



December 2019

UD17-094

Functional Servicing and Stormwater Management Report (Phase I)



 **Lithos**

Project: 1444-1458 Cawthra Road

2530173 Ontario Corporation

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Issues and Revisions Registry

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FSR/SWM Report (Phase I)	April 15 th , 2019	Re - Issued for Rezoning Application
FSR/SWM Report (Phase I)	December 19 th , 2019	Re - Issued for Rezoning Application

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Executive Summary

Lithos Group Inc. (Lithos) was retained by 2530173 Ontario Corporation (the “Owner”) to prepare a Functional Servicing and Stormwater Management (FSR-SWM) Report (Phase I), in support of a Rezoning Application, for a proposed residential use development to be located at 1444-1458 Cawthra Road, in the City of Mississauga (the “City”). The following summarizes our conclusions:

Storm Drainage

More details for the Stormwater Management (SWM) Section of this report will be prepared at the Site Plan Application stage (Phase II). The site stormwater discharge will be controlled to the 2-year pre-development flow. In order to achieve the target flows and meet the City’s Storm Water Quantity Control requirements, quantity controls will be utilized and up to 293.6 m³ of storage will be required. The stormwater management (SWM) system will be designed to provide enhanced level (Level 3) protection as specified by the Ministry of Environment, Conservation and Park (MECP). During Site Plan Application, a detailed analysis will be provided to assess the water quality on site and determine additional measures in order to achieve a minimum total suspended solids (TSS) removal of 80%.

Sanitary Sewers

Sixteen (16) separate ownerships will comprise the proposed development, one for each townhouse unit and one for each detached dwelling. In order to provide separate connection for each residential dwelling and townhouse development, an easement will be incorporated during the detailed design stage. The proposed development, will connect to the existing 250 mm sanitary sewer on Cawthra Road, via a 150mm diameter sanitary lateral. The additional net discharge flow from the proposed buildings, is anticipated at approximately 0.63 L/s, which represents less than 1% of the full flow capacity of the existing 250mm diameter sanitary sewer along Cawthra Road, therefore it is considered negligible. Following that fact, the existing infrastructure can support the proposed development.

Water Supply

The proposed development will be comprised by sixteen (16) separate ownerships. Similarly to sanitary connections, each ownership will connect to the proposed water service which will be located within the proposed easement. The proposed water service will connect to the existing 300 mm diameter watermain located on the south side of Cawthra Road. It is anticipated that a total design flow of 83.42 L/s will be required to support the proposed development. The results of the hydrant flow test reveal the existing water infrastructure can support the proposed development.

Site Grading

The proposed grades will improve the existing drainage conditions to meet the City’s/Regional requirements. Grades will be maintained along the property line wherever feasible and emergency overland flow will continue draining according to the existing draining pattern.

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1.0 Introduction

Lithos Group Inc. (Lithos) was retained by 2530173 Ontario Corporation (the “Owner”) to prepare a Functional Servicing and Stormwater Management Report (Phase I), in support of Rezoning Application for a proposed residential development, located at 1444-1458 Cawthra Road in the City of Mississauga (City).

The purpose of this report is to provide site-specific information for the City’s review with respect to infrastructure required to support the proposed development. More specifically, the report will present details on sanitary discharge, water supply and an outline of the storm pattern.

We contacted the City’s engineering department to obtain existing information in preparation of this report. The following documents were available for our review:

- Plan and profile drawings of Cawthra Road, Drainage and Utilities, drawing No.
 - 8313 – D, dated May 1985;
 - 8315 – D, dated May 1985;
 - 8325 – D, dated May 1985;
 - C – 5966, dated March 1963;
- Site Plan and Statistics prepared by KFA Architects and Planners Inc., dated December, 2019; and,
- Topographical Survey prepared by Tom A. Senkus, dated March 30, 2017.

2.0 Site Description

The existing site is approximately 0.536 hectares of residential-use land. It is currently occupied by four (4) detached residential dwellings, outdoor paved parking area and landscaped area, as indicated by the topographic survey in **Appendix B**. The site is bound by Cawthra Road to the north and residential dwellings to the south, east and west. Refer to **Figures 1** and **2** following this report and site photographs in **Appendix A**.

3.0 Site Proposal

The proposed development will include four (4) blocks of two-storey stacked townhouses as well as four (4) two-storey detached residential dwellings and it will be comprised of sixteen (16) ownerships, one for each of the proposed townhouses and single residential dwellings. The proposed development will include approximately a total 3,642 m² of Gross Floor Area (GFA). Please refer to **Appendix B** for the proposed site plan and site statistics.

Note that there is approximate portion of 0.016 ha on the north side of the property, which will be conveyed to the City (future extension of Cawthra Road). Therefore, the future private property will be 0.520 ha. Please refer to **Appendix B** for the proposed site plan and site statistics.

4.0 Terms of Reference and Methodology

4.1. Terms of Reference

The Terms of Reference used for the scope of this report were based on:

- City of Mississauga Development Requirements Manual, revised September 2016;
- Region of Peel Watermain Design Criteria, revised June 2010;
- Region of Peel Sanitary Sewer Design Criteria, revised March 2017;
- Ministry of Environment: Guidelines for the Design of Sanitary Sewage Works – 2008;
- Ministry of Environment: Design Guidelines for Drinking Water Systems – 2008;
- Ministry of Environment: Stormwater Management Planning and Design Manual – 2003; and
- Ontario Building Code 2012 (O.B.C.)

4.2. Methodology: Stormwater Drainage and Management

This report provides an overview of the pre and post-development conditions, and comments on opportunities to reduce peak flows. A detailed Stormwater Management (SWM) report will be prepared at the Site Plan Application Stage (Phase II).

The proposed development will be designed to meet the Region's and the standards of the Province of Ontario as set out in the Ministry of Environment, Conservation and Parks (MECP) 2003 Stormwater Management Planning and Design Manual (SWMPD). The following design criteria will be reviewed:

- Post-development peak flow for the 100-year from the site should be controlled to the two (2)-year target flow according to the Credit Valley Conservation (CVC) Flood Control Criteria of Cooksville Creek;
- A specified rainfall depth of 5 mm is to be retained on-site as required by the City of Mississauga Development Requirements Manual for stormwater runoff volume reduction;
- A safe overland flow will be provided for all flows in excess of the 100-year storm event.

4.3. Methodology: Sanitary Discharge

The sanitary sewage discharge from the site will be determined using sanitary sewer design sheets that incorporate the land use and building statistics as supplied by the design team. The calculated values provide peak sanitary flow discharge that considers infiltration.

The estimated sanitary discharge flows from the proposed site will be calculated based on the criteria shown in **Table 4.1**.

Table 4.1 – Sanitary Flows

Usage	Design Flow	Units	Population Equivalent
Residential	302.8	Litres / capita / day	Single & Semi-detached dwellings = 4.15 ppu Townhouses = 3.5 ppu

Based on the calculated peak flows, the adequacy of the existing infrastructure to support the proposed development will be discussed.

4.4. Methodology: Water Usage

The domestic water usage was calculated based on the City's design criteria outlined in **Table 4.2**.

Table 4.2 – Water Usage

Usage	Water Demand	Units
Typical Residential Water Demand	280	Litres / capita / day

Pressure and flow testing has been conducted on the existing hydrants located near the site along Cawthra Road to obtain existing flows, residual and static pressure.

5.0 Stormwater Management and Drainage

5.1. Existing Conditions

The property is currently occupied by four (4) detached residential dwellings, outdoor paved parking area and landscaped area. According to available records, there is an existing 1050 mm diameter storm sewer along Cawthra Road running south-east. In addition, according to our review along the property limits of the existing site, there is no external storm flow from the adjacent lands draining towards our site under pre-development conditions.

There are two (2) internal drainage areas in the existing site:

1. A1 Pre – Uncontrolled storm runoff from the south portion of the site, draining towards the rear yards, south-west of the existing dwellings;
2. A2 Pre – Uncontrolled storm runoff from the east portion of the site, which comprises mainly by runoff from the outdoor parking area and buildings' rooftops, discharged into the City's storm network along Cawthra Road.

Table 5.1 shows the input parameters which are illustrated on the pre-development drainage area plan in **Figure DAP-1** in **Appendix C**.

Table 5.1 – Target Input Parameters

Catchment	Drainage Area (ha)	C	Tc (min.)
A1 Pre	0.370	0.34	15
A2 Pre	0.150	0.50	15

Peak flows calculated for the existing conditions are shown in **Table 5.2** below. Detailed calculations are in **Appendix C**.

Table 5.2 – Target Peak Flows

Catchment	Peak Flow Rational Method			
	(L/s)			
	2-year	5-year	10-year	100-year
A1 Pre	20.9	28.1	34.7	49.2
A2 pre	12.5	16.8	20.7	29.3

As shown in **Table 5.2**, the post-development flows will need to be controlled to the target flow of 20.9 L/s and 11.8 L/s for the areas draining towards the east portion of the site and Cawthra Road, respectively.

5.2. Stormwater Management

In order to meet the City's Storm Design requirements, the development flow rate is to be controlled to the two (2)-year target flow established in **Section 5.1**.

The site has been separated into two (2) internal drainage areas:

1. A1 Post – Storm runoff from the rooftops, the driveway area and the landscape areas, controlled into an underground infiltration gallery (trench).
2. A2 Post – Uncontrolled storm runoff from the north portion of the site, flowing towards Cawthra Road

The post-development drainage areas and runoff coefficients are indicated on **Figure DAP-2**, located in **Appendix C** and summarized in **Table 5.3** below.

Table 5.3 – Post-development Input Parameters

Drainage Area	Drainage Area (ha)	Runoff Coefficient for 2,5,10-Year Return Period "c"	Runoff Coefficient for 100-Year Return Period "c"	Tc (min.)
A1 Post	0.476	0.67	0.84	15
A2 Post	0.015	0.40	0.50	15

As per City's stormwater management guidelines, in order to account for increase in storm runoff due to saturation of the catchment surface, an adjustment factor of 1.25 will be used for the 100-year storm.

5.2.1. Stormwater Runoff Volume Reduction

As required by the City's guidelines, a rainfall depth of 5 mm must be retained over the entire parcel area. A 5 mm rainfall over the entire site equates to a required water balance volume of 26.01 m³. In order to achieve this, the following low impact development (LID) techniques may be implemented.

- Soakway pit to infiltrate roof runoff;
- Permeable materials/Infiltration galleries/trenches to infiltrate surface runoff;
- Reuse for irrigation purposes;
- Rainwater barrels and/or tank;

Detailed calculations will be provided during the detailed design stage of Site Plan Application (Phase II).

5.2.2. Quantity Controls

As mentioned on **Section 5.1**, storm runoff from the south portion of the existing property is draining towards the south-west corner of the site while the north portion is draining towards Cawthra Road. Therefore, a quantity control analysis has been prepared for each drainage area adjacent to the site in order to assess the pre to post development impacts on each area.

5.2.2.1 Post Development Flows – South Portion of the Site (A1-Post)

Using the City's intensity-duration-frequency (IDF) data, modified rational method calculations were undertaken to determine the maximum storage required during each storm event. Results for the 2, 5, 10 and 100-year storm events are provided in **Table 5.4** below. The detailed post-development quantity control calculations are provided in **Appendix C**.

Table 5.4 – Post-development Quantity Control as per City Requirements (South Portion of the Site)

Drainage Areas	Area (ha)	Storm Event	Target Flow (L/s)	Controlled Site Release Rate (L/s)	Required Storage Volume in Trench (m ³)
A1 Post (Controlled in infiltration gallery)	0.476	2-year	20.9	0	97.6
		5-year		0	131.2
		10-year		0	161.6
		100-year		0	293.6

As shown in **Table 5.4**, in order to control post-development flows to 2-year pre-development conditions, a target flow of 20.9 L/s is to be satisfied. According to our calculations, the storm runoff volume for the proposed portion of the site reaches 293.6 m³ after 180 minutes from the beginning of the storm event. Based on this information, at least 293.6 m³ of underground storage will be adequate to accommodate all post-development flows up to a 100-year event. Quantity control for this parcel will be achieved by the implementation of an infiltration trench. To conclude, there will be no post-development release rate from the portion of the site to be altered and all post-development flows will be controlled on site. Details will be provided through the detailed design stage of Site Plan Application (Phase II).

5.2.2.2 Post Development Flows – North Portion of the Site

Using the City's intensity-duration-frequency (IDF) data, modified rational method calculations were undertaken to determine the maximum storage required during each storm event. Results for the 2, 5, 10 and 100-year storm events are provided in **Table 5.5** below. The detailed post-development quantity control calculations are provided in **Appendix C**.

Table 5.5 – Post-development Quantity Control as per City Requirements (North Portion of the Site)

Drainage Areas	Area (ha)	Storm Event	Target Flow (L/s)	Post-Development Uncontrolled Flow (L/s)
A2 Post (Uncontrolled)	0.044	2-year	12.5	2.9
		5-year		3.9
		10-year		4.8
		100-year		8.5

As shown on **Table 5.5**, under post-development conditions, uncontrolled flow towards Cawthra Road during a 100-year storm event is smaller than the two (2)-year pre-development target flow, therefore, no stormwater storage is required.

5.2.3. Quality Controls

Stormwater treatment must meet Enhanced Protection criteria as defined by the MECP 2003 SWMPD Manual, including a minimum 80% of total suspended solids removal (TSS). Water quality control can be provided by the rooftop/terraces and by an oil-grit separator (OGS) that will be required for the driveway area which will be exposed to oil and grit.

More details regarding sizing of the OGS and the total quality control achieved for the total site, will be provided through the detailed design stage of Site Plan Application (Phase II).

5.3. Proposed Storm Connection

Storm sewer connection will not be required for the development. The north portion of the property will keep draining as it currently does while the south portion will be contained on site up to the 100 year event. Refer to engineering drawing “SS-01” (submitted separately) for details regarding the private storm sewer network.

6.0 Sanitary Drainage System

6.1. Existing Sanitary Drainage System

The existing site is currently occupied by four (4) residential dwellings, outdoor paved parking area and landscaped area. According to available records there is an existing 250mm diameter sanitary sewer fronting the property along Cawthra Road running south-east.

6.2. Existing and Proposed Sanitary Flows

The sanitary flow generated by the proposed residential use development at 1444-1458 Cawthra Road was compared to the existing flow in order to quantify the net increase in the sanitary sewer.

Using the design criteria outlined in **Section 4.3** and existing site information, the sanitary discharge flow from the existing residential dwellings is estimated at 0.36 L/s. Detailed calculations can be found in **Appendix D**.

Similarly, using the design criteria and the proposed development statistics, the new development will discharge 0.99 L/s into the City's infrastructure.

The additional flow will be considered within the sanitary discharge rate, therefore, there is an increase in sanitary flow of approximately 0.63 L/s, which represents less than 1% of the full flow capacity of the existing 250mm diameter sanitary sewer along Cawthra Road, therefore it is considered negligible. Following that fact, the existing infrastructure can support the proposed development.

