Final Report

STORMWATER MANAGEMENT REPORT

12304 Heart Lake Road, Caledon

Prepared for Broccolini
by IBI Group
November 15, 2021

Table of Contents

1 Introduction

1.1 Background

IBI Group Canada (IBI) has been retained by Broccolini (the "Owner") to prepare a Stormwater Management Report to support the Zoning Bylaw Amendment (ZBA) and Site Plan Application (SPA) processes for a proposed industrial development at 12304 Heart Lake Road, in the Town of Caledon (the "Town") and the Region of Peel (the "Region"). The purpose of this report is to provide a municipal servicing strategy for storm drainage and stormwater management. More specifically, the report will evaluate Stormwater Management (SWM) opportunities and constraints, including:

- Calculate allowable and proposed runoff rates for the development;
- Evaluate suitable methods for attenuation and treatment of stormwater runoff; and
- Develop on-site control measures and examine theoretical performance to satisfy the Town's Development Standards.

The following documents have been obtained from various sources:

- Town of Caledon plan and profile drawings for Abbotside Way;
- Mayfield West Functional Servicing and Stormwater Management Study by David Schaeffer Engineering Ltd., dated November 2007;
- Design Brief for Stormwater Management Pond E3 and Pond E4 in the South Fields Community Moscorp 1A and Moscorp 2 Subdivisions by David Schaeffer Engineering Ltd., dated March 2008;
- South Fields Community Moscorp Phases 1A and Phases 2 External Storm Drainage Plan by David Schaeffer Engineering Ltd., dated March 2008
- Livingston Estates Phase 1 & 2 External Storm Drainage Plan by SCS Consulting Group Ltd., dated August 2016;
- Topographic Survey prepared by R-PE Surveying Ltd., dated September 2021; and,
- Architectural plans and site statistics prepared by Ware Malcomb.

1.2 Site Description

Located at 12304 Heart Lake Road in the Town of Caledon and Region of Peel, the overall subject site is approximately 37 ha in size, however, it should be noted that this report will only consider Phase 1 of the development, which consists of a 9.95 ha portion at the southwest of the site, bounded by Abbotside Way to the north, existing agricultural lands to the east, Highway 410 to the south, and an adjacent industrial development application to the west. A vicinity map and an aerial exhibit can be found as **Figure 1** and **Figure 2** respectively following the report.

The overall site is currently comprised of agricultural land and slopes in a southwesterly direction with a change in elevation starting at ±274 m at Heart Lake Road and falling to ±266 m at the west property line. A copy of the topographic survey can be found in **Appendix A** for reference.

The site is located within the Mayfield West Study Area for which a Functional Servicing and Stormwater Management Study was completed in November 2007 (Mayfield West FSR).

1.3 Site Proposal

As previously noted, this report will only consider Phase 1 of the development, which includes a 48,610 m^2 building (Building 1) within a 9.95 ha portion at the southwest corner of the site. Construction will be slab on grade, with no underground levels. Sample architectural drawings can be found in **Appendix A** for reference. It should also be noted that Abbotside Way will be extended in an easterly direction to Heart Lake Road and is to be conveyed to the Town through a Development Agreement.

2 Terms of Reference and Methodology

2.1 Terms of Reference

The terms of reference used for the scope of this report are based on the Town's Development Standards Manual, dated 2019 and the aforementioned background studies and reports.

2.2 Methodology: Stormwater Management

The proposed development falls within the tributary area for SWM Pond E4, as outlined in the Mayfield West FSR. Per the Mayfield West FSR, the receiving pond has been designed to satisfy water quantity, quality, and erosion control requirements. It should be noted that lands designated for employment uses, which includes the subject site, shall limit their total outflow to the calculated 10-year release rate as determined by the Rational Method. This will be discussed further in subsequent sections.

3 Stormwater Management

3.1 Pre-Development Conditions

A 900 mm storm service has been stubbed to the property line at the northwest limit of the subject site and is connected to an existing 1950 mm storm sewer within Abbotside Way, which conveys flows in a westerly direction to SWM Pond E4. As previously mentioned, the SWM Pond has been designed to accommodate storm flows from the subject site, provided outflow is limited to the 10-year release rate.

As previously mentioned, the site is currently comprised of agricultural lands resulting in a pre-development runoff coefficient of 0.25. Under pre-development conditions, storm flows are conveyed in a westerly direction to a ditch adjacent to the west property line. Storm flows are in turn conveyed in a northerly direction towards Abbotside Way and conveyed through a ditch inlet in the northwest corner of the property which in turn are conveyed through the existing 900 mm storm service, the existing 1950 mm storm sewer within Abbotside Way, and ultimately SWM Pond E4.

3.2 Grading

Under pre-development conditions, an external area of 3.04 ha external area will drain to the subject site from the undeveloped lands to the northeast. Proposed grades will match current drainage patterns wherever feasible. Emergency overland flow route in excess of a 100-year storm event will continue to be directed to the municipal right-of-way matching pre-development conditions.

3.3 Pre-Development Conditions

The pre-development runoff coefficient of the agricultural lands is taken as 0.25 however, it should be noted that the post-development release rate for the subject site shall be limited to the 10-year target flow, and a runoff coefficient of 0.75, as prescribed by the South Fields Community Moscorp Phases 1A and Phases 2 External Storm Drainage Plan. The following table summarizes the parameters use to establish the post-development release rate:

Table 3.1: Pre-development input parameters

Drainage Area ID	Area (ha)	Runoff Coefficient C	Tc (min)	Intensity (mm/h)	10-Year Peak Flow Rate (L/s)
A1 pre	9.95	0.75	10.0	134.2	2803.3

3.4 Allowable Release Rate

Using the Rational Method, a runoff coefficient of 0.75, the Town's IDF data for a 10-year storm event, and a time of concentration of 10 minutes, the allowable release rate for the subject site is calculated as follows:

$$Q_{Allowable} = \frac{(A \times R) * I_{10}}{360} = \frac{(9.96 \text{ ha} \times 0.75) \times 134.16 \text{ mm / hr}}{360} = 2.8 \text{ m}^3\text{/s}$$

As shown above, the allowable release rate from the subject site is taken as **2.8 m^3/s** however as the site is greater than 5 ha, the Rational Method must be checked against a dynamic model and the larger of the flows used to establish the allowable release rate. Accordingly, a PCSWMM model was obtained from the Town which indicated a peak runoff of **0.52 m^3/s** from the subject site**.** The results of the modelling can be found in **Appendix C** for reference.

Accordingly, the allowable release rate from the subject site shall be taken as **2.8 m^3/s** using the Rational Method.

3.5 Quantity Control

As previously mentioned, 100-year post-development flows must be controlled to the 10-year pre-development levels. To achieve this target release rate, the below control measures are proposed:

- 2,430 m^3 of quantity storage provided in roof storage. Town of Caledon policy is to limit roof drainage to 42 L/s/ha of roof area and maximum allowable ponding depths for roof storage is 150 mm.

Modified Rational Method (MRM) calculations were performed using the same IDF parameters as pre-development conditions to quantify the required storage for this development. See **Table 3.2** below for a summary of the proposed SWM strategy.

Table 3.2: Post-development Storage/Discharge Summary

Drainage Area	Area (ha)	Storage Req'd (m3)	Storage Provided (m3)	10-Year Target Flow Rate (m^3/s)
A1 post	4.86	2,401	2,430	2.8
A2 +A3 + A4 + EXT1	8.13	0	0	

By providing rooftop storage, the Town's requirements for quantity control are satisfied. Please see **Appendix B** for the detailed design sheets.

3.6 Quality Control

As previously mentioned, the subject site is tributary to existing SWM Pond E4 which has been designed to a provide quality control for the entire tributary area. Accordingly, no on-site quality controls will be required for the subject site.

3.7 Water Balance

The water budget was conducted using the Thornthwaite and Mather water balance method outlined in Chapter 3 of the MOE SWM Planning and Design Manual (MOE, 2003). The method estimates annual evapotranspiration, infiltration and runoff volumes based on soil types, vegetation cover, topography and annual precipitation.

The results from the existing water budget calculation are summarized in Table 3.3, below.

Table 3.3: Proposed Conditions Water Budget Summary

Cover Type	Area (ha)	ET/IA Volume (m3)	Site Balance (m3)	Volume Provided (m3)	Volume Required (m3)
Roof	4.86	48.60	497.5	109.9	387.60
Pavement	4.83	48.30			
Landscape	.26	13.00			

Post-development water balance calculations are provided in **Appendix B**. To satisfy the required volumes, clean rooftop storm flows will be directed to infiltration galleries located within the drive aisles. Please see **SS-01** thru **SS-04** for the location and details pertaining to the infiltration galleries.

3.8 Storm Service Connection

As previously mentioned, an existing 900 mm storm service and control MH have been provided for the subject site. It should be noted that this storm service will be fully surcharged under the 100-year return period due to the anticipated 100-year HGL within the receiving 1950 mm storm sewer within Abbotside Way.

To avoid a headwater effect, the incoming storm sewer at the control MH has been set at the 100-year HGL elevation. Please refer to the detailed design calculations which can be found in **Appendix B**, and the design drawings **SS-01 through SS-04** which can be found in **Appendix C**.

3.9 Emergency Overflow

It is recommended that rooftop scuppers be installed to ensure emergency overflow from roof areas should rooftop drains become plugged. All areas at grade level have been designed with positive drainage (away from the building). Maximum ponding within the development site shall not exceed the Town's requirements of 0.30 m for paved areas and parking lots and 0.15 m for rooftop areas.

3.10 Erosion and Sediment Control During Construction

During construction, it is recommended that a sediment control fence be installed along the perimeter of the site as required during demolition activities. All existing and proposed catch basins within close proximity of the subject site shall be protected with a geotextile fabric. A mud mat shall be installed as required to minimize distribution of mud into the public realm, and a temporary sediment control pond per the TRCA Erosion and Sediment Control Guide for Urban Construction. Please see drawing **EC-01** for further details.

As previously mentioned, the subject site is tributary to existing SWM Pond E4 which has been designed to a provide erosion control for the entire tributary area. Accordingly, no long-term on-site erosion controls will be required for the subject site.

4 Conclusions

Quantity Control

Stormwater shall be conveyed to the existing SWM Pond E4, which has been designed to accommodate storm flows from the subject site, provided outflow is limited to the 10-year release rate. By incorporating rooftop storage, the subject site shall be attenuated on-site and released to the SWM Pond via the municipal storm sewer within Abbotside Way at the 10-year release rate.

Quality Control

By conveying stormwater to the existing SWM pond, which has been designed to provide quality control for the entire tributary area, the Town's requirement for quality control has been met.

Water Balance

By directing rooftop areas to infiltration galleries, the Town's requirement for water balance has been satisfied.

Summary

In summary, it can be concluded that both the Zoning Bylaw Amendment and Site Plan application can be supported from both a storm servicing and a stormwater management perspective.

Should you have any questions, please do not hesitate to contact the undersigned.

Respectfully Submitted,

IBI Group Canada Inc.

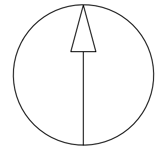
Jason Jenkins, P.Eng, P.E.
Associate Manager - Land Engineering

Tel: +1.905.763.2322 x 63542

E-Mail: Jason.Jenkins@ibigroup.com

j:\2020-0323\400_tchncl\70_rprts\draft plan and spa\revision 1\stormwater management report\2020-0323 - stormwater management report (revision 1).docx

Figure 1 – Vicinity Map



PROJECT NAME INDUSTRIAL DEVELOPMENT - PHASE 1 12304 HEART LAKE ROAD CALEDON, ONTARIO		IBI GROUP Unit 300 – 8133 Warden Avenue Markham ON L6G 1B3 Canada tel 905 763 2322 fax 905 763 9983 ibigroup.com		
SCALE: N.T.S.	DATE: NOV 2021	FIGURE NAME KEY PLAN	FIGURE NO. FIG-1	REVISION
PROJECT ENG: JJ	DRAWN BY: NDS			
CHECKED BY: JJ	APPROVED BY:			
PROJECT NO: 135636				

File Location: J:\135636_12304Heart\7.0_Production\7.03_Design\04_Civil\Sheets\SPA\Phase 1\Figures\135636-SHT-FIG.dwg Last Saved: November 2, 2021, by Jasmine.Zhang Plotted: Thursday, November 4, 2021 10:44:25 AM by Nicolas Di Stefano

10mm

SCALE CHECK
1 in

Figure 2 – Aerial Plan

True North

PROJECT NAME		IBI GROUP		
INDUSTRIAL DEVELOPMENT - PHASE 1 12304 HEART LAKE ROAD CALEDON , ONTARIO		IBI GROUP Unit 300 – 8133 Warden Avenue Markham ON L6G 1B3 Canada tel 905 763 2322 fax 905 763 9983 ibigroup.com		
SCALE: N.T.S.	DATE: NOV 2021	FIGURE NAME AERIAL PLAN	FIGURE NO. FIG-2	REVISION
PROJECT ENG: JJ	DRAWN BY: NDS			
CHECKED BY: JJ	APPROVED BY:			
PROJECT NO: 135636				

File Location: J:\135636_12304Heart\7.0_Production\7.03_Design\04_Civil\Sheets\SPA\Phase 1\Figures\135636-SHT-FIG.dwg Last Saved: November 2, 2021, by Jasmine.Zhang Plotted: Thursday, November 4, 2021 10:45:56 AM by Nicolas Di Stefano

10mm

SCALE CHECK
1 in

Appendix A – Background Information

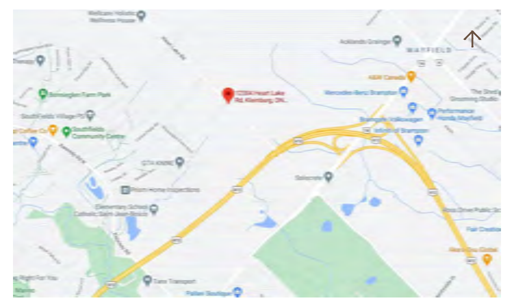
Sample Architectural Drawings (Ware Malcomb)
Topographic Survey (R-PE)
Plan and Profile Drawings (Town of Caledon)
Excerpt Mayfield West Functional Servicing Study (DSEL)
Excerpt Design Brief for Stormwater Management Pond E4 (DSEL)
Mayfield West Storm Drainage Area Plan (DSEL)
Livingston Estates Storm Drainage Area Plan (SCS)

NOTE: HEIGHT VARIANCE MAY BE REQUIRED DEPENDING ON ZONING

This conceptual design is based upon a preliminary review of entitlement requirements and on unverified and possibly incomplete site and/or building information, and is intended merely to assist in exploring how the project might be developed.

Stormwater Management Design: ASSUMED UNDERGROUND SYSTEM

Boundary Source: PDF ALTA SURVEY



1:1500
0 20m 40m 75m 150m
NORTH

scheme: 09

Conceptual Site Plan

BROCCOLINI

12304 Heart Lake Road
Caledon, ON, Canada

WARE MALCOMB

TOR21-0032-00
10.20.2021

SHEET
1

SKETCH SHOWING ELEVATIONS FOR CONSULTANT'S USE

SCALE 1:1000

10m 5m 0m 10m 20m 30m 40meters

R–PE SURVEYING LTD., O.L.S.

METRIC

LEGEND

BXB	DENOTES BELL BOX
CB	DENOTES CATCH BASIN
CONC	DENOTES CONCRETE
FH	DENOTES FIRE HYDRANT
P.I.N.	DENOTES PROPERTY IDENTIFIER NUMBER
LS	DENOTES LAMP STANDARD
MH	DENOTES MANHOLE
MHSA	DENOTES MANHOLE SANITARY
MHST	DENOTES MANHOLE STORM
MHW	DENOTES MANHOLE WATER
INV.	DENOTES INVERT ELEVATION
UP	DENOTES UTILITY POLE
WV	DENOTES WATER VALVE
–W–	DENOTES OVERHEAD WIRE
Ø	DENOTES DIAMETER
	DENOTES FENCE LINE
HYDRANT	DENOTES HYDRANT
	DENOTES CURB CUT
	DENOTES ANCHOR GUY WIRE

CAUTION

THIS IS NOT A PLAN OF SURVEY AND SHALL NOT TO BE USED EXCEPT FOR THE PURPOSE INDICATED IN THE TITLE BLOCK.

NOTES

BOUNDARY LINE–WORK TAKEN FROM PLAN OF SURVEY BY R–PE SURVEYING LTD., DATED FEBUARY 5, 2021. (CAD FILE No. 21–009R01)

THIS SKETCH IS AN ORIGINAL COPY IF EMBOSSED BY THE SURVEYOR.

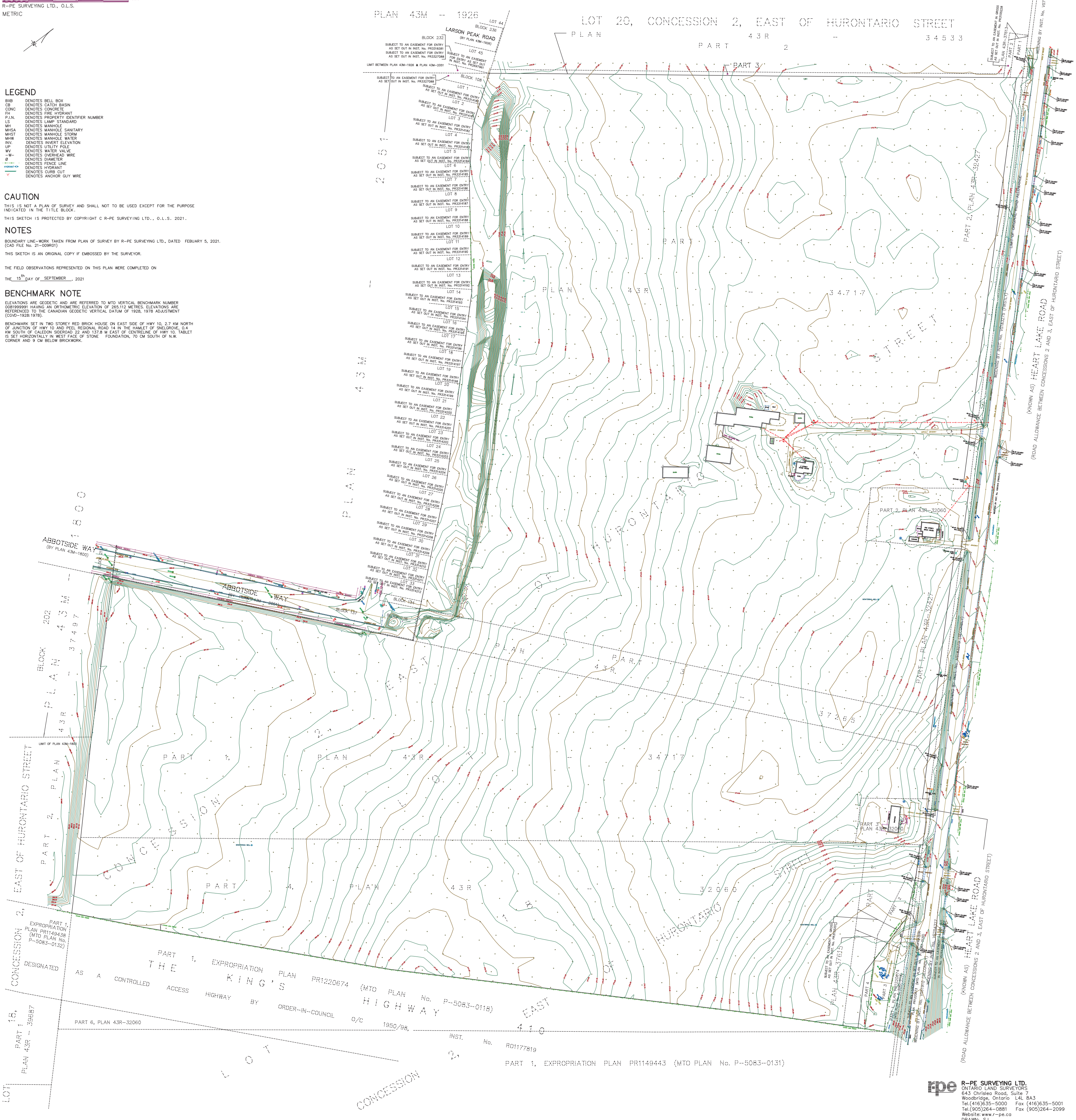
THE FIELD OBSERVATIONS REPRESENTED ON THIS PLAN WERE COMPLETED ON

THE 15th DAY OF SEPTEMBER, 2021

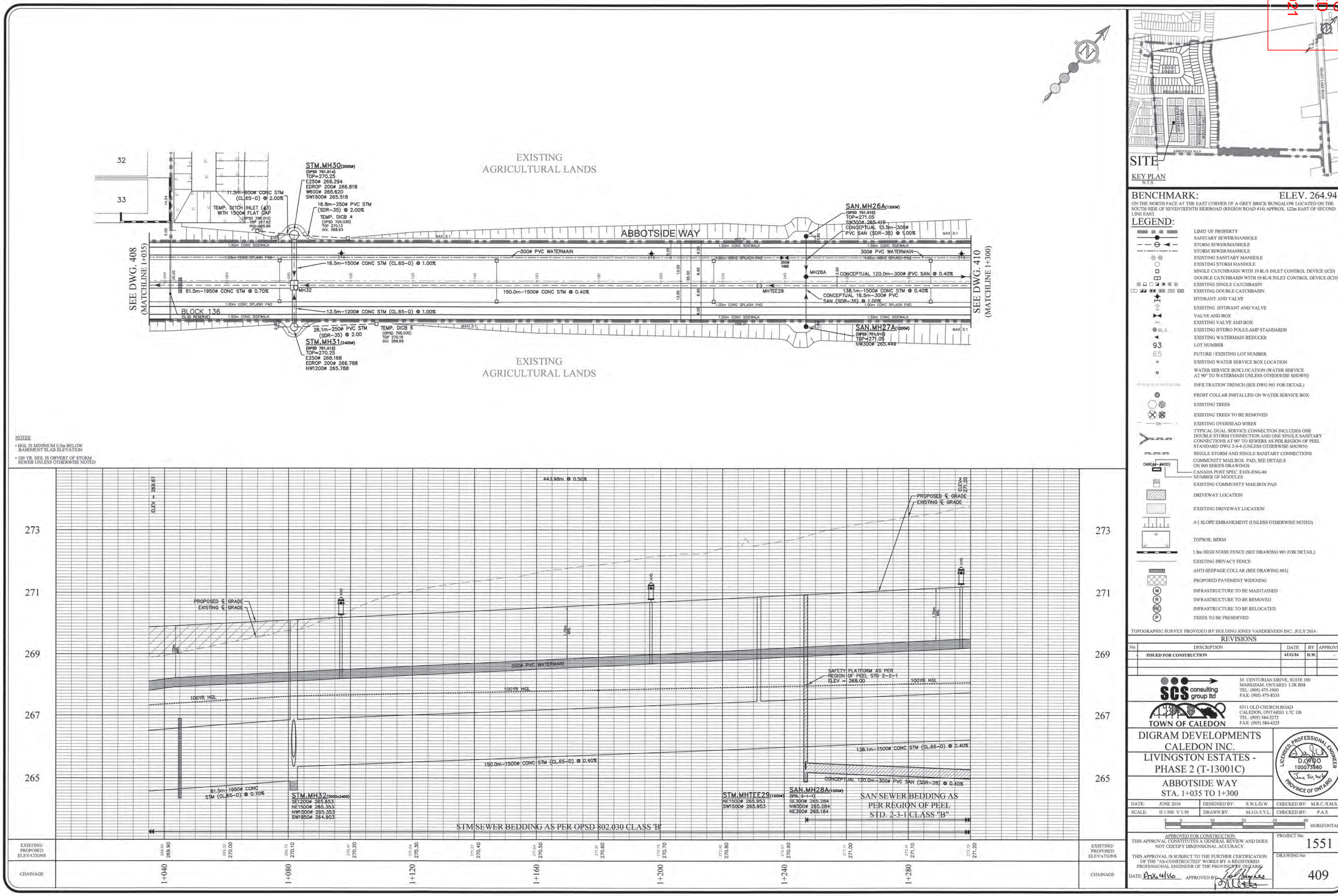
BENCHMARK NOTE

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO MTO VERTICAL BENCHMARK NUMBER 0081999991 HAVING AN ORTHOMETRIC ELEVATION OF 265.112 METRES. ELEVATIONS ARE REFERENCED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928, 1978 ADJUSTMENT (CGVD–1928:1978).

