detention elevation quantity control will be attained from the 2-year to 10-year water elevation with a Ditch Inlet Catchbasin (DICB) placed on the pond side slope at the extended detention water elevation to capture the flows. The inlet pipe will be fitted with a 288 mm diameter orifice plate to control flows from the DICBs to the control manhole. Rain events that create water elevations in excess of the 10-year elevation will be controlled, up to and including the 100-year water elevation, with a single Ditch Inlet Catchbasin (DICB) placed on the pond side slope at the 10-year water elevation. The inlet pipe will be fitted with a 232 mm diameter orifice plate to control flows from the DICB to the control manhole. A 600 mm diameter outlet pipe is provided to convey flows from the control manhole to the outfall headwall outside the pond. Details of the DICBs, inlet pipes, and orifice plates are provided in Table 2.4 and shown on Drawing SWM 4-6 in Appendix D. Riprap is provided at the pond outfall for erosion protection.

Table 2.4: Outlet Control Structure Details

Component	Aperture Description	Size	Invert Elevation (m)
Extended Detention	Orifice Plate	82 mm Φ	241.06
2-Year Storm Event	DICB Orifice Plate	1.8 x 0.9 m 288 mm Φ	241.70 240.92
25-Year Storm Event	DICB Orifice Plate	1.8 x 0.9 m 232 mm Φ	242.35 241.17
All Storm Events	Outlet Pipe	600 mm Φ	240.75

2.9 Pond Operation Confirmation

To ensure that the constructed pond will operate as designed and meet the erosion, quantity and quality control requirements, an evaluation of the operation of SWM Pond 4 outlet was conducted by generating a stage-discharge-storage relationship based on the provided/as-constructed (actual) pond volumes and release rates. The provided discharge and storage values were then applied to a route reservoir in the post-development hydrologic model. Results showed that SWM Pond 4 will operate as designed, by providing the required extended detention and 2-year through 100-year storm events quantity control, thereby mitigating any erosion and quantity related developmental impacts to downstream areas.

The provided stage-discharge-storage relationship for the SWM Pond 4 is presented in Table 2.5 and represents the actual/as-constructed operation of the facility. The corresponding post-development Visual OTTHYMO hydrologic modelling and stage-discharge-storage relationship calculations for confirmation of pond operation are provided in Appendix C. A comparison between the overall release rates, required storage and provided storage is presented in Table 2.5 below:

Table 2.5:Summary of Required and Provided Storage Volumes and Release Rates

Component	Target Release Rates (m^3/s)	Required Storage (m^3)**	As-constructed		
			Stage (m)	Release Rate (m^3/s)*	Provided Storage (m^3)
Permanent Pool	0.000	6,902	241.06	0.000	10,505
Extended Detention	0.010	6,212	241.70	0.032	6,320
2-Year Storm Event	0.163	11,000	241.95	0.174	11,064
5-Year Storm Event	0.262	13,800	242.17	0.202	14,100
10-Year Storm Event	0.318	15,700	242.35	0.215	16,639
25-Year Storm Event	0.357	18,280	242.55	0.317	19,460
50-Year Storm Event	0.483	19,620	242.69	0.370	21,434
100-Year Storm Event	0.578	21,720	242.70	0.390	21,575

*Release rates from VO2 model provided in Appendix C

** See VO2 modelling results (Required Storage) provided in Appendix C

Table 2.5 shows that most of the SWM Pond 4 release rates, calculated based on as-constructed drawings are less than the target release rates and the existing storage volumes area greater than or equal to the required storage volumes (respecting mathematical precision tolerances) as identified by SWM Pond 4 Design Report; therefore, erosion, quantity and quality control constraints will not be expected.

2.10 Emergency Spillway

SWM Pond 4 has been designed with an emergency spillway to allow storm drainage to safely exit the facility in the event that the outlet fails to function or the storm event is greater than the facility design 100-year return period. The emergency spillway is placed above the provided 100-year water elevation of 242.70 m. It will convey flows out of the pond and to McNair Creek should water elevation in the pond rise above the provided 100-year water elevation. The maximum discharge through the spillway is approximately 2.5 m^3/s (Table 2.6) (see calculations in Appendix C). The emergency spillway is shown on Drawings SWM 4-1 to SWM 4-6 in Appendix D.

Table 2.6: Emergency Spillway Design

Top Width (m)	Bottom Width (m)	Side Slopes	Maximum Discharge (m^3/s)
13	9	3:1	2.53

2.11 Groundwater Considerations

Based on the review of the geotechnical reports completed by Soil-Eng (January 2004) and Golder Associates (February 2004), all boreholes within the location of SWM Pond 4 were dry at the time of drilling or showed groundwater elevations below the bottom of the pond (Appendix F). As such, the SWM facility will not intercept the groundwater table. The soils that underlay the SWM facility are primarily silty clay till. As a result, no infiltration to the water table is expected.

2.12 Thermal Considerations

Thermal considerations are implemented in the proposed SWM Pond 4 design in order to minimize the thermal affects of the SWM facility. Thermal impacts from the SWM facility are mitigated through landscaping of the SWM facility and appropriate outlet structure design. Landscaping of the SWM facility (i.e. high density planting of trees and shrubs) will provide shade and protection from the sun. The outlet design thermal measures that are proposed are a reverse slope pipe and Hickenbottom pipe extending into the permanent pool of the pond. The Hickenbottom pipe will draw water from the base of the permanent pool, which is generally cooler than at shallower depths. A conceptual landscaping drawing for SWM Pond 4 and Drawing SWM 4-6 which presents the SWM facility outflow structure can be found in Appendix D.

3 SUMMARY AND CLOSING REMARKS

This report provides the City of Vaughan with a final stormwater management analysis for SWM Pond 4 and demonstrates that the constructed pond servicing the Andridge Homes, Major Bob Farms Inc., and Lindstone Developments lands within Block 12 will operate as designed. It has been demonstrated that the stormwater management facility will adequately provide water quality, erosion control and water quantity control for the proposed development.

Respectfully Submitted,

SCHAEFFER & ASSOCIATES LTD.

Noor Kamran, B.Sc., M.B.A
Water Resources Analyst

Harold Reinthaler, P.Eng.
Sr. Associate