6.3. Proposed Sanitary Connection

Sixteen (16) separate ownerships will comprise the proposed development, one for each townhouse unit and one for each detached residential dwelling. Each residential dwelling and townhouse development sanitary connection will be according to the City of Mississauga and Region of Peel criteria. Each ownership will connect into a proposed 150mm diameter sanitary sewer within the easement, which will discharge into the existing 250mm diameter sanitary sewer on the south side of Cawthra Road, at a minimum grade of 2.00% (or equivalent pipe design). Refer to engineering drawing "SS-01" (submitted separately) for details.

7.0 Water Supply System

7.1. Existing System

The existing watermain system consists of a 300 mm diameter watermain on the south side of Cawthra Road. Hydrant flow tests were carried out by Cole Engineering on April 11, 2018 along Cawthra Road Trail, to determine the flow and pressure in the existing water.

The results of the test indicate the existing static pressure is 441 KPa (64 psi) and 123.0 L/sec (1950 USGPM) of water is available with a residual pressure of 400 KPa (58 psi). The full detailed report is included in **Appendix E**.

7.2. Proposed Water Supply Requirements

The estimated water consumption was calculated based on the occupancy rates shown on **Table 4.2**, based on the Region's Watermain Design Criteria, revised June 2010. It is anticipated that an average consumption of approximately 0.14 L/s (12,096 L/day), a maximum daily consumption of 0.29 L/s (25,056 L/day) and a peak hourly demand of 0.43 L/s (1,548 L/hr) will be required to service this development with domestic water. Detailed calculations can be found in **Appendix E**.

The fire flow requirements were estimated using the method prescribed by the Fire Underwriters Survey (FUS) be undertaken to assess the minimum requirement for fire suppression. The fire flow calculation is normally conducted for the largest storey, by area, and for the two immediately adjacent storeys. For this development, we have selected the worst-case scenario for townhouse fire separation of 600m²/townhouse unit, according to the OBC requirements which translates to an equal separation of 200m²/floor for the three storey townhouse units. **Table 7.1** below illustrates the input parameters used for the FUS calculations. According to our calculations, a minimum fire suppression flow of approximately 83.13 L/s (1,317 USGPM) will be required. Refer to detailed calculations found in **Appendix E**.

Table 7.1 – Fire Flow Input Parameters

Parameter	Frame used for Building	Combustibility of Contents	Presence of Sprinklers	Separation Distance			
				North	West	South	East
Value according to FUS options	Ordinary Construction	Non-Combustible	No	10.1m-20m	0.0m-3.0m	20.0m-3.0m	20.1m-30m
Surcharge/reduction from base flow	1.0	25%	0%	15%	25%	25%	10%

In summary, the required design flow is the sum of ‘the minimum fire suppression flow’ and ‘maximum daily demand’ ($83.13+0.29 = 83.42 \text{ L/s}$, 1,322 USGPM).

The results of the hydrant flow test carried out by Cole Engineering on April 11, 2018 along Cawthra Road, indicate that 361.51 L/s (5750 USGPM) of water is available with a pressure of 138KPa (20.0 psi) revealing that the existing water infrastructure will support the proposed development. The hydrant flow tests can be found in **Appendix E**.

7.3. Proposed Watermain Connection

Sixteen (16) separate ownerships will comprise the proposed development, one for each townhouse unit and one for each detached residential dwelling. Similarly to sanitary connections, each residential dwelling and townhouse development watermain connection will be according to the City of Mississauga and Region of Peel criteria. Furthermore, a private hydrant is proposed within the driveway area of the site, as per Region of Peel standard drawing 1-8-2.

The proposed municipal water service will connect to the existing 300 mm diameter watermain located on the south side of Cawthra Road. Proposed townhouse developments residential dwellings will be serviced by 25mm diameter domestic services. For details, refer to engineering drawing “SS-01” (submitted separately).

8.0 Site Grading

8.1. Existing Grades

The existing property is currently occupied by four (4) residential dwellings, outdoor paved parking area and landscaped area. The existing site drains uncontrolled partially towards Cawthra Road and partially towards the rear yards, south-west of the existing dwellings.

8.2. Proposed Grades

The proposed grades will improve the existing drainage patterns wherever feasible. Grades will be maintained along the property line to the extent possible.

Stormwater consisting of the Cawthra Road access driveway, rooftops and the adjacent landscape area will be directed towards the underground storm tank and then discharged into the City’s network. Overland flow for the proposed development will be maintained as is, however stormwater drainage conditions will be improved, due to the stormwater quantity controls described in **Section 5.2.2**.

9.0 Conclusions and Recommendations

Based on our investigations, we conclude the following:

Storm Drainage

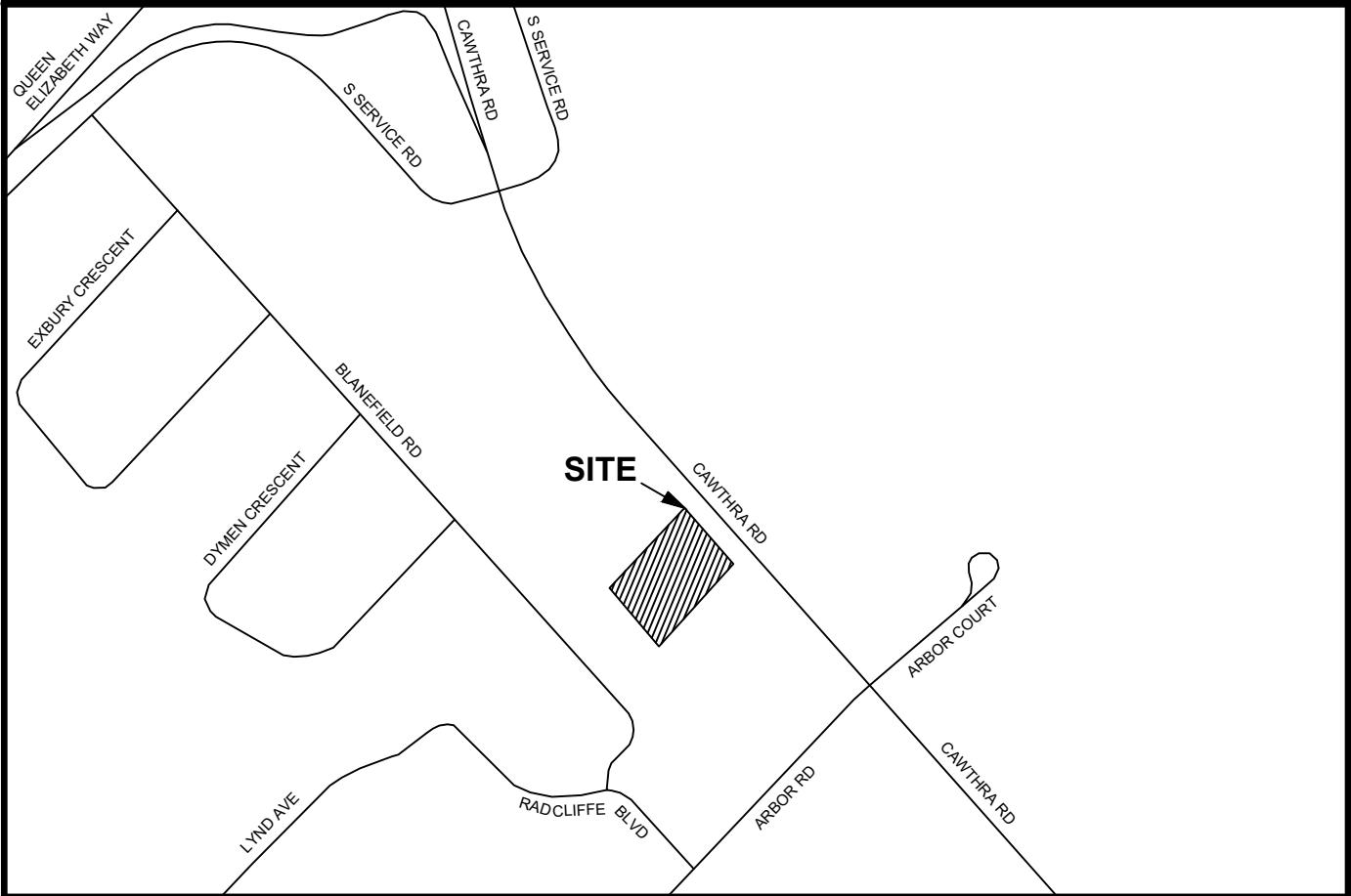
More details for the Stormwater Management (SWM) Section of this report will be prepared at the Site Plan Application stage (Phase II). The site stormwater discharge will be controlled to the 2-year pre-development flow. In order to achieve the target flows and meet the City's Storm Water Quantity Control requirements, quantity controls will be utilized and up to 293.6 m³ of storage will be required. The stormwater management (SWM) system will be designed to provide enhanced level (Level 3) protection as specified by the Ministry of Environment, Conservation and Park (MECP). During Site Plan Application, a detailed analysis will be provided to assess the water quality on site and determine additional measures in order to achieve a minimum total suspended solids (TSS) removal of 80%.

Sanitary Sewers

Sixteen (16) separate ownerships will comprise the proposed development, one for each townhouse unit and one for each detached dwelling. In order to provide separate connection for each residential dwelling and townhouse development, an easement will be incorporated during the detailed design stage. The proposed development, will connect to the existing 250 mm sanitary sewer on Cawthra Road, via a 150mm diameter sanitary lateral. The additional net discharge flow from the proposed buildings, is anticipated at approximately 0.63 L/s, which represents less than 1% of the full flow capacity of the existing 250mm diameter sanitary sewer along Cawthra Road, therefore it is considered negligible. Following that fact, the existing infrastructure can support the proposed development.

Water Supply

The proposed development will be comprised by sixteen (16) separate ownerships. Similarly to sanitary connections, each ownership will connect to the proposed water service which will be located within the proposed easement. The proposed water service will connect to the existing 300 mm diameter watermain located on the south side of Cawthra Road. It is anticipated that a total design flow of 83.42 L/s will be required to support the proposed development. The results of the hydrant flow test reveal the existing water infrastructure can support the proposed development.



 **Lithos**

150 Bermonsday Road, North York, Ontario M4A 1Y1

LOCATION PLAN

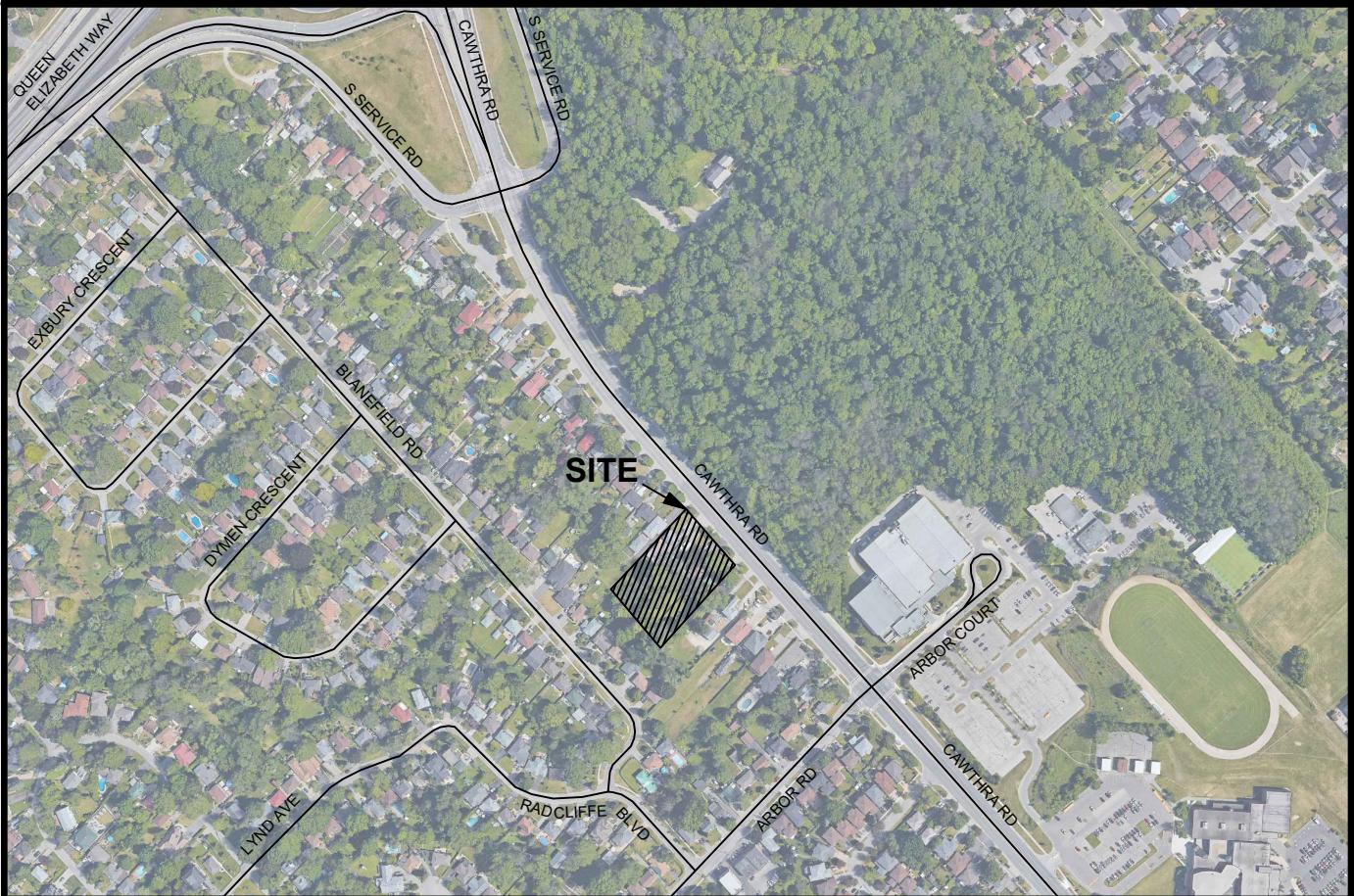
RESIDENTIAL USE DEVELOPMENT
1444-1458 CAWTHRA ROAD
MISSISSAUGA, ONTARIO

DATE: DECEMBER 2019

PROJECT No: UD17-094

SCALE: N.T.S.