BENCHMARK SET IN TWO STOREY RED BRICK HOUSE ON EAST SIDE OF HWY 10, 2.7 KM NORTH OF JUNCTION OF HWY 10 AND PEEL REGIONAL ROAD 14 IN THE HAMLET OF SNELGROVE, 0.4 KM SOUTH OF CALEDON SIDEROAD 22 AND 137.8 M EAST OF CENTRELINE OF HWY 10. TABLET IS SET HORIZONTALLY IN WEST FACE OF STONE FOUNDATION, 70 CM SOUTH OF N.W. CORNER AND 9 CM BELOW BRICKWORK.

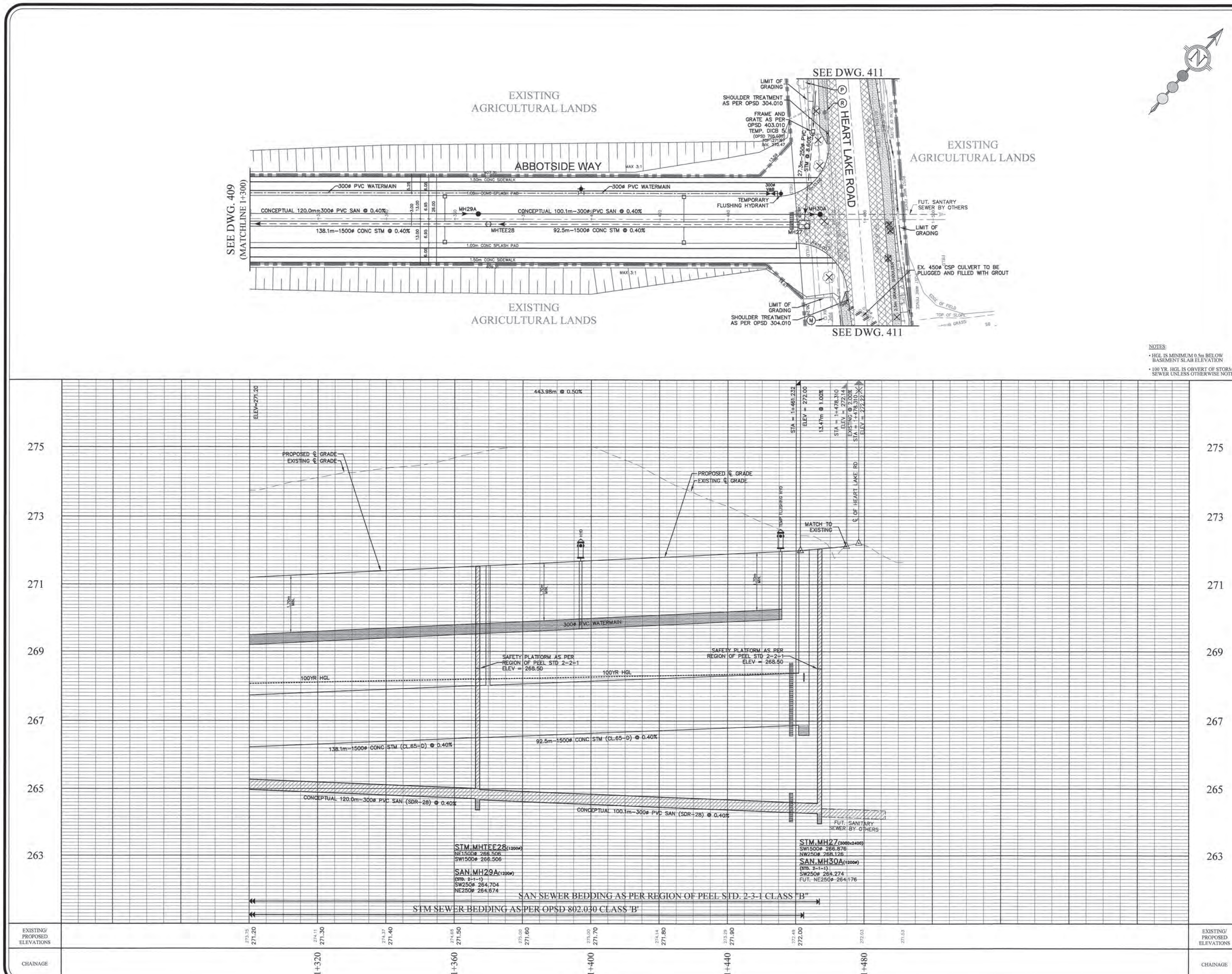


R–PE SURVEYING LTD.
ONTARIO LAND SURVEYORS
643 Chrislea Road, Suite 7
Woodbridge, Ontario L4L 8A3
Tel.(416)635–5000 Fax (416)635–5001
Tel.(905)264–0881 Fax (905)264–2099
Website: www.r–pe.ca
DRAWN: S.L.
JOB No. 21–279 CAD FILE No. 21–279TP01


EXISTING AGRICULTURAL LANDS
ABBOTSIDE WAY
EXISTING AGRICULTURAL LANDS
SEE DWG. 408 (MATCHLINE 1+035)
SEE DWG. 410 (MATCHLINE 1+300)
BLOCK 136
32
33
STM.MH30
STM.MH31
SAN.MH26A
SAN.MH27A
300ø PVC WATERMAIN
16.5m–1500ø CONC STM (CL.65–D) @ 1.00%
61.5m–1950ø CONC STM @ 0.70%
150.0m–1500ø CONC STM @ 0.40%
13.5m–1200ø CONC STM (CL.65–D) @ 1.00%
138.1m–1500ø CONC STM @ 0.40%
CONCEPTUAL 120.0m–300ø PVC SAN @ 0.40%
NOTES:
• HGL IS MINIMUM 0.5m BELOW BASEMENT SLAB ELEVATION
• 100 YR. HGL IS OBVERT OF STORM SEWER UNLESS OTHERWISE NOTED
443.98m @ 0.50%
PROPOSED ℄ GRADE
EXISTING ℄ GRADE
100YR HGL
SAFETY PLATFORM AS PER REGION OF PEEL STD 2–2–1 ELEV = 268.00
STM.MH32
STM.MHTEE29
SAN.MH28A
SAN SEWER BEDDING AS PER REGION OF PEEL STD. 2-3-1 CLASS "B"
STM SEWER BEDDING AS PER OPSD 802.030 CLASS 'B'
273
271
269
267
265
EXISTING/ PROPOSED ELEVATIONS
CHAINAGE
1+040
1+080
1+120
1+160
1+200
1+240
1+280
SITE
KEY PLAN N.T.S.
BENCHMARK: ELEV. 264.941
ON THE NORTH FACE AT THE EAST CORNER OF A GREY BRICK BUNGALOW LOCATED ON THE SOUTH SIDE OF SEVENTEENTH SIDEROAD (REGION ROAD #14) APPROX. 122m EAST OF SECOND LINE EAST.
LEGEND:
LIMIT OF PROPERTY
SANITARY SEWER/MANHOLE
STORM SEWER/MANHOLE
STORM SEWER/MANHOLE
EXISTING SANITARY MANHOLE
EXISTING STORM MANHOLE
SINGLE CATCHBASIN WITH 19.8L/S INLET CONTROL DEVICE (ICD)
DOUBLE CATCHBASIN WITH 19.8L/S INLET CONTROL DEVICE (ICD)
EXISTING SINGLE CATCHBASIN
EXISTING DOUBLE CATCHBASIN
HYDRANT AND VALVE
EXISTING HYDRANT AND VALVE
VALVE AND BOX
EXISTING VALVE AND BOX
EXISTING HYDRO POLE/LAMP STANDARDS
EXISTING WATERMAIN REDUCER
LOT NUMBER
FUTURE / EXISTING LOT NUMBER
EXISTING WATER SERVICE BOX LOCATION
WATER SERVICE BOX LOCATION (WATER SERVICE AT 90° TO WATERMAIN UNLESS OTHERWISE SHOWN)
INFILTRATION TRENCH (SEE DWG 901 FOR DETAIL)
FROST COLLAR INSTALLED ON WATER SERVICE BOX
EXISTING TREES
EXISTING TREES TO BE REMOVED
EXISTING OVERHEAD WIRES
TYPICAL DUAL SERVICE CONNECTION INCLUDES ONE DOUBLE STORM CONNECTION AND ONE SINGLE SANITARY CONNECTIONS AT 90° TO SEWERS AS PER REGION OF PEEL STANDARD DWG 2-4-4 (UNLESS OTHERWISE SHOWN)
SINGLE STORM AND SINGLE SANITARY CONNECTIONS
COMMUNITY MAILBOX PAD, SEE DETAILS ON 900 SERIES DRAWINGS
EXISTING COMMUNITY MAILBOX PAD
DRIVEWAY LOCATION
EXISTING DRIVEWAY LOCATION
4:1 SLOPE EMBANKMENT (UNLESS OTHERWISE NOTED)
TOPSOIL BERM
1.8m HIGH NOISE FENCE (SEE DRAWING 901 FOR DETAIL)
EXISTING PRIVACY FENCE
ANTI-SEEPAGE COLLAR (SEE DRAWING 901)
PROPOSED PAVEMENT WIDENING
INFRASTRUCTURE TO BE MAINTAINED
INFRASTRUCTURE TO BE REMOVED
INFRASTRUCTURE TO BE RELOCATED
TREES TO BE PRESERVED
TOPOGRAPHIC SURVEY PROVIDED BY HOLDING JONES VANDERVEEN INC., JULY 2014
REVISIONS
No. DESCRIPTION DATE BY APPROVED
ISSUED FOR CONSTRUCTION AUG/16 D.W.
SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100 MARKHAM, ONTARIO L3R 8B8 TEL: (905) 475-1900 FAX: (905) 475-8335
TOWN OF CALEDON
6311 OLD CHURCH ROAD CALEDON, ONTARIO L7C 1J6 TEL: (905) 584-2272 FAX: (905) 584-4325
DIGRAM DEVELOPMENTS CALEDON INC.
LIVINGSTON ESTATES - PHASE 2 (T-13001C)
ABBOTSIDE WAY
STA. 1+035 TO 1+300
DATE: JUNE 2016
SCALE: H 1:500 V 1:50
DESIGNED BY: S.W.L/D.W.
DRAWN BY: M.J.O./J.Y.L.
CHECKED BY: M.R.C./S.M.S.
CHECKED BY: P.A.S.
HORIZONTAL
APPROVED FOR CONSTRUCTION
THIS APPROVAL CONSTITUTES A GENERAL REVIEW AND DOES NOT CERTIFY DIMENSIONAL ACCURACY.
THIS APPROVAL IS SUBJECT TO THE FURTHER CERTIFICATION OF THE "AS-CONSTRUCTED" WORKS BY A REGISTERED PROFESSIONAL ENGINEER OF THE PROVINCE OF ONTARIO.
PROJECT No. 1551
DRAWING No. 409
LICENSED PROFESSIONAL ENGINEER D. WOO 100073980 PROVINCE OF ONTARIO

TOWN OF CALEDON
PLANNING
RECEIVED

Nov 26, 2021



NOTES:
- HGL IS MINIMUM 0.5m BELOW BASEMENT SLAB ELEVATION
- 100 YR. HGL IS OBVERT OF STORM SEWER UNLESS OTHERWISE NOTED

SITE
KEY PLAN
N.T.S.

BENCHMARK: ELEV. 264.941
ON THE NORTH FACE AT THE EAST CORNER OF A GREY BRICK BUNGALOW LOCATED ON THE SOUTH SIDE OF SEVENTEENTH SIDEROAD (REGION ROAD #14) APPROX. 122m EAST OF SECOND LINE EAST.

LEGEND:
- LIMIT OF PROPERTY
- SANITARY SEWER/MANHOLE
- STORM SEWER/MANHOLE
- STORM SEWER/MANHOLE
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- SINGLE CATCHBASIN WITH 19.8L/S INLET CONTROL DEVICE (ICD)
- DOUBLE CATCHBASIN WITH 19.8L/S INLET CONTROL DEVICE (ICD)
- EXISTING SINGLE CATCHBASIN
- EXISTING DOUBLE CATCHBASIN
- HYDRANT AND VALVE
- EXISTING HYDRANT AND VALVE
- VALVE AND BOX
- EXISTING VALVE AND BOX
- EXISTING HYDRO POLE/LAMP STANDARDS
- EXISTING WATERMAIN REDUCER
- LOT NUMBER
- FUTURE / EXISTING LOT NUMBER
- EXISTING WATER SERVICE BOX LOCATION
- WATER SERVICE BOX LOCATION (WATER SERVICE AT 90° TO WATERMAIN UNLESS OTHERWISE SHOWN)
- INFILTRATION TRENCH (SEE DWG 901 FOR DETAIL)
- FROST COLLAR INSTALLED ON WATER SERVICE BOX
- EXISTING TREES
- EXISTING TREES TO BE REMOVED
- EXISTING OVERHEAD WIRES
- TYPICAL DUAL SERVICE CONNECTION INCLUDES ONE DOUBLE STORM CONNECTION AND ONE SINGLE SANITARY CONNECTIONS AT 90° TO SEWERS AS PER REGION OF PEEL STANDARD DWG 2-4-4 (UNLESS OTHERWISE SHOWN)
- SINGLE STORM AND SINGLE SANITARY CONNECTIONS
- COMMUNITY MAILBOX PAD, SEE DETAILS ON 900 SERIES DRAWINGS
- CANADA POST SPEC. E10X-ENG-## NUMBER OF MODULES
- EXISTING COMMUNITY MAILBOX PAD
- DRIVEWAY LOCATION
- EXISTING DRIVEWAY LOCATION
- 4:1 SLOPE EMBANKMENT (UNLESS OTHERWISE NOTED)
- TOPSOIL BERM
- 1.8m HIGH NOISE FENCE (SEE DRAWING 901 FOR DETAIL)
- EXISTING PRIVACY FENCE
- ANTI-SEEPAGE COLLAR (SEE DRAWING 901)
- PROPOSED PAVEMENT WIDENING
- INFRASTRUCTURE TO BE MAINTAINED
- INFRASTRUCTURE TO BE REMOVED
- INFRASTRUCTURE TO BE RELOCATED
- TREES TO BE PRESERVED

TOPOGRAPHIC SURVEY PROVIDED BY HOLDING JONES VANDERVEEN INC., JULY 2014.

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
-	ISSUED FOR CONSTRUCTION	AUG/16	D.W.	-

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

TOWN OF CALEDON
6311 OLD CHURCH ROAD
CALEDON, ONTARIO L7C 1J6
TEL: (905) 584-2272
FAX: (905) 584-4325

DIGRAM DEVELOPMENTS CALEDON INC.
LIVINGSTON ESTATES - PHASE 2 (T-13001C)
ABBOTSIDE WAY
STA. 1+300 TO 1+491.459

LICENSED PROFESSIONAL ENGINEER D. WOO 100073980 PROVINCE OF ONTARIO

DATE:	JUNE 2016	DESIGNED BY:	S.W.L/D.W.	CHECKED BY:	M.R.C./S.M.S.
SCALE:	H 1:500 V 1:50	DRAWN BY:	M.J.O./J.Y.L.	CHECKED BY:	P.A.S.

HORIZONTAL

APPROVED FOR CONSTRUCTION
THIS APPROVAL CONSTITUTES A GENERAL REVIEW AND DOES NOT CERTIFY DIMENSIONAL ACCURACY.
THIS APPROVAL IS SUBJECT TO THE FURTHER CERTIFICATION OF THE "AS-CONSTRUCTED" WORKS BY A REGISTERED PROFESSIONAL ENGINEER OF THE PROVINCE OF ONTARIO
DATE: Aug 4/16 APPROVED BY:

PROJECT No. 1551
DRAWING No. 410

File: P:\1551 Livingston Estates\Drawings\Phase 1\Prp\1551G-PROF-410.dwg

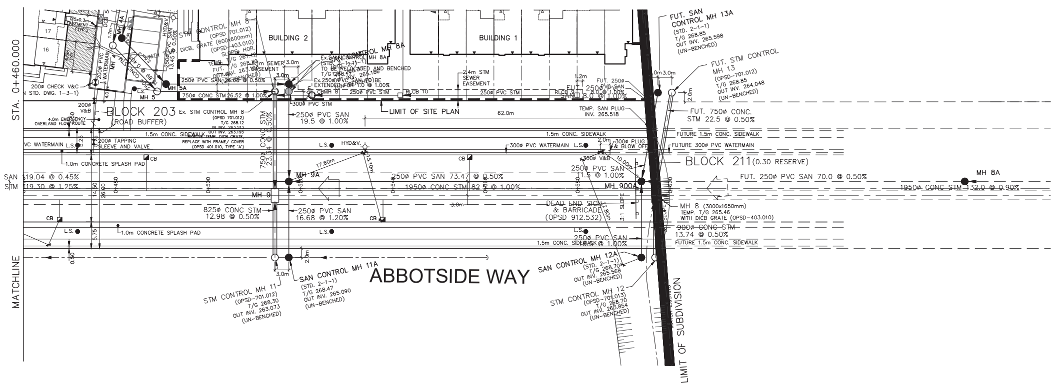
PAVEMENT DESIGN

40mm DFC ASPHALT CONCRETE
110mm HDBC ASPHALT CONCRETE
150mm GRANULAR "A"
450mm GRANULAR "B" SUB-BASE

LEGEND

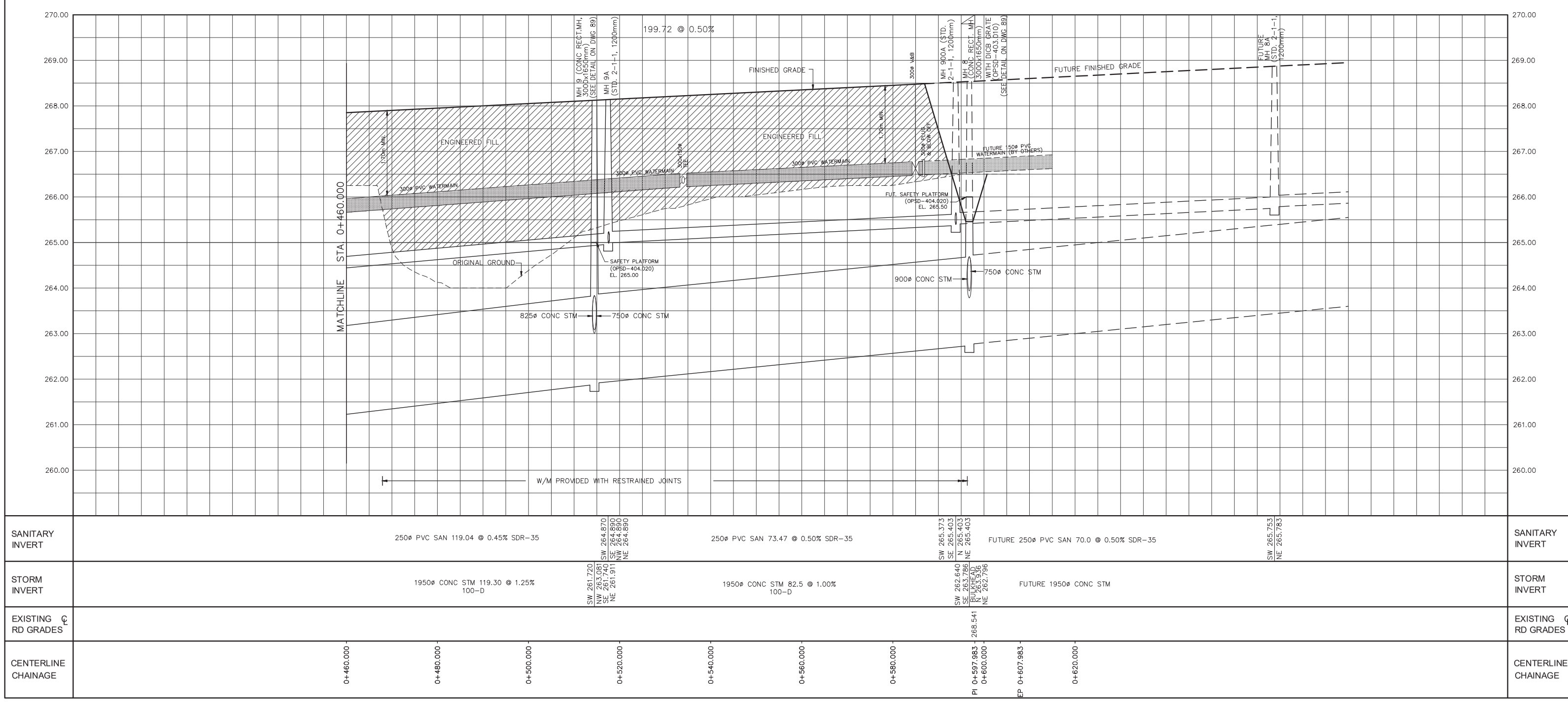
- VALVE AND BOX
- VALVE AND CHAMBER
- HYDRANT
- SINGLE CATCHBASIN
- DOUBLE CATCHBASIN
- CATCHBASIN WITH INLET CONT. DEVICE TYPE B (Qmax=28.4 L/s)
- CATCHBASIN WITH INLET CONT. DEVICE TYPE C (Qmax=37 L/s)
- CATCHBASIN WITH INLET CONT. DEVICE TYPE D (Qmax=54 L/s)
- CATCHBASIN WITH INLET CONT. DEVICE TYPE F (Qmax=76 L/s)
- CATCHBASIN WITH INLET CONT. DEVICE TYPE G (Qmax=100 L/s)
- CATCHBASIN WITH INLET CONT. DEVICE TYPE H (Qmax=150 L/s)
- CATCHBASIN WITH INLET CONT. DEVICE TYPE I (Qmax=200 L/s)
- CATCHBASIN WITH INLET CONT. DEVICE TYPE J (Qmax=250 L/s)
- SANITARY MANHOLE
- STORM MANHOLE
- SINGLE STM. & SAN. HOUSE CONNECTION
- DOUBLE STM. & SAN. HOUSE CONNECTION
- WATER CONNECTION
- COMMUNITY MAIL BOX AND PAD LOCATION (WITH SIDEWALK)
- COMMUNITY MAIL BOX AND PAD LOCATION (WITHOUT SIDEWALK)
- LIGHT STANDARD
- 1.8m HIGH ACOUSTIC FENCE
- 2.0m HIGH ACOUSTIC FENCE SEE LANDSCAPE DWG. FOR DETAIL
- 1.5m HIGH BLACK VINYL CHAIN LINK FENCE UNLESS OTHERWISE NOTED
- RETAINING WALL (SEE NOTES ON DWG. 1, SEE RW-1, RW-2, RW-3, RW-4 FOR DETAIL)
- MIN. BASEMENT FLOOR ELEVATION
- PHASING LIMIT
- 150ø FILTRATION SUBDRAIN (SEE DETAIL ON DWG. No. 88)
- OVERLAND FLOW DIRECTION
- OVERLAND FLOW DIRECTION
- REGIONAL FLOOD LEVEL

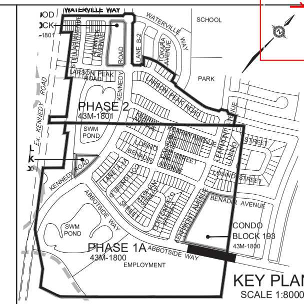
REFER TO DWG No. 64



FOR NOTES OF WATERMAIN CONSTRUCTED IN FILL AREA SEE DWG. No. 37

NOTE:
ALL AS-CONSTRUCTED INFORMATION PROVIDED BY RADY-PENTEK & EDWARD SURVEYING LTD.





TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY RADY-PENTEK & EDWARD SURVEYING LTD., PROJECT No. 05-260, TOPOGRAPHIC SURVEY DATED ON FEBRUARY 27, 2008.

LEGAL INFORMATION

CALCULATED M-PLAN PROVIDED BY RADY-PENTEK & EDWARD SURVEYING LTD., PROJECT No. 07-258 FOR PHASE 1A, SURVEY DATED APRIL 24, 2008. PROJECT No. 07-259 FOR PHASE 2, SURVEY DATED FEBRUARY 19, 2008.

AS-CONSTRUCTED

NO.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D
2	A.S.	10-01-22	AS-CONSTRUCTED SANITARY AND STORM SEWERS		
1	Z.L.	08-10-09	CONCRETE SPLASH PAD ADDED FOR ABBOTSIDE WAY		

APPROVED FOR CONSTRUCTION
THIS APPROVAL CONSTITUTES A GENERAL REVIEW AND DOES NOT CERTIFY DIMENSIONAL ACCURACY.

THIS APPROVAL IS SUBJECT TO THE FURTHER CERTIFICATION OF THE "AS CONSTRUCTED" WORKS BY A REGISTERED PROFESSIONAL ENGINEER OF THE PROVINCE OF ONTARIO.

DATE: SEPT. 9, 2008 APPROVED BY: C. CAMPBELL (ORIGINALLY SIGNED)
C. CAMPBELL C.E.T.
DIRECTOR OF PUBLIC WORKS AND ENGINEERING

BENCH MARK:
ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CITY OF BRAMPTON BENCHMARK No. JI-313, HAVING AN ELEVATION OF 252.147 METRES. LOCATED ON SOUTH FACE OF CONCRETE PORCH DECK ON WHITE SIDE BUNGALOW No. 11575 DIXIE ROAD, BEING 0.55km SOUTH OF MAYFIELD ROAD. TABLET IS SET 0.07m BELOW TOP OF DECK AND 0.27m EAST OF SOUTHEAST CORNER OF DECK.
ELEVATION = 252.147 m

ORIGINALLY APPROVED BY THE REGION OF PEEL ON SEPT. 12, 2008

SOUTH FIELDS COMMUNITY MOSCORP
PHASES 1A (21T-06004C)
PHASES 2 (21T-06002C)

DSEL david schaeffer engineering ltd
600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

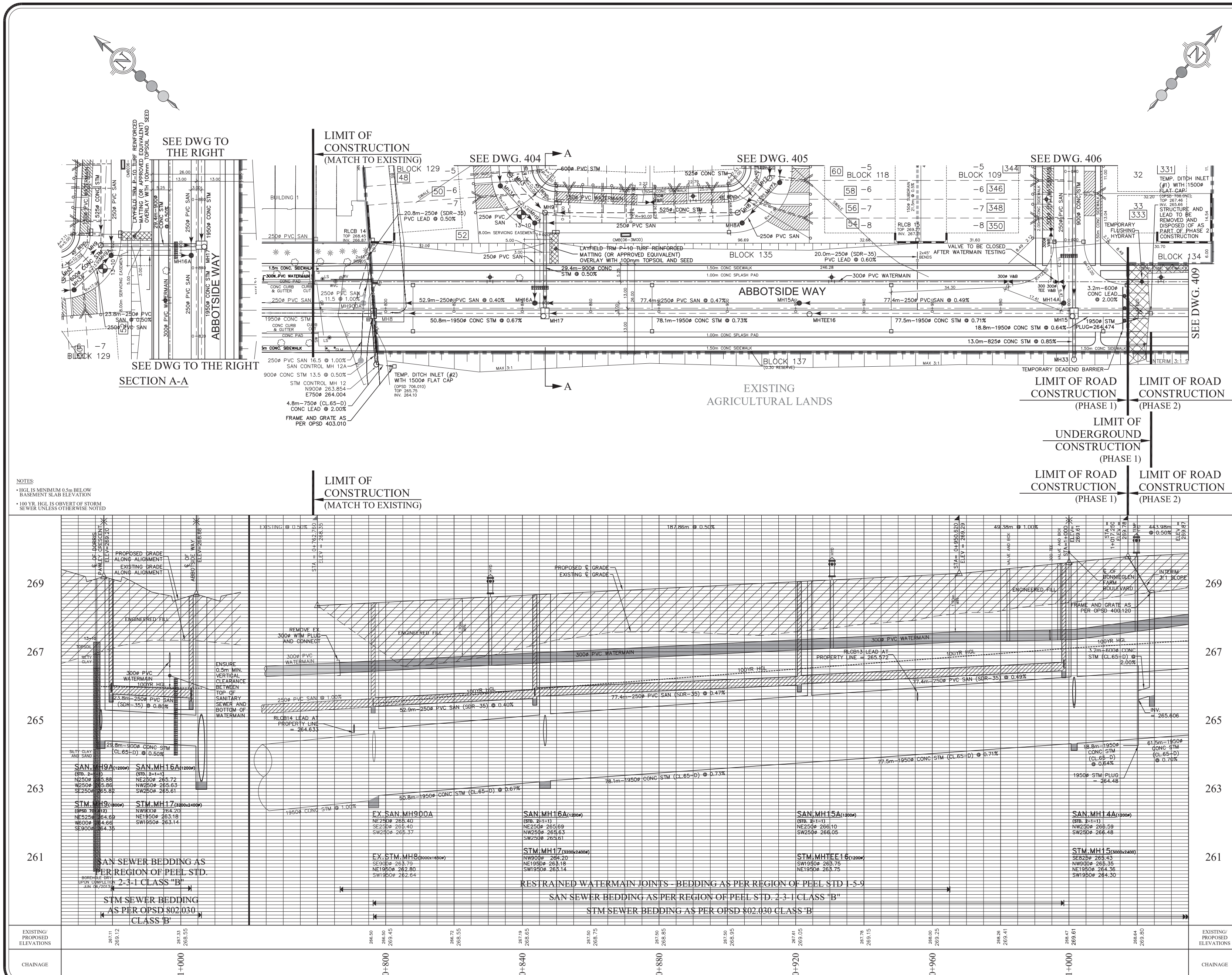
Region of Peel Public Works

TOWN OF CALEDON

PLAN AND PROFILE OF
ABBOTSIDE WAY
(FROM STA. 0+460.000 TO STA. 0+597.983)

SCALE: HORIZ. 1:500	VERT. 1:50	PROJECT No. 07-294
DESIGNED BY: K.M.	DRAWN BY: M.Z./D.Z.	DRAWING No. 65
CHECKED BY: Z.L.	DATE: MARCH 2008	

TOWN OF CALEDON
PLANNING
RECEIVED
Nov 26, 2021



SITE

KEY PLAN
N.T.S.

BENCHMARK: ELEV. 264.941

ON THE NORTH FACE AT THE EAST CORNER OF A GREY BRICK BUNGALOW LOCATED ON THE SOUTH SIDE OF SEVENTEENTH SIDEROAD (REGION ROAD #14) APPROX. 122m EAST OF SECOND LINE EAST.

LEGEND:

- LIMIT OF PROPERTY
- SANITARY SEWER/MANHOLE
- STORM SEWER/MANHOLE
- STORM SEWER/MANHOLE
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- SINGLE CATCHBASIN WITH 19.8L/S INLET CONTROL DEVICE (ICD)
- DOUBLE CATCHBASIN WITH 19.8L/S INLET CONTROL DEVICE (ICD)
- EXISTING SINGLE CATCHBASIN
- EXISTING DOUBLE CATCHBASIN
- HYDRANT AND VALVE
- EXISTING HYDRANT AND VALVE
- VALVE AND BOX
- EXISTING VALVE AND BOX
- EXISTING HYDRO POLE/LAMP STANDARDS
- EXISTING WATERMAIN REDUCER
- LOT NUMBER
- MUNICIPAL ADDRESS
- FUTURE / EXISTING LOT NUMBER
- EXISTING WATER SERVICE BOX LOCATION
- WATER SERVICE BOX LOCATION (WATER SERVICE AT 90° TO WATERMAIN UNLESS OTHERWISE SHOWN)
- INFILTRATION TRENCH (SEE DWG 901 FOR DETAIL)
- FROST COLLAR INSTALLED ON WATER SERVICE BOX
- EXISTING TREES
- EXISTING OVERHEAD WIRES
- TYPICAL DUAL SERVICE CONNECTION INCLUDES ONE DOUBLE STORM CONNECTION AND ONE SINGLE SANITARY CONNECTIONS AT 90° TO SEWERS AS PER REGION OF PEEL STANDARD DWG 2-4-4 (UNLESS OTHERWISE SHOWN)
- SINGLE STORM AND SINGLE SANITARY CONNECTIONS
- COMMUNITY MAILBOX PAD, SEE DETAILS ON 900 SERIES DRAWINGS
- CANADA POST SPEC. E10X-ENG-##
- NUMBER OF MODULES
- EXISTING COMMUNITY MAILBOX PAD
- DRIVEWAY LOCATION
- EXISTING DRIVEWAY LOCATION
- 4:1 SLOPE EMBANKMENT (UNLESS OTHERWISE NOTED)
- TOPSOIL BERM
- 1.8m HIGH NOISE FENCE (SEE DRAWING 901 FOR DETAIL)
- EXISTING PRIVACY FENCE
- ANTI-SEEPAGE COLLAR (SEE DRAWING 901)
- PROPOSED PAVEMENT WIDENING
- INFRASTRUCTURE TO BE MAINTAINED
- INFRASTRUCTURE TO BE REMOVED
- INFRASTRUCTURE TO BE RELOCATED
- TREES TO BE PRESERVED

AS-CONSTRUCTED

TOPOGRAPHIC SURVEY PROVIDED BY HOLDING JONES VANDERVEEN INC., JULY 2014

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	AS-CONSTRUCTED SUBMISSION	OCT/18	D.W.	-
2.	REVISED AS-CONSTRUCTED SUBMISSION	MAY/19	D.W.	-

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

TOWN OF CALEDON
6311 OLD CHURCH ROAD
CALEDON, ONTARIO L7C 1J6
TEL: (905) 584-2272
FAX: (905) 584-4325

DIGRAM DEVELOPMENTS CALEDON INC.

LIVINGSTON ESTATES - PHASE 1 (T-13001C)

ABBOTSIDE WAY
STA. 0+800 TO 1+035

DATE:	MAY 2019	DESIGNED BY:	S.W.L/D.W.	CHECKED BY:	M.R.C./S.M.S.
SCALE:	H 1:500 V 1:50	DRAWN BY:	M.J.O./J.Y.L.	CHECKED BY:	P.A.S.

5 0 10 20 30 40 HORIZONTAL

APPROVED FOR CONSTRUCTION
THIS APPROVAL CONSTITUTES A GENERAL REVIEW AND DOES NOT CERTIFY DIMENSIONAL ACCURACY.
THIS APPROVAL IS SUBJECT TO THE FURTHER CERTIFICATION OF THE "AS-CONSTRUCTED" WORKS BY A REGISTERED PROFESSIONAL ENGINEER OF THE PROVINCE OF ONTARIO

DATE: ______ APPROVED BY: ______

PROJECT No: 1551

DRAWING No: 408

File: P:\1551 Livingston Estates\Drawings\Phase 1\As-builts\Pnp\1551AB-PROF-408.dwg – Revised by <TMCNEIL> : Mon, Oct 04 2021 – 11:10am

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT STUDY

FOR

MAYFIELD WEST COMMUNITY

IN THE

TOWN OF CALEDON

NOVEMBER 2007

the north east limit of the community. An unnamed tributary of Etobicoke Creek is located in the south east corner of the community. Within the community, the lands are drained by a series of intermittent drainage features and plowed-over swales.

The Mayfield West community is located within two watersheds. The majority of the lands are located within the Etobicoke Creek watershed, while the balance of the lands is located in the Humber River watershed in the north east portion of the urban area.

The delineation of pre-development drainage areas is illustrated in ***Figure 5.***

6.0 STORMWATER MANAGEMENT

6.1 Etobicoke Creek Watershed Stormwater Management Requirements

Under existing conditions, approximately 448 hectares of the Mayfield West community drains to Etobicoke Creek and its tributaries. In accordance with the *Etobicoke Creek Study*, stormwater management must be practiced as follows:

Water Quality Control
- Sized for "Enhanced" protection in accordance with the SWMP Design Manual

Erosion Control
- Detention of runoff from the 50 mm storm (no flow outlet)

Quantity Control
- Control post development flows in accordance with Unit Flow Equations and pre-development areas

Volume resulting in a continuous simulation to achieve the erosion threshold as established for the Fluvial Geomorphology report. Threshold values for each of the proposed ponds will be clearly identified.

Post development release rates for the 2 through 100 year storm events will be set based on the Estimated Unit Flow Rate Regression Relationships provided by the Toronto Region Conservation Authority, July 14, 2006.

It should be noted that the Etobicoke Creek Headwaters Study was not completed and the updated hydrology model was not available at the time of this writing. The above requirements should be reviewed once the completed Headwaters Study and the results from the updated hydrology model are available.

6.2 West Humber River Watershed Stormwater Management Requirements

Under existing conditions, approximately 152 hectares of the Mayfield West community drains to the H3 and H2 Tributaries of the West Humber River. In accordance with the *West Humber Study*, stormwater management must be practiced as follows:

Water Quality Control	➢	Sized for "Enhanced" protection in accordance with the SWMP Design Manual
Erosion Control	➢	Based on Distributed Runoff Controls (see below)
Quantity Control	➢	Control post development flows in accordance with Unit Flow Equations and pre-development areas

The pre-development drainage areas were used to determine the target release rates for each SWM pond. In accordance with ***Figure 5***, the pre-development drainage areas to the H2 and H3 tributaries of the West Humber River are 39.8 and 53.3 hectares respectively.

Post development release rates for the 2 through 100 year storm events will be set based on the Unit Flow Relationships for Sub-Basin 36, as provided by the Toronto Region Conservation Authority.

To mitigate the potential for stream bank erosion, a "Distributed Runoff Control" (DRC) approach is to be used. For the study area, 85% overcontrol is recommended. Accordingly, the "DRC" discharge is to be 15% of the 2 year pre-development peak flow (calculated using the Unit Flow equations). Furthermore, the storage volume in the ponds associated with the DRC discharge should be 2/3 of the two year storage volume.

Stormwater management pond volumes should be determined based on the more conservative results obtained from either the 6 hour or 12 hour Atmospheric Environment Services (AES) rainfall distributions. These volumes may change during the detailed design stage, please refer to the Agency Correspondence, which forms part of this MESP.

The AES rainfall distributions as provided by TRCA are included in ***Appendix D.***

6.3 Selection of Stormwater Management Controls

Based on the ***SWMP Design Manual***, the preferred method of addressing stormwater management objectives is based on the following hierarchy of treatment solutions:

1. Stormwater lot level controls
2. Stormwater conveyance controls
3. End-of-pipe stormwater management facilities

Infiltration Strategy

Development in the Mayfield West Community must take into consideration the 'environment first' principle, which has been established as a guiding principle for the development of the community. One component of achieving this desired objective, and the sustainability and Adaptive Management objectives for the community, is the integration of best management practices pertaining to maintaining as closely as possible and practicable, pre-development ground water conditions post-development.

With the inevitable changes in impervious areas, and potential changes to surface and ground water quality and quantity, best management practices that promote post-development groundwater infiltration/recharge, and maintain post-development surface water quality and quantity to pre-development levels are critical. Providing for the best possible water quality from proposed stormwater management ponds. maintaining or enhancing thermal qualities associated with the ponds, and mitigating against downstream erosion must all be considered.

In this regard, the following should be considered:

a) In support of each proposed development, existing infiltration through an appropriate long term water budget assessment (i.e. AES Thornthwaite - minimum monthly or daily) and groundwater recharge contributions to natural features, specifically Snell's Hollow wetland (wetland at the south development limit) must be quantified. References and/or supporting documentation for the meteorological data and calculations of potential evapotranspiration values used for the water budget analysis will be required. Also, the hydrogeological setting must be adequately assessed through secondary source information and/or field work, and any direct relationship and/or potential influence on surface water recharge contributions must be identified and supported with sufficient information and/or analysis.

b) In support of each proposed development a post-development water budget assessment to quantify both recharge as well as deficits must be provided. Any roof runoff directed to lawns, used to mitigate an infiltration deficit should be accounted for as additional monthly precipitation input to the pervious areas in the post-development Thornthwaite Mather calculations. The infiltration factor for pervious areas in the post-development calculations should be adjusted to account for lot grading and soil compaction resulting from construction activities. In general, a reduction of 0.1 is considered appropriate.

c) A screening of infiltration mitigation measures must be carried out based on available site information collected either through background sources and/or field work.

Potential measures (above and beyond traditional lot level controls) to be considered include:

- Rain water harvesting from roof-top water collection on more intensive residential uses, commercial or employment lands, which may be used for irrigation purposes (residential for adjacent park areas)
- Infiltration galleries
- Exfiltration galleries
- Biofiltration measures
- Green roofs
- Porous pavement
- Additional non-compacted topsoil
- "third pipe' systems
- additional evapotranspiration measures"

Lot Level Controls

Lot level controls include rainwater harvesting, reduced lot grading, ponding areas, soakaway pits, infiltration trenches, etc.

In the case of Mayfield West, ponding areas are discouraged due to the impervious nature of the Halton till, which would result in nuisance ponding for extended periods of time.

Where footing drains are constructed, these may connected to features such as infiltration trenches, provided that there is a mechanism for ensuring that the water does not remain in the footing drain and leak back into basements.

Soakaway pits may have some limited applicability, but are generally not recommended because of the size required to be effective given the poor infiltration characteristics of the existing soils and and the issue of location restricting land use on residential lots (i.e. conflict with the construction of back yard pools). Special attention should be paid to the occasional sandy areas which were identified sporadically throughout the community. In these localized areas, soakaway pits can be considered.

Rainwater harvesting in combination with infiltration trenches can be considered. Harvested water can be used for irrigation of private lawns, vegetated areas in the commercial/industrial and employment land areas. Excess water can also be diverted to infiltration measures such as infiltration trenches and soakaway pits which could be designed to further overflow to the storm water system. This would maximize the potential to infiltrate available water harvested for roof tops.

Reduced lot grading should be considered to the extent permitted by Town of Caledon. Furthermore, the discharge of roof leaders onto splash pads is also recommended. The reduced lot grading will result in the polishing of the runoff water as it passes through the vegetative medium. It will also reduce the volume of runoff through initial abstraction and evaporation, and reduce peak flows by reducing the flow velocity. These techniques will promote infiltration to the maximum extent possible.

Conveyance Controls

Conveyance controls include pervious pipe and catchbasin systems, and grassed or vegetative swales.

In the case of Mayfield West, pervious pipe and catchbasin systems generally offer limited benefit due to the impervious nature of the Halton till. Special attention should be paid to the occasional sandy areas which were identified sporadically throughout the community. In these localized areas, pervious pipe and catchbasin systems can be considered.

Vegetative swales may be applied in some limited locations, such as parks and green connectors to the extent permitted by Town of Caledon. The vegetative swale will polish the water as it passes through the vegetative medium. It will also reduce the volume of runoff through initial abstraction and evaporation, and reduce peak flows by reducing the flow velocity. These techniques will promote infiltration to the maximum extent possible.

End-of-Pipe Controls

End-of-Pipe controls include ponds, infiltration basins, and oil / grit separators.

Storm ponds are considered extremely effective in achieving a comprehensive approach to water quantity, quality, and erosion control objectives.

