Burlie New Townhome Dev.

759 Maple Avenue, City of Burlington

Functional Servicing and Stormwater Management Report (FSR/SWM)

September 26th, 2024

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1 Introduction

1.1 Background

Arcadis Professional Services (Canada) Inc. (Arcadis) was retained by Burlie New Townhome Dev. (the "Owner") to prepare a Functional Servicing and Stormwater Management Report (FSR/SWM) in support of a Zoning By-Law Application (ZBA) for a proposed residential development located at 759 Maple Avenue in the City of Burlington (the "City") and Halton Region (the "Region"). The purpose of this report is to develop a municipal site servicing strategy (stormwater, sanitary discharge, and water supply), and to identify any potential constraints within the existing municipal infrastructure. More specifically, the report will present the following:

- Calculate allowable runoff rates for the development;
- Evaluate suitable methods for attenuation and treatment of stormwater runoff;
- Develop on-site control measures and examine theoretical performance to satisfy the City's stormwater management criteria;
- Identify storm servicing opportunities and constraints;
- Identify sanitary servicing opportunities and constraints and evaluate the capacity of the receiving municipal sewer; and
- Identify water servicing opportunities and constraints, calculate the proposed domestic water and firefighting supply needs; and evaluate the capacity of the municipal infrastructure.

The following documents have been obtained from various sources:

- Halton Region plan and profile drawings for Maple Avenue;
- Halton Region-City of Burlington water and sewer network;
- Topographic Survey prepared by A.J Clark and Associates, dated February 2023; and,
- Site plan and site statistics prepared by Arcadis Professional Service Canada.

1.2 Existing Site Description

Located in the City of Burlington, the 1,073 m^2 (0.107 ha) subject site is bounded by existing residential developments to the east, west, and north, and Maple Skatepark to the south of the development.

The site currently hosts a single family home with a vegetated lot, and generally slopes a northeasterly direction. towards adjacent residential developments fronting Maple Avenue.. .

Please refer to **Figure 1** in **Appendix A** for an aerial plan for the subject site.

1.3 Site Proposal

The proposed residential development will consist of four three-storey townhouse dwellings, four proposed driveways, and associated surface parking with vehicular access from Maple Avenue.

Sample architectural site plan drawings and statistics are located in Appendix **A** for reference.

1.4 Service Connections

Individual sanitary, storm and domestic services shall be provided for the multi-use residential dwellings per City standards. Site servicing requirements will be discussed in greater detail in subsequent sections.

2 Terms of Reference and Methodology

2.1 Terms of Reference

The following documents and mapping information has been reviewed in the preparation of this report:

- City of Burlington Stormwater Management Design Guidelines Manual (May 2020).
- Halton Region Water and Wastewater Linear Design Manual (April 2019, Version 4.0).
- Existing Infrastructure Plan and Profile Drawings from the City of Burlington.
- Topographic Survey (A.J Clarke and Associates Ltd., dated January 12, 2024).
- MECP's Design Guidelines for Sewage Works and Drinking Water Systems.

2.2 Methodology: Stormwater Management

Per the City of Burlington, and the Region of Halton requirements, the following SWM criteria shall apply:

Quantity Control

- The maximum allowable release rate from the site during all storm events, up to and including the 100-year event, must not exceed the flow equivalent to the peak runoff rate generated during the two through 100-year pre-development storm events.
- The City of Burlington requires the use of orifice tubes to prevent removal in the future. A bolted and welded orifice plate will be utilized, such that it is not removable. Rooftop storage will not count towards the stormwater storage requirements.
- Discharge to a storm sewer shall not exceed capacity constraints.
- An overland flow route shall be provided within the developed site to direct runoff in excess of the 100-year storm runoff to an approved overland flow outlet.

Quality Control

All runoff from the site shall achieve Level 1 (Enhanced protection) a long-term average removal of 80% of Total Suspended Solids (TSS) on an annual loading basis.

2.3 Methodology: Sanitary Discharge

In accordance with the Halton Region Design Criteria, pre- and post-development peak sewer flows shall be calculated on the basis of the following for residential areas:

- Peaking factor – minimum 2.0 and maximum 4.0; and,
- Velocity – minimum 0.6 m/s and maximum 3.0 m/s.

Table 2.1 Sanitary Design Parameters

Design Flows		Population Densities	
Infiltration Allowance Peaking Factor Qavg	0.286 L/s/ha Harmon's Formula 275 L/c/day	Semi-detached, duplex and 4-plex Townhouse, Maisonette (6 storey apt. or less)	100 pp/ha 135 pp/ha

All sanitary sewers shall be sized to handle the theoretical daily peak flow per the City's requirement, the sanitary sewage flows have been estimated using the following formula:

$$Q = \frac{PqM}{86.4} + IA$$

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

2.4 Methodology: Water Supply

The domestic water usage will be calculated based on the following City design criteria:

Table 2.2 Water Design Parameters

Average Daily Demand		Harmon Peaking Factor	
		Peak Hour	Max Day
Q_{AVG}	275 L/c/day	4.00	2.25

Pressure and flow testing to determine the adequacy of the existing watermain to support the development with fire suppression in accordance with the City of Burlington and Halton Region, Ontario Building Code (OBC), and Fire Underwriters Survey (FUS) Guidelines will be discussed in the subsequent sections.

3 Stormwater Management

3.1 Pre-Development Conditions

Based on the infrastructure plan and profile drawings provided by Halton Region, there is an existing 375 mm storm sewer within Maple Street, and a 900 mm storm sewer within Hammond Street currently discharging to a 735 x 1145 mm horizontal elliptical storm sewer within the intersection of Maple Avenue and Hammond Street that drains southwest.

Existing storm infrastructure is shown on the Site Servicing exhibit, **SS-01** located in **Appendix E.**

3.2 Grading

The proposed grades will match current drainage patterns wherever feasible. Grades will be modified to slope towards Maple Avenue. On-site grading is proposed to be implemented as per City of Burlington, Halton Region, and AODA Standards (where required).

Emergency overland flow route in excess of a 100-year storm event will be directed southwest to Maple Avenue.

Refer to the Site Grading exhibit **SG-01**, which can be found in **Appendix E**.

3.3 Stormwater Management Modelling

The following are descriptions of the catchments modelled to represent the pre-development and preliminary post-development conditions of the site.

Table 3.1 Stormwater Management Modelling

Catchment	Description
Total Pre-Development 0.107 Hectares 41% Impervious	Under the pre-development condition of the site, the existing site consists of asphalt, parking, and landscaped areas. The existing overland flow discharges partially towards residential dwellings, and partially to Maple Avenue.
Post-Development 0.107 Hectares 94% Impervious	Under the proposed conditions, the site will consist of rooftop areas, parking areas, and landscaped areas. Runoff generated from the site will be directed towards Maple Avenue.

3.4 Allowable Release Rate

Using the City's IDF data for a 100-year storm event and applying a post-development 100-year safety factor of 1.25 applied to the runoff coefficient, and using time of concentration of 10 minutes, the allowable release rate for the portion of the site draining to Maple Avenue in existing conditions is calculated as follows:

$$Q_{Allowable} = \frac{(A \times R) * I_{100}}{360} = \frac{(0.107ha \times 0.49) \times 163.20\ mm/hr}{360} \times \left(\frac{1000\ L}{m^3}\right) = \mathbf{10.1\ L/s}$$

As shown above, the release rate from the subject site shall be limited to a maximum of **10.1 L/s**.

The associated pre-development drainage area plan is shown on **Figure DAP-1**, which can be found in **Appendix B** for reference.

3.5 Quantity Control

An on-site storm sewer system will balance post- to pre-development for the 100-year minor storm event contained and controlled on-site and directed to an outlet on Maple Avenue.

As previously mentioned, the post-development release rate for the subject site shall be limited to the 5-year target flow which has been calculated to be **10.1 L/s**. To attenuate flows, the subject site will incorporate underground pipe storage.