FIGURE No: FIG 1



 **Lithos**

AERIAL PLAN
RESIDENTIAL USE DEVELOPMENT
1444-1458 CAWTHRA ROAD
MISSISSAUGA, ONTARIO

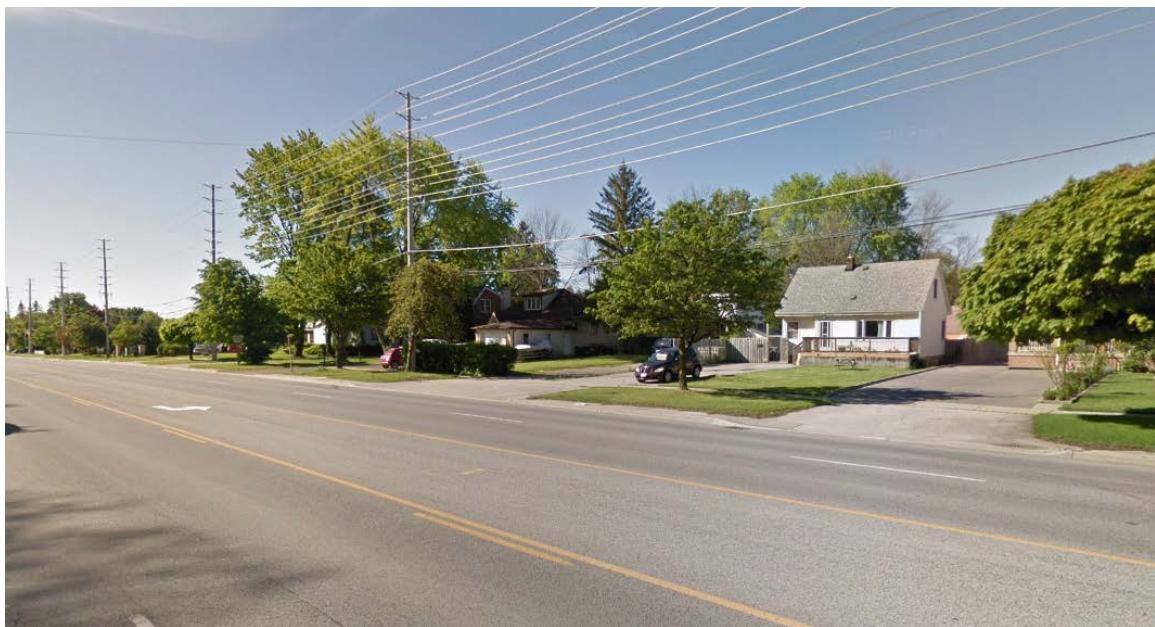
150 Bermonsday Road, North York, Ontario M4A 1Y1

DATE:	DECEMBER 2019	PROJECT No:	UD17-094
SCALE:	N.T.S.	FIGURE No:	FIG 2

APPENDIX A
Site Photographs



South-east Corner of property along Cawthra Road facing north



North-east Corner of property along Cawthra Road facing south

APPENDIX B

Background Information

**SURVEYOR'S REAL PROPERTY REPORT
AND TOPOGRAPHIC DETAIL**
PART 1) PLAN OF SURVEY OF
PART OF LOTS 188, 189, 190 AND 191
REGISTERED PLAN B-19
CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL
SCALE 1:250
5m 0m 5m 10m 15m

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METRIC
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

PART 2) PLAN REPORT

EASEMENTS AND/OR RIGHT-OF-WAYS
NO REGISTERED EASEMENTS

MONUMENTATION
CORNERS MARKED/MITNESSED BY SURVEY MONUMENTS SHOWN ON PLAN.

REMARKS
NOTE POSITION OF FENCES AS SHOWN ON PLAN.

BOUNDARIES
DISTANCES AS MEASURED ARE IN GENERAL AGREEMENT WITH DIMENSIONS SHOWN ON REGISTERED PLAN.

COMPLIANCE WITH ZONING BY-LAWS
NO INVESTIGATION WAS MADE REGARDING MUNICIPAL ZONING BY-LAWS FOR SETBACK REQUIREMENTS.

THIS REPORT WAS PREPARED FOR:
ATKINSON LAW
AND THE UNDERSIGNED ACCEPTS NO RESPONSIBILITY
FOR USE BY OTHER PARTIES.

THIS REPORT REFLECTS CONDITIONS OF TIME OF SURVEY. UPDATING MAY BE REQUIRED TO ISSUE ADDITIONAL COPIES SUBSEQUENT TO DATE OF SURVEYOR'S CERTIFICATE.

NOTES AND LEGEND

□	DENOTES SURVEY MONUMENT PLANTED
■	DENOTES SURVEY MONUMENT FOUND
SIB	DENOTES STANDARD IRON BAR
IB	DENOTES IRON BAR
WT	DENOTES WITNESS
OU	DENOTES ORIGIN UNKNOWN
RBC	DENOTES REBORN CAVELL (MAY 21, 1948)
CD	DENOTES CROWN CAVELL, O.L.S. (NOV. 27, 1953)
PK	DENOTES PAUL KIDD, O.L.S. (OCT. 20, 1989)
SW	DENOTES SPEIGHT & VAN NOSTRAND, O.L.S. (JAN. 29, 1987)
JW	DENOTES JAMES & WANDABENSE, O.L.S. (NOV. 28, 1956)
Plan	DENOTES REGISTERED PLAN B-19
PL	DENOTES REGISTERED PLAN 460
¢	DENOTES CENTRE LINE
DA	DENOTES DIAMOND BACK BASIN
TGZ	DENOTES TOM CZERWINSKI, O.L.S. (NOV. 3, 1987)
TM	DENOTES TARASICK, Mc MILLAN, O.L.S. (NOV. 4, 1996)
B50	DENOTES CUNNINGHAM, Mc CONNELL, O.L.S.
D	DENOTES INST. NO. V613504
IT	DENOTES IRON TUBE
COLK	DENOTES CONCRETE BLOCK
FDN	DENOTES FOUNDATION
Fd	DENOTES FOUND

BEARING NOTE
BEARINGS ARE ASTRONOMIC AND ARE REFERRED TO THE SOUTH WESTERLY LIMIT OF CAWTHRA ROAD AS SHOWN ON REGISTERED PLAN B-19 HAVING A BEARING OF N45°00'00"W.

ELEVATION NOTE
ELEVATIONS ARE REFERRED TO CITY OF MISSISSAUGA BENCHMARK No. 75 ELEVATION 98.308 METRES (NON GEODETIC)

AREA=5360.50 Sq.m.
0.339 Ha
1.325 Ac

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM
2. THE SURVEY WAS COMPLETED ON THE 26th DAY OF MARCH, 2017

DATE: MARCH 30, 2017

T. A. SENKUS
ONTARIO LAND SURVEYOR

TOM A. SENKUS
ONTARIO LAND SURVEYOR
40 BURROWS AVENUE
TORONTO (ISLINGTON), ONTARIO
M9B 4Y7

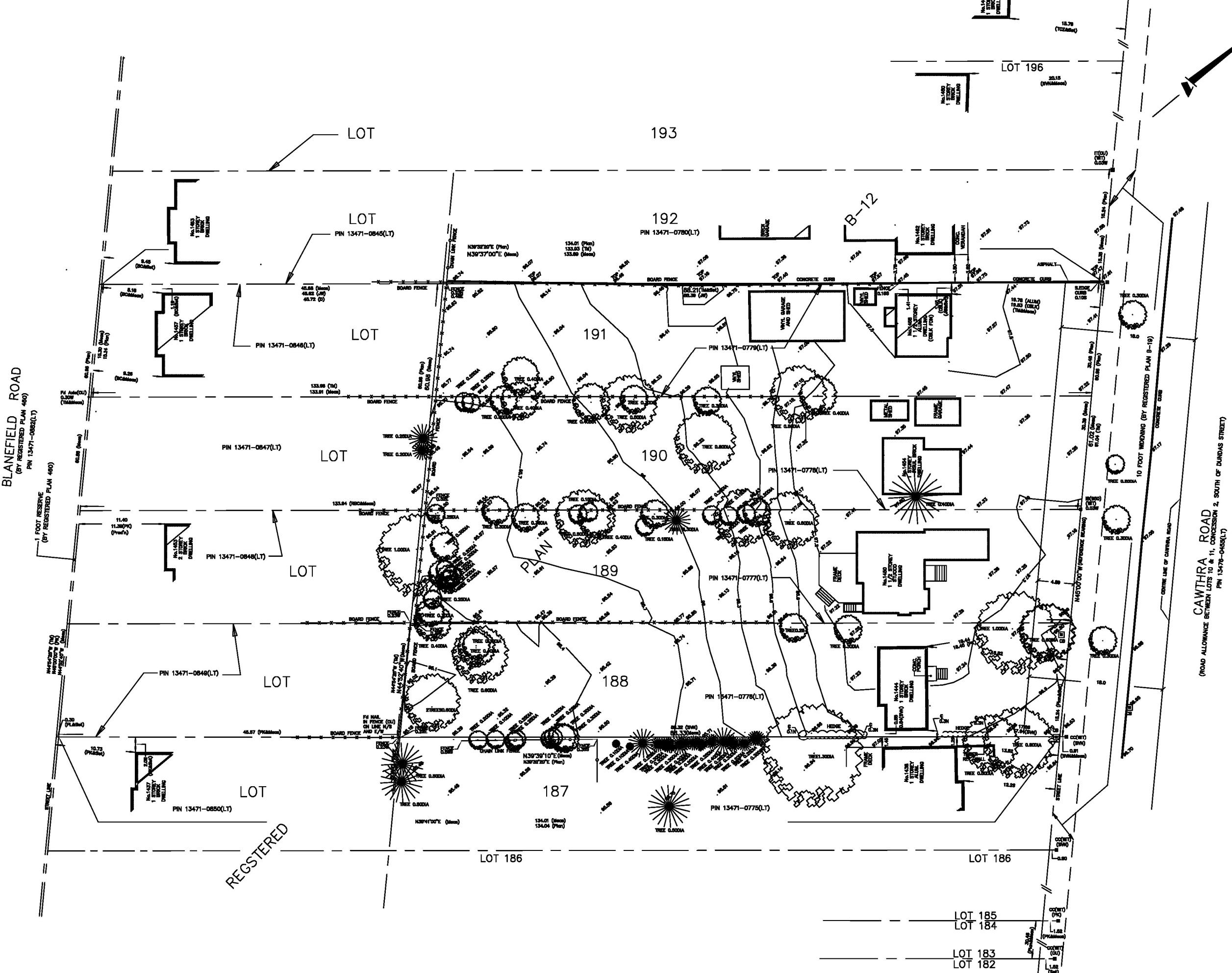
PHONE: (416) 257-1898
E-MAIL: tom.senkus@rogers.com
mapsof@rogers.com

FILE: 02-77A
CAD FILE: CAWTHRA-SITE-TOPO

BLANEFIELD ROAD

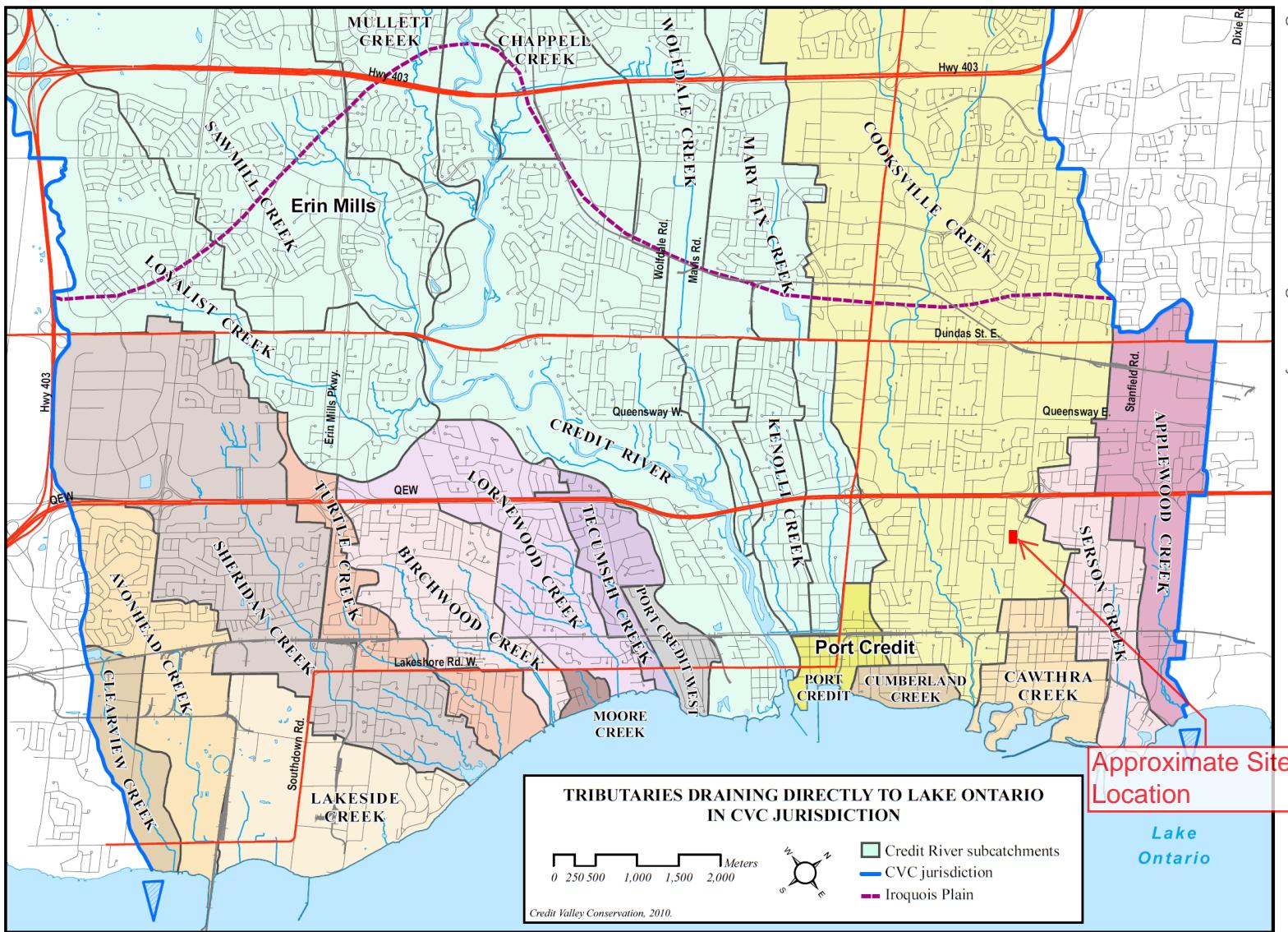
(BY REGISTERED PLAN 460)

REGISTERED



CAWTHRA ROAD
(ROAD ALLOWANCE BETWEEN LOTS 10 & 11, CONCESSION 2, SOUTH OF DUNDAS STREET)
PIN 13476-QASEC(1)