As stated previously, infiltration basins would generally not be effective due to the impervious nature of the Halton till. Oil / grit separators could be considered as part of a comprehensive treatment train in the event that there are isolated parcels of land which are constrained by grade, and cannot be conveyed by gravity towards a stormwater management pond.

Recommended Water Quality Techniques

The following water quality techniques are recommended in order to meet the Enhanced level of protection:

- Rain water harvesting, including the use of cisterns in residential area, in combination with other infiltration techniques
- Discharge of roof leaders to splash pads in residential areas.
- The use of infiltration trenches to the extent permitted by the municipality
- Reduced lot grading; to the extent permitted by the municipality
- Vegetative swales; in larger open space areas to the extent permitted by the municipality
- Stormwater management ponds; designed in accordance with the ***SWMP Design Manual***

Furthermore, in isolated areas where sandy soils are found, the following additional localized techniques can be considered on a site specific basis:

- Soakaway pits
- Pervious pipe and catchbasin systems

It should be noted that the Town of Caledon does not support the use of built infiltration measures. As such, the vegetative swales, soakaway pits and pervious pipe and catchbasin systems identified above will likely not be applied. Furthermore, selection of stormwater management techniques includes consideration for minimizing the long term maintenance and operations costs to the municipality.

6.4 Preliminary Pond locations

Based on detailed pond analysis, it was determined that ten multi-function stormwater management ponds will be provided in the larger Mayfield West area to achieve the required stormwater management objectives.

The pond locations were selected based on the following criteria:

- Minimizing the number of stormwater management facilities.
- General conformance with the pre-development drainage areas under post development conditions
- Avoidance of unnecessary crossing of major infrastructure under post development conditions, such as arterial roads.
- Generally locating pond outfalls near the location where pre-development flows enter the receiving drainage system.

- Generally limiting pond drainage areas to a maximum of 100 hectares, after which the magnitude of the major system flows exceeds the capacity of the road allowance and 100 year capture is required.

The pond requirements were considered comprehensively, including consideration for future development areas which are have a high likelihood of being included in a future urban expansion of Mayfield West.

Where external lands are tributary to stormwater management ponds, assumptions have been made regarding land use and impervious coverage. The feasibility of pre-building these ponds to their ultimate size will be assessed at the detailed design stage. In cases where the external land contribution is small, it is recommended that the pond be constructed to its ultimate size in one comprehensive operation. When the external land contribution is large, it is recommended that the pond be constructed to accommodate the current urban area only, with consideration in the design for the potential future expansion.

It should be recognized that the proposed pond locations and designs are conceptual and are subject to change later in the planning process. The detailed pond design and locations will be finalized at the detailed design stage, based on the final land use, the detailed grading design and the final impervious coverage. Furthermore, opportunities to consolidate ponds should be explored at the detailed design stage in order to minimize the long term maintenance and operations costs to the municipality.

The location of the above ponds is illustrated in ***Figure 6.***

7.0 POND OPERATING CHARACTERISTICS

The stormwater management ponds have been designed in accordance with the requirements of the ***Town of Caledon*** and the ***SWMP Design Manual***, and include the following features:

Sediment Forebay
- to improve sediment removal prior to entering the pond

Permanent Pool
- to buffer storm flows and trap pollutants

Extended Detention Storage
- to provide water quality and erosion control

Quantity Control Storage
- to attenuate post development flows to the allowable release rates as per the Subwatershed Study

The conceptual design of the stormwater management ponds as well as a typical cross section is presented in ***Appendix E.*** A summary of the pond operating characteristics is presented in ***Table 6.***

Table 6
Summary of Stormwater Management Facility Characteristics

Pond I.D.	Pond Type	Drainage Area (ha)	Imp. Cover (%)	Estimated Required Storage Volume (m^3)							
				Quality and Erosion [1, 2]		Quantity Control [3]					
				Perm. Pool	Quality + Erosion	2 Yr	5 Yr	10 Yr	25 Yr	50Yr	100 Yr
E1	wet	58.4	55	8,760	19,038	12,420	18,110	19,130	22,170	24,960	27,840
E2	wet	98.8	60	15,973	33,869	22,990	32,950	34,100	39,270	43,930	48,820
E3	wet	66.9	55	10,035	21,809	14,220	20,750	21,920	25,270	28,410	31,690
E4	wet	81.4	75	15,735	32,080	23,910	32,080	32,740	37,010	41,030	45,110
E5	wet	35.1 [4]	70.7	6,536	13,373	9,963	13,370	13,540	15,090	16,650	18,270
E6	wet	20.8	75	4,021	8,197	6,108	8,198	8,359	9,442	10,460	11,510
E7	wet	58.4 [5]	61.9	9,700	20,679	15,400	20,680	20,920	22,960	25,240	27,640
E8	wet	22.9	55	3,435	9,025	6,724	9,025	9,235	10,430	11,550	12,700
H1	wet	31.6 [6]	67.9	5,691	2,331	3,497	4,859	5,844	7,105	8,079	9,042
H2	wet	61.0	75	11,793	9,567	14,220	19,020	22,570	27,240	30,780	34,270
H3	wet	59.2	65	10,259	7,667	11,480	16,020	19,450	23,880	27,230	30,580
H2 Int. [7]	wet	14.56	75	2,815	2,253	3,377	4,534	5,398	6,513	7,369	8,208
H3 Int [7]	wet	20.46	65	3,546	2,633	3,942	5,592	6,811	8,363	9,534	10,700

1 as per SWMP Design Manual, Table 3.2, Enhanced protection
2 based on 50 mm storm volume without release rate for ponds E1 to E8 and based on DRC rates of 15% of 2 year pre-development rates from unit flow equations for ponds H1 to H3, all include the extended detention volumes of 40 m^3/ha.
3 based on Unit Flow Equations
4 includes one woodlot area totaling 2.0 ha
5 includes one woodlot area totaling 10.2 ha
6 includes two woodlot areas totaling 8.6 ha
7 for interim conditions

The impervious coverage has been estimated based on the various land uses and their respective sizes in the current plan. Please note that the final impervious coverage will up-dated at the detailed design stage based on the characteristics of the actual plan, and the pond sizing adjusted accordingly.

8.0 POND COMPONENTS

8.1 Sediment Forebay

All stormwater management ponds include a sediment forebay in order to improve the pollutant removal by trapping larger particles near the inlet of the pond. The forebay should be designed with a length to width ratio of approximately 2:1 and should not exceed one third of the permanent pool surface area for wet ponds or one fifth of the permanent pool area for wetlands, as required in the ***SWMP Design Manual***. Furthermore, the forebay should have a minimum depth of 1.0 metre (1.5 metres preferred) to minimize the potential for re-suspension.

8.2 Permanent Pool

The permanent pool is approximately 1.5 metres deep, which falls within the one to two metre deep range recommended in the ***SWMP Design Manual***.

The permanent pools have been sized to provide Enhanced protection in accordance with the ***SWMP Design Manual***. Side slopes will be graded with at 5:1 for three metres either side of the permanent pool water level, with minor localized variations.

8.3 Extended Detention Storage

The extended detention component has been provided with side slopes of 5:1 in the vicinity of the permanent pool, and 4:1 elsewhere. The side slopes conform with the **SWMP Design Manual** which recommends a maximum slope of 3:1.

8.4 Extended Detention Outlet

The extended detention volume within the ponds will outlet through a reverse graded pipe. An orifice will be provided to discharge the extended detention volume at the allowable release rate for erosion control.

It should be noted however, that the Town of Caledon does not support reverse graded pipes. The preferred outlet configuration will be determined at the detailed design stage based on further discussions with City of Brampton and CVC.

Quantity control will be provided by a combination orifice / notched weir located in the outlet structure. The allowable release rates for the ponds are summarized in ***Tables 7 and 8.***

Table 7
Summary of Discharge Characteristics
Etobicoke Watershed – Unit Flows

Pond I.D.	Imp. Coverage (%)	Drainage Area (ha)	Release Rates (m^3/s) [1]					
			Extended Detention [2]	Erosion [2]	2 Year	5 Year	25 Year	100 Year
E1	55	58.4	0	0	0.250 [3]	0.449 [3]	0.812	1.154
E2	60	98.8	0	0	0.422 [3]	0.759 [3]	1.374	1.953
E3	55	66.9	0	0	0.286 [3]	0.514 [3]	1.124	1.322
E4	75	81.4	0	0	0.348 [3]	0.625 [3]	1.132	1.609
E8	55	22.9	0	0	0.098 [3]	0.176 [3]	0.318	0.453
From ponds to Etobicoke Creek		328.4	0	0	**1.404** [3]	**2.523** [3]	**4.567**	**6.490**
E5	70.7	35.1	0	0	0.157 [3]	0.281 [3]	0.509	0.723
E6	75	20.8	0	0	0.093 [3]	0.167 [3]	0.302	0.428
E7	61.9	58.4	0	0	0.261 [3]	0.468 [3]	0.847	1.202
From ponds to E2 Tributary		114.3	0	0	**0.510** [3]	**0.916** [3]	**1.657**	**2.353**
Woodlot AE9 (undeveloped)		5.0	N/A	N/A	0.066 [4]	0.101 [4]	0.166 [4]	0.226[4]
Total to E2 Tributary		119.3	0	0	0.576 [3]	1.017 [3]	1.823	2.579

[1] Release rates are based on unit flow equations applied to pre-development drainage areas (330.8 ha to Etobicoke Creek and 118.4 ha to Tributary E2 of Etobicoke Creek) and prorated based on post-development areas.
[2] For preliminary sizing of the ponds, the first 50 mm storm volume is stored without release and this storage also provides for the extended detention.
[3] Unused release rate since 2-yr and 5-yr storm are contained within required 50 mm storm volume, which is without release rate.
[4] Pre-development release rates for most critical storm (6-hour)

Table 8
Summary of Discharge Characteristics
Humber Watershed – Unit Flows

Pond I.D.	Imp. Coverage (%)	Drainage Area (ha)	Unit Release Rates (m^3/s)					
			Extended Detention	Erosion (DRC)	2 Year	5 Year	25 Year	100 Year
H1	57.7	37.2	0.023	0.030	0.348	0.531	0.824	1.085
To H2 Tributary			0.023	0.030	0.348	0.531	0.824	1.085
H2	75	55.4	0.016	0.060	0.295	0.449	0.697	0.917
H3	65	59.2	0.022	0.058	0.286	0.436	0.676	0.890
To H3 Tributary			0.038	0.118	0.581	0.885	1.373	1.807
H2 Interim	75	14.56	0.009	0.017	0.070	0.107	0.166	0.219
H3 Interim	65	20.46	0.015	0.023	0.099	0.151	0.234	0.308

8.5 Access Road

Four metre wide access roads will be provided in each facility in order to facilitate routine inspection and maintenance activities. The maximum slope of access roads is 10:1.

8.6 Emergency Overflows

In the event of a blockage or a storm greater than the design horizon, provision must be provided for emergency overflows.

Ponds located adjacent to watercourses should include an overflow spillway. Where a pond is not located immediately adjacent to an open watercourse, or where a spillway is not available, the outlet structure should be protected from blockage by an oversized metal cage / trash rack. Furthermore, the outlet structure should be sized to accommodate emergency overflows based on an assumed 50% blockage factor.

8.7 Thermal Mitigation

Pond H2 will release into the H3 Channel, which is considered a cold water fishery. Based on the above, Pond H2 will provide thermal mitigation by the application of the following measures:

- A reverse graded pipe has been provided in a deep pool to draw the cooler water from the deepest portions of the ponds.
- The extended detention discharge is released through a buried outlet pipe, thereby using the thermal mass of the surrounding soil to reduce water temperatures.
- The facilities have been designed with a high length to width ratio to allow for effective shading with landscape material.
- Increased riparian vegetation will be provided along the permanent pool and outlet.

9.0 OPERATIONS AND MAINTENANCE

A detailed operations and maintenance manual for the stormwater management ponds and related infrastructure will be submitted at the time of detailed design. The operations and maintenance manual will be prepared in conformance with the Town of Caledon design criteria and the SWMP Design Manual.

The typical operations and maintenance activities for the stormwater management features and the respective costs are set out in the SWMP Design Manual. Please refer to Sections 6.0 of the SWMP Design Manual, *Operation, Maintenance and Monitoring*, and Section 7.0, *Capital and Operational Costs* for additional details.

10.0 STORM DRAINAGE

10.1 Conveyance of Minor System Flows

All lands within the study area will be serviced by a conventional storm sewer system designed in accordance with Town of Caledon standards. The storm sewers will be sized using a 10 year return frequency and Town of Caledon IDF curves.

All storm flows will be directed to one of ten stormwater management facilities, where the runoff will be treated for water quality, erosion, and quantity control.

The conceptual storm servicing scheme is illustrated in ***Figure 7.***

10.2 Conceptual Storm Trunk Sewers

A network of storm trunk sewers will be required in order to convey the ten year flows to the respective stormwater management ponds.

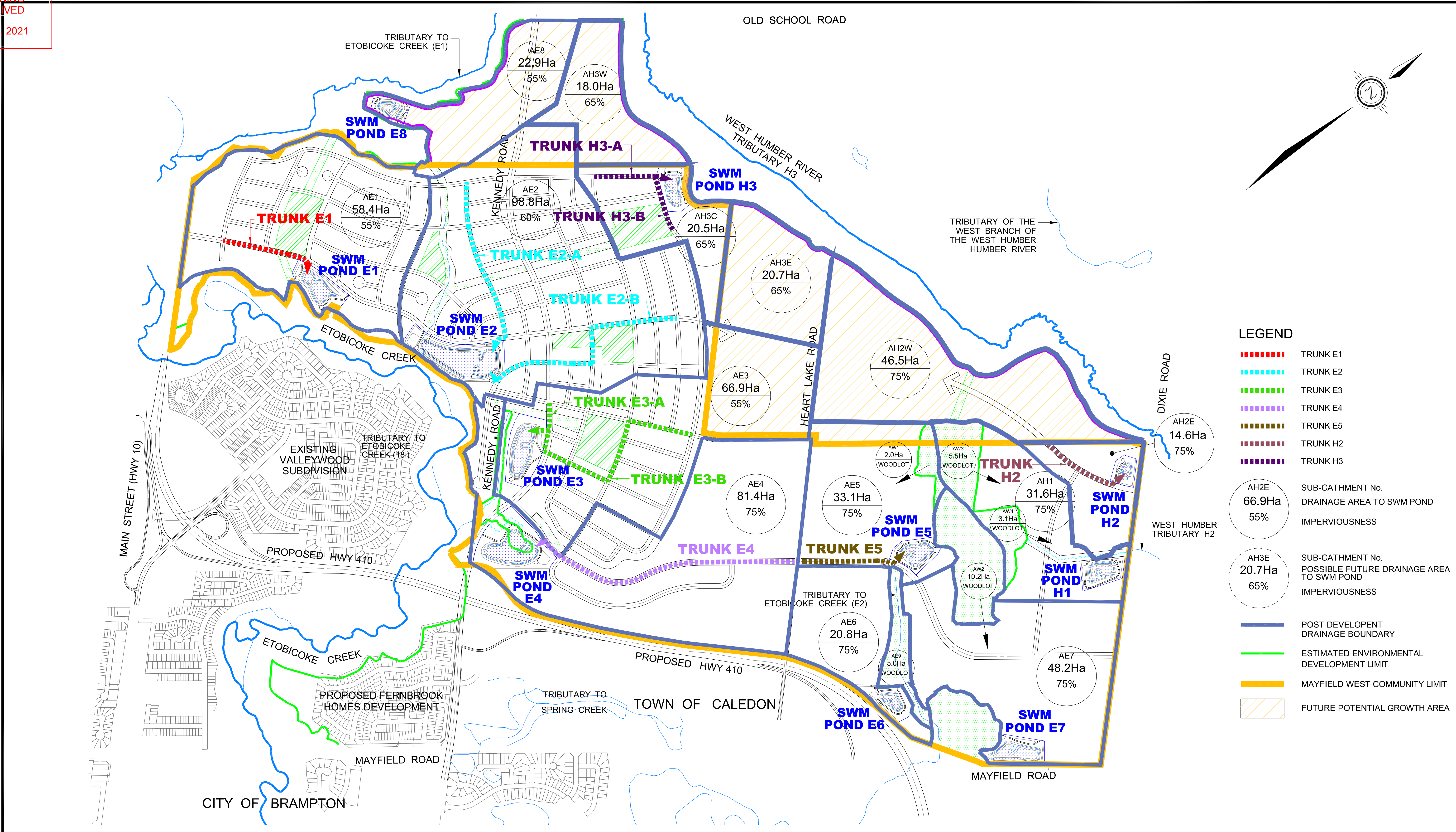
The conceptual storm trunk layout is illustrated in ***Figure 7.***

The preliminary profiles for the storm trunks are included in ***Appendix F.*** For estimating preliminary pipe sizes, ten year flows have been increased by 20% to account for increased runoff capture in the storm sewer during the 100 year event. The actual hydraulic performance of the storm sewer during one hundred year storm event will be confirmed at the detailed design stage.

10.3 Conveyance of Major Storm Flows

A continuous overland flow route has been provided through the study area in order to safely convey major system flows in excess of the minor system and up to the hundred year event. All overland flow routes will be directed to one of ten stormwater management ponds located in the study area. The major system flow will not exceed the width of the road allowance, and in no case will the depth of flow will exceed 0.15 metres above the crown of the road. Should the major system flow exceeds the conveyance capacity of any given road, the storm sewer will be sized to accommodate the flows in excess of the road capacity.

The conceptual major storm system is illustrated in ***Figure 7 and Drawing 1.***



COSCORP Master Builder

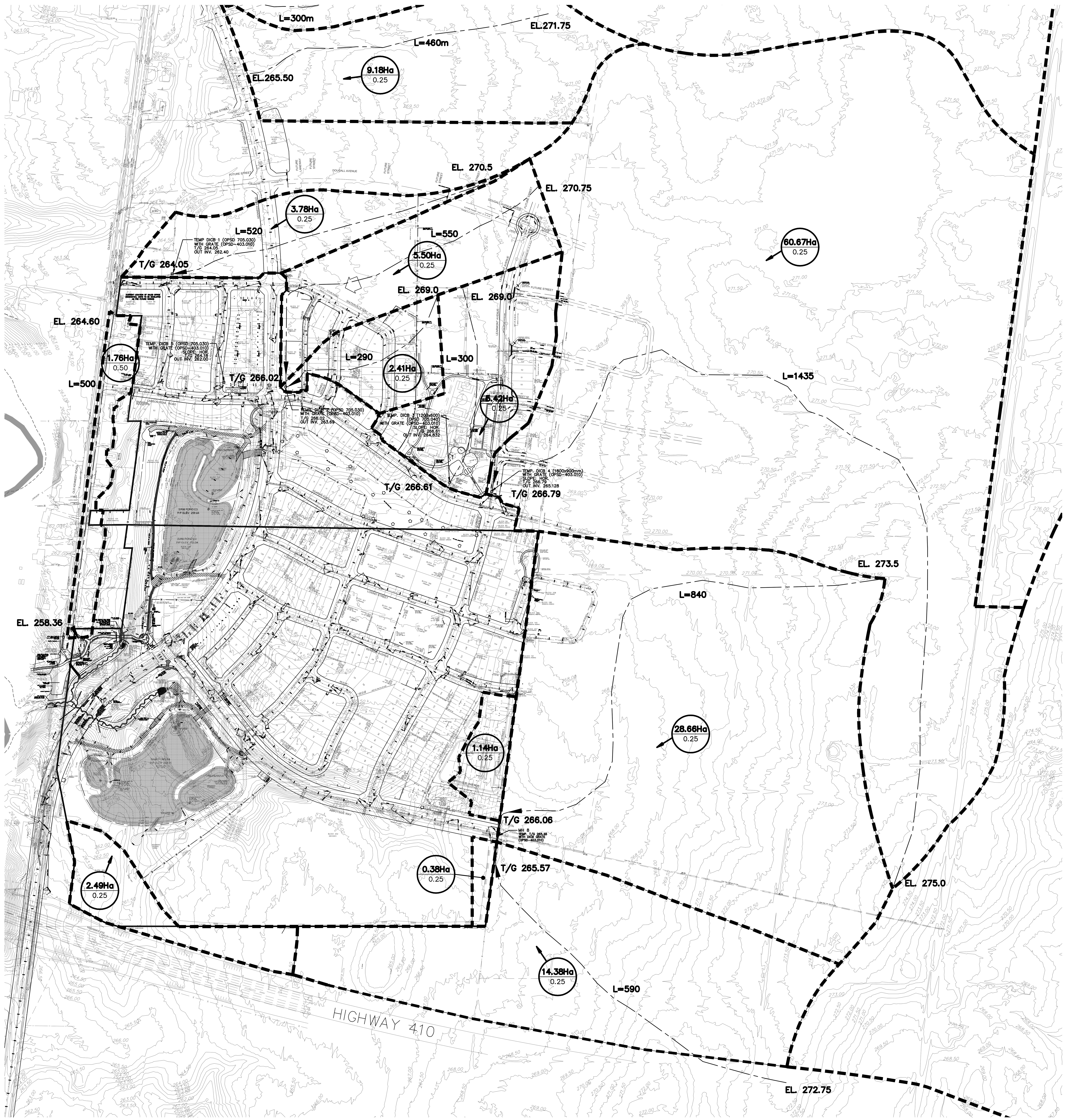
Monarch by Taylor Woodrow

DAVID SCHAEFFER ENGINEERING LTD.
600 ALDEN ROAD., SUITE 500
MARKHAM, ONTARIO., L3R 0E7
(905) 475-3080

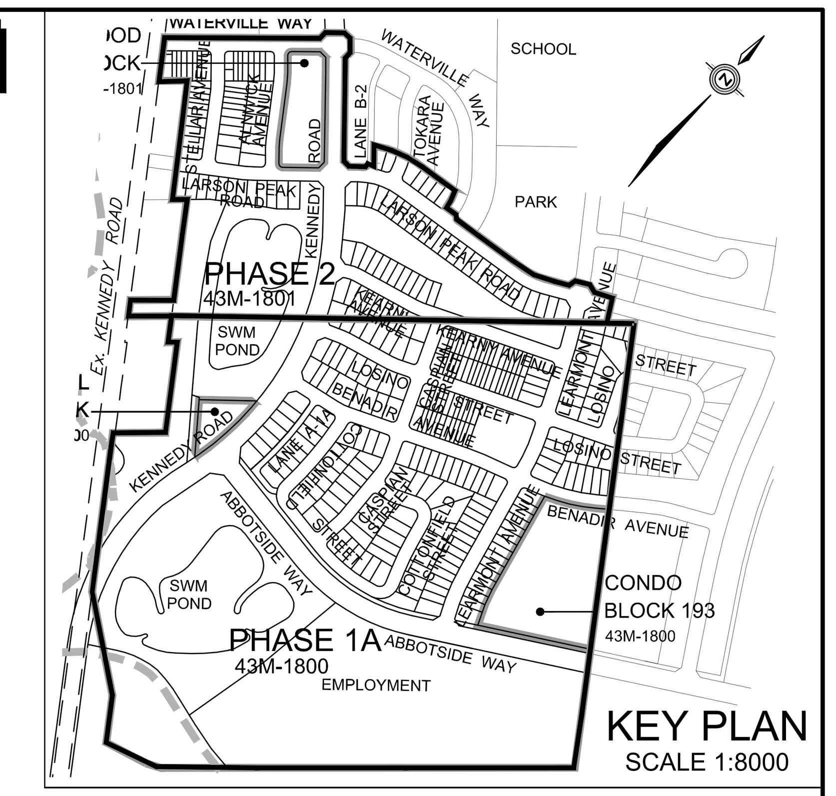
MAYFIELD WEST COMMUNITY CONCEPTUAL STORM SERVICING TOWN OF CALEDON

DATE: AUGUST 2006
SCALE: 1:15000
PROJECT No.: 05-266
FIGURE 7

AS-CONSTRUCTED



NOTE:
ALL AS-CONSTRUCTED INFORMATION PROVIDED BY RADY-PENTEK & EDWARD SURVEYING LTD.