Underground Storage

To attenuate flows, 109.00 m of 375 mm storm pipes, one 1200 mm maintenance holes, one 1500 mm maintenance hole, three 1200 mm catch-basin manholes, and four 600 mm catch-basins shall be installed to provide underground storage with discharge limited by an 69 mm orifice plate.

The orifice discharge is calculated as follows:

$$Q_{Orifice} = (0.6) * \frac{\pi * (0.069)^2}{4} * \sqrt{2 * 9.81 * (1.032\text{-}0.069/2)}\ \times \frac{1000\ L}{1\ m^3} = \mathbf{10.1\ L/s}$$

The following is a summary of the stormwater management parameters pertaining to quantity control:

Table 3.2 Quantity Control Summary

Return Period	Storage Req'd (m^3)	Storage Provided (m^3)	Allowable Release Rate (L/s)	Orifice Release Rate (L/s)
100-yr	24.9	24.9	10.1	10.1

As shown above, the total peak flow from the site is calculated to be **10.1 L/s** which is equal to the site's allowable release rate of **10.1 L/s**. By providing on-site pipe storage and an orifice control, the City's objectives for quantity control have been met. Refer to **Appendix B** for the detailed quantity control calculations.

It should be noted that inspection and maintenance of any storage element and orifice control should be conducted on a regular basis to ensure that the system is functioning as designed.

3.6 Quality Control

An oil/grit separator (OGS) unit is proposed in order to provide adequate stormwater quality control. The recommended quality control structure is a Stormceptor EFO4 which will provide an estimated net annual sediment (TSS) load reduction of 66%. Given our post-development site has an overall TSS removal of 47.7%, once combined with the proposed OGS, all runoff from the site shall achieve a long-term average removal of more than 80% of Total Suspended Solids (TSS) on an annual loading basis.

The Stormceptor EFO4 Sizing Report, as well as the water quality calculations, can be found in **Appendix B** for reference.

3.7 Storm Service Connections

It is proposed that a new 375 mm storm service at a 2.0 % slope be installed from the control manhole at the property line to the existing 375 mm storm sewer within Maple Avenue. The following table illustrates the peak flow and corresponding capacity of the proposed storm service:

Table 3.3 Storm Service Performance

From	To	Pipe Size (mm)	Pipe Slope	Peak Flow (L/s)	Capacity (L/s)	Percent Of Full Flow
Control MH	Storm Sewer	200	2.0 %	10.1	248.0	21.8 %

As shown above, the proposed storm service will easily convey the post-development peak storm flow while operating at a maximum of 21.8 % of full flow capacity.

Refer to the detailed design sheet located in **Appendix B** and Site Servicing exhibit, **SS-01** located in **Appendix E**.

3.8 Emergency Overflow

All areas at grade level have been designed with positive drainage (away from the building). Should the site experience a storm greater than the 100-year return period, or should a blockage occur in the orifice control, storm flows will be directed to the Maple Avenue right-of-way.

3.9 Erosion and Sediment Control

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.

4 Sanitary Drainage System

4.1 Existing Sanitary Services

Based on the infrastructure plan and profile drawings provided by Halton Region, there is an existing 750 mm sanitary sewer and an existing 525 mm sanitary sewer within Maple Avenue. The sanitary flows from Maple Avenue are being directed eastwardly.

Existing sanitary infrastructure is shown on the Site Servicing exhibit, **SS-01**which can be found in **Appendix E.**

4.2 Pre-Development Sanitary Design Flow

As previously mentioned, the subject site in the existing condition is mainly composed of greenfield, with a two-storey vinyl dwelling open field with some impervious area. Therefore, the pre-development peak sanitary flow has been calculated as follows:

$$Q_{Pre\text{-}Dev.} = \left(\frac{275\ L/c{\cdot}d \cdot 11\ pp \cdot 4_{P.F.}}{86400\ s/day}\right) + (0.286\ L/s\ ha \cdot 0.107\ ha) = \mathbf{0.17\ L/s}$$

Refer to **Appendix C** for the detailed sanitary design sheet.

4.3 Post-Development Sanitary Design Flow

Based on the criteria set in **Section 2.3** and the conceptual site plan and statistics provided by the architect, the corresponding post-development sanitary flow is calculated as follows:

$$Q_{Post\text{-}Dev.} = (Q_{Residential}) \times P.F. + I/I$$

Using the aforementioned criteria, the post-development sanitary design flow is calculated as follows:

$$Q_{Post\text{-}Dev} = \left(\frac{(275\ L/c{\cdot}d \cdot 14\ pers \cdot 4_{P.F.}}{86400\ s/day}\right) + (0.286\ L/s{\cdot}ha \cdot 0.107\ ha) = \mathbf{0.21\ L/s}$$

Therefore, the total design flow from the proposed development is 0.21 L/s as per the design guidelines of the Halton Region Water and Wastewater Linear Design Manual (April 2019, Version 4.0).

The subject lands are zoned for specific residential use, the following population density has been used and as shown in the following **Table 4.1,** along with the calculated sanitary flow values for the subject lands.

Table 4.1 Post-Development Sanitary Flows

Land Use	Population Density	Area	Peaking Factor	Design Flow (L/s)	Infiltration (L/s)	Total Sanitary Flow (L/s)
Townhouse Dwellings	135.0 (pp/ha)	0.107	4	0.18		0.18
Infiltration					0.03	0.03
Total		**0.107**			**0.03**	**0.21**

4.4 Sanitary Service Connection

*It is proposed that a new 100 mm sanitary service at a 4.0 % slope be installed from a new control manhole at the property line to connect to the existing 750 mm sanitary sewer within Maple Avenue. The following table illustrates the peak flow and corresponding capacity of the proposed sanitary services:**Table 4.2 Sanitary Service Performance***

From	To	Pipe Size (mm)	Pipe Slope	Peak Flow (L/S)	Capacity (L/s)	Percent Of Full Flow
Control MH	Municipal MH	100	4.0 %	0.21	10.8	1.9 %

As shown above, the proposed sanitary service will easily convey the post-development peak sanitary flow while operating at a maximum of 1.9 % of full flow capacity.

Refer to the detailed sanitary design sheet which can be found in **Appendix C** and the Site Servicing exhibit, **SS-01**, which can be found in **Appendix E.**

5 Water Supply System

5.1 Existing Water Infrastructure

Based on the infrastructure plan and profile drawings provided by the City of Burlington, there is an existing 300 mm PVC watermain within Maple Avenue, connected to an existing municipal fire hydrant fronting the site.

Hydrant flow testing was performed by Arcadis Professional Services (Canada) Inc. at existing fire hydrants along Maple Avenue to confirm the available water supply's flow-pressure response curve. These tests were performed on December 1st, 2023, and were conducted in accordance with NFPA 291. The results are summarized as follows:

Table 5.1 Hydrant Response Curve (Maple Avenue)

Flow (gpm)	Flow (L/s)	Pressure (psi)	Pressure (kPa)
0	0	62	427
1,087	68.58	60	414
1,744	110.03	59	407

As shown above, static pressure within the system is expected to be approximately 62 psi. A copy of the hydrant flow test can be found in **Appendix E** for reference.

5.2 Domestic Water Supply Demands

Using the criteria set in **Section 2.4** and the site statistics provided by the Architect, the Average Day Demand (ADD), Peak Hour Demand (PHD), and Max Day Demand (MDD) have been calculated, and are summarized as follows:

Table 5.2 Domestic Water Demands

Building	Population Density	Area	ADD(L/s)	PHD (L/s)	MDD (L/s)
Townhouse Dwellings	135 (pp/ha)	0.107	0.06	0.24	0.14
Total		**0.107**	**0.06**	**0.24**	**0.14**

The domestic supply line for each building will be designed based on PHD while maintaining a minimum available pressure of 40 psi (275 kPa) at the face of the building.

Refer to **Appendix D** for the detailed calculations.