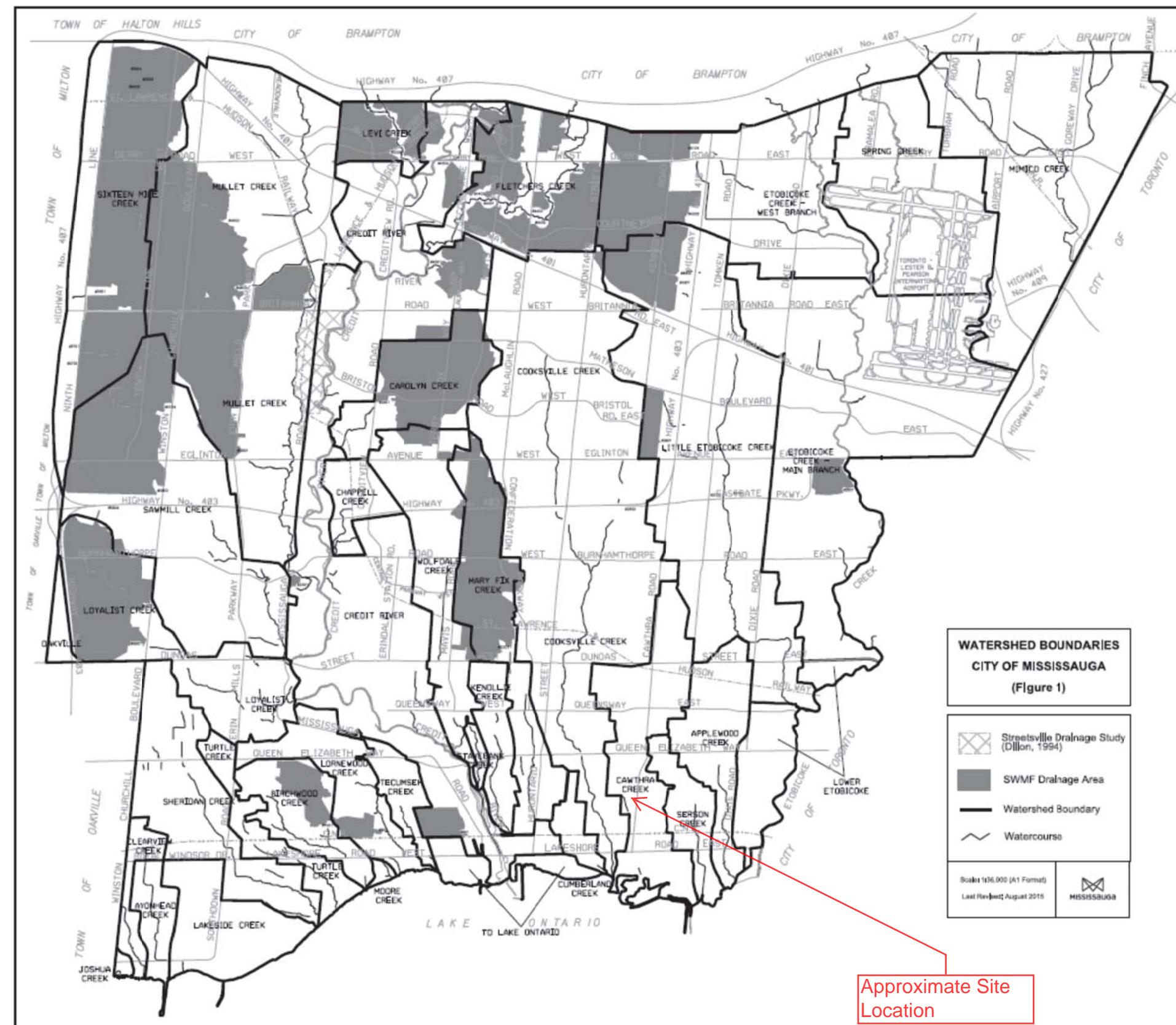
Figure 3-3: Tributaries Draining Directly to Lake Ontario

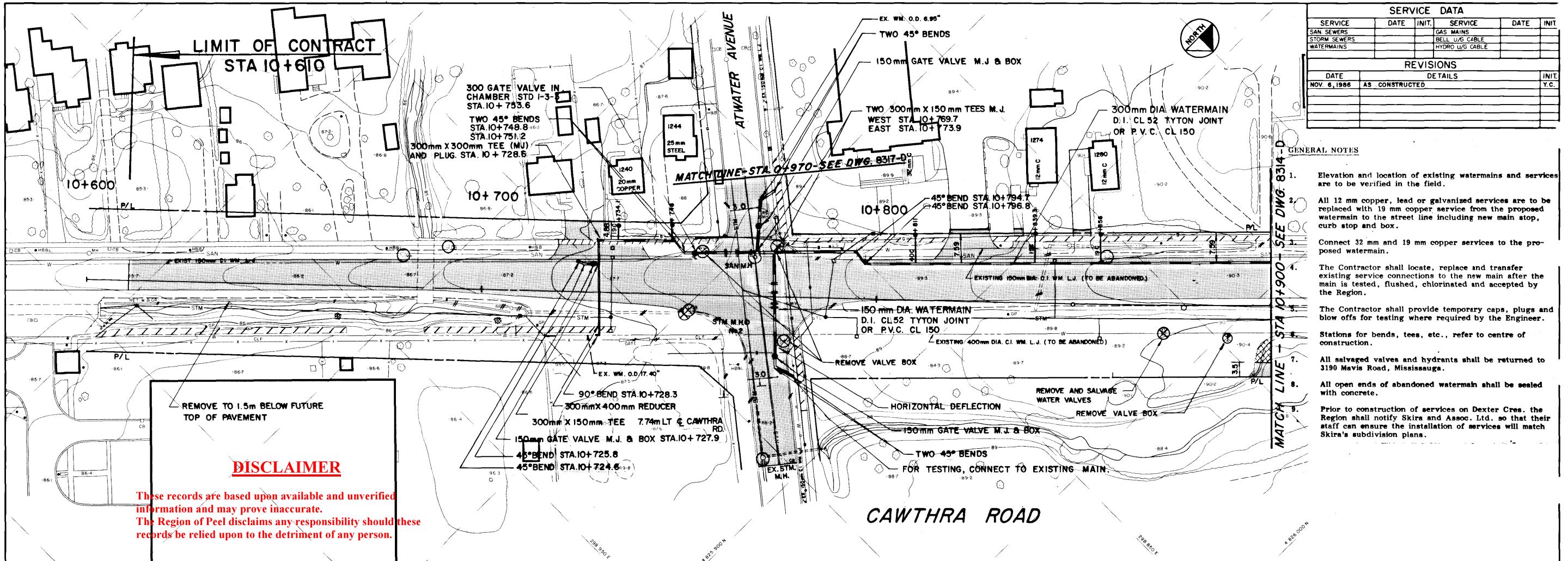


SECTION 2 - DESIGN REQUIREMENTS

*City of Mississauga
Transportation and Works Department*

A-1 - Watershed Boundaries





DISCLAIMER

These records are based upon available and unverified information and may prove inaccurate.
The Region of Peel disclaims any responsibility should these records be relied upon to the detriment of any person.

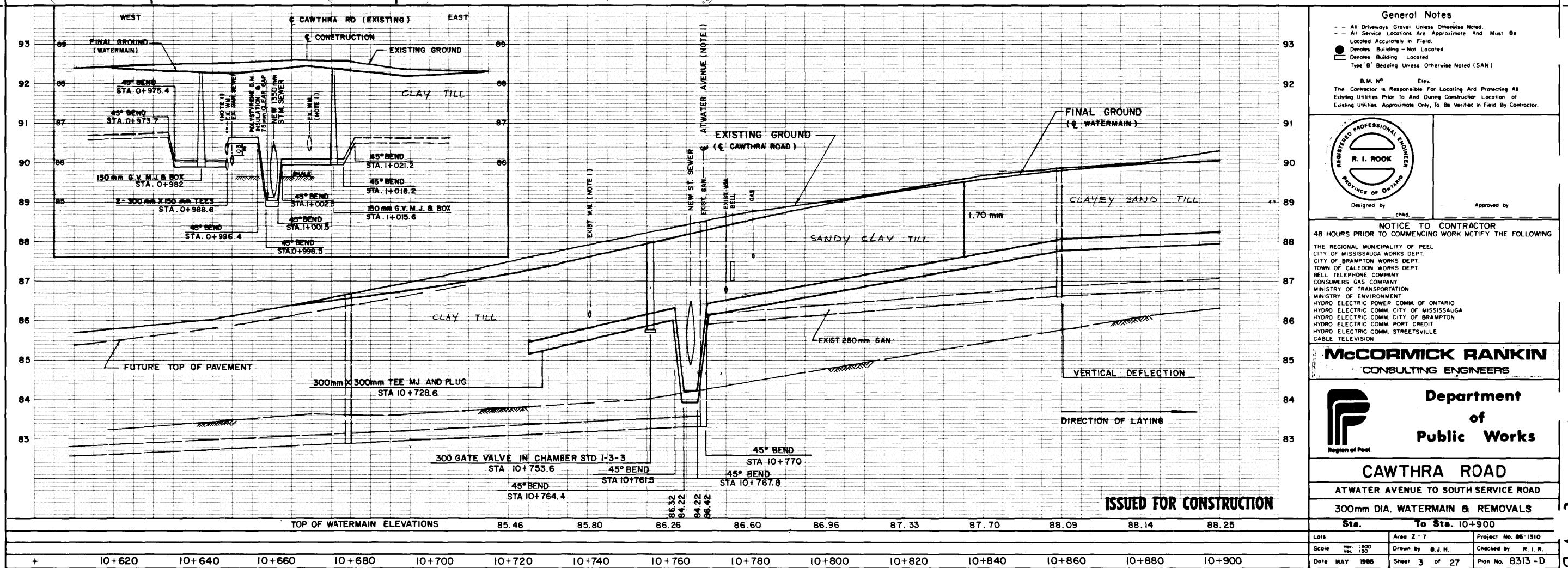
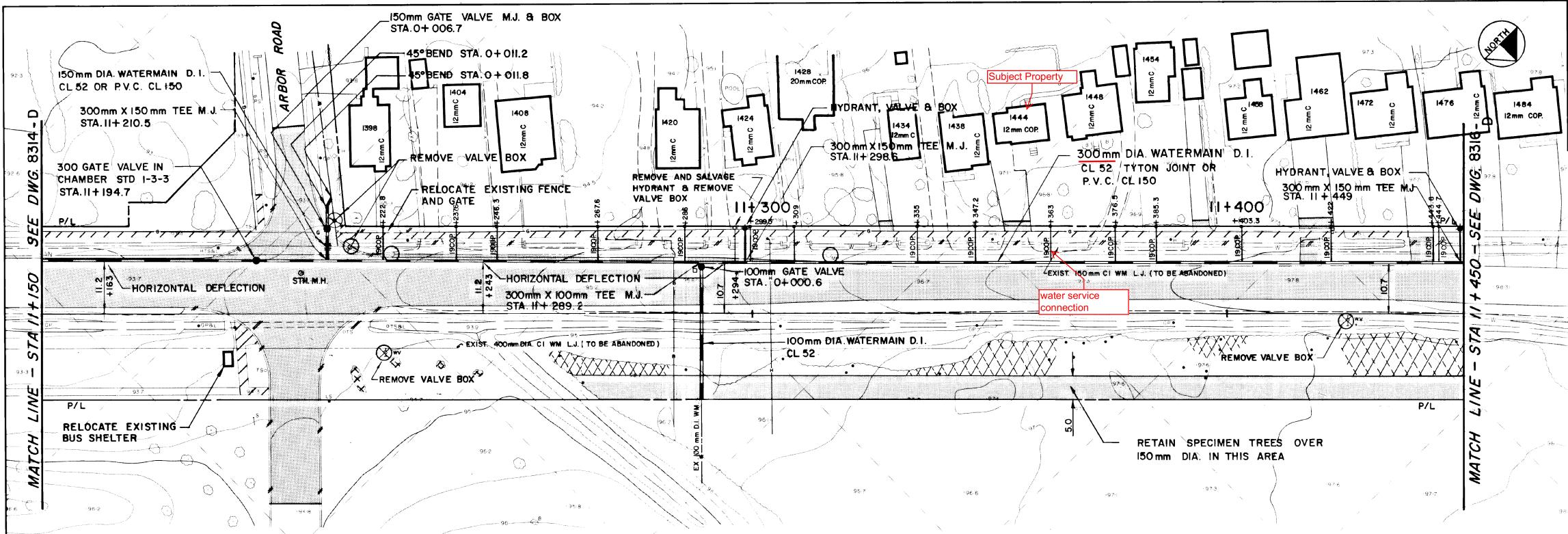
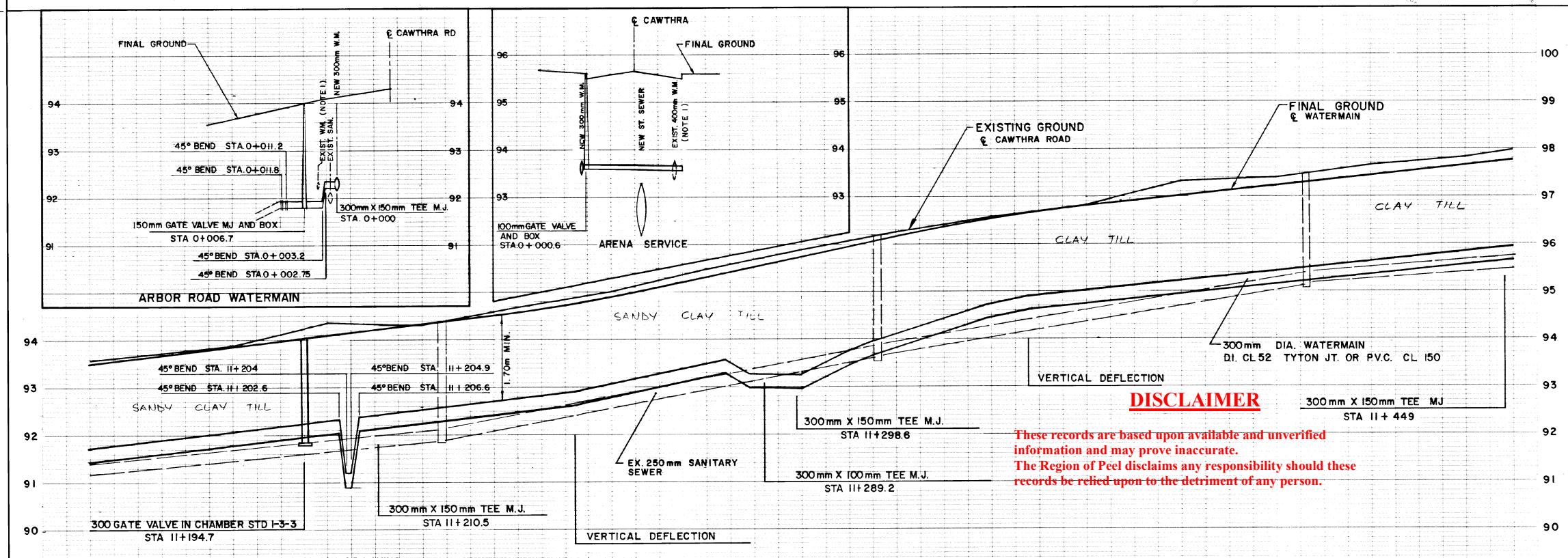


Table 3-2: CVC Flood Control Criteria for Tributaries Draining Directly to Lake Ontario