KEY PLAN
SCALE 1:8000

LEGEND

2.06Ha / 0.25 — EXISTING EXTERNAL DRAINAGE AREA IN HECTARES RUN-OFF COEFFICIENT

EXTERNAL STORM TRIBUTARY BOUNDARY

PHASE LINE

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY RADY-PENTEK & EDWARD SURVEYING LTD., PROJECT No. 05-260, TOPOGRAPHIC SURVEY DATED ON FEBRUARY 27, 2008.

LEGAL INFORMATION

CALCULATED M-PLAN PROVIDED BY RADY-PENTEK & EDWARD SURVEYING LTD., PROJECT No. 07-258 FOR PHASE 1A, SURVEY DATED APRIL 24, 2008. PROJECT No. 07-259 FOR PHASE 2, SURVEY DATED FEBRUARY 19, 2008.

NO.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D
1	A.S.	10-01-22	AS-CONSTRUCTED SANITARY AND STORM SEWERS.		

APPROVED FOR CONSTRUCTION
THIS APPROVAL CONSTITUTES A GENERAL REVIEW AND DOES NOT CERTIFY DIMENSIONAL ACCURACY.

THIS APPROVAL IS SUBJECT TO THE FURTHER CERTIFICATION OF THE "AS CONSTRUCTED" WORKS BY A REGISTERED PROFESSIONAL ENGINEER OF THE PROVINCE OF ONTARIO.

DATE : SEPT. 9, 2008 APPROVED BY: C. CAMPBELL (ORIGINALLY SIGNED)
C. CAMPBELL, C.E.T.
DIRECTOR OF PUBLIC WORKS
AND ENGINEERING

BENCH MARK:

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CITY OF BRAMPTON BENCHMARK No. J1-313, HAVING AN ELEVATION OF 252.147 METRES. LOCATED ON SOUTH FACE OF CONCRETE PORCH DECK ON WHITE SIDE BUNGALOW No. 11575 DIXIE ROAD, BEING 0.55km SOUTH OF MAYFIELD ROAD. TABLET IS SET 0.07m BELOW TOP OF DECK AND 0.27m EAST OF SOUTHEAST CORNER OF DECK.

ELEVATION = 252.147 m

SOUTH FIELDS COMMUNITY MOSCORP
PHASES 1A (21T-06004C)
PHASES 2 (21T-06002C)

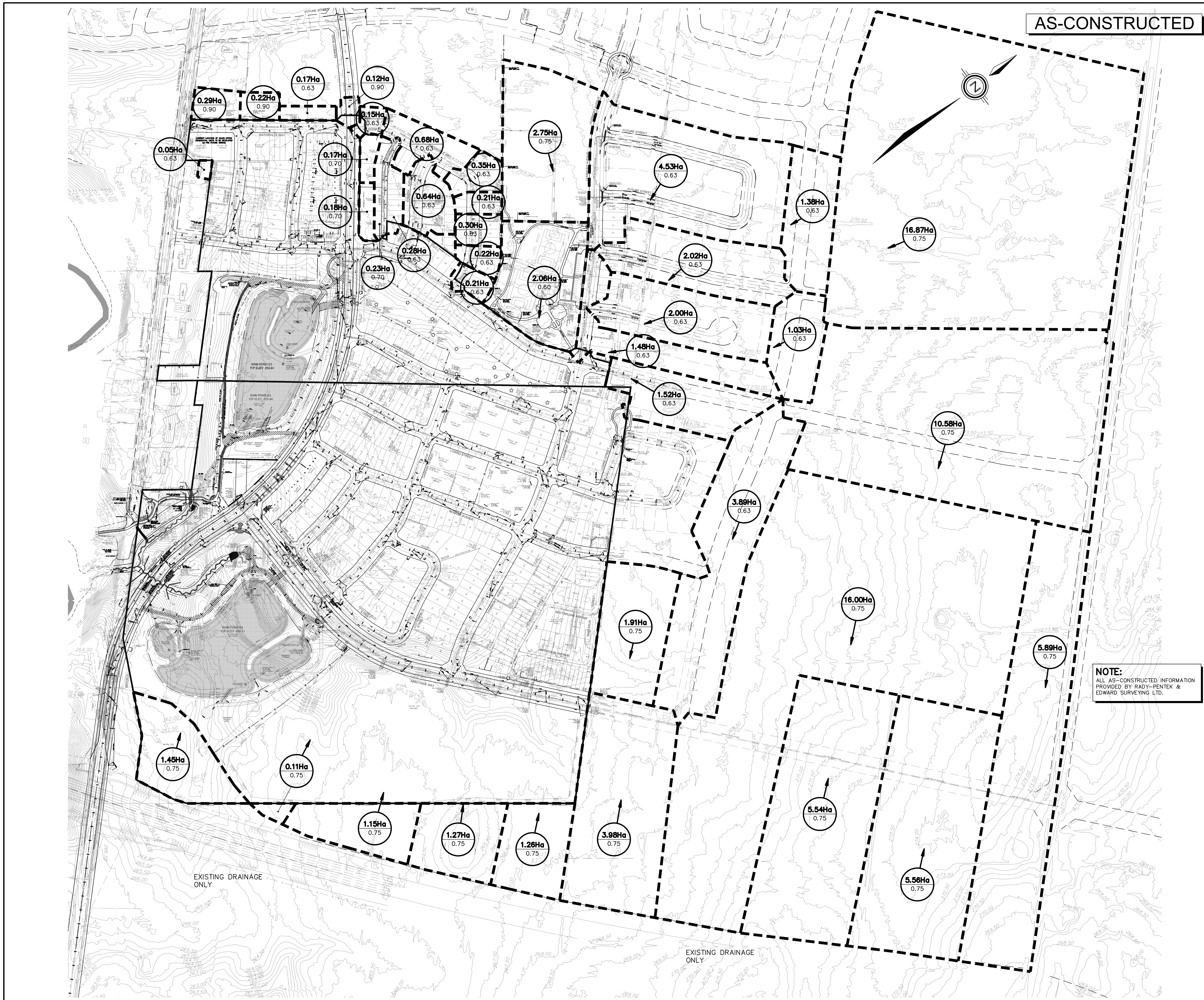
DSEL
david schaeffer engineering ltd
600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

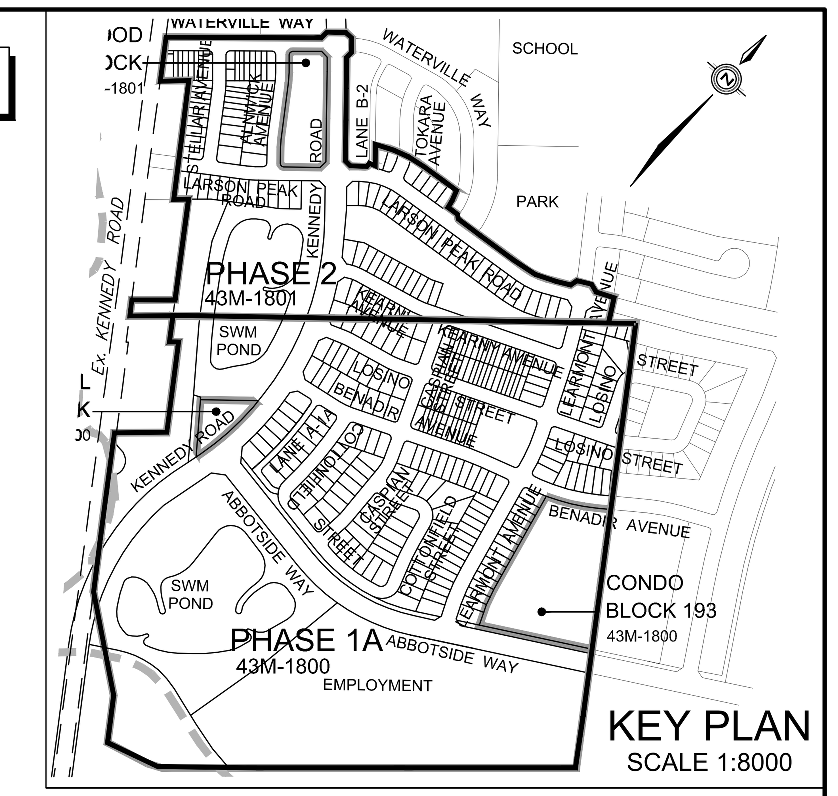
Region of Peel
Public Works

TOWN OF CALEDON

EXISTING EXTERNAL STORM DRAINAGE PLAN

SCALE: 1:3000		PROJECT No.	07-294
DESIGNED BY: K.M.	DRAWN BY: M.Z./D.Z.	DRAWING No.	21B
CHECKED BY: Z.L.	DATE: MARCH 2008		





KEY PLAN
SCALE 1:8000

LEGEND

2.06Ha — EXTERNAL DRAINAGE AREA IN HECTARES (FUTURE LANDS TO BE DEVELOPED UNLESS OTHERWISE NOTED)
0.25 — RUN-OFF COEFFICIENT

EXTERNAL STORM TRIBUTARY BOUNDARY

PHASE LINE

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY RADY-PENTEK & EDWARD SURVEYING LTD., PROJECT No. 05-260, TOPOGRAPHIC SURVEY DATED ON FEBRUARY 27, 2008.

LEGAL INFORMATION

CALCULATED M-PLAN PROVIDED BY RADY-PENTEK & EDWARD SURVEYING LTD., PROJECT No. 07-258 FOR PHASE 1A, SURVEY DATED APRIL 24, 2008. PROJECT No. 07-259 FOR PHASE 2, SURVEY DATED FEBRUARY 19, 2008.

NO.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D
1	A.S.	10-01-22	AS-CONSTRUCTED SANITARY AND STORM SEWERS.		

APPROVED FOR CONSTRUCTION
THIS APPROVAL CONSTITUTES A GENERAL REVIEW AND DOES NOT CERTIFY DIMENSIONAL ACCURACY.

THIS APPROVAL IS SUBJECT TO THE FURTHER CERTIFICATION OF THE "AS CONSTRUCTED" WORKS BY A REGISTERED PROFESSIONAL ENGINEER OF THE PROVINCE OF ONTARIO.

DATE: SEPT. 9, 2008 APPROVED BY: C. CAMPBELL (ORIGINALLY SIGNED)
C. CAMPBELL, C.E.T.
DIRECTOR OF PUBLIC WORKS AND ENGINEERING

BENCH MARK:

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CITY OF BRAMPTON BENCHMARK No. J1-313, HAVING AN ELEVATION OF 252.147 METRES. LOCATED ON SOUTH FACE OF CONCRETE PORCH DECK ON WHITE SIDE BUNGALOW No. 11575 DIXIE ROAD, BEING 0.55km SOUTH OF MAYFIELD ROAD. TABLET IS SET 0.07m BELOW TOP OF DECK AND 0.27m EAST OF SOUTHEAST CORNER OF DECK.

ELEVATION = 252.147 m

SOUTH FIELDS COMMUNITY MOSCORP
PHASES 1A (21T-06004C)
PHASES 2 (21T-06002C)

DSEL
david schaeffer engineering ltd
600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

Region of Peel
Public Works

TOWN OF CALEDON

EXTERNAL STORM DRAINAGE PLAN

SCALE: 1:2500		PROJECT No. 07-294
DESIGNED BY: K.M.	DRAWN BY: M.Z./D.Z.	DRAWING No. 21A
CHECKED BY: Z.L.	DATE: MARCH 2008	

DESIGN BRIEF

FOR

STORMWATER MANAGEMENT POND E3 & POND E4

IN THE

SOUTH FIELDS COMMUNITY

MOSCORP 1A AND MOSCORP 2 SUBDIVISIONS

TOWN OF CALEDON

PROJECT NO. 07-294
MARCH 2008
REVISED AUGUST 2008

DESIGN BRIEF
FOR
SOUTH FIELDS COMMUNITY
POND E3 & POND E4
IN THE
MOSCORP 1A AND MOSCORP 2 SUBDIVISIONS
TOWN OF CALEDON

MARCH 2008
REVISED AUGUST 2008

1.0 INTRODUCTION

Stormwater Management Ponds E3 and E4 in the South Fields Community within the Mayfield West Community are located within the Etobicoke Creek Watershed. The drainage areas for Ponds E3 and E4 are generally bound by existing Kennedy Road to the west, and future development to the north, south, and east, as shown in Figure 1.

As set out in the ***Functional Servicing and Stormwater Management Report for Moscorp 1A Subdivision in the South Neighbourhood of Mayfield West Community***, two multi-function ponds are required within the subject lands. The ponds are intended to satisfy various stormwater management requirements, including the following:

- **Water Quality Control:** The permanent pool should be sized for enhanced level of protection.
- **Erosion Control:** Volume resulting from a continuous simulation to match the prescribed erosion exceedance threshold.
- **Water Quantity Control:** Control of post-development flows in accordance with Unit Flow Equations (refer to Appendix E).

Ponds E3 and E4 outflows will ultimately discharge treated runoff into the main branch of Etobicoke Creek.

The following design brief is intended to provide technical support for the detailed design of the ponds, as well as to demonstrate conformance with the overall servicing requirements of the ***FSR, SWMP Design Manual*** and generally accepted stormwater management practice.

2.0 PREVIOUS STUDIES AND REPORTS

2.1 General

The following material has been reviewed in order to identify the constraints, which govern development within the subject site:

- ***Development Phasing Plan for Mayfield West Community, Phase 1: South Neighbourhood in the Town of Caledon,*** David Schaeffer Engineering Ltd., Dillon Consulting, and ENTRA Consultants, December 2006.

- ***Comprehensive Environmental Impact Study and Management Plan, Mayfield West Community Plan Area, Town of Caledon***, David Schaeffer Engineering Ltd., Dillion Consulting, Shaheen & Peaker Limited, and Valcoustics Canada Ltd., November 2007.

- ***Town of Caledon Draft Development Standards, Policies and Guidelines,*** January 2008

- ***Etobicoke Creek Hydrology Update, Final Draft Study Report,*** March 2007, Toronto and Region Conservation Authority

- ***SWM Plan Stormwater Management Planning and Design Manual, March 2003,*** Ministry of Environment *(SWMP Design Manual)*

- ***Functional Servicing and Stormwater Management Report (FSR) for Moscorp 1A Subdivision in the South Neighbourhood of Mayfield West Community,*** David Schaeffer Engineering Limited, March 2007, Revised October 2007

- ***Functional Servicing and Stormwater Management Report (FSR) for Moscorp 2 Subdivision in the South Neighbourhood of Mayfield West Community,*** David Schaeffer Engineering Limited, October 2007

The above documents form the basis of this report.

3.0 DRAINAGE ANALYSIS

The pond design characteristics and requirements, based on the drainage areas as shown, are summarized in Table 1 as follows:

Table 1: SWM Pond Design Characteristics

Item	Approximated Design Criteria (E3)	Approximated Design Criteria (E4)	Comments
Drainage Area	62.221 ha	88.248 ha	(refer to Appendix F)
% Imperviousness	63.15	71.79	Measured Imperviousness (refer to Appendix F)
Permanent Pool Volume	25 700 m^3	33 916 m^3	Refer to Calculation Sheet B-1 of Appendix B
Extended Detention Volume	2489 m^3	3530 m^3	Refer to Calculation Sheet B-1 of Appendix B
Required Storage Volume for Erosion Control	9277 m^3	14 914 m^3	Based on Continuous Erosion Model. Refer to Calculation Sheet B-2 of Appendix B
Allowable Release Rate – Erosion Control	37 L/s	59 L/s	Based on Continuous Erosion Model. Refer to Calculation Sheet B-2 of Appendix B
Allowable Release Rate – 2 Year 5 Year 10-year 25 Year 50-year 100-year	 269 L/s 483 L/s 648 L/s 874 L/s 1055 L/s 1241 L/s	 381 L/s 684 L/s 917 L/s 1238 L/s 1493 L/s 1757 L/s	Based on TRCA's Unit Flow Equations (refer to Appendix E)

In order to simulate the runoff from the areas draining to Ponds E3 and E4, a DDSWMM/XPSWMM Model was developed. The model simulates pond inflow hydrographs for the 2- to 100-year events. The hydrographs are routed through the proposed SWM Pond and the flows generated by the model were used to design the various pond components described in Section 6.0. Refer to Appendix A for the DDSWMM/XPSWMM hydrologic and hydraulic modeling data and results (Refer to CD for DDSWMM input and output files). For more details refer to the ***Stormwater Management Plan for the Mayfield West Subdivision, Phases 1A and 2 to Pond E3***, and ***Stormwater Management Plan for the Mayfield West Subdivision, Phase 1A to Pond E4***, prepared by JFSA Inc., dated August 2008.

A SWMHYMO model was also developed to simulate the interim conditions for Pond E3 and the ultimate conditions for Ponds E3 and E4 (Refer to Appendix J).

4.0 SUBDIVISION DRAINAGE

4.1 Conveyance of Minor System Flows

Moscorp Subdivision will be serviced by a conventional storm sewer system designed in general conformance with "*Draft*" Town of Caledon standards. The storm sewers will be sized using a 10-year return frequency and Town of Caledon IDF curves.

All storm flows will be directed to one of two stormwater management facilities, Pond E3 and E4, where the runoff will be treated for water quality, erosion, and quantity control.

4.1.1 Pond E3

The 6-hour AES storms have been used with the models to verify that target release rates for all return periods are achieved, and that the storage volumes are adequate. The simulated peak flows, release rates and maximum storage volumes for the 2- to 100-year storms are presented and compared in Table 2A.

Table 2A: XPSWMM Flows and Storage Summary for Pond E3

Storm Event	Pond Inflow (m^3/s)	Pond Outflow (m^3/s)	Pond Level (m)	Max Storage Used (m^3)
2yr/6hr AES	3.247	0.136	260.491	12611
5yr/6hr AES	4.771	0.311	260.660	15934
10yr/6hr AES	5.862	0.448	260.806	18856
25yr/6hr AES	7.269	0.663	260.998	22773
50yr/6hr AES	8.340	0.922	261.119	25285
100yr/6hr AES	9.405	1.201	261.229	27596

4.1.2 Pond E4

The 6-hour AES storms have been used with the models to verify that target release rates for all return periods are achieved, and that the storage volumes are adequate. The simulated peak flows, release rates and maximum storage volumes for the 2- to 100-year storms are presented and compared in Table 2B.

Table 2B: XPSWMM Flows and Storage Summary for Pond E4

Storm Event	Pond Inflow MH 35 (m^3/s)	Pond Inflow MH42 (m^3/s)	Total Pond Inflow (m^3/s)	Pond Outflow (m^3/s)	Pond Level (m)	Max Storage Used (m^3)
2yr/6hr AES	5.374	0.051	5.425	0.220	258.949	18978
5yr/6hr AES	7.908	0.075	7.982	0.554	259.159	24759
10yr/6hr AES	9.734	0.091	9.825	0.791	259.312	29060
25yr/6hr AES	11.910	0.122	12.032	1.063	259.505	34602
50yr/6hr AES	13.525	0.152	13.676	1.387	259.634	38367
100yr/6hr AES	15.100	0.181	15.281	1.746	259.756	41985

4.2 Conveyance of Major System

Major system runoff in excess of the minor system and up to the 100-year event will be conveyed within the road allowances via a continuous overland flow route, ultimately directed to Ponds E3 and E4. The major system flow will not exceed the width of the road allowance, and in no case will the depth of flow exceed 0.30 m above the gutter of the road. Should the major system flow exceed the conveyance capacity of any given road, the storm sewer will be sized to accommodate the flows in excess of the road capacity. For details refer to the ***Stormwater Management Plan for the Mayfield West Subdivision, Phases 1A and 2 to Pond E3***, and ***Stormwater Management Plan for the Mayfield West Subdivision, Phase 1A to Pond E4***, prepared by JFSA Inc., dated May 2008.

4.3 Employment Lands

It should be noted that the subdivision and external contributing areas include lands that are designated for employment uses. These land uses typically produce high runoff due to high imperviousness coverage, which would readily exceed the carrying capacity of the receiving road network. In accordance with standard industry practice, the employment lands will limit their total outflow to the calculated 10-year storm flow, with no major system flow permitted to leave the site. On site detention techniques will be applied to achieve the 10-year release rate as determined by the Rational Method. For more details refer to the ***Stormwater Management Plan for the Mayfield West Subdivision, Phases 1A and 2 to Pond E3***, and ***Stormwater Management Plan for the Mayfield West Subdivision, Phase 1A to Pond E4***, prepared by JFSA Inc., dated May 2008.