5.3 System Pressure Under Normal Operation

As previously mentioned, the domestic service shall be sized to convey domestic demands under normal system operating conditions (PHD) while maintaining a minimum available pressure of 40 psi (275 kPa). The residual pressure at the building is calculated by first interpolating the PHD residual pressure within the existing watermain, and then subtracting head losses within the system using the Hazen-Williams formula. The following table summarizes the residual pressure for the proposed domestic service:

Table 5.2 Residual Pressure Under PHD Conditions

Flow Conditions	PHD (L/S)	Domestic Service (mm)	Residual Pressure @ Main		Residual Pressure @ Bldg	
			(psi)	(kPa)	(psi)	(kPa)
PHD	0.24	250	62.0	427	62.0	427

As shown above, there is no appreciable head loss within the system, and the residual pressure at the building face is above the minimum acceptable pressure of 40 psi (275 kPa) under PHD conditions.

Refer to **Appendix D** for the detailed design calculations.

5.4 System Pressure Under Fire Flow

The available fire flow within the municipal water supply system is determined by interpolating the response curve established by the hydrant flow test.

Table 5.3 Residual Pressure Under Fire + MDD Conditions

Flow Conditions	FF + MDD (L/S)	Fire Service (mm)	Residual Pressure @ Main		Residual Pressure @ Bldg	
			(psi)	(kPa)	(psi)	(kPa)
FF + MDD	116.8	300	56.7	62.0	n/a	n/a

As shown above, the residual pressure within the municipal watermain is above the minimum acceptable pressure of 20 psi (140 kPa) under fire demand conditions (Fire + MDD).

Refer to **Appendix D** for the detailed design calculations.

5.5 Water Service Connections

To service the townhouse dwellings, a proposed 150 mm domestic service is proposed to connect to the existing 300 mm watermain within Maple Avenue. A valve and box, as well as a meter and backflow preventer, shall be installed at the property line for the proposed water service.

Refer to the Site Servicing exhibit, **SS-01**, which can be found in **Appendix E** for the location of existing and proposed water infrastructure.

5.6 Hydrant Coverage

There is an existing municipal fire hydrant along Maple Avenue fronting the subject site (759 Maple Avenue) within the northern boulevard of Maple Avenue.

Since the OBC requirement of a maximum 90 m hose length is fulfilled, no additional private hydrants are proposed to be included within the proposed development.

Refer to the Site Servicing exhibit, **SS-01**, located in **Appendix E** for the location of existing fire hydrant.

6 Summary

Storm Sewer and Stormwater Management
Storm flows shall be attenuated on-site and released to the municipal storm sewer at an appropriate discharge rate thus meeting the City's target for quantity control. The site will meet the City's target for quality control by installing an OGS EFO4 within the site.

Sanitary Sewers
The proposed development represents a minor increase in wastewater flow such that it is not expected to have a significant impact on the existing downstream sewer system. It is therefore deemed an appropriate conclusion that the proposed development can proceed without any mitigation measures.

Water Supply
The existing 300 mm watermain within Maple Avenue has sufficient capacity to support the proposed fire and domestic water demands for the proposed development without improvements to the municipal water supply network.

Summary
In summary, it can be concluded that the Zoning By-Law Amendment can be supported from a municipal site servicing perspective.

Appendix A

Background Information

Aerial Plan (Subject Site)

Conceptual Site Plan and Statistics (Arcadis Professional Services (Canada) Inc.)

Topographic Surveys (A.J Clarke and Associates Ltd.)

Plan and Profile Drawings (Halton Region)



CLIENT
BURLIE NEW TOWNHOME DEV.

759 Maple Avenue, Burlington, ON

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RESIDENTIAL DEVELOPMENT
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SCALE:	DATE:
NTS	2024-03-08
PROJECT ENG:	DRAWN BY:
SK	KP
CHECKED BY:	APPROVED BY:
SK	IQ
PROJECT NO:	
145256	

FIGURE NAME: AERIAL PLAN

FIGURE NO.	REVISION
FIG.1	1

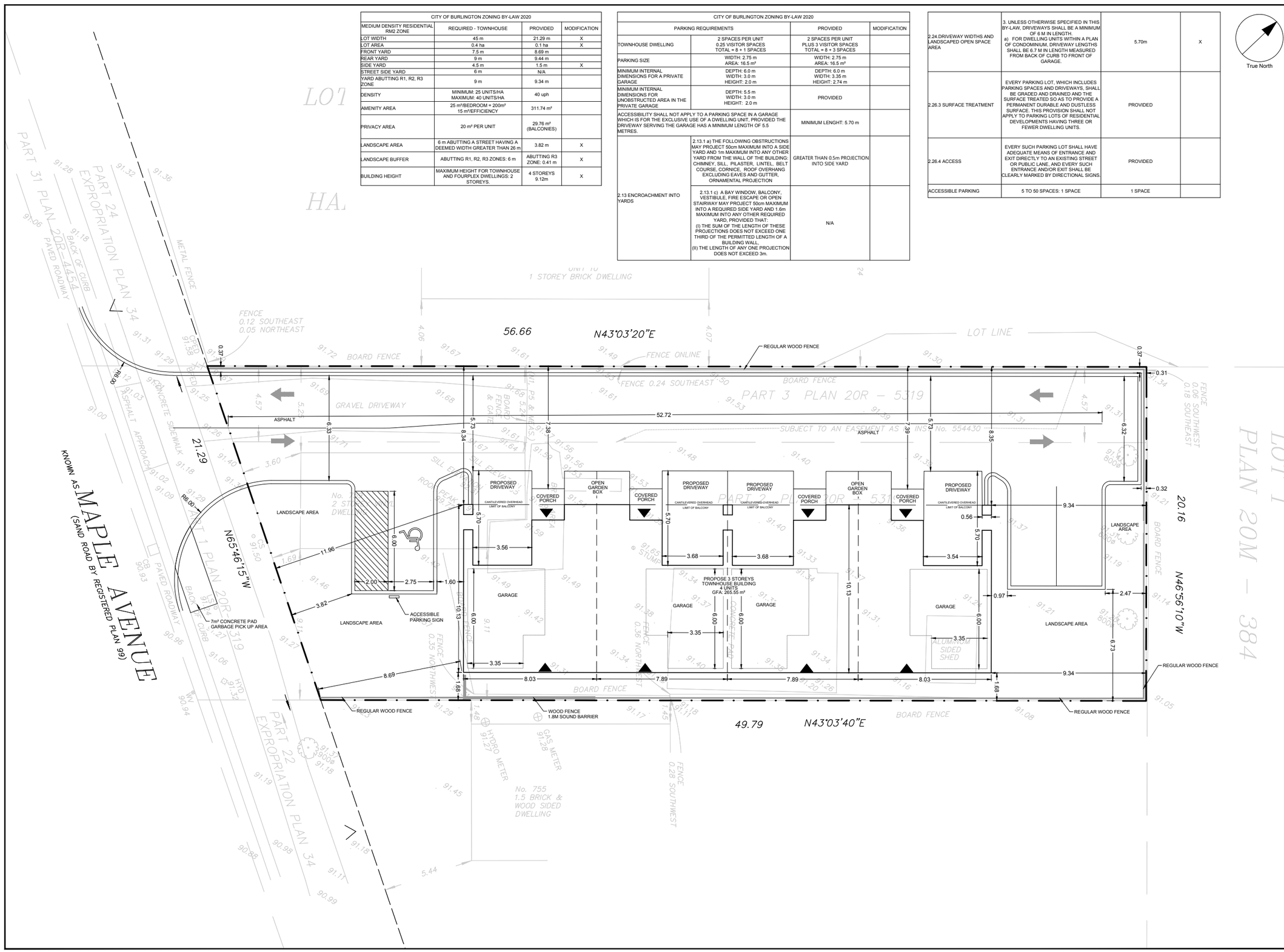
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CITY OF BURLINGTON ZONING BY-LAW 2020			
MEDIUM DENSITY RESIDENTIAL RM2 ZONE	REQUIRED - TOWNHOUSE	PROVIDED	MODIFICATION
LOT WIDTH	45 m	21.29 m	X
LOT AREA	0.4 ha	0.1 ha	X
FRONT YARD	7.5 m	8.69 m	
REAR YARD	9 m	9.44 m	
SIDE YARD	4.5 m	1.5 m	X
STREET SIDE YARD	6 m	N/A	
YARD ABUTTING R1, R2, R3 ZONE	9 m	9.34 m	
DENSITY	MINIMUM: 25 UNITS/HA MAXIMUM: 40 UNITS/HA	40 uph	
AMENITY AREA	25 m²/BEDROOM = 200m² 15 m²/EFFICIENCY	311.74 m²	
PRIVACY AREA	20 m² PER UNIT	29.76 m² (BALCONIES)	
LANDSCAPE AREA	6 m ABUTTING A STREET HAVING A DEEMED WIDTH GREATER THAN 26 m	3.82 m	X
LANDSCAPE BUFFER	ABUTTING R1, R2, R3 ZONES: 6 m	ABUTTING R3 ZONE: 0.41 m	X
BUILDING HEIGHT	MAXIMUM HEIGHT FOR TOWNHOUSE AND FOURPLEX DWELLINGS: 2 STOREYS.	4 STOREYS 9.12m	X