#	Subwatershed Name	Flood Control Criteria	References & Notes
21	Clearview Creek	100 Year Post to 2 Year Pre-development Control	Southdown District Master Drainage Plan dated August, 2000 by TSH
	Avonhead Creek	100 Year Post to 2 Year Pre-development Control	Southdown District Master Drainage Plan dated August, 2000 by TSH
	Lakeside Creek	100 Year Post to 2 Year Pre-development Control	Southdown District Master Drainage Plan dated August, 2000 by TSH
	Sheridan Creek	100 Year Post to 2 Year Pre-development Control	-
	Turtle Creek	2 to 10 year – Post to Pre Control	-
	Birchwood Creek	100 Year Post to 2 Year Pre-development Control	-
	Moore Creek	2 to 10 year – Post to Pre Control	No floodline mapping study
	Lornewood Creek	100 Year Post to 2 Year Pre-development Control	-
	Tecumseh Creek	100 Year Post to 2 Year Pre-development Control	-
22	Cumberland Creek	2 to 10 year – Post to Pre Control	No floodline mapping study
	Cooksville Creek	100 Year Post to 2 Year Pre-development Control	Revised development standards – Cooksville Creek from City of Mississauga
	Cawthra Creek	2 to 10 year – Post to Pre Control	Drainage diversion to Cooksville Creek and a very small area draining to creek.
	Serson Creek	100 Year Post to 2 Year Pre-development Control	Large number of buildings (> 150) in the regulated flood plain
	Applewood Creek	100 Year Post to 2 Year Pre-development Control	-



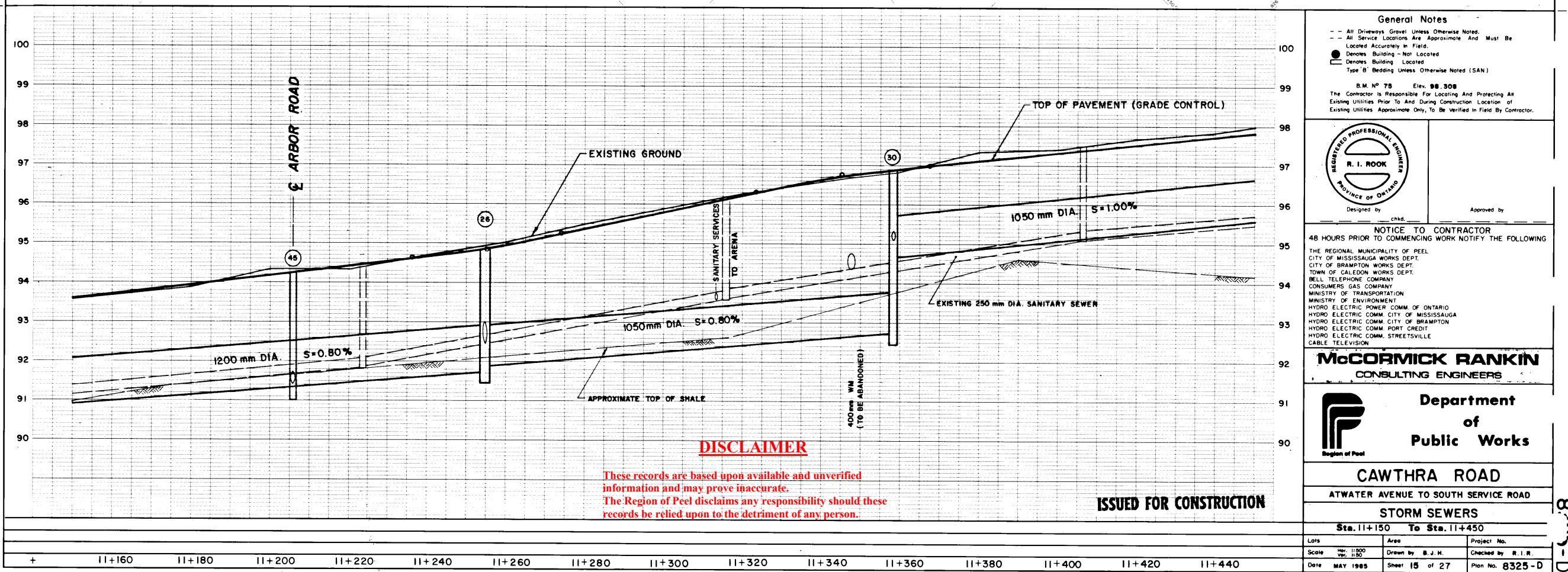
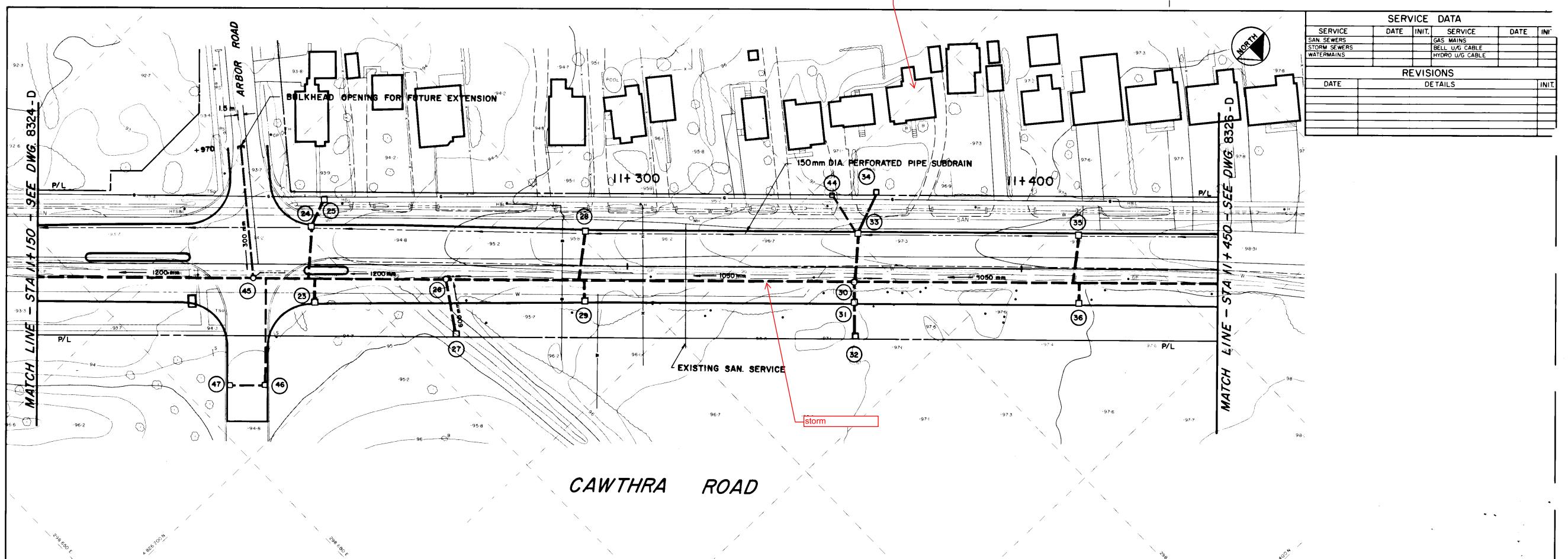
CAWTHRA ROAD

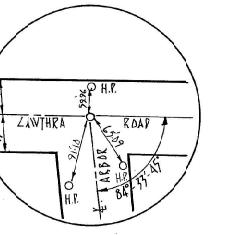


These records are based upon available and unverified information and may prove inaccurate.
The Region of Peel disclaims any responsibility should the records be relied upon to the detriment of any person.

ISSUED FOR CONSTRUCTION

Sta. II+150 To Sta. II+450																		
91.83	92.06	92.30	92.54	92.77	93.08	93.48	93.25	94.10	94.72	95.01	95.22	95.42	95.63	95.83	Lots	Area Z - 7	Project No. 85-1310	
TOP OF WATERMAIN ELEVATIONS															Scale	Hor. 11:500 Ver. 1:50	Drawn by B.J.H.	Checked by R.I.R.
+	II+160	II+180	II+200	II+220	II+240	II+260	II+280	II+300	II+320	II+340	II+360	II+380	II+400	II+420	II+440	Date MAY 1985	Sheet 5 of 27	Plan No. 8315-D



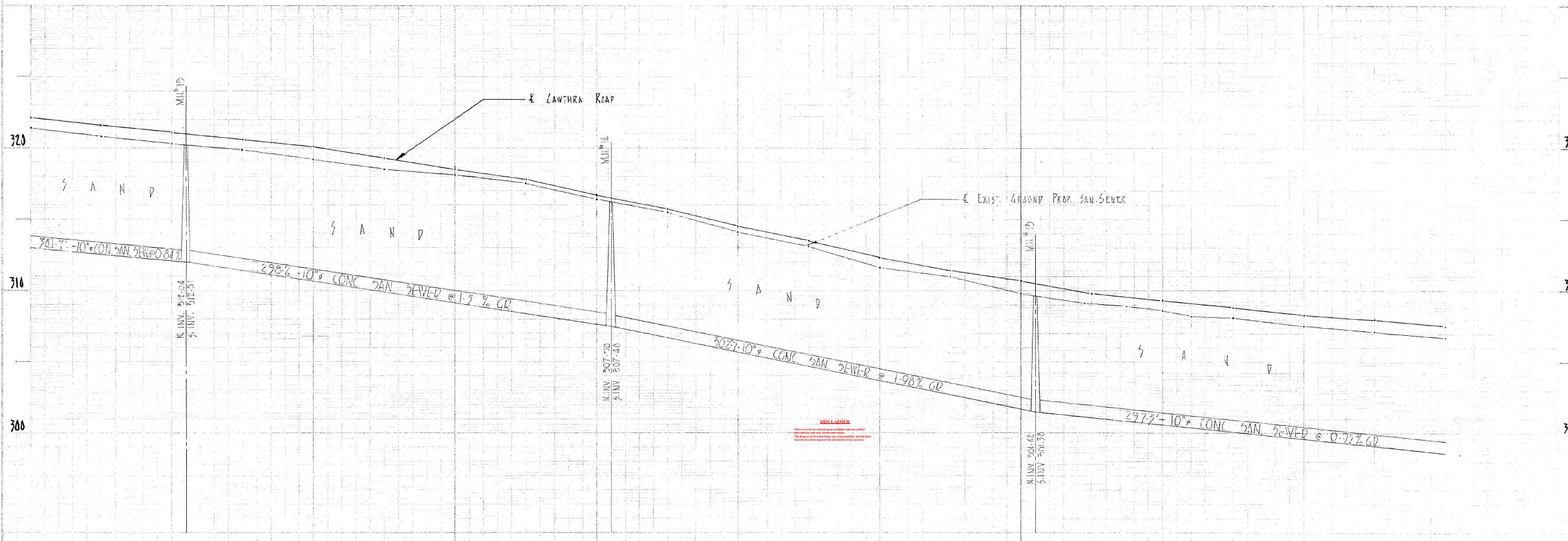
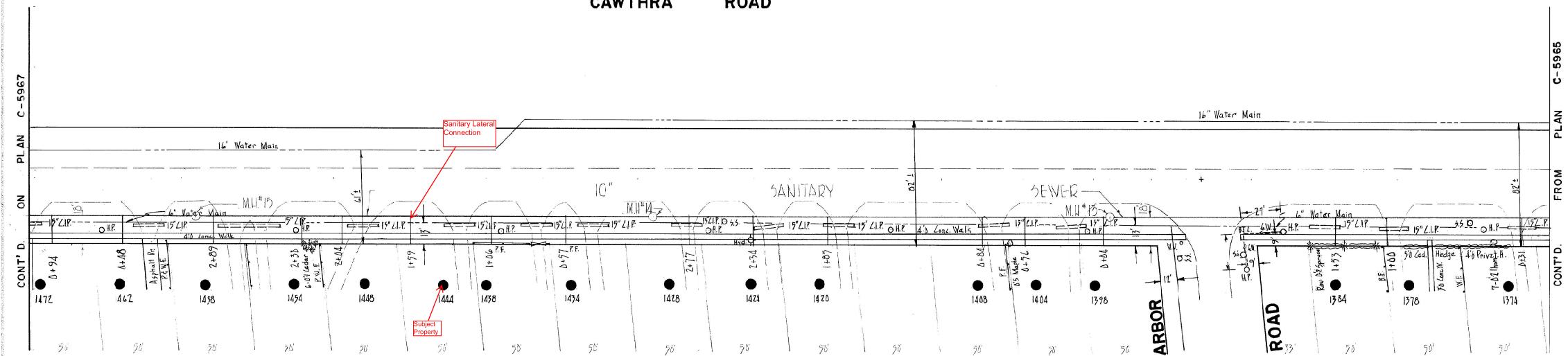


STA. 39+29'00

CAWTHRA ROAD

SERVICE DATA					
SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
MAIN SEWERS	MAY 25, 1965	R.V.	SAS MAINS	JULY 1, 1965	R.V.
FORM SEWERS	MAY 25, 1965	R.V.	BELL U/G CABLE	JULY 1, 1965	R.V.
ATERMAINS	MAY 25, 1965	R.V.	HYDRO U/G CABLE	JULY 1, 1965	R.V.

REVISIONS					
DATE	DETAILS			INIT.	
6-9-1965	MANUFACTURED			R.V.	
1-28-1965	AS CONSTRUCTED			R.V.	
FEP	1964				



GENERAL NOTES

- ALL DRIVEWAYS GRAVEL UNLESS OTHERWISE NOTED.
ALL SERVICE LOCATIONS ARE APPROXIMATE AND
MUST BE LOCATED ACCURATELY IN FIELD.
DENOTES BUILDING -- NOT LOCATED.
DENOTES BUILDING LOCATED.
FT.B.M. No. ELEV.
TEMP BENCH MARK CLIV 3052
DESCRIPTION 6' SPIKE IN HI SPK. HSE. # 433
AFRAK ROAD

"THE ALL BEDDING TO BE TYPE 'E'"

NO



DESIGNED BY
C. Heavens CHKD.