4.4 Pond E3 Pipe Network

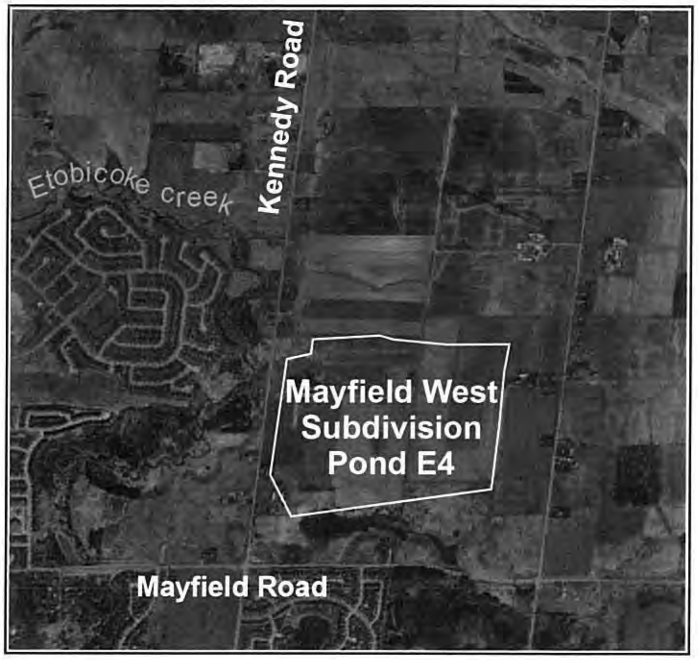
Based on the combined DDSWMM/XPSWMM models, the maximum 100-year minor system flow to the SWM Pond E3 would be approximately 9.405 m^3/s. This flow was simulated with a 6-hour, 100-year AES storm (refer to Table 2A).

4.5 Pond E4 Pipe Network

Based on the combined DDSWMM /XPSWMM models, the maximum 100-year minor and major system flow to the SWM Pond E4 and would be approximately 15.100 m^3/s to the east forebay and 0.181 m^3/s to the west forebay. These flows were simulated with a 6-hour, 100-year AES storm (refer to Table 2B).

STORMWATER MANAGEMENT PLAN FOR THE MAYFIELD WEST SUBDIVISON – PHASE 1A TO POND E4

Town of Caledon
March 2008
Updated August 2008



Project No. 552-05

Prepared for:
David Schaeffer Engineering Ltd

Prepared by:
J.F. Sabourin and Associates Inc.

JFSA inc.
WATER RESOURCES AND ENVIRONMENTAL CONSULTANTS

STORMWATER MANAGEMENT PLAN FOR THE MAYFIELD WEST SUBDIVISON PHASE 1A TO POND E4

Town of Caledon
March 2008
Updated August 2008

1.0 Introduction and Objectives

J.F. Sabourin and Associates Inc. (JFSA) were retained by David Schaeffer Engineering Ltd. (DSEL) to prepare a Stormwater Management Plan for the Mayfield West Subdivision – the portion of Phase 1A draining to Pond E4 located within the Town of Caledon. As shown by Figure 1, the proposed development is located west of Kennedy Road and North of Mayfield Road and this area drains to the Etobicoke Creek.

Pond E4 will drain a total area of 88.25 hectares, including 18.38 ha from Phase 1A. The portion of Phase 1A that drains to Pond E4 will accommodate a residential development totaling 12.41 ha, a storm water management pond block of 5.72 ha and a 0.25 ha park. Note that some 69.86 ha of external area will drain to Pond E4.

The purpose of the present study/report is to evaluate the major and minor system flows of the proposed development with respect to the Town of Caledon stormwater management guidelines and to check the adequacy of the proposed pipe sizes to convey the 10-year and the 100-year storm flows from within the development and from external areas. The DDSWMM and XPSWMM programs are used to model the major and minor systems and on-site detention to ensure that all of the Town of Caledon's stormwater management requirements are satisfied.

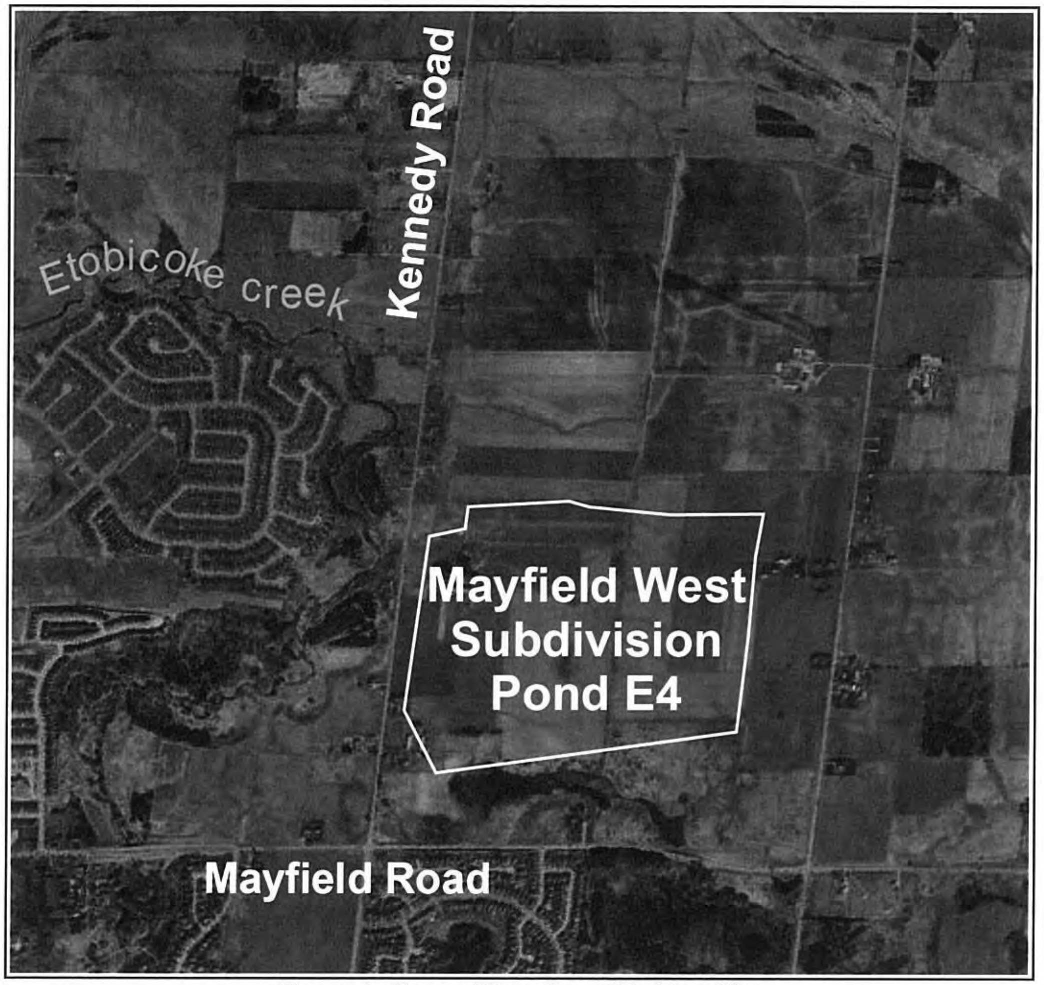


Figure 1: General Location of Subject Site

2.0 Design Requirements and Guidelines

In accordance with generally accepted stormwater management design guidelines, including those of the Town of Caledon, the following objectives were set for the site's proposed drainage system:

- Minor system should be sized to provide a 1:10 year level of service.
- Under full flow conditions, the allowable velocity in storm sewers is to be no less than 0.75 m/s and no greater than 6.0 m/s.
- For single catchbasins, the minimum size of connection shall be 250 mm and the minimum grade shall be 2.0%.
- For double catchbasins, the minimum size of connection shall be 300 mm and the minimum grade shall be 2.0%.
- The frame and grate for road catchbasins shall be as detailed in the OPSD 400.100 (Perforated) Standards and catchbasins located within rear lots, parks and open spaces with pedestrian traffic shall have the Beehive Type Frame and Grate per Town of Caledon Standard No. 710.00.
- For the 100-yr storm, no building shall be inundated at the ground line, unless the building has been flood proofed.
- Flow across road intersections shall not be permitted for minor storms (generally 10-yr or less).
- For all classes of roads during the 100-yr storm, the depth of water at the gutter shall not exceed 0.3 m and/or flood outside of the right-of-way, whichever governs.
- For lineal passive parks/walkways during the 100-yr storm, the depth of water shall not exceed 0.6 m and/or flood outside of the town's property or easement.
- For the 100-yr event, the product of depth of water (m) at the gutter multiplied by the velocity of flow (m/s) shall not exceed 0.65 m^2/s on all roads.
- For all residential buildings, the stormwater roof leaders shall discharge on ground via splash pads. Flows shall be directed away from the building towards the front of the lot without any erosion or inconvenience to adjacent property.

3.0 Assumptions and Sources of Data

Sources of information and assumptions made in this study are provided below:

- SWM model:	DDSWMM (release 2.1), XPSWMM (version 10)
- Minor system design:	1:10 yr (Rational Method in Appendix A)
- Major system design:	1:100 yr (DDSWMM)
- Manning's n coefficient:	0.013 for concrete pipes, 0.013 for PVC pipes
- Minor losses:	entered in XPSWMM (refer to Appendix D)
- Road layout/grading:	as per DSEL Drawings
- Street CB covers:	OPSD 400.100 (refer to Appendix B for details) in the absence of flow capture curves for OSPD 400.100, OPSD 400.01 covers are assumed
- Backyard CB covers:	Town of Caledon Standard 710.00 (100% capture)
- Curb and gutter:	OPSD 600.07 - in the absence of flow capture curves for 600.07 curbs and gutters, OPSD 600.01 curbs and gutters were assumed
- Imperviousness ratios:	Measured based on DSEL's drawings as per DSEL; in rear yards % imp. values were reduced by 50% since roofs are not directly connected
- Parameters for Horton's eq.:	Fo=76.2 mm/hr, Fc=13.6 mm/hr, K=4.14/hr
- Sub-catchment grading:	as per DSEL Drawings
- Pipe dimensions and slopes:	as per DSEL Drawings
- Design storms:	Four (4) hour Chicago as per Town of Caledon IDF relationship (refer to Appendix A for details)
- Downstream HGL:	Free flow conditions assumed for all return periods

4.0 Proposed Minor System Drainage

The minor system layout and drainage to the storm sewer outlets are shown on Figure 2.

In accordance with the Town of Caledon standards, the minor system has been designed to accommodate the 10-year post development flows from within the site. A Rational Method design was conducted by DSEL (refer to Appendix A) in order to estimate minor system flows based on the Town of Caledon IDF relationship and selected runoff coefficients.

Note that the minor system capture was limited to the post-development 10-year flow (as determined by the Rational Method – refer to Calculation Sheet 2 in Appendix E) at the following locations. Excess major system flow for sub-catchments E505NW, E9 and all street segments prefixed with "S" will drain to Abbotside Way, and sub-catchments E1 and E505NN will drain to Benadir Avenue. Excess flow for all employment blocks will be stored on site.

1) Employment Block - sub-catchment E10N (2.546 ha): 712 L/s
2) Employment Block - sub-catchment E10S (1.148 ha): 321 L/s
3) Employment Block 202 - sub-catchment E11N (2.398 ha): 670 L/s
4) Employment Block 202 - sub-catchment E11S (0.111 ha): 31 L/s
5) Employment Block - sub-catchment E501N (3.335 ha): 932 L/s
6) Employment Block - sub-catchment E501S (2.310 ha): 646 L/s
7) Employment Block - sub-catchment E502N (1.436 ha): 401 L/s
8) Employment Block - sub-catchment E502S (3.732 ha): 1043 L/s
9) Employment Block - sub-catchment E503N (1.368 ha): 382 L/s
10) Employment Block - sub-catchment E503S (3.786 ha): 1058 L/s
11) Employment Block - sub-catchment E504N (11.960 ha): 3348 L/s
12) Employment Block - sub-catchment E504S (3.594 ha): 1005 L/s
13) Employment Block - sub-catchment E505NE (10.581 ha): 2957 L/s
14) Employment Block - sub-catchment E505SW (3.566 ha): 997 L/s
15) Employment Block - sub-catchment E8 (1.959 ha): 548 L/s
16) Employment Block 202 - sub-catchment E8N (1.218 ha): 340 L/s
17) Employment Block - sub-catchment E8S (1.262 ha): 353 L/s
18) Medium Density Site Block 193 - sub-catchment E9 (2.293 ha): 641 L/s
19) Employment Block 202 - sub-catchment E9N (1.930 ha): 539 L/s
20) Employment Block - sub-catchment E9S (1.272 ha): 356 L/s
21) Employment Block - sub-catchment S01N (0.128 ha): 36 L/s
22) Employment Block - sub-catchment S01S (0.121 ha): 34 L/s
23) Employment Block - sub-catchment S02N (0.207 ha): 58 L/s
24) Employment Block - sub-catchment S02S (0.190 ha): 53 L/s
25) Employment Block - sub-catchment S03N (0.201 ha): 56 L/s

26) Employment Block - sub-catchment S03S (0.182 ha): 52 L/s
27) Employment Block - sub-catchment S04N (0.199 ha): 56 L/s
28) Employment Block - sub-catchment S04S (0.190 ha): 53 L/s
29) Employment Block - sub-catchment S05N (0.170 ha): 48 L/s
30) Employment Block - sub-catchment S05S (0.169 ha): 48 L/s

The minor system capture for the following external residential areas was limited to the post-development 10-year flow (as determined by DDSWMM) at the following locations:

31) Residential Block - sub-catchment E1 (0.906 ha): 244 L/s
32) Residential Block - sub-catchment E505NN (0.857 ha): 266 L/s
33) Residential Block - sub-catchment E505NW (3.092 ha): 726 L/s

5.0 Proposed Major System Drainage

The major system sub-catchment areas are shown on Figure 3.

Continuous overland flow routes have been provided on the internal streets of the proposed subdivision in order to convey the major system flows to the appropriate outlets. In general, the major system has been designed to accommodate the 100-year less the 10-year post development flows from any external areas and from within the site. In order to prevent major system flow from crossing major roads during the 10-year event, 100% flow capture points have been included in the design.

Note that a 3-m wide depressed curb has been designed to convey the 0.147 m^3/s major system flow from the low point located on Abbotside Way, just north of the pond, to the pond for the 100-year event (refer to Calculation Sheet 4 of Appendix E).

The surface runoff collected by backyard catch basins is not to be controlled, hence they capture 100% of the flows up to the 100-year event. There are twenty-three (23) such catch basins within the proposed portion of Phase 1A that drains to Pond E4.

LEGEND :

- LIMITS OF POND TRIBUTARY AREA
- MAJOR SYSTEM CATCHMENT BOUNDARY
- MAJOR SYSTEM FLOW DIRECTION
- FIRST DIRECTION OF EXCESS MAJOR SYSTEM FLOW AT LOW POINT
- LP02 — LOW POINT
- SUB-CATCHMENT ID / SUB-CATCHMENT AREA / TOTAL IMPERVIOUSNESS
- CATCHBASIN

SCALE : 0 25 50 75 100 125 150m

J.F. Sabourin & Associates Inc.
WATER RESOURCES AND ENVIRONMENTAL CONSULTANTS
OTTAWA (613) 836-3884
GATINEAU (819) 243-6858

DSEL
david schaeffer engineering ltd
600 ALDEN ROAD., SUITE 500
MARKHAM, ONTARIO., L3R 0E7
(905) 475-3080

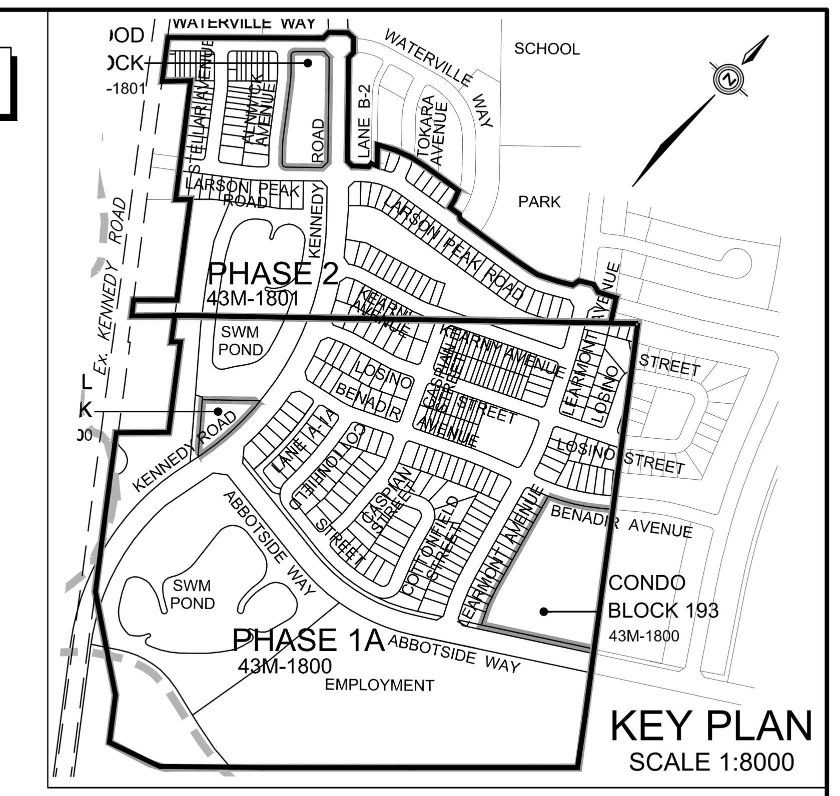
Phase 1a of Mayfield West Subdivision to Pond E4

Proposed Major System

FIGURE 3

DESIGNED:	
DRAWN:	SPB/LP
VERIFIED:	AV
APPROVED:	AV
DATE	PROJECT No.
July/08	552-05

DRAWING REF.
552-05\200807 3rd PDB SWMR\Design\CAD\JFSA Figures.dwg



LEGEND

2.06Ha / 0.25 — EXTERNAL DRAINAGE AREA IN HECTARES (FUTURE LANDS TO BE DEVELOPED UNLESS OTHERWISE NOTED) / RUN-OFF COEFFICIENT

EXTERNAL STORM TRIBUTARY BOUNDARY

PHASE LINE

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY RADY-PENTEK & EDWARD SURVEYING LTD., PROJECT No. 05-260, TOPOGRAPHIC SURVEY DATED ON FEBRUARY 27, 2008.

LEGAL INFORMATION

CALCULATED M-PLAN PROVIDED BY RADY-PENTEK & EDWARD SURVEYING LTD., PROJECT No. 07-258 FOR PHASE 1A, SURVEY DATED APRIL 24, 2008. PROJECT No. 07-259 FOR PHASE 2, SURVEY DATED FEBRUARY 19, 2008.

NO.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D
1	A.S.	10-01-22	AS-CONSTRUCTED SANITARY AND STORM SEWERS.		

APPROVED FOR CONSTRUCTION
THIS APPROVAL CONSTITUTES A GENERAL REVIEW AND DOES NOT CERTIFY DIMENSIONAL ACCURACY.

THIS APPROVAL IS SUBJECT TO THE FURTHER CERTIFICATION OF THE "AS CONSTRUCTED" WORKS BY A REGISTERED PROFESSIONAL ENGINEER OF THE PROVINCE OF ONTARIO.

DATE : SEPT. 9, 2008 APPROVED BY: C. CAMPBELL (ORIGINALLY SIGNED)
C. CAMPBELL, C.E.T.
DIRECTOR OF PUBLIC WORKS AND ENGINEERING

BENCH MARK:

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CITY OF BRAMPTON BENCHMARK No. J1-313, HAVING AN ELEVATION OF 252.147 METRES. LOCATED ON SOUTH FACE OF CONCRETE PORCH DECK ON WHITE SIDE BUNGALOW No. 11575 DIXIE ROAD, BEING 0.55km SOUTH OF MAYFIELD ROAD. TABLET IS SET 0.07m BELOW TOP OF DECK AND 0.27m EAST OF SOUTHEAST CORNER OF DECK.

ELEVATION = 252.147 m

SOUTH FIELDS COMMUNITY MOSCORP
PHASES 1A (21T-06004C)
PHASES 2 (21T-06002C)

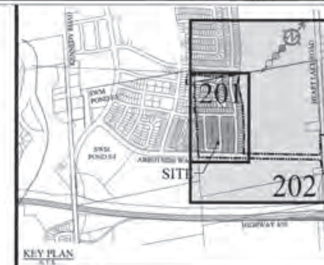
DSEL
david schaeffer engineering ltd
600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

Region of Peel
Public Works

TOWN OF CALEDON

EXTERNAL STORM DRAINAGE PLAN

SCALE: 1:2500		PROJECT No. 07–294	
DESIGNED BY: K.M.	DRAWN BY: M.Z./D.Z.	DRAWING No. 21A	
CHECKED BY: Z.L.	DATE: MARCH 2008		



BENCHMARK: ELEV. 264.941

LEGEND:

0.51ha
0.50

10-YEAR | 100-YEAR
997 L/s | 7913 L/s
10 MIN

REVISIONS

SCS consulting group ltd

TOWN OF CALEDON

DIGRAM DEVELOPMENTS CALEDON INC.