CITY OF BURLINGTON ZONING BY-LAW 2020			
PARKING REQUIREMENTS		PROVIDED	MODIFICATION
TOWNHOUSE DWELLING	2 SPACES PER UNIT 0.25 VISITOR SPACES TOTAL = 8 + 1 SPACES	2 SPACES PER UNIT PLUS 3 VISITOR SPACES TOTAL = 8 + 3 SPACES	
PARKING SIZE	WIDTH: 2.75 m AREA: 16.5 m²	WIDTH: 2.75 m AREA: 16.5 m²	
MINIMUM INTERNAL DIMENSIONS FOR A PRIVATE GARAGE	DEPTH: 6.0 m WIDTH: 3.0 m HEIGHT: 2.0 m	DEPTH: 6.0 m WIDTH: 3.35 m HEIGHT: 2.74 m	
MINIMUM INTERNAL DIMENSIONS FOR UNOBSTRUCTED AREA IN THE PRIVATE GARAGE	DEPTH: 5.5 m WIDTH: 3.0 m HEIGHT: 2.0 m	PROVIDED	
ACCESSIBILITY SHALL NOT APPLY TO A PARKING SPACE IN A GARAGE WHICH IS FOR THE EXCLUSIVE USE OF A DWELLING UNIT, PROVIDED THE DRIVEWAY SERVING THE GARAGE HAS A MINIMUM LENGTH OF 5.5 METRES.		MINIMUM LENGHT: 5.70 m	
2.13 ENCROACHMENT INTO YARDS	2.13.1 a) THE FOLLOWING OBSTRUCTIONS MAY PROJECT 50cm MAXIMUM INTO A SIDE YARD AND 1m MAXIMUM INTO ANY OTHER YARD FROM THE WALL OF THE BUILDING: CHIMNEY, SILL, PILASTER, LINTEL, BELT COURSE, CORNICE, ROOF OVERHANG EXCLUDING EAVES AND GUTTER, ORNAMENTAL PROJECTION	GREATER THAN 0.5m PROJECTION INTO SIDE YARD	
	2.13.1 c) A BAY WINDOW, BALCONY, VESTIBULE, FIRE ESCAPE OR OPEN STAIRWAY MAY PROJECT 50cm MAXIMUM INTO A REQUIRED SIDE YARD AND 1.6m MAXIMUM INTO ANY OTHER REQUIRED YARD, PROVIDED THAT: (I) THE SUM OF THE LENGTH OF THESE PROJECTIONS DOES NOT EXCEED ONE THIRD OF THE PERMITTED LENGTH OF A BUILDING WALL. (II) THE LENGTH OF ANY ONE PROJECTION DOES NOT EXCEED 3m.	N/A	

2.24.DRIVEWAY WIDTHS AND LANDSCAPED OPEN SPACE AREA	3. UNLESS OTHERWISE SPECIFIED IN THIS BY-LAW, DRIVEWAYS SHALL BE A MINIMUM OF 6 M IN LENGTH. a) FOR DWELLING UNITS WITHIN A PLAN OF CONDOMINIUM, DRIVEWAY LENGTHS SHALL BE 6.7 M IN LENGTH MEASURED FROM BACK OF CURB TO FRONT OF GARAGE.	5.70m	X
2.26.3 SURFACE TREATMENT	EVERY PARKING LOT, WHICH INCLUDES PARKING SPACES AND DRIVEWAYS, SHALL BE GRADED AND DRAINED AND THE SURFACE TREATED SO AS TO PROVIDE A PERMANENT DURABLE AND DUSTLESS SURFACE. THIS PROVISION SHALL NOT APPLY TO PARKING LOTS OF RESIDENTIAL DEVELOPMENTS HAVING THREE OR FEWER DWELLING UNITS.	PROVIDED	
2.26.4 ACCESS	EVERY SUCH PARKING LOT SHALL HAVE ADEQUATE MEANS OF ENTRANCE AND EXIT DIRECTLY TO AN EXISTING STREET OR PUBLIC LANE, AND EVERY SUCH ENTRANCE AND/OR EXIT SHALL BE CLEARLY MARKED BY DIRECTIONAL SIGNS.	PROVIDED	
ACCESSIBLE PARKING	5 TO 50 SPACES: 1 SPACE	1 SPACE	



True North

CLIENT

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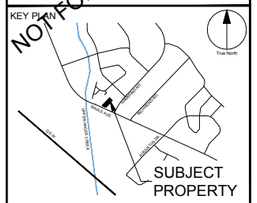
Arcadis Professional Services (Canada) Inc.

ISSUES

No.	DESCRIPTION	DATE
01	SITE PLAN SUBMISSION	2024-08-19

NOT FOR CONSTRUCTION

KEY PLAN



BENCHMARK

SOURCE

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PROJECT
RESIDENTIAL DEVELOPMENT

759 MAPLE AVENUE, BURLINGTON, ON

SCALE
1 0 1 2 4
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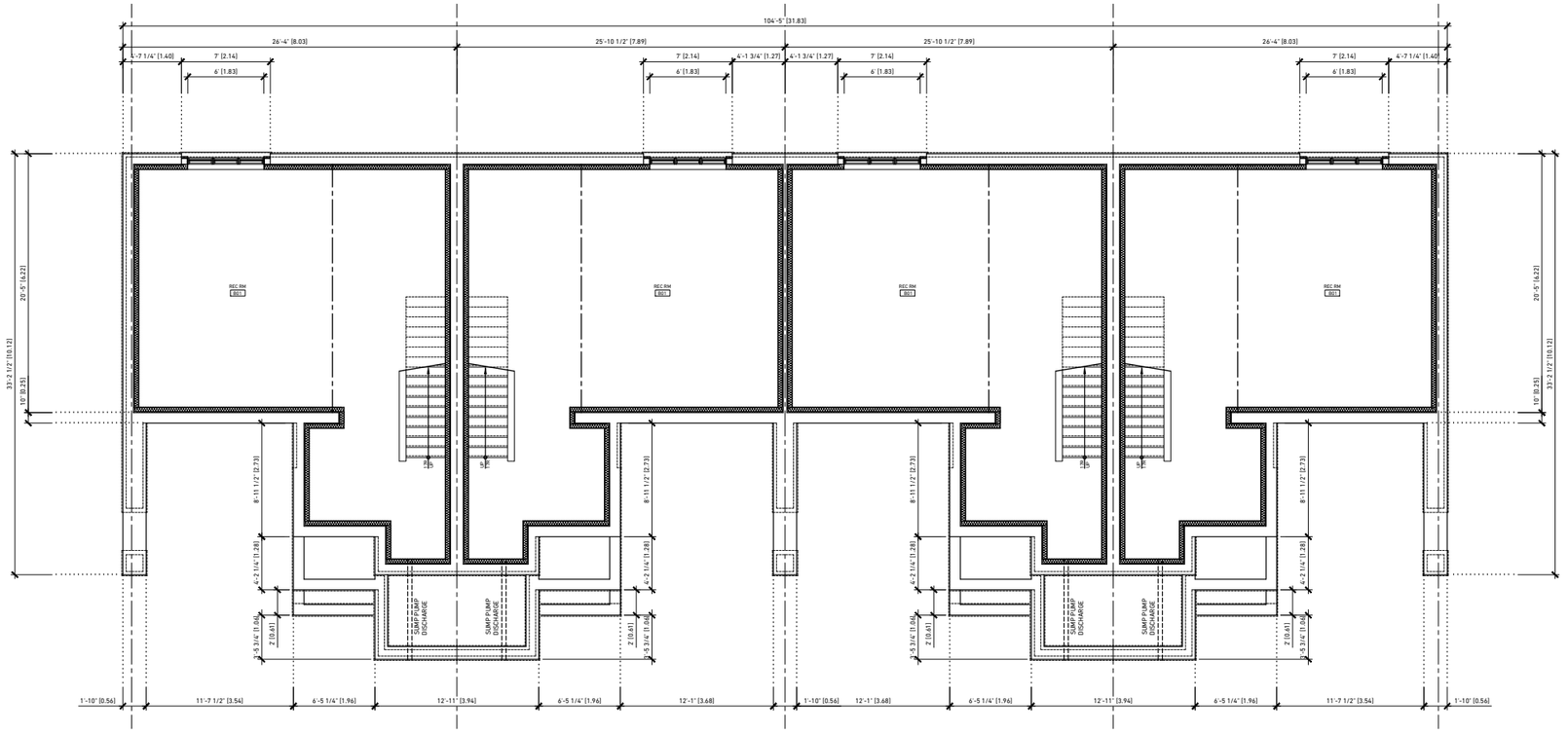
PROJECT NO:
145256