APPROVED BY
J. Anderson

TOWNSHIP OF TORONTO
COUNTY OF PEEL
ENGINEERING DEPARTMENT

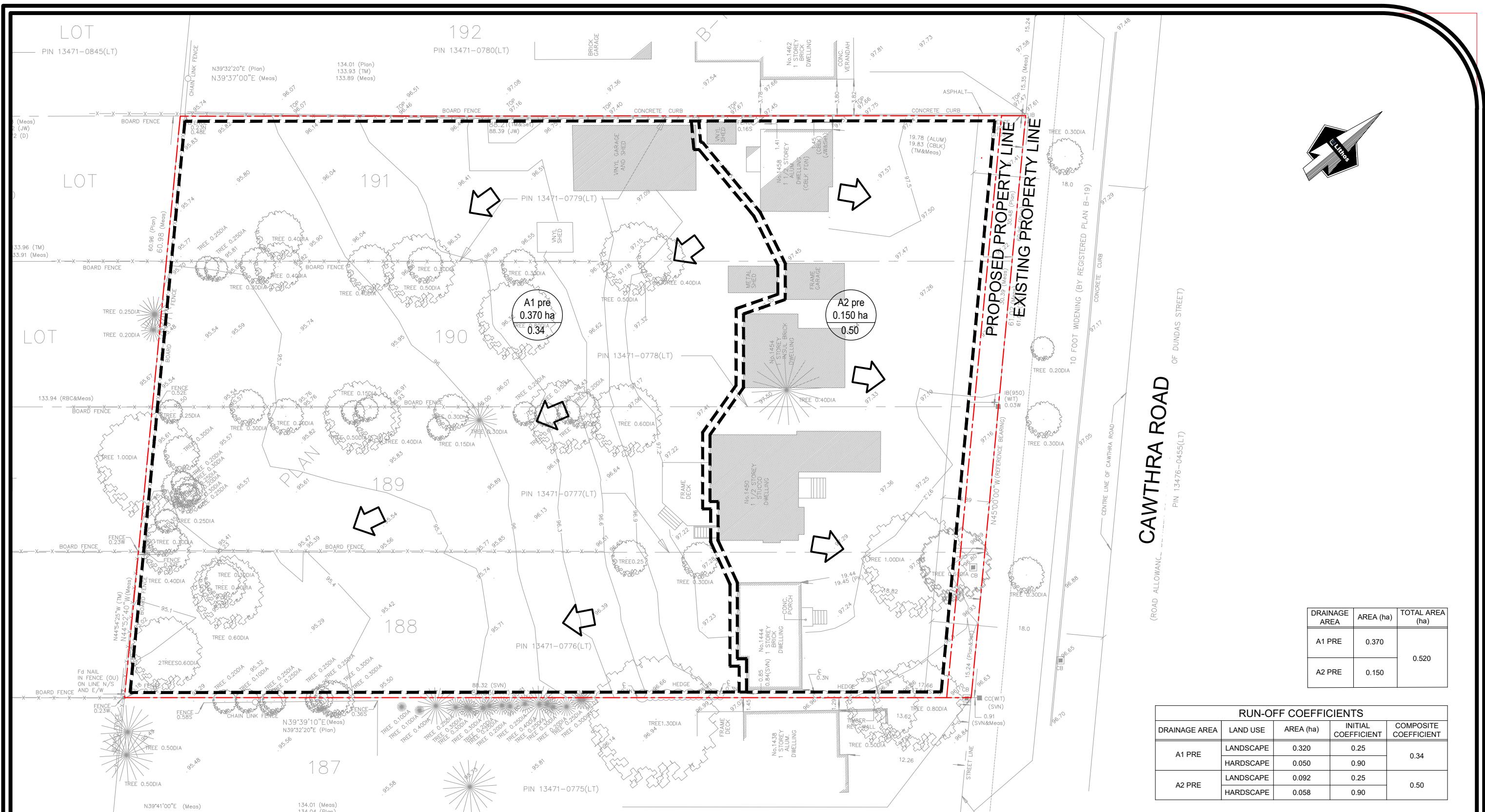
CAWTHRA ROAD
FROM C.N.R. NORTH TO S. SERVICE RD.
STN. 37+00 TO STN. 47+00

322.1 321.6 321.1 320.6 320.1 319.7 318.5 317.0 316.7 315.6 314.5 313.5 312.7 311.1 310.7 309.8 308.7 308.8 308.3 308.0 307.5 EXIST. ROAD GRAPE
47.00 +50 46.00 +50 45.00 +50 44.00 +50 43.00 +50 42.00 +50 41.00 +50 40.00 +50 39.00 +50 38.00 +50 37.00 +50 CHAINAGE

SIN. 37400 TO STN. 47400			
/S	II	CON / RANGE	PROJECT NO. 28 63 A
DATE MAY 10, 1963	VIRT 1° 40'	2 S.D.	
DRAWN BY		R.Y.	CHECKED BY L.B.
MAR. 14, 1963		SHEET 4 OF 6	PLAN NO. 5-5966

APPENDIX C

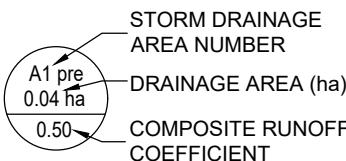
Storm Analysis



 Lithos

150 Bermonsdey Road, North York, Ontario M4A 1Y1

LEGEND



— — — — PRE-DEVELOPMENT STORM DRAINAGE AREA

PROPERTY LINE

DRAINAGE DIRECTION - BOTH MANOR AND MAJOR DRAINAGE PATTERNS

RUN-OFF COEFFICIENTS				
AINAGE AREA	LAND USE	AREA (ha)	INITIAL COEFFICIENT	COMPOSITE COEFFICIENT
A1 PRE	LANDSCAPE	0.320	0.25	0.34
	HARDSCAPE	0.050	0.90	
A2 PRE	LANDSCAPE	0.092	0.25	0.50
	HARDSCAPE	0.058	0.90	

DRAINAGE AREA	AREA (ha)	TOTAL AREA (ha)
A1 PRE	0.370	0.520
A2 PRE	0.150	

PRE-DEVELOPMENT
STORM DRAINAGE AREA PLAN
RESIDENTIAL USE DEVELOPMENT
1444-1458 CAWTHRA ROAD
MISSISSAUGA, ONTARIO

DATE: DECEMBER 2019 PROJECT No: UD17-094
CALE: N.T.S. FIGURE No: DAP1



Prepared by: John Pasalidis, P.E., M.A.Sc.
Reviewed by: Nick Moutzouris, P.Eng., M.A.Sc.

Rational Method
Pre-Development Flow Calculation
1444-1458 Cawthra Road
File No. UD17-094
City of Mississauga
Date: December 2019

Input Parameters

Area Number	Area (ha)	C	Tc (min.)	$Q = 0.0028 \text{ C} \mid A$
A1 pre (Towards South - West corner of the Site)	0.370	0.34	15	
A2 pre (Towards Cawthra Road)	0.150	0.50	15	

Rational Method Calculation

Event 2 yr
IDF Data Set City of Mississauga
 $a = 610$
 $b = 4.6$
 $c = 0.78$

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m³/s)	Q (L/s)
A1 pre (Towards South - West corner of the Site)	0.370	0.34	0.13	15	59.9	0.021	20.9
A2 pre (Towards Cawthra Road)	0.150	0.50	0.08	15	59.9	0.012	12.5

Event 5 yr
IDF Data Set City of Mississauga
 $a = 820$
 $b = 4.6$
 $c = 0.78$

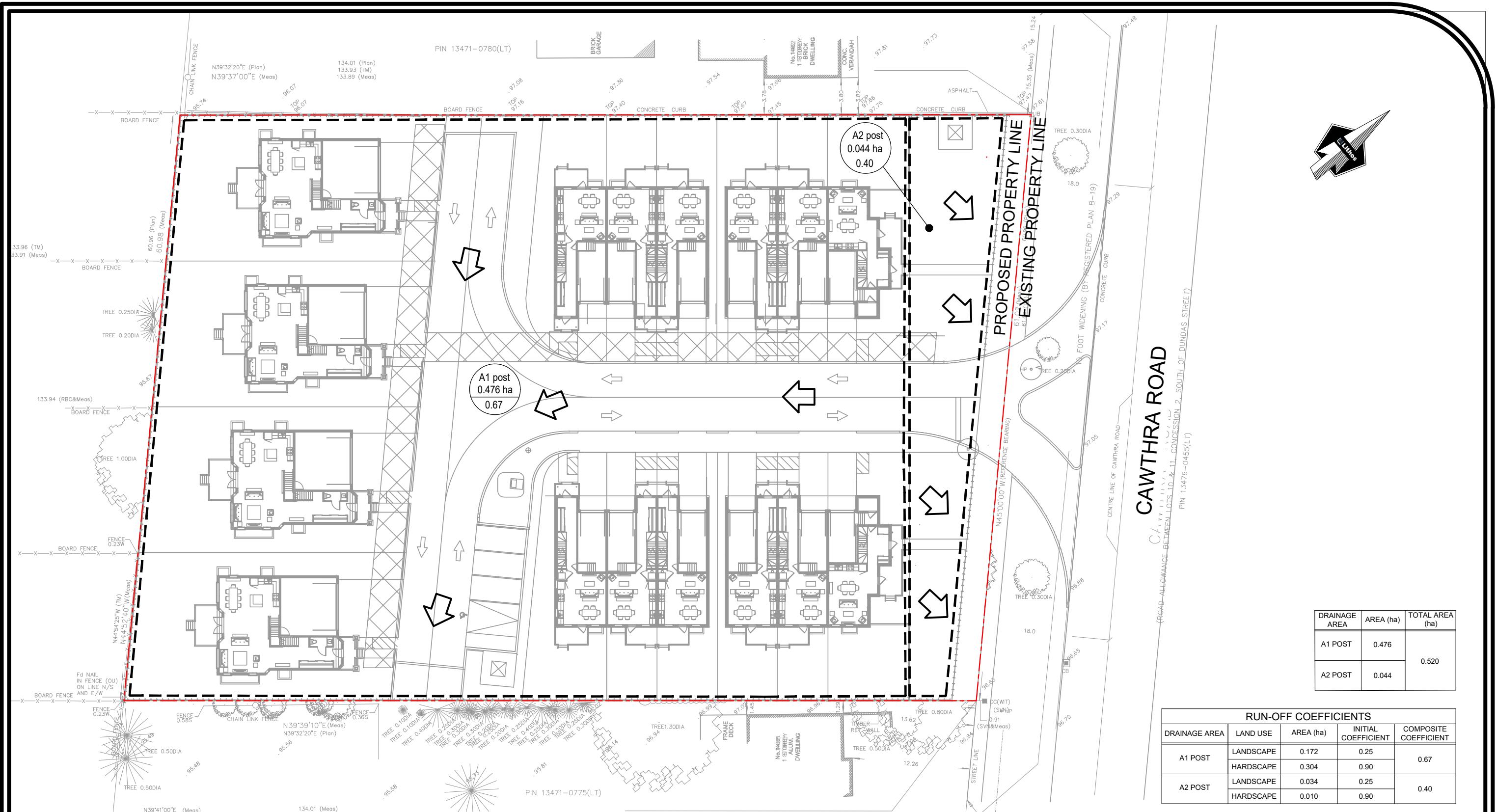
Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m³/s)	Q (L/s)
A1 pre (Towards South - West corner of the Site)	0.370	0.34	0.13	15	80.5	0.028	28.1
A2 pre (Towards Cawthra Road)	0.150	0.50	0.08	15	80.5	0.017	16.8

Event 10 yr
IDF Data Set City of Mississauga
 $a = 1010$
 $b = 4.6$
 $c = 0.78$

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m³/s)	Q (L/s)
A1 pre (Towards South - West corner of the Site)	0.370	0.34	0.13	15	99.2	0.035	34.7
A2 pre (Towards Cawthra Road)	0.150	0.50	0.08	15	99.2	0.021	20.7

Event 100 yr
IDF Data Set City of Mississauga
 $a = 1450$
 $b = 4.9$
 $c = 0.78$

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m³/s)	Q (L/s)
A1 pre (Towards South - West corner of the Site)	0.370	0.34	0.13	15	140.7	0.049	49.2
A2 pre (Towards Cawthra Road)	0.150	0.50	0.08	15	140.7	0.029	29.3



Lithos

150 Bermonsday Road, North York, Ontario M4A 1Y1

LEGEND

- STORM DRAINAGE AREA NUMBER
- DRAINAGE AREA (ha)
- COMPOSITE RUNOFF COEFFICIENT

- POST-DEVELOPMENT STORM DRAINAGE AREA
- PROPERTY LINE



**Modified Rational Method - Two Year Storm
Site Flow and Storage Summary**

1444-1458 Cawthra Road

File No. UD17-094

Date: December 2019

Prepared By: John Pasalidis, P.E., M.A.Sc.

Reviewed By: Nick Moutzouris, P.Eng., M.A.Sc.

Controlled - A1 Post					
		Drainage Areas	A1 Post		
		Area (A1) =	0.476	ha	
		"C" =	0.67		
		AC1=	0.32		
		Tc =	15.0	min	
		Time Increment =	5.0	min	
		Controlled Release Rate =	0.0	L/s	
		Min. Storage =	97.6	m³	
2-Year Design Storm					
a=	610.00	Type	Area (ha)	"C"	
b=	4.60	Landscaped	0.172	0.25	
c=	0.78	Hardscaped	0.304	0.90	
I =	a (b + t) ^c	Total Area (A1)	0.476	0.67	
(1)	(2)	(3)	(4)	(5)	(6)
Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (A1 post) (m ³ /s)	Runoff Volume (A1 post) (m ³)	Target Released Volume (A1 post) (m ³)	Total Required Storage (A1 post) (m ³)
15.0	59.9	0.053	47.40	0.00	47.40
20.0	50.2	0.044	52.94	0.00	52.94
25.0	43.4	0.038	57.28	0.00	57.28
30.0	38.4	0.034	60.86	0.00	60.86
35.0	34.6	0.030	63.91	0.00	63.91
40.0	31.5	0.028	66.57	0.00	66.57
45.0	29.0	0.026	68.93	0.00	68.93
50.0	26.9	0.024	71.06	0.00	71.06
55.0	25.2	0.022	73.01	0.00	73.01
60.0	23.6	0.021	74.79	0.00	74.79
65.0	22.3	0.020	76.45	0.00	76.45
70.0	21.1	0.019	77.99	0.00	77.99
75.0	20.1	0.018	79.44	0.00	79.44
80.0	19.1	0.017	80.80	0.00	80.80
85.0	18.3	0.016	82.09	0.00	82.09
90.0	17.5	0.015	83.32	0.00	83.32
95.0	16.9	0.015	84.48	0.00	84.48
100.0	16.2	0.014	85.60	0.00	85.60
105.0	15.6	0.014	86.66	0.00	86.66
110.0	15.1	0.013	87.68	0.00	87.68
115.0	14.6	0.013	88.67	0.00	88.67
120.0	14.2	0.012	89.61	0.00	89.61
125.0	13.7	0.012	90.52	0.00	90.52
130.0	13.3	0.012	91.41	0.00	91.41
135.0	13.0	0.011	92.26	0.00	92.26
140.0	12.6	0.011	93.09	0.00	93.09
145.0	12.3	0.011	93.89	0.00	93.89
150.0	12.0	0.011	94.67	0.00	94.67
155.0	11.7	0.010	95.42	0.00	95.42
160.0	11.4	0.010	96.16	0.00	96.16
165.0	11.1	0.010	96.88	0.00	96.88
170.0	10.9	0.010	97.58	0.00	97.58
175.0	10.6	0.009	98.26	0.00	98.26
180.0	10.4	0.009	98.92	0.00	98.92



**Modified Rational Method - Two Year Storm
Site Flow and Storage Summary**

1444-1458 Cawthra Road

File No. UD17-094

Date: December 2019

Prepared By: John Pasalidis, P.E., M.A.Sc.

Reviewed By: Nick Moutzouris, P.Eng., M.A.Sc.