LIVINGSTON ESTATES - PHASE 1 & 2 (T-13001C)

EXTERNAL STORM DRAINAGE PLAN

LICENSED PROFESSIONAL ENGINEER
D. WOO
100073980
PROVINCE OF ONTARIO

APPROVED FOR CONSTRUCTION

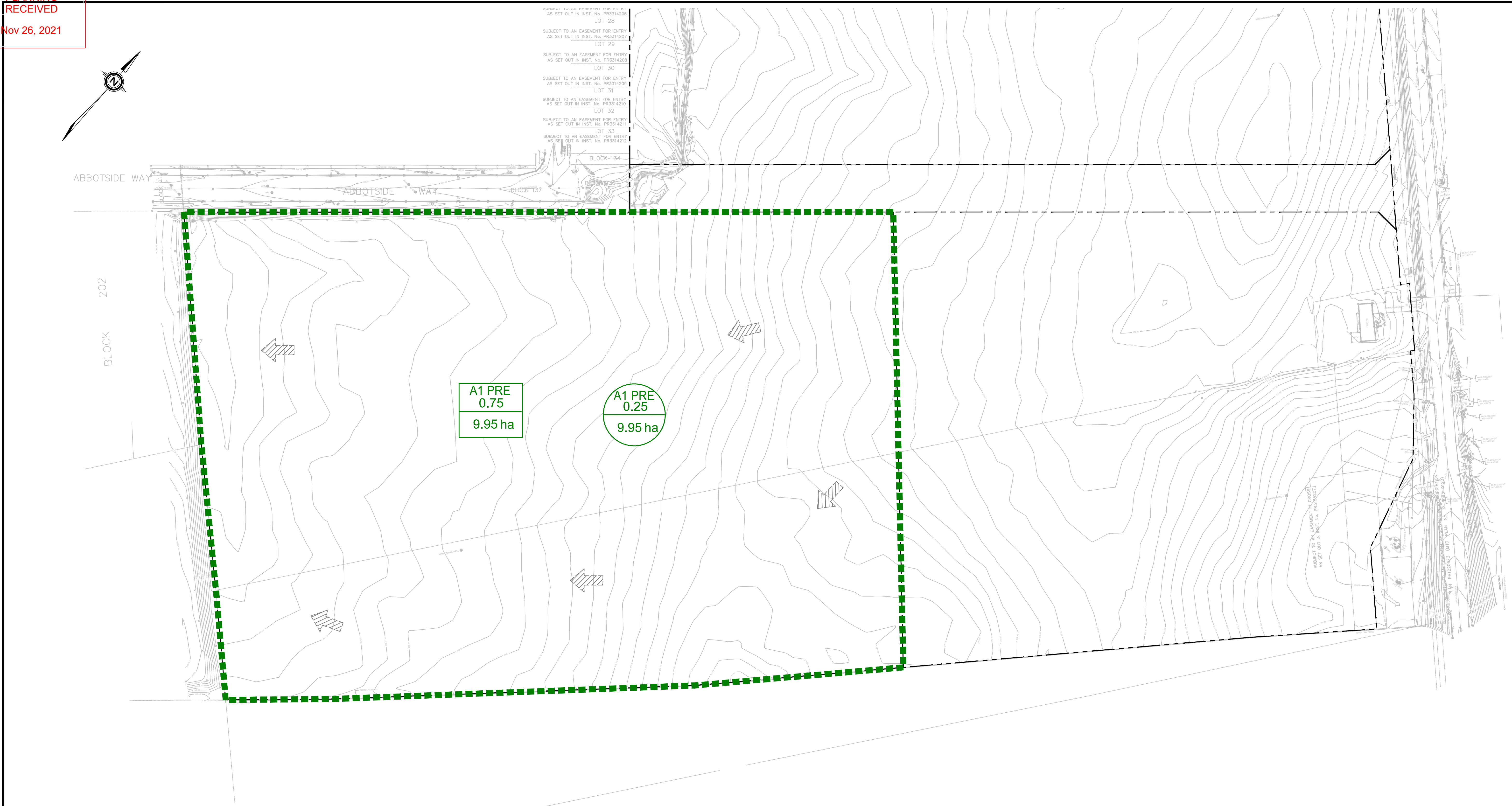
DATE: AUG4/16 APPROVED BY:

PROJECT No. 1551

DRAWING No. 202

Appendix B – Storm Data Analysis

Pre and Post Development Drainage Area Plans
Roof Storage Calculations
Storm Design Calculations



LEGEND

EXISTING STORM DRAINAGE AREA

OVERLAND FLOW DIRECTION

EXISTING CONDITION

A1 PRE — AREA ID
0.25 — DRAINAGE COEFFICIENT
1.36 ha — DRAINAGE AREA

ALLOWABLE TARGET RELEASE CONDITION

A1 PRE — AREA ID
0.25 — DRAINAGE COEFFICIENT
1.36 ha — DRAINAGE AREA

PROJECT NAME
INDUSTRIAL DEVELOPMENT - PHASE 1
12304 HEART LAKE ROAD
CALEDON, ONTARIO

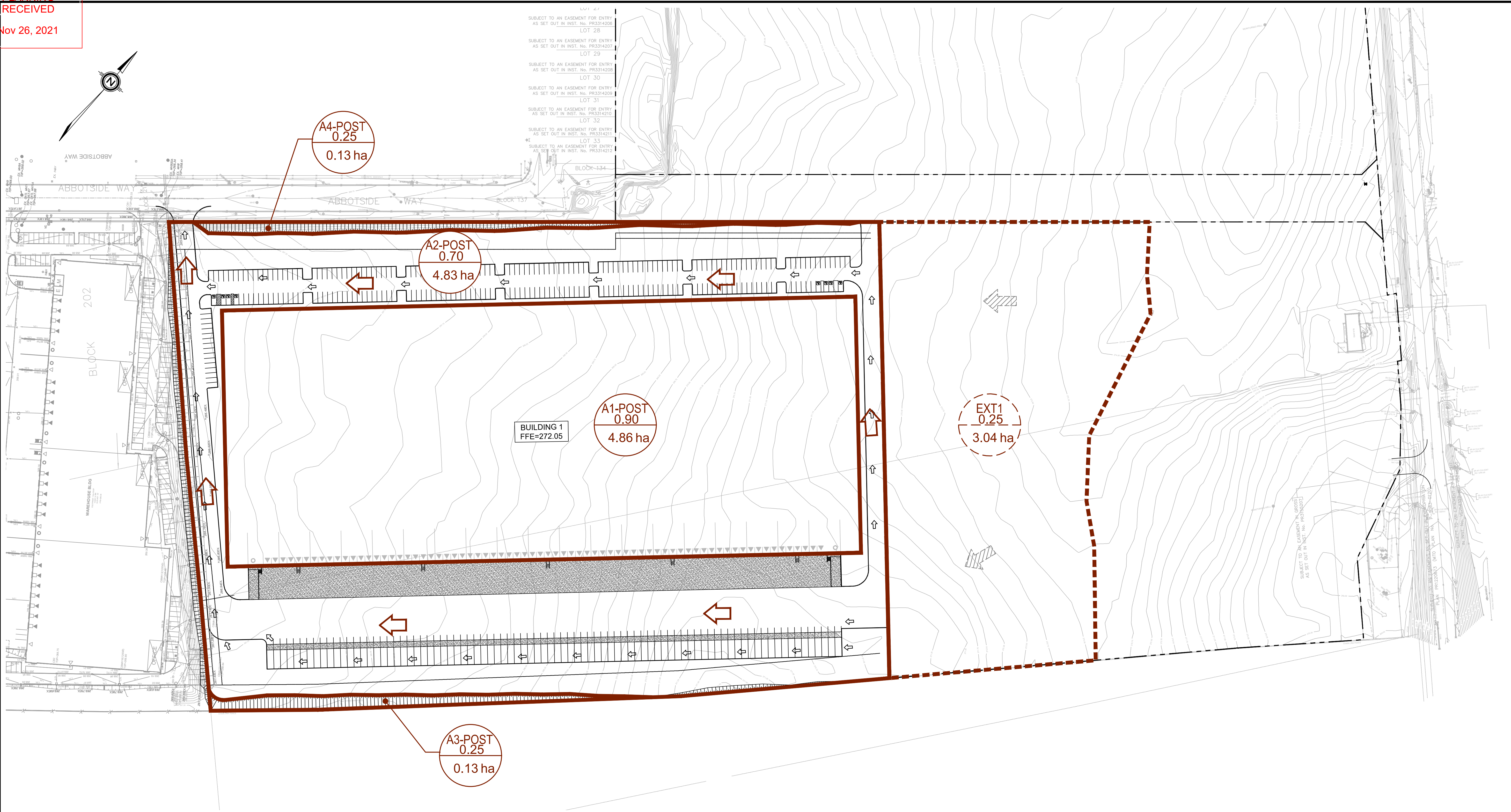
IBI GROUP
Unit 300 – 8133 Warden Avenue
Markham ON L6G 1B3 Canada
tel 905 763 2322 fax 905 763 9983
ibigroup.com

SCALE: 1:2000	DATE: NOV 2021	FIGURE NAME	FIGURE NO.	REVISION
PROJECT ENG: JJ	DRAWN BY: NDS	PRE-DEVELOPMENT STORM DRAINAGE AREA PLAN	DAP-01	1
CHECKED BY: JJ	APPROVED BY:			
PROJECT NO: 135636				

10mm

SCALE CHECK
1 in

File Location: J:\135636_12304Heart\7.0_Production\7.03_Design\04_Civil\Sheets\SPA\Phase 1\Figures\135636-SHT-DAP-01.dwg Last Saved: November 4, 2021, by nicolas.distefano
Plotted: Thursday, November 4, 2021 10:40:29 AM by Nicolas Di Stefano



LEGEND

- PROPOSED STORM DRAINAGE AREA
- EXTERNAL STORM DRAINAGE AREA
- OVERLAND FLOW DIRECTION
- EXTERNAL OVERLAND FLOW DIRECTION

101 — PROPOSED AREA ID
0.95 — PROPSED FRACTION IMPERVIOUS
1.36 ha — PROPOSED DRAINAGE AREA

101 — EXTERNAL AREA ID
0.95 — EXTERNAL FRACTION IMPERVIOUS
1.36 ha — EXTERNAL DRAINAGE AREA

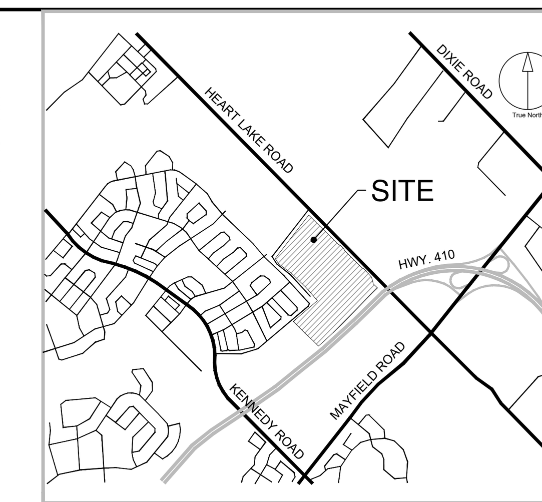
PROJECT NAME
INDUSTRIAL
DEVELOPMENT - PHASE 1
12304 HEART LAKE ROAD
CALEDON, ONTARIO

IBI GROUP
Unit 300 – 8133 Warden Avenue
Markham ON L6G 1B3 Canada
tel 905 763 2322 fax 905 763 9983
ibigroup.com

SCALE:	DATE:
1:2000	NOV 2021
PROJECT ENG: JJ	DRAWN BY: NDS
CHECKED BY: JJ	APPROVED BY:
PROJECT NO: 135636	

FIGURE NAME	FIGURE NO.	REVISION
POST-DEVELOPMENT STORM DRAINAGE AREA PLAN	DAP-02	1

SCALE CHECK 10mm 1 in



KEY PLAN

CLIENT

BROCCOLINI

2680 SKYMARK AVENUE, SUITE 800
MISSISSAUGA, ON. L4W5L6

ISSUES

No.	DESCRIPTION	DATE
1	ISSUED FOR SPA SUBMISSION	OCT __, 2021

LEGEND

SEAL

IBI GROUP
Unit 300 – 8133 Warden Avenue
Markham ON L6G 1B3 Canada
tel 905 763 2322 fax 905 763 9983
ibigroup.com

PROJECT
12304 HEART LAKE ROAD

CALEDON, ON. L7C 2J2

LIST OF DRAWINGS
SG-01 - PRELIMINARY SITE GRADING PLAN 1
SS-01 - PRELIMINARY SITE SERVICING PLAN 1
XS-01 - CONCEPTUAL SECTION DRAWING 1

PROJECT NO: 135636	
DRAWN BY: **NDS**	CHECKED BY: **JJ**
PROJECT MGR: **JJ**	APPROVED BY: **JJ**

SITE PLAN INFORMATION

WARE MALCOMB
250 UNIVERSITY AVE, SUITE 235
TORONTO, ON. M5H 3E5
PHONE: (437) 537-5700
WEBSITE: www.waremalcomb.com

SURVEYOR INFORMATION

R-PE SURVEYING LTD.
ONTARIO LAND SURVEYORS
643 CHRISLEA ROAD, SUITE 7
WOODBRIDGE, ON. L4L 8A3
PHONE: (416) 635-5000
WEBSITE: www.r-pe.ca

BENCHMARK INFORMATION:
ELEVATIONS ARE GEODETIC AND ARE REFERRED TO MTO VERTICAL BENCHMARK NUMBER 0081999991 HAVING AN ORTHOMETRIC ELEVATION OF 265.112 METRES. ELEVATIONS ARE REFERENCED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928, 1978 ADJUSTMENT (CGVD-1928:1978).

SCALE:

SHEET TITLE

SHEET NUMBER

ISSUE
01

IBI GROUP
300 – 8133 Warden Avenue
Markham ON L6G 1B3 Canada
tel 905 763 2322
ibigroup.com

Pre-Development Flow Calculation

12304 HEART LAKE ROAD
File No. 135636
Date: November 2021

Time of Concentration Calculation

Area Number	Area (ha)	C	Tc min
A1 pre	9.95	0.75	10.0

Rational Method Calculation

Event 2 yr
IDF Data Set Town of Caledon
a = 1070.00
b = 7.85
c = 0.8759

Area Number	A (ha)	C	AC	Tc (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1 pre	9.95	0.75	7.46	10.0	85.7	1.791	1791.1

Event 10 yr
IDF Data Set Town of Caledon
a = 2221.00
b = 12.00
c = 0.9080

Area Number	A (ha)	C	AC	Tc (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1 pre	9.95	0.75	7.46	10.0	134.2	2.803	2803.3

Event 100 yr
IDF Data Set Town of Caledon
a = 4688.00
b = 17.00
c = 0.9624

Area Number	A (ha)	C	AC	Tc (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1 pre	9.95	0.75	7.46	10.0	196.5	4.107	4106.6

IBI GROUP
300 – 8133 Warden Avenue
Markham ON L6G 1B3 Canada
tel 905 763 2322
ibigroup.com

10 Yr AES
Pre-Development Flow Calculation

12304 HEART LAKE ROAD
File No. 135636
Date: November 2021

Time of Concentration Calculation

Area Number	Area (ha)	C	Tc min
A1-POST	4.86	0.90	10.0
A2-POST	4.83	0.70	10.0
A3-POST	0.13	0.25	10.0
A4-POST	0.13	0.25	10.0
EXT-1	3.04	0.25	10.0

Uncontrolled

A2 POST + A3 POST +A4 POST +EXT- PAVEMENT		(ha)		
	Total Area:	8.130		
	Impervious:	4.830	oefficient:	0.70
	Landscape	3.300	oefficient:	0.25
	Composite C:	0.52		

Rational Method Calculation

Event 2 yr
IDF Data Set Town of Caledon
a = 1070.00
b = 7.85
c = 0.8759

Area Number	A (ha)	C	AC	Tc (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1-POST	4.86	0.90	4.37	10.0	85.7	1.050	1049.8
A2-POST	4.83	0.70	3.38	10.0	85.7	0.811	811.5
A3-POST	0.13	0.25	0.03	10.0	85.7	0.008	7.8
A4-POST	0.13	0.25	0.03	10.0	85.7	0.008	7.8
EXT-1	3.04	0.25	0.76	10.0	85.7	0.182	182.4

Event 10 yr
IDF Data Set Town of Caledon
a = 2221.00
b = 12.00
c = 0.9080

Area Number	A (ha)	C	AC	Tc (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1-POST	4.86	0.90	4.37	10.0	134.2	1.643	1643.1
A2-POST	4.83	0.70	3.38	10.0	134.2	1.270	1270.1
A3-POST	0.13	0.25	0.03	10.0	134.2	0.012	12.2
A4-POST	0.13	0.25	0.03	10.0	134.2	0.012	12.2
EXT-1	3.04	0.25	0.76	10.0	134.2	0.285	285.5

Event 100 yr
IDF Data Set Town of Caledon
a = 4688.00
b = 17.00
c = 0.9624

Area Number	A (ha)	C	AC	Tc (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1-POST	4.86	0.90	4.37	10.0	196.5	2.407	2407.0
A2-POST	4.83	0.70	3.38	10.0	196.5	1.861	1860.6
A3-POST	0.13	0.25	0.03	10.0	196.5	0.018	17.9
A4-POST	0.13	0.25	0.03	10.0	196.5	0.018	17.9
EXT-1	3.04	0.25	0.76	10.0	196.5	0.418	418.2

IBI GROUP
300 – 8133 Warden Avenue
Markham ON L6G 1B3 Canada
tel 905 763 2322
ibigroup.com

Modified Rational Method - Five Year Storm Event
Site Flow and Storage Summary

12304 HEART LAKE ROAD
File No. 135636

Date: November 2021

Date: November 2021

A2 post+A3 Post+A4 Post+ EXT1 Uncontrolled

Drainage Areas	A2 post+A3 Post+A4 Post+ EXT1	
Area =	**8.130**	ha
"C" =	**0.52**	
AC=	**4.21**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Site Release Rate (R1) =	**2599.1**	L/s
Total Storage Volume Required (S1) =	**0.0**	m^3

A1 Controlled Roof - Building A

Drainage Areas	A1 post	
Area =	**4.860**	ha
"C" =	**0.90**	
AC=	**4.37**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Release Rate (R2) =	**204.2**	L/s
Max.Storage Required (S2) =	**1303.0**	m3
Max Ponding Depth =	**0.12**	m

Ponding Area Volume Equation
k = 720000

$$V = k \times h^3$$

Ponding Volume Available(SP2) = **2430** m3
(based on roof with 0.15m of ponding depth)

Allowable Site Release (L/s) =	**2803.3**
Total Site Release (L/s) =	**2803.3**
Total Storage Required (m^3) =	**1303.0**
Total Storage Provided (m^3) =	**2430.0**

Five Year Design Storm

a=	2221.00
b=	12.00
c=	0.91

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (m^3/s)	Runoff Volume (m^3)	Allowable Release Volume (m^3)	Total Storage Volume Required (m^3)	Storm Runoff (m^3/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)	Storage Depth (m)
10.0	134.2	1.772	1063.0	1559.49	0.00	1.630	978.04	122.50	855.54	0.11
15.0	111.4	1.506	1355.1	2339.23	0.00	1.353	1218.12	183.75	1034.37	0.11
20.0	95.5	1.320	1583.5	3118.98	0.00	1.160	1391.97	244.99	1146.98	0.12
25.0	83.7	1.182	1772.7	3898.72	0.00	1.017	1525.07	306.24	1218.82	0.12
30.0	74.6	1.076	1936.0	4678.47	0.00	0.906	1631.12	367.49	1263.63	0.12
35.0	67.3	0.991	2081.0	5458.21	0.00	0.818	1718.22	428.74	1289.48	0.12
40.0	61.4	0.922	2212.6	6237.96	0.00	0.746	1791.45	489.99	1301.46	0.12
45.0	56.5	0.865	2334.2	7017.70	0.00	0.687	1854.19	551.24	1302.95	0.12
50.0	52.4	0.816	2447.9	7797.44	0.00	0.636	1908.77	612.49	1296.29	0.12
55.0	48.8	0.774	2555.4	8577.19	0.00	0.593	1956.87	673.73	1283.14	0.12
60.0	45.7	0.738	2657.9	9356.93	0.00	0.555	1999.72	734.98	1264.74	0.12
65.0	43.0	0.707	2756.2	10136.68	0.00	0.523	2038.24	796.23	1242.01	0.12
70.0	40.6	0.679	2851.0	10916.42	0.00	0.494	2073.15	857.48	1215.67	0.12
75.0	38.5	0.654	2942.9	11696.17	0.00	0.468	2105.01	918.73	1186.28	0.12
80.0	36.6	0.632	3032.3	12475.91	0.00	0.445	2134.26	979.98	1154.28	0.12
85.0	34.9	0.612	3119.5	13255.66	0.00	0.424	2161.26	1041.23	1120.03	0.12
90.0	33.3	0.593	3204.8	14035.40	0.00	0.405	2186.30	1102.47	1083.82	0.11
95.0	31.9	0.577	3288.5	14815.14	0.00	0.388	2209.63	1163.72	1045.90	0.11
100.0	30.6	0.562	3370.7	15594.89	0.00	0.372	2231.44	1224.97	1006.47	0.11
105.0	29.4	0.548	3451.6	16374.63	0.00	0.357	2251.92	1286.22	965.70	0.11
110.0	28.3	0.535	3531.4	17154.38	0.00	0.344	2271.19	1347.47	923.72	0.11
115.0	27.3	0.523	3610.2	17934.12	0.00	0.332	2289.39	1408.72	880.67	0.11
120.0	26.4	0.512	3688.0	18713.87	0.00	0.320	2306.62	1469.97	836.65	0.11
125.0	25.5	0.502	3765.0	19493.61	0.00	0.310	2322.97	1531.22	791.76	0.10
130.0	24.7	0.492	3841.2	20273.36	0.00	0.300	2338.52	1592.46	746.06	0.10
135.0	23.9	0.484	3916.7	21053.10	0.00	0.291	2353.35	1653.71	699.63	0.10
140.0	23.2	0.475	3991.5	21832.84	0.00	0.282	2367.50	1714.96	652.54	0.10
145.0	22.5	0.467	4065.8	22612.59	0.00	0.274	2381.04	1776.21	604.83	0.09
150.0	21.9	0.460	4139.5	23392.33	0.00	0.266	2394.02	1837.46	556.56	0.09
155.0	21.3	0.453	4212.8	24172.08	0.00	0.259	2406.47	1898.71	507.77	0.09
160.0	20.7	0.446	4285.5	24951.82	0.00	0.252	2418.45	1959.96	458.49	0.09
165.0	20.2	0.440	4357.8	25731.57	0.00	0.245	2429.97	2021.20	408.76	0.08

IBI GROUP
300 – 8133 Warden Avenue
Markham ON L6G 1B3 Canada
tel 905 763 2322
ibigroup.com

Modified Rational Method - Hundred Year Storm Event
Site Flow and Storage Summary

12304 HEART LAKE ROAD

File No. 135636

Date: November 2021

Date: November 2021

Hundred Year Design Storm

a=	4688.00
b=	17.00
c=	0.96

A2 post+A3 Post+A4 Post+ EXT1 Uncontrolled

Drainage Areas	A1 post + Ext. 1	
Area =	**8.130**	ha
"C" =	**0.52**	
AC=	**4.21**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Site Release Rate (R1) =	**2599.1**	L/s
Total Storage Volume Required (S1) =	**0.0**	m^3

A2 Controlled Roof - Building A

Drainage Areas	A2 post	
Area =	**4.860**	ha
"C" =	**0.90**	
AC=	**4.37**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Release Rate (R2) =	**204.2**	L/s
Max.Storage Required (S2) =	**2401.0**	m3
Max Ponding Depth =	**0.15**	m

Ponding Area Volume Equation

$$V = k \times h^3$$

k = 720000

Ponding Volume Available (SP2) = **2430** m3
(based on roof with 0.15m of ponding depth)

Allowable Site Release (L/s) =	**2803.3**
Total Site Release (L/s) =	**2803.3**
Total Storage Required (m^3) =	**2401.0**
Total Storage Provided (m^3) =	**2430.0**