DRAWN BY:	CHECKED BY:
M. ROJAS	M. CROUGH
PROJECT MGR:	APPROVED BY:
M. CROUGH	M. CROUGH

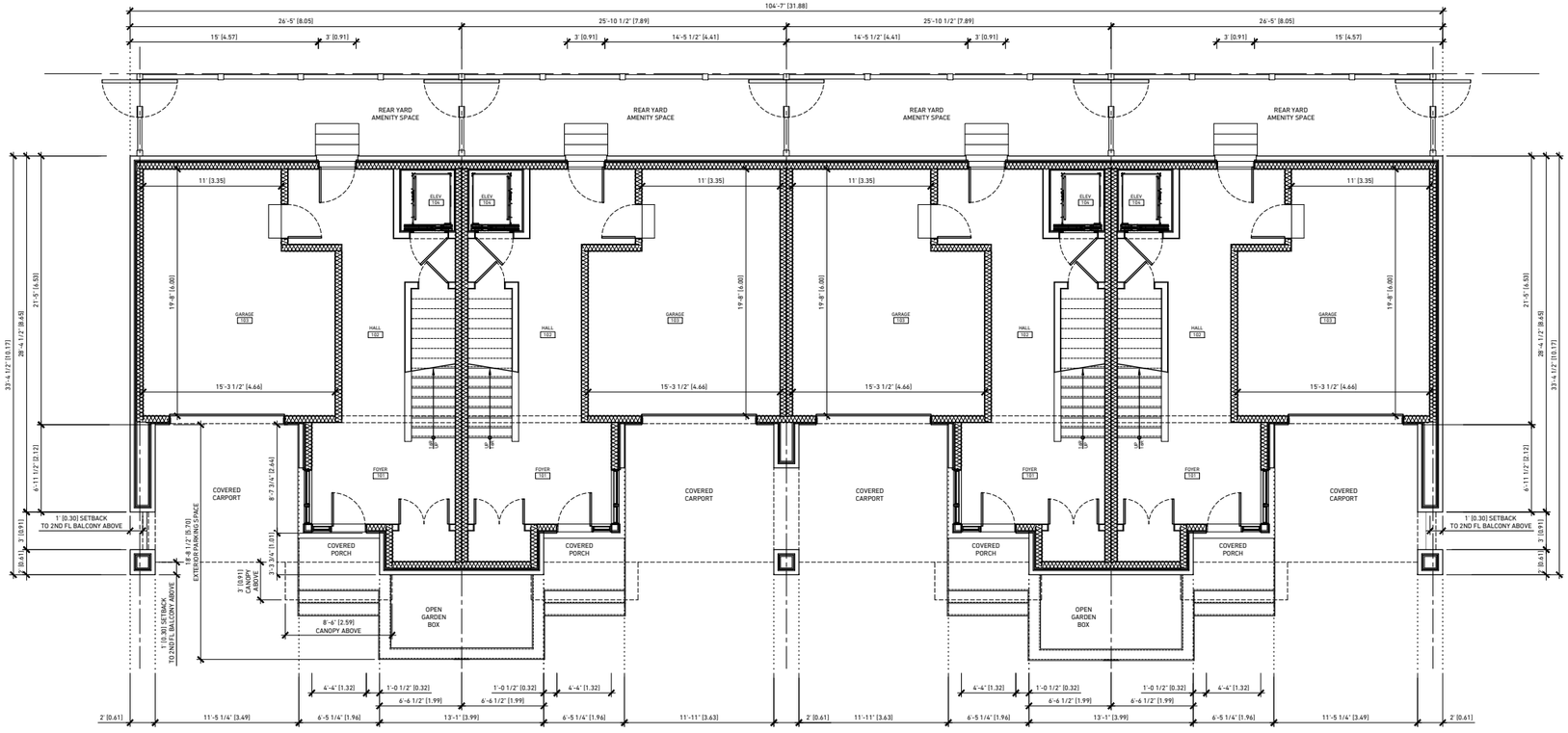
SHEET TITLE
SITE PLAN

SHEET NUMBER	ISSUE
SP 1.0	01

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1 | PROPOSED BASEMENT FLOOR PLAN
A1 | SCALE: 3/16"=1'-0"



2 | PROPOSED FIRST FLOOR PLAN
A1 | SCALE: 3/16"=1'-0"

STRUCTURED CREATIONS

416.204.0351 | 590 WOODLAND AVE, BURLINGTON, ON | info@structuredcreations.com

BURLIE
NEW TOWNHOME DEV

759 MAPLE AVE
BURLINGTON ONTARIO

PROJECT NORTH | ENG. STAMP:



BCIN STAMP

OBC REGISTRATION

I, DARREN SANGER-SMITH, DECLARE THAT I HAVE REVIEWED AND TAKE RESPONSIBILITY FOR THE DESIGN ON BEHALF OF A FIRM REGISTERED UNDER SUBSECTION 3.2.4. OF THE ONTARIO BUILDING CODE. I AM REGISTERED, AND THE FIRM IS REGISTERED IN THE APPROPRIATE CLASES/CATEGORIES.