Controlled - A1 Post					
		Drainage Areas	A1 Post		
		Area (A1) =	0.476	ha	
		"C" =	0.67		
		AC1=	0.32		
		Tc =	15.0	min	
		Time Increment =	5.0	min	
		Controlled Release Rate =	0.0	L/s	
		Min. Storage =	97.6	m³	
2-Year Design Storm					
a=	610.00	Type	Area (ha)	"C"	
b=	4.60	Landscaped	0.172	0.25	
c=	0.78	Hardscaped	0.304	0.90	
I =	a (b + t) ^c	Total Area (A1)	0.476	0.67	
(1)	(2)	(3)	(4)	(5)	(6)
Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (A1 post) (m ³ /s)	Runoff Volume (A1 post) (m ³)	Target Released Volume (A1 post) (m ³)	Total Required Storage (A1 post) (m ³)
15.0	59.9	0.053	47.40	0.00	47.40
20.0	50.2	0.044	52.94	0.00	52.94
25.0	43.4	0.038	57.28	0.00	57.28
30.0	38.4	0.034	60.86	0.00	60.86
35.0	34.6	0.030	63.91	0.00	63.91
40.0	31.5	0.028	66.57	0.00	66.57
45.0	29.0	0.026	68.93	0.00	68.93
50.0	26.9	0.024	71.06	0.00	71.06
55.0	25.2	0.022	73.01	0.00	73.01
60.0	23.6	0.021	74.79	0.00	74.79
65.0	22.3	0.020	76.45	0.00	76.45
70.0	21.1	0.019	77.99	0.00	77.99
75.0	20.1	0.018	79.44	0.00	79.44
80.0	19.1	0.017	80.80	0.00	80.80
85.0	18.3	0.016	82.09	0.00	82.09
90.0	17.5	0.015	83.32	0.00	83.32
95.0	16.9	0.015	84.48	0.00	84.48
100.0	16.2	0.014	85.60	0.00	85.60
105.0	15.6	0.014	86.66	0.00	86.66
110.0	15.1	0.013	87.68	0.00	87.68
115.0	14.6	0.013	88.67	0.00	88.67
120.0	14.2	0.012	89.61	0.00	89.61
125.0	13.7	0.012	90.52	0.00	90.52
130.0	13.3	0.012	91.41	0.00	91.41
135.0	13.0	0.011	92.26	0.00	92.26
140.0	12.6	0.011	93.09	0.00	93.09
145.0	12.3	0.011	93.89	0.00	93.89
150.0	12.0	0.011	94.67	0.00	94.67
155.0	11.7	0.010	95.42	0.00	95.42
160.0	11.4	0.010	96.16	0.00	96.16
165.0	11.1	0.010	96.88	0.00	96.88
170.0	10.9	0.010	97.58	0.00	97.58
175.0	10.6	0.009	98.26	0.00	98.26
180.0	10.4	0.009	98.92	0.00	98.92



**Modified Rational Method - Ten Year Storm
Site Flow and Storage Summary**

1444-1458 Cawthra Road

File No. UD17-094

Date: December 2019

Prepared By: John Pasalidis, P.E., M.A.Sc.

Reviewed By: Nick Moutzouris, P.Eng., M.A.Sc.

Controlled - A1 Post					
		Drainage Areas	A1 Post		
		Area (A1) =	0.476	ha	
		"C" =	0.67		
		AC1=	0.32		
		Tc =	15.0	min	
		Time Increment =	5.0	min	
		Controlled Release Rate =	0.0	L/s	
		Min. Storage =	161.6	m ³	
10-Year Design Storm					
a=	1010.00	Type	Area (ha)	"C"	
b=	4.60	Landscaped	0.172	0.25	
c=	0.78	Hardscaped	0.304	0.90	
I =	a (b + t) ^c	Total Area (A1)	0.476	0.67	
(1)	(2)	(3)	(4)	(5)	(6)
Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (A1 post) (m ³ /s)	Runoff Volume (A1 post) (m ³)	Target Released Volume (A1 post) (m ³)	Total Required Storage (A1 post) (m ³)
15.0	99.2	0.087	78.49	0.00	78.49
20.0	83.1	0.073	87.66	0.00	87.66
25.0	71.9	0.063	94.84	0.00	94.84
30.0	63.7	0.056	100.77	0.00	100.77
35.0	57.3	0.050	105.81	0.00	105.81
40.0	52.2	0.046	110.22	0.00	110.22
45.0	48.1	0.042	114.13	0.00	114.13
50.0	44.6	0.039	117.66	0.00	117.66
55.0	41.7	0.037	120.88	0.00	120.88
60.0	39.1	0.034	123.84	0.00	123.84
65.0	36.9	0.032	126.58	0.00	126.58
70.0	35.0	0.031	129.13	0.00	129.13
75.0	33.2	0.029	131.53	0.00	131.53
80.0	31.7	0.028	133.79	0.00	133.79
85.0	30.3	0.027	135.93	0.00	135.93
90.0	29.0	0.026	137.95	0.00	137.95
95.0	27.9	0.025	139.88	0.00	139.88
100.0	26.9	0.024	141.72	0.00	141.72
105.0	25.9	0.023	143.49	0.00	143.49
110.0	25.0	0.022	145.18	0.00	145.18
115.0	24.2	0.021	146.81	0.00	146.81
120.0	23.4	0.021	148.37	0.00	148.37
125.0	22.7	0.020	149.89	0.00	149.89
130.0	22.1	0.019	151.35	0.00	151.35
135.0	21.4	0.019	152.76	0.00	152.76
140.0	20.9	0.018	154.13	0.00	154.13
145.0	20.3	0.018	155.45	0.00	155.45
150.0	19.8	0.017	156.74	0.00	156.74
155.0	19.3	0.017	158.00	0.00	158.00
160.0	18.9	0.017	159.22	0.00	159.22
165.0	18.4	0.016	160.40	0.00	160.40
170.0	18.0	0.016	161.56	0.00	161.56
175.0	17.6	0.015	162.69	0.00	162.69
180.0	17.2	0.015	163.79	0.00	163.79



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

1444-1458 Cawthra Road

File No. UD17-094

Date: December 2019

Prepared By: John Pasalidis, P.E., M.A.Sc.

Reviewed By: Nick Moutzouris, P.Eng., M.A.Sc.

Controlled - A1 Post					
		Drainage Areas	A1 Post		
		Area (A1) =	0.476	ha	
		"C" =	0.83		
		AC1=	0.40		
		Tc =	15.0	min	
		Time Increment =	5.0	min	
		Controlled Release Rate =	0.0	L/s	
		Min. Storage =	293.6	m ³	
100-Year Design Storm					
a=	1450.00	Type	Area (ha)	"C"	
b=	4.90	Landscaped	0.172	0.25	
c=	0.78	Hardscaped	0.304	0.90	
I =	a (b + t) ^c	Total Area (A1)	0.476	0.67	
(1)	(2)	(3)	(4)	(5)	(6)
Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (A1 post) (m ³ /s)	Runoff Volume (A1 post) (m ³)	Target Released Volume (A1 post) (m ³)	Total Required Storage (A1 post) (m ³)
15.0	140.7	0.155	139.19	0.00	139.19
20.0	118.1	0.130	155.82	0.00	155.82
25.0	102.4	0.113	168.87	0.00	168.87
30.0	90.8	0.100	179.62	0.00	179.62
35.0	81.8	0.090	188.78	0.00	188.78
40.0	74.6	0.082	196.76	0.00	196.76
45.0	68.7	0.076	203.86	0.00	203.86
50.0	63.8	0.070	210.25	0.00	210.25
55.0	59.6	0.065	216.08	0.00	216.08
60.0	56.0	0.062	221.43	0.00	221.43
65.0	52.8	0.058	226.39	0.00	226.39
70.0	50.0	0.055	231.01	0.00	231.01
75.0	47.6	0.052	235.35	0.00	235.35
80.0	45.4	0.050	239.43	0.00	239.43
85.0	43.4	0.048	243.29	0.00	243.29
90.0	41.6	0.046	246.95	0.00	246.95
95.0	40.0	0.044	250.44	0.00	250.44
100.0	38.5	0.042	253.77	0.00	253.77
105.0	37.1	0.041	256.95	0.00	256.95
110.0	35.8	0.039	260.00	0.00	260.00
115.0	34.7	0.038	262.94	0.00	262.94
120.0	33.6	0.037	265.77	0.00	265.77
125.0	32.6	0.036	268.49	0.00	268.49
130.0	31.6	0.035	271.13	0.00	271.13
135.0	30.7	0.034	273.67	0.00	273.67
140.0	29.9	0.033	276.14	0.00	276.14
145.0	29.1	0.032	278.54	0.00	278.54
150.0	28.4	0.031	280.86	0.00	280.86
155.0	27.7	0.030	283.12	0.00	283.12
160.0	27.0	0.030	285.32	0.00	285.32
165.0	26.4	0.029	287.46	0.00	287.46
170.0	25.8	0.028	289.54	0.00	289.54
175.0	25.3	0.028	291.58	0.00	291.58
180.0	24.7	0.027	293.56	0.00	293.56



Modified Rational Method
Two Year Storm
Site Flow and Storage Summary
- towards Cawthra Road
1444-1458 Cawthra Road

Drainage Area A2 Post

Uncontrolled area towards Cawthra Road

Area (A2) =	0.044	ha
"C" =	0.40	
AC2=	0.018	
Tc =	15.0	min
Time Increment =	5.0	min
Max. Release Rate =	2.9	L/s

2-Year Design Storm	
a=	610.00
b=	4.60
c=	0.78
I =	a (b + t) ^c

Type	Area (ha)	"C"
Landscaped	0.034	0.25
Hardscaped	0.010	0.90
Total Area (A2 Post)	0.044	0.40

2-yr Pre-Development Site
Release Rate towards Cawthra Road (A2-pre)= **12.5** L/s

Site Release Rate towards Cawthra Road (A2 Post)= **2.9** L/s

(1) Time (min)	(2) Rainfall Intensity (mm/hr)	(3) Storm Runoff (A2 post) (m ³ /s)	(4) Runoff Volume (A2 post) (m ³)
15.0	59.9	0.003	2.62
20.0	50.2	0.002	2.93
25.0	43.4	0.002	3.17
30.0	38.4	0.002	3.36
35.0	34.6	0.002	3.53
40.0	31.5	0.002	3.68
45.0	29.0	0.001	3.81
50.0	26.9	0.001	3.93
55.0	25.2	0.001	4.04
60.0	23.6	0.001	4.13
65.0	22.3	0.001	4.23
70.0	21.1	0.001	4.31
75.0	20.1	0.001	4.39
80.0	19.1	0.001	4.47
85.0	18.3	0.001	4.54
90.0	17.5	0.001	4.61
95.0	16.9	0.001	4.67
100.0	16.2	0.001	4.73
105.0	15.6	0.001	4.79
110.0	15.1	0.001	4.85
115.0	14.6	0.001	4.90
120.0	14.2	0.001	4.95
125.0	13.7	0.001	5.00
130.0	13.3	0.001	5.05
135.0	13.0	0.001	5.10
140.0	12.6	0.001	5.15
145.0	12.3	0.001	5.19
150.0	12.0	0.001	5.23
155.0	11.7	0.001	5.27
160.0	11.4	0.001	5.32
165.0	11.1	0.001	5.35
170.0	10.9	0.001	5.39
175.0	10.6	0.001	5.43
180.0	10.4	0.001	5.47



Modified Rational Method
Five Year Storm
Site Flow and Storage Summary
- towards Cawthra Road
1444-1458 Cawthra Road

Drainage Area A2 Post

Uncontrolled area towards Cawthra Road

Area (A2) =	0.044	ha
"C" =	0.40	
AC2=	0.018	
Tc =	15.0	min
Time Increment =	5.0	min
Max. Release Rate =	3.9	L/s

5-Year Design Storm	
a=	820.00
b=	4.60
c=	0.78
I =	a (b + t) ^c

Type	Area (ha)	"C"
Landscaped	0.034	0.25
Hardscaped	0.010	0.90
Total Area (A2 Post)	0.044	0.40

2-yr Pre-Development Site
Release Rate towards Cawthra Road (A2-pre)= **12.5** L/s

Site Release Rate towards Cawthra Road (A2 Post)= **3.9** L/s

(1) Time (min)	(2) Rainfall Intensity (mm/hr)	(3) Storm Runoff (A2 post) (m ³ /s)	(4) Runoff Volume (A2 post) (m ³)
15.0	80.5	0.004	3.52
20.0	67.4	0.003	3.93
25.0	58.4	0.003	4.26
30.0	51.7	0.003	4.52
35.0	46.5	0.002	4.75
40.0	42.4	0.002	4.95
45.0	39.0	0.002	5.12
50.0	36.2	0.002	5.28
55.0	33.8	0.002	5.42
60.0	31.8	0.002	5.56
65.0	30.0	0.001	5.68
70.0	28.4	0.001	5.80
75.0	27.0	0.001	5.90
80.0	25.7	0.001	6.00
85.0	24.6	0.001	6.10
90.0	23.6	0.001	6.19
95.0	22.7	0.001	6.28
100.0	21.8	0.001	6.36
105.0	21.0	0.001	6.44
110.0	20.3	0.001	6.52
115.0	19.6	0.001	6.59
120.0	19.0	0.001	6.66
125.0	18.4	0.001	6.73
130.0	17.9	0.001	6.79
135.0	17.4	0.001	6.86
140.0	16.9	0.001	6.92
145.0	16.5	0.001	6.98
150.0	16.1	0.001	7.03
155.0	15.7	0.001	7.09
160.0	15.3	0.001	7.15
165.0	15.0	0.001	7.20
170.0	14.6	0.001	7.25
175.0	14.3	0.001	7.30
180.0	14.0	0.001	7.35



Modified Rational Method

Ten Year Storm

**Site Flow and Storage Summary
- towards Cawthra Road**

1444-1458 Cawthra Road

Drainage Area A2 Post

Uncontrolled area towards Cawthra Road

Area (A2) =	0.044	ha
"C" =	0.40	
AC2=	0.018	
Tc =	15.0	min
Time Increment =	5.0	min
Max. Release Rate =	4.8	L/s

10-Year Design Storm	
a=	1010.00
b=	4.60
c=	0.78
I =	$a \cdot (b + t)^c$

Type	Area (ha)	"C"
Landscaped	0.034	0.25
Hardscaped	0.010	0.90
Total Area (A2 Post)	0.044	0.40

**2-yr Pre-Development Site
Release Rate towards Cawthra Road (A2-pre)=** **12.5** L/s

Site Release Rate towards Cawthra Road (A2 Post)= **4.8** L/s

(1) Time (min)	(2) Rainfall Intensity (mm/hr)	(3) Storm Runoff (A2 post) (m³/s)	(4) Runoff Volume (A2 post) (m³)	
			Runoff (A2 post) (m³)	Volume (A2 post) (m³)
15.0	99.2	0.005		4.34
20.0	83.1	0.004		4.85
25.0	71.9	0.003		5.24
30.0	63.7	0.003		5.57
35.0	57.3	0.003		5.85
40.0	52.2	0.003		6.09
45.0	48.1	0.002		6.31
50.0	44.6	0.002		6.50
55.0	41.7	0.002		6.68
60.0	39.1	0.002		6.85
65.0	36.9	0.002		7.00
70.0	35.0	0.002		7.14
75.0	33.2	0.002		7.27
80.0	31.7	0.002		7.40
85.0	30.3	0.001		7.51
90.0	29.0	0.001		7.63
95.0	27.9	0.001		7.73
100.0	26.9	0.001		7.83
105.0	25.9	0.001		7.93
110.0	25.0	0.001		8.02
115.0	24.2	0.001		8.11
120.0	23.4	0.001		8.20
125.0	22.7	0.001		8.28
130.0	22.1	0.001		8.37
135.0	21.4	0.001		8.44
140.0	20.9	0.001		8.52
145.0	20.3	0.001		8.59
150.0	19.8	0.001		8.66
155.0	19.3	0.001		8.73
160.0	18.9	0.001		8.80
165.0	18.4	0.001		8.87
170.0	18.0	0.001		8.93
175.0	17.6	0.001		8.99
180.0	17.2	0.001		9.05