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (m^3/s)	Runoff Volume (m^3)	Allowable Release Volume (m^3)	Total Storage Volume Required (m^3)	Storm Runoff (m^3/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)	Storage Depth (m)
10.0	196.5	2.500	1500.2	1559.49	0.00	2.388	1432.75	122.50	1310.25	0.12
15.0	166.9	2.154	1938.6	2339.23	0.00	2.028	1824.95	183.75	1641.20	0.13
20.0	145.1	1.900	2279.7	3118.98	0.00	1.763	2115.96	244.99	1870.97	0.14
25.0	128.5	1.705	2557.5	3898.72	0.00	1.561	2341.21	306.24	2034.97	0.14
30.0	115.3	1.551	2791.9	4678.47	0.00	1.401	2521.21	367.49	2153.72	0.14
35.0	104.6	1.426	2994.9	5458.21	0.00	1.271	2668.71	428.74	2239.97	0.15
40.0	95.7	1.323	3174.8	6237.96	0.00	1.163	2792.04	489.99	2302.05	0.15
45.0	88.3	1.236	3336.8	7017.70	0.00	1.073	2896.88	551.24	2345.64	0.15
50.0	82.0	1.162	3485.0	7797.44	0.00	0.996	2987.24	612.49	2374.76	0.15
55.0	76.5	1.098	3622.0	8577.19	0.00	0.929	3066.06	673.73	2392.33	0.15
60.0	71.7	1.042	3750.1	9356.93	0.00	0.871	3135.51	734.98	2400.52	0.15
65.0	67.5	0.992	3870.7	10136.68	0.00	0.820	3197.23	796.23	2401.00	0.15
70.0	63.7	0.949	3985.1	10916.42	0.00	0.774	3252.52	857.48	2395.04	0.15
75.0	60.4	0.910	4094.3	11696.17	0.00	0.734	3302.38	918.73	2383.65	0.15
80.0	57.4	0.875	4199.0	12475.91	0.00	0.697	3347.62	979.98	2367.64	0.15
85.0	54.7	0.843	4300.0	13255.66	0.00	0.664	3388.89	1041.23	2347.66	0.15
90.0	52.2	0.814	4397.6	14035.40	0.00	0.635	3426.72	1102.47	2324.25	0.15
95.0	50.0	0.788	4492.3	14815.14	0.00	0.607	3461.56	1163.72	2297.83	0.15
100.0	47.9	0.764	4584.5	15594.89	0.00	0.582	3493.76	1224.97	2268.79	0.15
105.0	46.0	0.742	4674.5	16374.63	0.00	0.559	3523.64	1286.22	2237.42	0.15
110.0	44.3	0.722	4762.5	17154.38	0.00	0.538	3551.46	1347.47	2203.99	0.15
115.0	42.7	0.703	4848.8	17934.12	0.00	0.518	3577.44	1408.72	2168.72	0.14
120.0	41.2	0.685	4933.4	18713.87	0.00	0.500	3601.77	1469.97	2131.81	0.14
125.0	39.8	0.669	5016.6	19493.61	0.00	0.483	3624.62	1531.22	2093.41	0.14
130.0	38.5	0.654	5098.6	20273.36	0.00	0.467	3646.13	1592.46	2053.67	0.14
135.0	37.3	0.639	5179.3	21053.10	0.00	0.453	3666.42	1653.71	2012.71	0.14
140.0	36.1	0.626	5259.0	21832.84	0.00	0.439	3685.61	1714.96	1970.65	0.14
145.0	35.0	0.614	5337.7	22612.59	0.00	0.426	3703.79	1776.21	1927.58	0.14
150.0	34.0	0.602	5415.6	23392.33	0.00	0.413	3721.04	1837.46	1883.58	0.14
155.0	33.1	0.591	5492.6	24172.08	0.00	0.402	3737.44	1898.71	1838.73	0.14
160.0	32.2	0.580	5568.9	24951.82	0.00	0.391	3753.06	1959.96	1793.11	0.14
165.0	31.3	0.570	5644.4	25731.57	0.00	0.381	3767.96	2021.20	1746.76	0.13

IBI GROUP
300 – 8133 Warden Avenue
Markham ON L6G 1B3 Canada
tel 905 763 2322
ibigroup.com

Roof Drain Weir Calculation

12304 HEART LAKE ROAD
File No. 135636
Date: November 2021

Roof Drain Weir (0.315 L/s per 25.4mm of head)

BUILDING A

Storm Event (Year)	Roof	Area (ha.)	Allowable Flow (L/s)	Unit Flow (L/s per ha)	Total Head (m)	Minimum # Roof Drain Weirs Needed
100	A2 post	4.86	204.2	42.0	0.15	110
10	A2 post	4.86	155.5	32.0	0.12	103

12304 Heart Lake Road

Industrial Development

Post-Development Runoff Coefficients

Project Name: 12304 Heart Lake Road
Project Number: 135636
Date: October 29, 2021
Designed By: Jason Jenkins, P.Eng.

A1 Post				
Conventional Roof	48,610	100.0%	0.90	0.90
Green Roof:	0	0.0%	0.50	0.00
Landscaping:	0	0.0%	0.25	0.00
Permeable Pavers:	0	0.0%	0.55	0.00
Impervious:	0	0.0%	0.90	0.00
Total Area:	**48,610**	100%		**0.90**

A2 Post				
Conventional Roof	0	0.0%	0.90	0.00
Green Roof:	0	0.0%	0.50	0.00
Landscaping:	14,877	30.8%	0.25	0.08
Permeable Pavers:	0	0.0%	0.55	0.00
Impervious:	33,421	69.2%	0.90	0.62
Total Area:	**48,298**	100%		**0.70**

A3 Post				
Conventional Roof	0	0.0%	0.90	0.00
Green Roof:	0	0.0%	0.50	0.00
Landscaping:	1,290	100.0%	0.25	0.25
Permeable Pavers:	0	0.0%	0.55	0.00
Impervious:	0	0.0%	0.90	0.00
Total Area:	**1,290**	100%		**0.25**

A4 Post				
Conventional Roof	0	0.0%	0.90	0.00
Green Roof:	0	0.0%	0.50	0.00
Landscaping:	1,349	100.0%	0.25	0.25
Permeable Pavers:	0	0.0%	0.55	0.00
Impervious:	0	0.0%	0.90	0.00
Total Area:	**1,349**	100%		**0.25**

Total Post				
Conventional Roof	48,610	48.8%	0.90	0.44
Green Roof:	0	0.0%	0.50	0.00
Landscaping:	17,516	17.6%	0.25	0.04
Permeable Pavers:	0	0.0%	0.55	0.00
Impervious:	33,421	33.6%	0.90	0.30
Total Area:	**99,547**	100%		**0.79**

12304 Heart Lake Road

Industrial Development

ALLOWABLE RELEASE RATE AND STORM SERVICE DESIGN

10 / 100 -YEAR STORM SEWER DESIGN SHEET

IBI

$$I_{10\text{-}year} = \frac{2221}{(T+12)^{0.9080}} = 134.16 \text{ mm/hr}$$

$$I_{100\text{-}year} = \frac{4688.0}{(T+17)^{0.9624}} = 196.54 \text{ mm/hr}$$

Project Name: 12304 Heart Lake Road
Project Number: 135636
Date: October 29, 2021
Designed By: Jason Jenkins, P.Eng.

			DESIGN FLOW CALCULATIONS									SEWER DESIGN & ANALYSIS									
	From MH	To MH	A (ha)	R	A x R	Accum. A x R	T_c (min)	I (mm/hr)	Roof Leader (m3/s)	Accum Roof Leader	Q_{act} (m3/s)	Size of Pipe (mm)	Slope (%)	Nominal Capacity Q_{cap} (m3/s)	Full Flow Velocity (m/s)	Actual Velocity (m/s)	Length (m)	Time in Sect. (min)	Total Time (min)	Percent of Full Flow (%)	Notes
ALLOWABLE RELEASE RATE																					
Building 1			9.95	0.75	7.466	7.466	10.0	134.2	0.00	0.00	2.78	900	0.50%	1.3	2.0	2.1	14.0	0.1	10.1	217.4%	The ex. service is already
																					below the 100-yr HGL in
																					Abbotside Way
ON-SITE SEWER DESIGN																					
CAP14 + CAP13 + CAP12	MH19	MH18	1.14	0.33	0.373	0.373	10.0	196.5	0.00	0.00	0.20	525	0.30%	0.2	1.1	1.2	61.6	0.9	10.9	86.5%	
CAP11 + CAP10	MH18	MH17	0.90	0.31	0.279	0.652	10.9	190.1	0.00	0.00	0.34	675	0.30%	0.5	1.3	1.4	83.1	1.1	12.0	74.8%	
CAP9 + CAP8	MH17	MH16	0.79	0.36	0.284	0.937	12.0	183.4	0.00	0.00	0.48	750	0.30%	0.6	1.4	1.5	42.2	0.5	12.5	78.2%	
CAP7 + Roof Leader	MH16	MH15	0.21	0.60	0.126	1.063	12.5	180.3	0.02	0.02	0.55	750	0.30%	0.6	1.4	1.6	69.3	0.8	13.4	90.6%	
CAP6 + Roof Leader	MH15	MH14	0.21	0.60	0.127	1.189	13.4	175.5	0.02	0.04	0.62	900	0.30%	1.0	1.6	1.6	64.6	0.7	14.1	62.6%	
CAP5 + CAP4 + Roof Leader	MH14	MH13	0.43	0.60	0.259	1.448	14.1	171.8	0.02	0.06	0.75	900	0.30%	1.0	1.6	1.7	74.1	0.8	14.9	75.8%	
CAP3 + Roof Leader	MH13	MH12	0.21	0.60	0.126	1.574	14.9	167.6	0.02	0.08	0.81	900	0.30%	1.0	1.6	1.7	72.4	0.8	15.6	82.1%	
CAP2 + CAP1 + Roof Leader	MH12	MH2	0.23	0.60	0.135	1.709	15.6	163.8	0.02	0.10	0.88	900	0.30%	1.0	1.6	1.8	51.0	0.5	16.2	88.7%	
CAP15 + CAP16 + CAP17	MH11	MH10	1.01	0.42	0.427	0.427	10.0	196.5	0.00	0.00	0.23	600	0.30%	0.3	1.2	1.3	53.1	0.7	10.7	69.2%	
CAP18 + CAP19 + Roof Leader	MH10	MH9	0.45	0.74	0.332	0.759	10.7	191.5	0.02	0.02	0.42	750	0.30%	0.6	1.4	1.5	60.0	0.7	11.5	69.5%	
CAP20 + CAP21 + Roof Leader	MH9	MH8	0.45	0.73	0.334	1.092	11.5	186.8	0.02	0.04	0.61	825	0.30%	0.8	1.5	1.6	60.0	0.7	12.1	77.3%	
CAP22 + CAP23 + Roof Leader	MH8	MH7	0.44	0.75	0.330	1.422	12.1	182.6	0.02	0.06	0.78	900	0.30%	1.0	1.6	1.7	59.9	0.6	12.8	78.9%	
CAP24 + CAP25 + Roof Leader	MH7	MH6	0.43	0.76	0.330	1.752	12.8	178.8	0.02	0.08	0.95	900	0.35%	1.1	1.7	1.9	60.0	0.6	13.4	88.9%	
CAP26 + CAP27 + Roof Leader	MH6	MH5	0.35	0.78	0.273	2.025	13.4	175.4	0.02	0.10	1.09	900	0.35%	1.1	1.7	1.9	40.8	0.4	13.8	101.7%	
CAP28 + CAP29	MH5	MH4	0.19	0.52	0.100	2.126	13.8	173.2	0.00	0.10	1.12	900	0.35%	1.1	1.7	1.9	48.2	0.5	14.3	105.0%	
CAP30 + CAP31 + CAP32	MH4	MH3	0.15	0.77	0.116	2.241	14.3	170.7	0.00	0.10	1.16	900	0.35%	1.1	1.7	1.8	90.0	0.9	15.2	108.7%	
CAP33 + CAP34	MH3	MH2	0.18	0.80	0.141	2.383	15.2	166.1	0.00	0.10	1.20	900	0.35%	1.1	1.7	1.8	72.7	0.7	15.9	112.2%	
CAP35 + Total	MH2	MH1	0.09	0.67	0.062	4.154	15.6	163.8	0.00	0.20	2.09	900	1.00%	1.8	2.8	3.0	32.1	0.2	10.2	115.7%	
CAP35 + Total	MH1	CTRL MH1	-	-	-	4.154	15.8	162.9	0.00	0.20	2.08	900	1.00%	1.8	2.8	3.0	6.9	0.0	10.0	115.1%	

12304 Heart Lake Road **Water Balance Calculations**

Industrial Development

IBI

Project Name: 12304 Heart Lake Road
Project Number: 135636
Date: October 29, 2021
Designed By: Jason Jenkins, P.Eng.

Total Volume to be Retained	
Required Water Balance (mm):	5.0
Recall Site Area (m²):	99,547
Total Water Balance to be Retained (m³):	**497.7**

Initial Abstraction				
Surface	**Area (m²)**		**I.A.**	**Vol. (m³)**
Conventional Roof	48,610		1	48.6
Landscape	17,516		5	87.6
Impervious	33,421		1	33.4
Total Area:	**99,547**			**169.6**

Infiltration Gallery (North)	
Area (m²):	564.0
Depth of (m):	0.8
Void Ratio:	0.4
Stone Storage Capacity (m³):	**180.5**

Infiltration Gallery (South)	
Area (m²):	484.0
Depth of (m):	0.8
Void Ratio:	0.4
Stone Storage Capacity (m³):	**154.9**

Water Balance Summary	Vol. (m³)
Initial Abstraction:	169.6
Infiltration Galleries:	335.4
Irrigation:	14.0
Total Water Balance Achieved:	**519.0**

Site Meets City's Water Balance Criteria

Percolation Rate / Drawdown Time (North Gallery)	
Recall Infiltration Volume (m³):	180.5
Recall Infiltration Area (m²):	564.0
Depth of Water (m):	0.32
Depth of Water (mm):	320
Infiltration Rate Provided by Geotechnical (mm/hr):	8
Drawdown Time (hr):	**40.0**

Drawdown Time is less than 48 hours, thus satisfies MECP.

Percolation Rate / Drawdown Time (South Gallery)	
Recall Infiltration Volume (m³):	154.9
Recall Infiltration Area (m²):	484.0
Depth of Water (m):	0.32
Depth of Water (mm):	320
Infiltration Rate Provided by Geotechnical (mm/hr):	8
Drawdown Time (hr):	**40.0**

Drawdown Time is less than 48 hours, thus satisfies MECP.

Appendix C – PCSWMM Output

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

WARNING 09: time series interval greater than recording interval for Rain Gage AES_10Yr

****
Element Count
****
Number of rain gages 5
Number of subcatchments ... 8
Number of nodes 10
Number of links 9
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
AES_100Yr	AES_100Yr	INTENSITY	5 min.
AES_10Yr	AES_10Yr	INTENSITY	5 min.
Chicago_6h	Chicago_6h_100yr	INTENSITY	15 min.
Chicago_6h_10yr	Chicago_6h_10yr	INTENSITY	5 min.
Chicago_6h_2Y	Chicago_6h_2Y	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	9.96	200.00	79.00	2.0000	AES_10Yr	J5
S2	12.81	150.00	79.00	2.0000	AES_10Yr	J4
S3	14.78	250.00	79.00	2.0000	AES_10Yr	J3
S4	4.30	80.00	79.00	2.0000	AES_10Yr	J7
S5	13.33	225.00	79.00	2.0000	AES_10Yr	J9
S6	3.09	70.00	79.00	2.0000	AES_10Yr	J5
S7	3.16	157.00	79.00	2.0000	AES_10Yr	J2
S8	15.00	300.00	79.00	2.0000	AES_10Yr	J9

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	267.78	4.28	0.0	
J2	JUNCTION	267.28	4.16	0.0	
J3	JUNCTION	266.38	5.05	0.0	
J4	JUNCTION	265.33	5.35	0.0	
J5	JUNCTION	263.98	5.93	0.0	
J6	JUNCTION	256.07	4.00	0.0	
J7	JUNCTION	262.77	6.39	0.0	
J9	JUNCTION	258.29	5.16	0.0	
OF1	OUTFALL	255.58	1.65	0.0	
SU1	STORAGE	258.21	2.40	0.0	

****

Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	J2	CONDUIT	98.5	0.4995	0.0130
C2	J2	J3	CONDUIT	150.0	0.6000	0.0130
C3	J3	J4	CONDUIT	150.0	0.7000	0.0130
C4	J4	J5	CONDUIT	150.0	0.9000	0.0130
C5	J5	J7	CONDUIT	132.0	0.9228	0.0130
C6	J6	OF1	CONDUIT	42.0	1.1620	0.0130
C7	J7	J9	CONDUIT	525.1	0.8534	0.0100
C8	J9	SU1	CONDUIT	149.4	0.0502	0.0100
W1	SU1	J6	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	1.20	1.13	0.30	1.20	1	2.76
C2	CIRCULAR	1.35	1.43	0.34	1.35	1	4.14
C3	CIRCULAR	1.50	1.77	0.38	1.50	1	5.92
C4	CIRCULAR	1.95	2.99	0.49	1.95	1	13.50
C5	CIRCULAR	1.95	2.99	0.49	1.95	1	13.67
C6	CIRCULAR	1.65	2.14	0.41	1.65	1	9.83
C7	CIRCULAR	2.25	3.98	0.56	2.25	1	25.03
C8	RECT_CLOSED	2.10	6.30	0.62	3.00	1	10.24

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****

```
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 11/04/2021 00:00:00
Ending Date .............. 11/05/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001524 m
```

```
  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......         1.419        18.563
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.157         2.049
  Surface Runoff ...........         1.226        16.035
  Final Storage ............         0.047         0.613
  Continuity Error (%) .....        -0.723


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         1.226        12.256
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         1.221        12.209
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.005         0.048
  Continuity Error (%) .....        -0.005


  ***************************
  Time-Step Critical Elements
  ***************************
  None


  ********************************
  Highest Flow Instability Indexes
  ********************************
  All links are stable.


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     4.50 sec
  Average Time Step           :     5.00 sec
  Maximum Time Step           :     5.00 sec
  Percent in Steady State     :     0.00
  Average Iterations per Step :     2.00
  Percent Not Converging      :     0.00
  Time Step Frequencies       :
      5.000 -  3.155 sec      :   100.00 %
      3.155 -  1.991 sec      :     0.00 %
      1.991 -  1.256 sec      :     0.00 %
      1.256 -  0.792 sec      :     0.00 %
      0.792 -  0.500 sec      :     0.00 %


  ***************************
  Subcatchment Runoff Summary
  ***************************

  -----------------------------------------------------------------------------------------------
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Tot Runo
S1	18.56	0.00	0.00	2.01	14.19	1.89	16.
S2	18.56	0.00	0.00	2.17	14.12	1.73	15.
S3	18.56	0.00	0.00	2.06	14.16	1.85	16.
S4	18.56	0.00	0.00	2.03	14.22	1.87	16.
S5	18.56	0.00	0.00	2.06	14.16	1.85	16.
S6	18.56	0.00	0.00	1.98	14.21	1.93	16.
S7	18.56	0.00	0.00	1.83	14.39	2.08	16.
S8	18.56	0.00	0.00	2.01	14.19	1.89	16.

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.00	0.00	267.78	0 00:00	0.00
J2	JUNCTION	0.02	0.21	267.49	0 02:35	0.21
J3	JUNCTION	0.04	0.40	266.78	0 02:35	0.40
J4	JUNCTION	0.05	0.42	265.76	0 02:36	0.42
J5	JUNCTION	0.06	0.52	264.50	0 02:36	0.51
J6	JUNCTION	0.10	0.28	256.35	0 03:55	0.28
J7	JUNCTION	0.05	0.45	263.21	0 02:37	0.45
J9	JUNCTION	0.06	0.57	258.86	0 02:39	0.56
OF1	OUTFALL	0.09	0.28	255.86	0 03:56	0.28
SU1	STORAGE	0.06	0.28	258.49	0 03:55	0.28

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Fl Balan Err Perce
J1	JUNCTION	0.000	0.000	0 00:00	0	0	0.0
J2	JUNCTION	0.230	0.230	0 02:35	0.52	0.52	-0.0
J3	JUNCTION	0.721	0.916	0 02:35	2.37	2.89	0.0
J4	JUNCTION	0.528	1.406	0 02:36	2.03	4.92	0.0
J5	JUNCTION	0.691	2.016	0 02:36	2.1	7.02	-0.0
J6	JUNCTION	0.000	0.606	0 03:55	0	12.2	0.0
J7	JUNCTION	0.240	2.242	0 02:36	0.692	7.71	0.0
J9	JUNCTION	1.434	3.396	0 02:37	4.55	12.3	0.0
OF1	OUTFALL	0.000	0.606	0 03:56	0	12.2	0.0
SU1	STORAGE	0.000	3.783	0 02:38	0	12.3	-0.0

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maxi Outf
SU1	1.275	2	0	0	6.423	10	0 03:55	0.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	94.70	0.149	0.606	12.209
System	94.70	0.149	0.606	12.209

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.000	0 00:00	0.00	0.00	0.09
C2	CONDUIT	0.210	0 02:36	0.88	0.05	0.22
C3	CONDUIT	0.903	0 02:36	2.32	0.15	0.27
C4	CONDUIT	1.385	0 02:36	2.51	0.10	0.24
C5	CONDUIT	2.031	0 02:36	3.58	0.15	0.25
C6	CONDUIT	0.606	0 03:56	2.55	0.06	0.17
C7	CONDUIT	2.171	0 02:37	3.51	0.09	0.22
C8	CONDUIT	3.783	0 02:38	3.68	0.37	0.17
W1	WEIR	0.606	0 03:55			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	---------- Fraction of Time in Flow Class ----------								
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.99	0.00

C3	1.00	0.01	0.00	0.00	0.79	0.20	0.00	0.00	0.92	0.00
C4	1.00	0.01	0.00	0.00	0.65	0.34	0.00	0.00	0.98	0.00
C5	1.00	0.01	0.00	0.00	0.42	0.57	0.00	0.00	0.01	0.00
C6	1.00	0.04	0.00	0.00	0.02	0.95	0.00	0.00	0.22	0.00
C7	1.00	0.01	0.00	0.00	0.21	0.78	0.00	0.00	0.39	0.00
C8	1.00	0.01	0.00	0.00	0.93	0.06	0.00	0.00	0.39	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Nov 9 10:47:39 2021
Analysis ended on: Tue Nov 9 10:47:40 2021
Total elapsed time: 00:00:01