27-Dec-17
DATE

SIGNATURE OF DESIGNER

D. SANGER-SMITH, B.ARCH BCIN 26286
STRUCTURED CREATIONS INC. BCIN 29617

GENERAL NOTES

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DRAWING ISSUES | REVISIONS

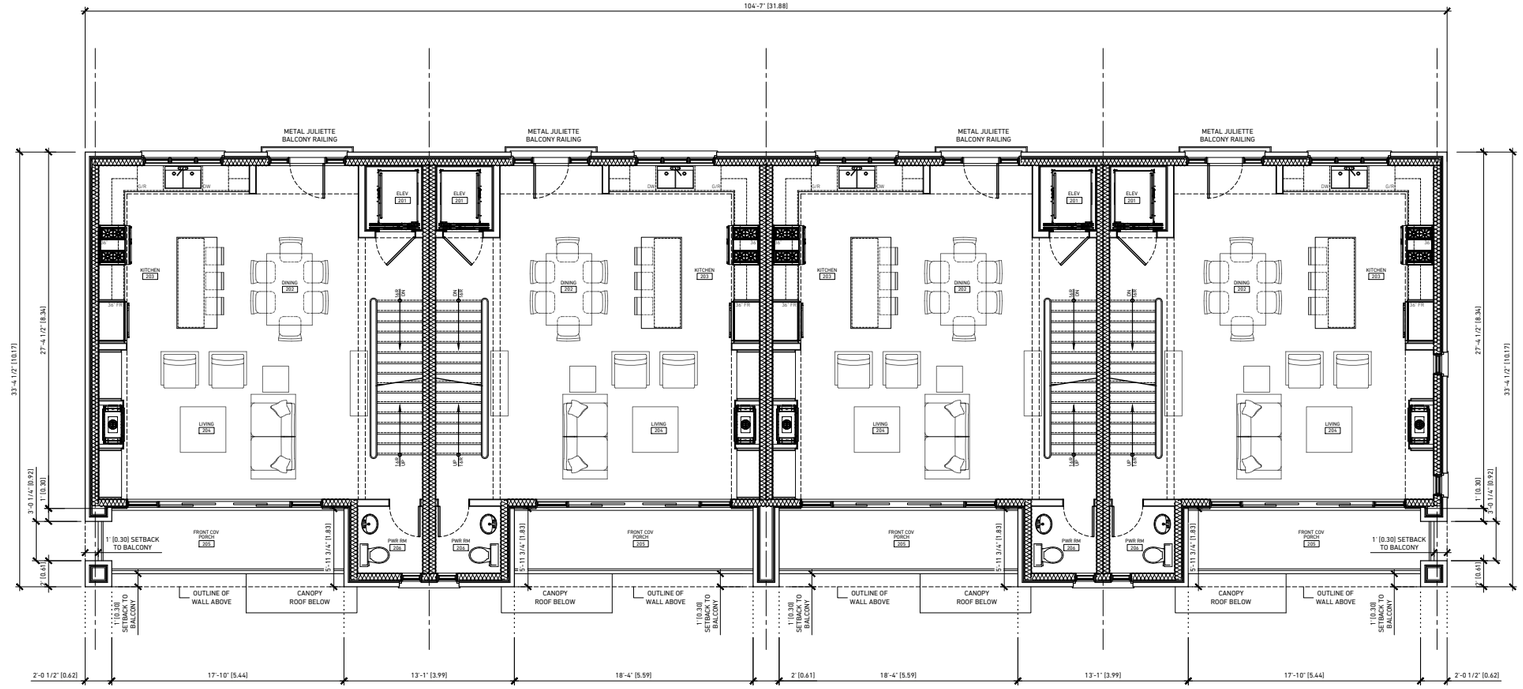
PROP FLOOR PLANS AND NOTES

DESIGN BY	DRAWN BY	APPROVED BY
D.S.S.	J.S.	D.S.S.
SCALE	DATE	PROJECT #
3/16"=1'-0"	SEPT 20/24	22-071

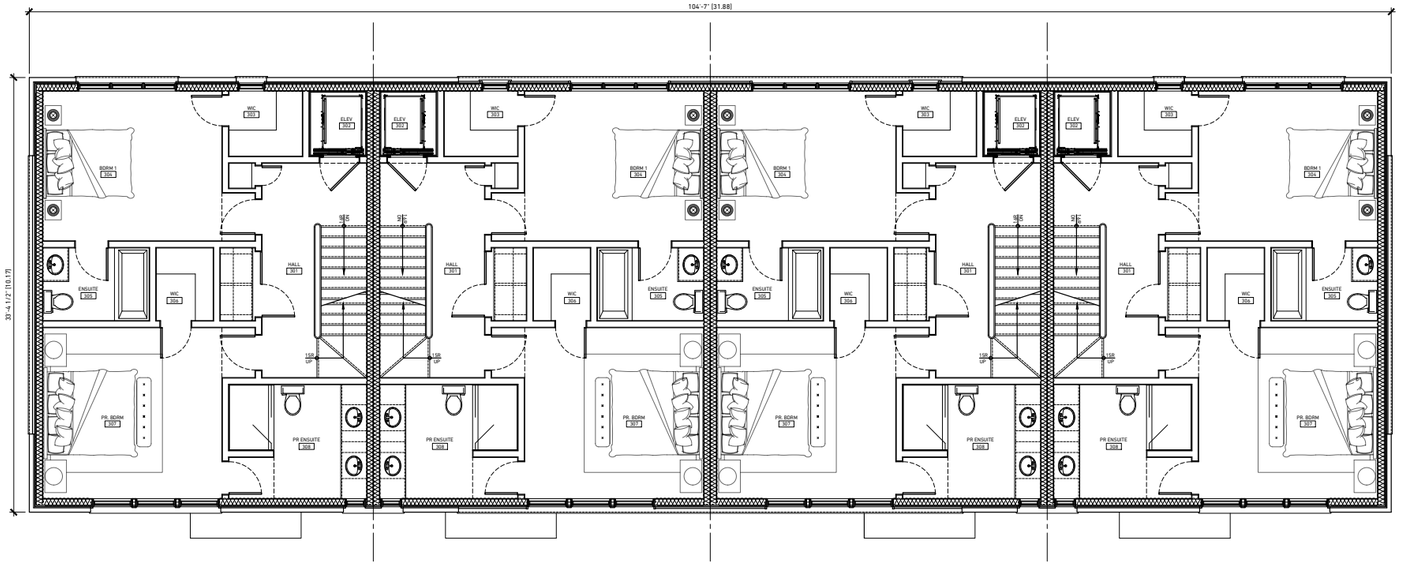
DRAWING #

A1

22-071-SPA.dwg



1 | PROPOSED MAIN FLOOR PLAN
A2 | SCALE: 3/16"=1'-0"



2 | PROP SECOND FLOOR PLAN
A2 | SCALE: 3/16"=1'-0"

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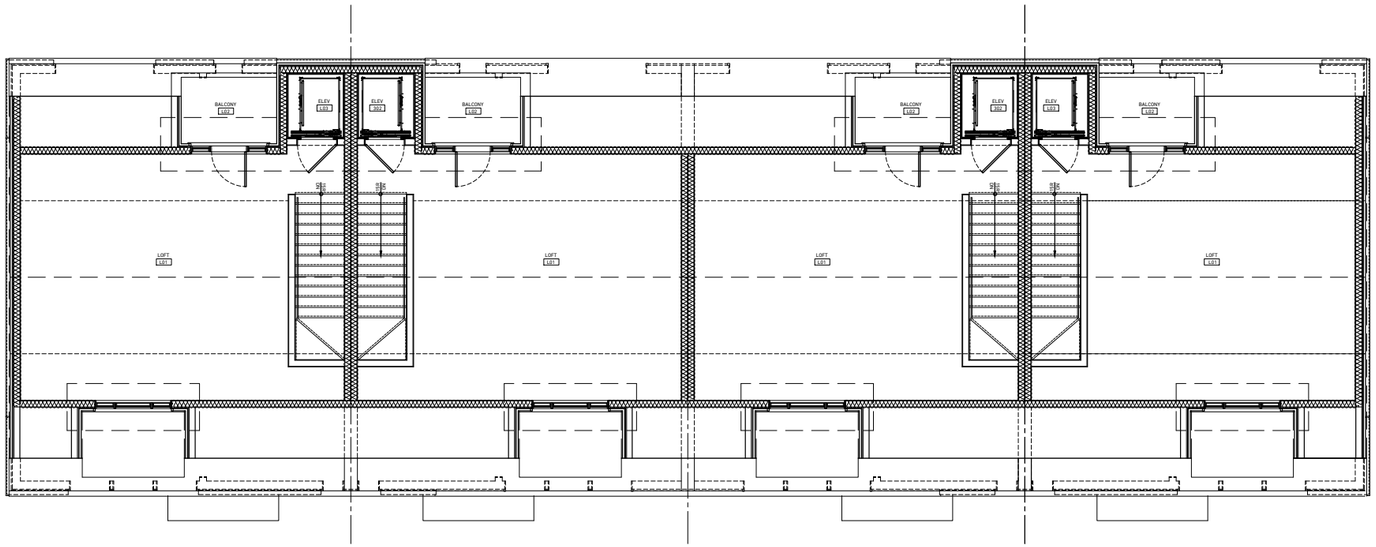
PROP FLOOR PLANS AND NOTES