Modified Rational Method
Hundred Year Storm
Site Flow and Storage Summary
- towards Cawthra Road

1444-1458 Cawthra Road

Drainage Area A2 Post

Uncontrolled area towards Cawthra Road

Area (A2) =	0.044	ha
"C" =	0.50	
AC2=	0.022	
Tc =	15.0	min
Time Increment =	5.0	min
Max. Release Rate =	8.5	L/s

100-Year Design Storm	
a=	1450.00
b=	4.90
c=	0.78
I =	$a \cdot (b + t)^c$

Type	Area (ha)	"C"
Landscaped	0.034	0.25
Hardscaped	0.010	0.90
Total Area (A2 Post)	0.044	0.40

Adjustment Factor = $C(100) = 1.25 * C$

2-yr Pre-Development Site
Release Rate towards Cawthra Road (A2-pre)=

12.5 L/s

Site Release Rate towards Cawthra Road (A2 Post)=

8.5 L/s

(1) Time (min)	(2) Rainfall Intensity (mm/hr)	(3) Storm Runoff (A2 post) (m³/s)	(4) Runoff Volume (A2 post) (m³)
15.0	140.7	0.009	7.69
20.0	118.1	0.007	8.61
25.0	102.4	0.006	9.33
30.0	90.8	0.006	9.93
35.0	81.8	0.005	10.43
40.0	74.6	0.005	10.88
45.0	68.7	0.004	11.27
50.0	63.8	0.004	11.62
55.0	59.6	0.004	11.94
60.0	56.0	0.003	12.24
65.0	52.8	0.003	12.51
70.0	50.0	0.003	12.77
75.0	47.6	0.003	13.01
80.0	45.4	0.003	13.23
85.0	43.4	0.003	13.45
90.0	41.6	0.003	13.65
95.0	40.0	0.002	13.84
100.0	38.5	0.002	14.03
105.0	37.1	0.002	14.20
110.0	35.8	0.002	14.37
115.0	34.7	0.002	14.53
120.0	33.6	0.002	14.69
125.0	32.6	0.002	14.84
130.0	31.6	0.002	14.99
135.0	30.7	0.002	15.13
140.0	29.9	0.002	15.26
145.0	29.1	0.002	15.40
150.0	28.4	0.002	15.52
155.0	27.7	0.002	15.65
160.0	27.0	0.002	15.77
165.0	26.4	0.002	15.89
170.0	25.8	0.002	16.00
175.0	25.3	0.002	16.12
180.0	24.7	0.002	16.23

APPENDIX D
Sanitary Data Analysis



SANITARY SEWER DESIGN SHEET

1444-1458 Cawthra Road
CITY OF MISSISSAUGA

LOCATION	RESIDENTIAL			COMMERCIAL		FLOW								SEWER DESIGN																				
	SECTION AREA (ha.)	Single & Semi-Detached Dwellings @ 4.15 ppu	Townhouses @ 3.5 ppu	SECTION POP. (persons)	COMMERCIAL/OFFICE AREA (ha.)	SECTION POP. @ 50p/ha (persons)	TOTAL ACCUM. POP. (persons)	AVERAGE RESIDENTIAL FLOW @ 302.8 L/c/d (L/s)	HARMON PEAKING FACTOR	RES. PEAK FLOW (L/s)	AVERAGE COMMERCIAL/OFFICE FLOW @ 302.8 L/c/d (L/s)	TOTAL ACCUM. AREA (ha.)	INFILT. @ 0.2 L/s/ha. (L/s)	TOTAL DESIGN FLOW (L/s)	PIPE LENGTH (m)	PIPE DIA. (mm)	SLOPE (%)	FULL FLOW CAPACITY n = 0.013 (L/sec)	% of DESIG CAPACITY (%)															
column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19															
Existing Condition																																		
Residential Development	0.520	4	0	17	0.00	0	17	0.06	4.39	0.255	0.00	0.520	0.104	0.36																				
Proposed Condition																																		
Residential-Use Development	0.520	4	12	59	0.00	0	59	0.21	4.30	0.88	0.00	0.520	0.104	0.99																				
Residential/Commercial Flow Rate - 302.8 litres/capita/day														Total Net Flow	0.63																			
Infiltration - 0.2 L/ha																																		
Peaking Factor = $1 + [14 / (4 + P^{0.5})]$, P=Population in thousands																																		
Site Area: 0.506 ha																																		
Lithos Prepared by: John Pasalidis, P.E., M.A.Sc. Reviewed by: Nick Moutzouris, P.Eng., M.A.Sc. Date: December 2019									Project: 1444-1458 Cawthra Road Project No: UD17-088 City of Mississauga								Sheet 1 OF 1																	

APPENDIX E
Water Data Analysis



WATER DEMAND

1444-1458 Cawthra Road

File No: PUD17-094

Date: December 2019

Prepared by: John Pasalidis, P.E., M.A.Sc.

Reviewed By: Nick Moutzouris, P.Eng., M.A.Sc.

Fire Flow Calculation

$$F = 220 C (A)^{1/2}$$

Where F= Fire flow in Lpm

C= construction type coefficient

= 1.0 Ordinary Construction

A = total floor area in sq.m. excluding basements, includes garage*

Area Applied		
Level 1=	200 m ²	100%
Level 2=	200 m ²	25%
Level -1=	200 m ²	25%
=	300 sq.m.	

$$F = 3,810.51 \text{ L/min}$$

$$F = 3,800 \text{ L/min} \quad \text{Round to nearest 100 l/min}$$

Occupancy Reduction

25% non-combustible occupancy

$$F = 2850 \text{ L/min}$$

Note: The levels indicated, reference the worst case scenario for townhouse fire separation according to the OBC

Sprinkler Reduction

0% Reduction for NFPA Sprinkler System

$$F = 2850 \text{ l/min}$$

Separation Charge

15% N 10.1 to 20m

25% E 0 to 3m

25% W 0 to 3m

10% S 20.1 to 30m

75% Total Separation Charge 2138 L/min

$$F = 4,988.00 \text{ L/min}$$

$$83.13 \text{ L/s}$$

$$F = 1318 \text{ US GPM}$$

Domestic Flow Calculations

Population = 44 Persons (from sanitary design sheet for Residential)

Commercial Area = 0 Persons (from sanitary design sheet for Commercial)

Average Day Demand = 280 L/cap/day 1 US Gallon=3.785 L

=

$$= 0.14 \text{ L/s}$$

$$= 2 \text{ US GPM}$$

$$1 \text{ US GPM}=15.852 \text{ L/s}$$

Max. Daily Demand Peaking Factor = 2.0 (For residential)

Max. Daily Demand = 0.29 L/s = 5 US GPM

or

Max. Hourly Demand Peaking Factor = 3.0

Max. Hourly Demand = 0.43 L/s = 7 US GPM

Max Daily Demand = 0.29 L/s
Fire Flow = 83.13 L/s

Required 'Design' Flow = 83.42 L/s
1322 US GPM

Note: Required 'Design' Flow is the maximum of either:

- 1) Fire Flow + Maximum Daily Demand
- 2) Maximum Hourly Demand



WATER DEMAND

1444-1458 Cawthra Road

File No: PUD17-094

Date: December 2019

Prepared by: John Pasalidis, P.E., M.A.Sc.

Reviewed By: Nick Moutzouris, P.Eng., M.A.Sc.

Pressure Losses

Hazen-Williams Formula

$$V = k CR_h^{0.63} \times S^{0.54}$$

$k = 0.85$ - conversion factor (0.849 for SI units and 1.318 for US customary units)

$C = 140$ - roughness coefficient (PVC : 140-150)

$S = h_f/L$

$R_h = D/4$ - hydraulic radius ($D/4$ for full flow, A/P_w for partially flow)

Fire Fighting and Domestic Head Loss

Flow Requirements=	83.4 L/s
Diameter=	150 mm
Area=	1.77E-02 m ²
L=	13 m
V=	4.72 m/s
S=	1.17E-01
R _h =	0.04
H _f =	1.52 m
=	2.17 psi

Flow Test (dated: April 11, 2018)

when:	Static Pressure =	64 psi	Flow =	0	GPM	=	0.00 L/s
	Residual Pressure =	58 psi	Flow =	1950	GPM	=	123.01 L/s

Pressure

Pressure (psi)	Flow (L/s)
64	0.00
58	123.01

Based on the Pressure/Flow relationship, we have to confirm that the flow requirement of 83.42 L/s can be provided at minimum pressure (20.3 psi + Losses) as set out by the FUS guidelines

59.9 83.42

Fire Flow is above minimum of

22.47 psi (20.3+Hf)

Since the flow of 83.42 L/s required for the proposed development is provided in the existing watermain at 59.9 psi (which is more than the minimum of 22.47 psi), we anticipate that the existing watermain infrastructure can support the proposed development.

HYDRANT FLOW TEST FORM

Project No: 2018-0046Date: Apr. 11, 2018Site Location: 1444-1458 Cawthra Rd. Hydrants Opened by: Peel Region Water
Mississauga, On. Tested By: Cadron St. Sarnouthak

1) Required photos:

- Site Id & Date
 Location Overview
 Other

- Condition of Flow Hydrant
 Condition of Residual Hydrant

2) Test Data

Time of Test: 1300Location of Test: (Flow) In front of 1424 Cawthra Rd., south side
(Residual) In front of 1476 Cawthra Rd., south sideMain Size: 300 mmStatic Pressure: 64 psi

	Number of Outlets & Orifice Size	Pitot Pressure	Flow (USGPM)	Residual Pressure
1	1 x 2.5"	54	1250	60
2	2 x 2.5"	34	1950	58
3				
4				

3) Calculations

$$Q = 29.83 cd^2 \sqrt{p}$$

$$Q_f = (29.83)(0.9)(2.5")^2 \sqrt{54} \\ = 1233.03$$

$$Q_f = \sim 1250 \text{ USGPM}$$

$$Q_t = 2(29.83)(0.9)(2.5")^2 \sqrt{34} \\ = 1956.79$$

$$Q_t = \sim 1950 \text{ USGPM}$$

Where c- coefficient of discharge (1 in smooth pipe)

d- pipe diameter (inches)

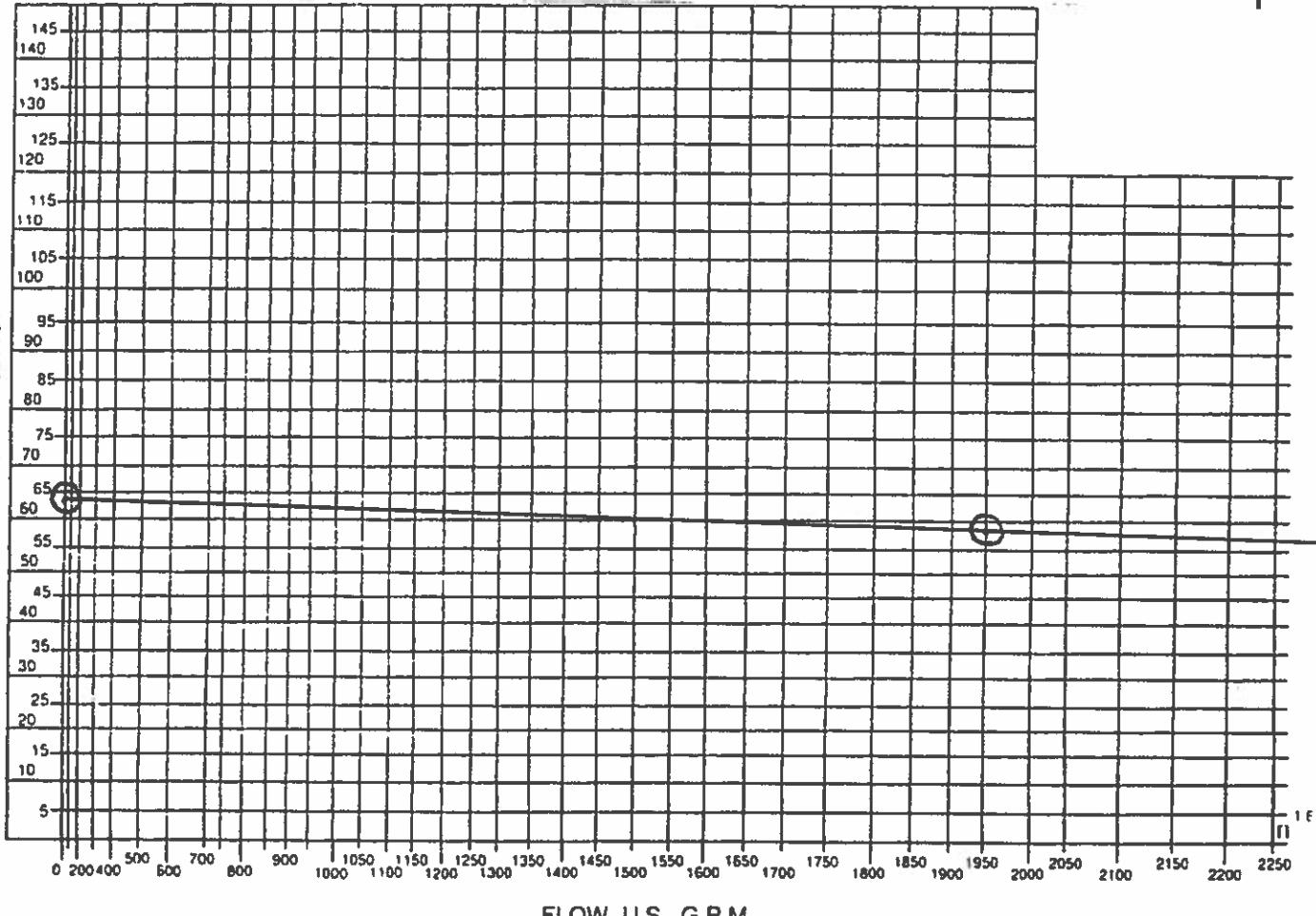
p- pitot reading (psi)

Q- flow (USGPM)

Note: Hydrants tested according to NFPA 291: Recommended Practice for Fire Flow Testing and Marking of Hydrants

4) Plot

PRESSURE P.S.I.G.



$$\begin{aligned}
 Q_{avail} @ 20 \text{ psi} &= Q_c ((P_s - P_A))^{0.5} \\
 &= 1956.79 ((64 - 20))^{0.5} \\
 &= 5738.63
 \end{aligned}$$

$Q_{avail} \sim 5750 \text{ U.S.GPM}$

5) Site sketch & Comments



QEW

Residual
hydrent
Flowing
hydrent

Arbor Rd.

Canthra Rd.