DESIGN BY	DRAWN BY	APPROVED BY
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SCALE	DATE	PROJECT #
3/16"=1'-0"	SEPT 20/24	22-071

DRAWING #

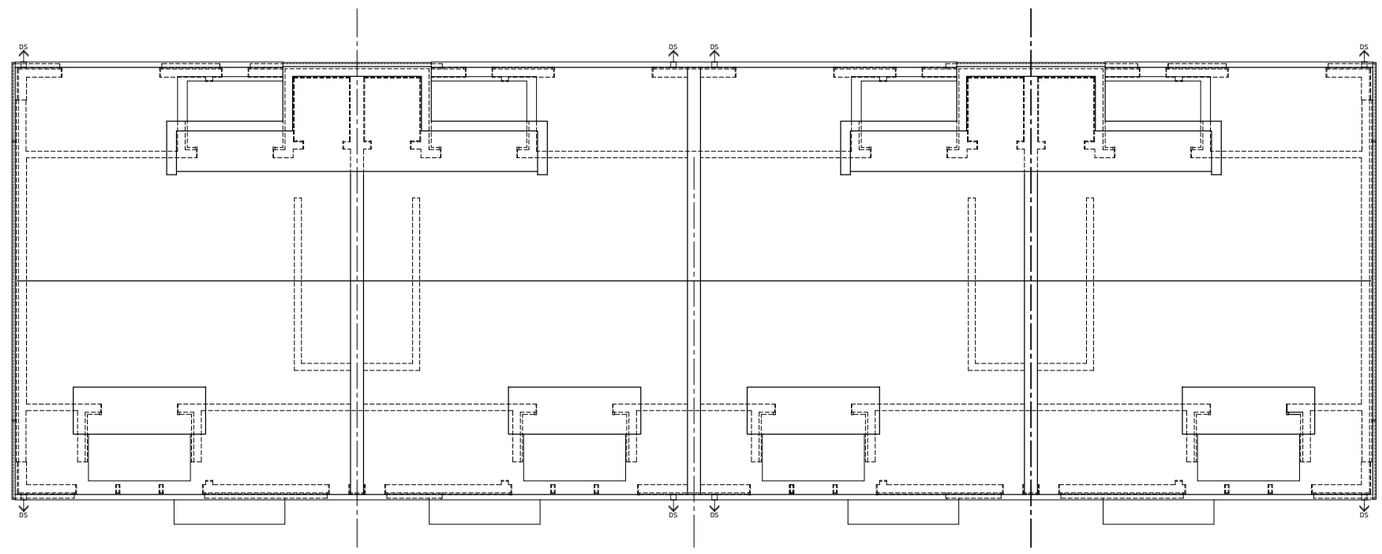
A2

22-071-SPA.dwg



1 | PROPOSED LOFT PLAN

A3 | SCALE: 3/16"=1'-0"



2 | PROPOSED ROOF PLAN

A3 | SCALE: 3/16"=1'-0"

[redacted]

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BURLIE
NEW TOWNHOME DEV

759 MAPLE AVE
BURLINGTON ONTARIO

PROJECT NORTH



ENG. STAMP:

BCIN STAMP

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DRAWING ISSUES | REVISIONS

PROP FLOOR PLANS AND NOTES

DESIGN BY	DRAWN BY	APPROVED BY
D.S.S.	J.S.	D.S.S.
SCALE	DATE	PROJECT #
3/16"=1'-0"	SEPT 20/24	22-071

DRAWING #

A3

22-071-SPA.dwg



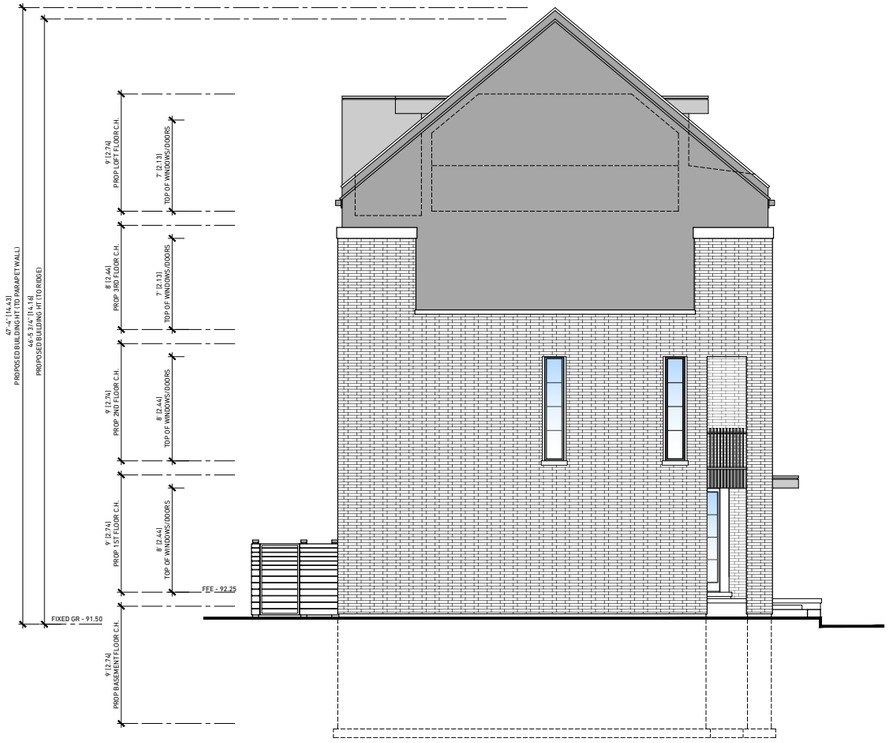
1 | PROPOSED FRONT (NORTH) ELEVATION
A4 | SCALE: 3/16"=1'-0"

ROMAN BRICK STYLE STAINED AS PER COLOR

1-1/2" x 1-1/2" VERTICAL SLATTED SIDING

WINDOWS, DOORS, RAILINGS, CANOPY ROOFS, TRIM

STANDING SEAM METAL ROOF



2 | PROPOSED SIDE (EAST) ELEVATION
A4 | SCALE: 3/16"=1'-0"

STRUCTURED CREATIONS

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BURLIE
NEW TOWNHOME DEV

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DRAWING ISSUES | REVISIONS

PROP EXTERIOR ELEVATIONS AND NOTES

DESIGN BY	DRAWN BY	APPROVED BY
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SCALE	DATE	PROJECT #
3/16"=1'-0"	SEPT 20/24	22-071

DRAWING #

A4

22-071-SPA.dwg



1 | PROPOSED REAR (SOUTH) ELEVATION

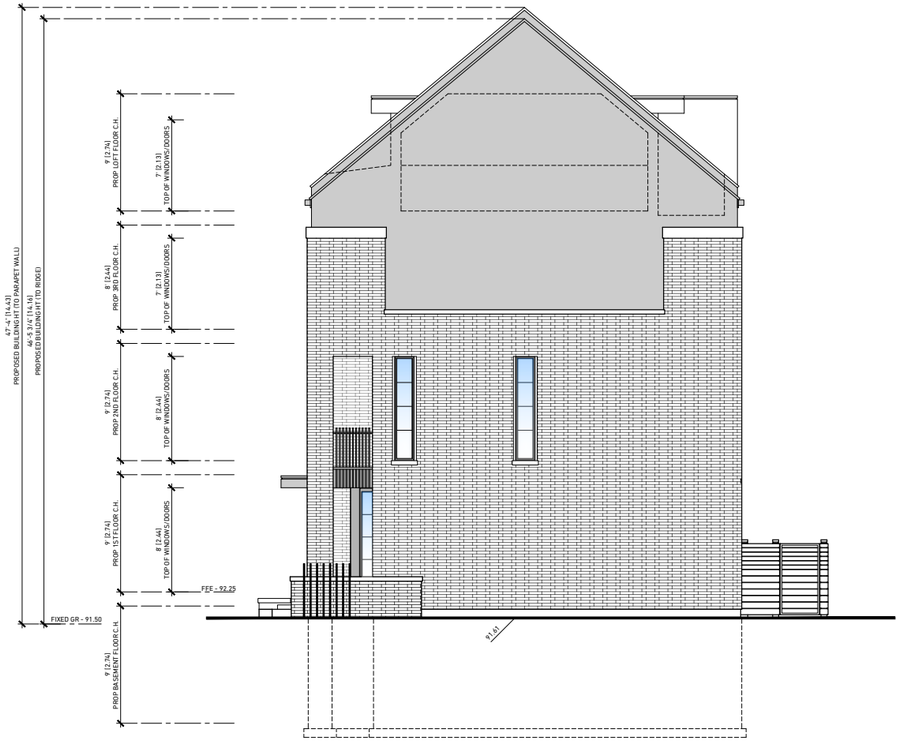
A5 | SCALE: 3/16"=1'-0"

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1-1/2" x 1-1/2" VERTICAL SLATTED SIDING

WINDOWS, DOORS, RAILINGS, CANOPY ROOFS, TRIM

STANDING SEAM METAL ROOF



2 | PROPOSED SIDE (WEST) ELEVATION

A5 | SCALE: 3/16"=1'-0"

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3	10.01.24	REV TO ADD LOFT	D.S.S.
2	16.11.23	ISSUED FOR FINAL APPROVAL	D.S.S.
1	19.05.23	INIT DESIGN PRES	D.S.S.

DRAWING ISSUES | REVISIONS

PROP EXTERIOR ELEVATIONS AND NOTES

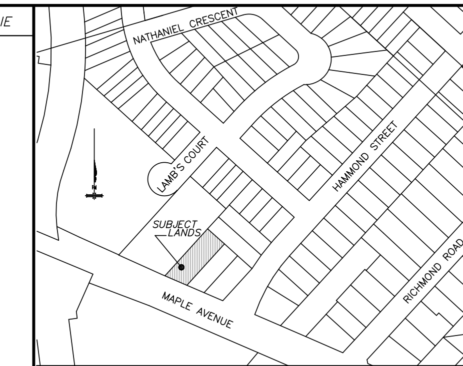
DESIGN BY	DRAWN BY	APPROVED BY
D.S.S.	J.S.	D.S.S.
SCALE	DATE	PROJECT #
3/16"=1'-0"	SEPT 20/24	22-071

DRAWING #

A5

22-071-SPA.dwg

GRANT BURLIE



KEY PLAN N.T.S.

R-4711D

SITE PLAN SHOWING PROPOSED STRUCTURE AT

759 MAPLE AVENUE

IN THE

CITY OF BURLINGTON

SCALE 1:200

0 5 10 metres

DAWID SZEREMETA O.L.S.

NOTE

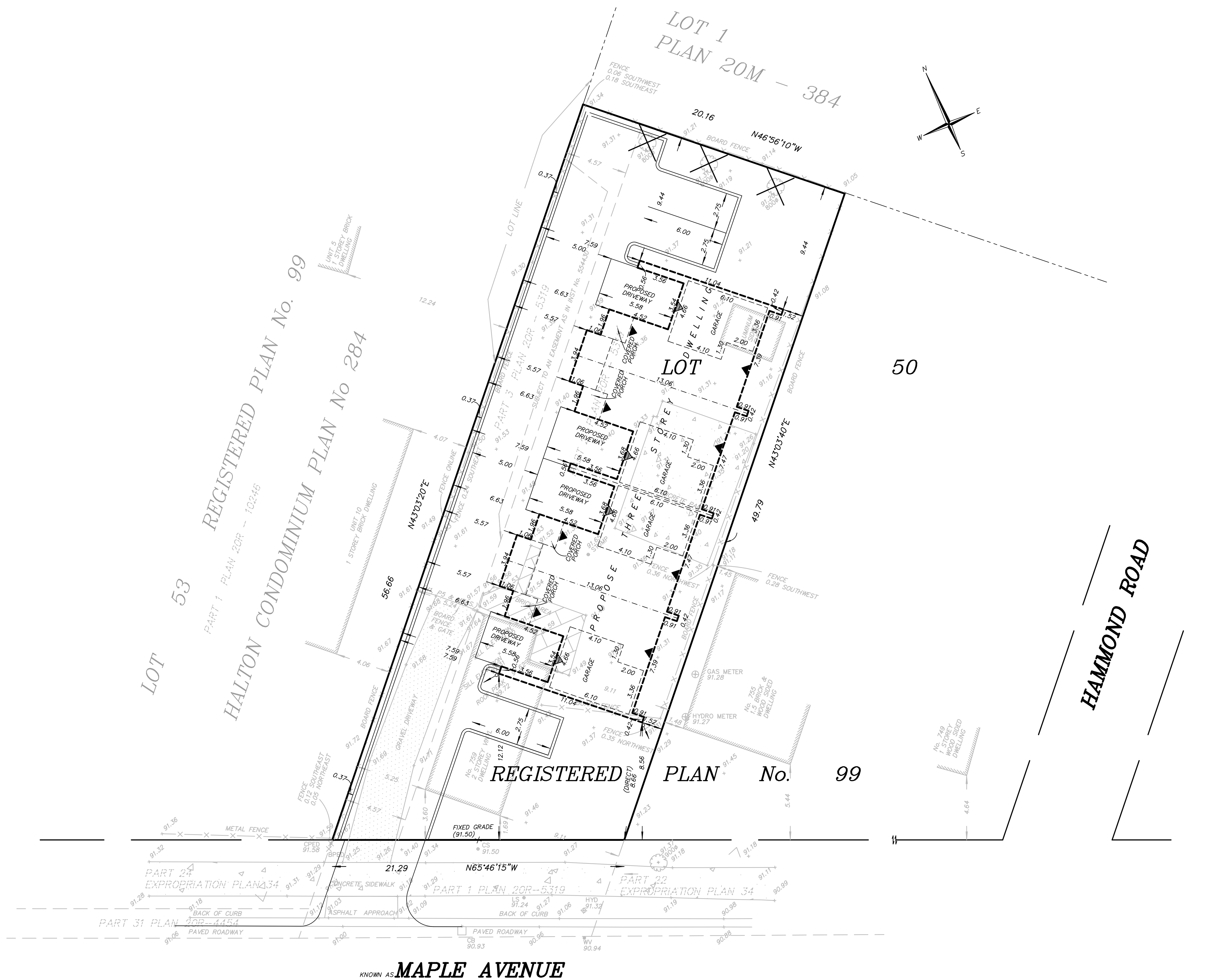
THE ABOVE LANDS ARE LEGALLY DESCRIBED AS:
PART OF LOT 50
REGISTERED PLAN No.99

Caution:
This is not a plan of survey and shall not be used except for the purpose indicated in the title block.

NOTE

THE BOUNDARIES MEASUREMENTS AND THE ELEVATIONS SHOWN ON THIS PLAN ARE DERIVED FROM A SURVEYOR' REAL PROPERTY REPORT PREPARED BY A. J. CLARKE & ASSOCIATES LIMITED DATED DECEMBER 22, 2022 (INDEXED R-4711)

TOPOGRAPHIC DETAIL DERIVED FROM PLAN R-4711, HAS BEEN REVISED TO REFLECT UPDATED TREE INVENTORY FROM SITE VISIT DATED AUGUST 2023



MUNICIPAL No 759 MAPLE AVENUE, BURLINGTON PROPOSED STREET TOWN HOUSES TWO STOREY DWELLING "H-RM5" ZONING		
	REQUIRED	PROPOSED
MIN. LOT AREA	200.0m²	1072.65m²
MAX. LOT COVERAGE	35%	(GROUND FLOOR AREA=296.29m²) 28%
MIN. LOT WIDTH	6.80m	21.29m
MIN. FRONT YARD	6.00m	8.56m
MIN. SIDE YARD	1.20m INTERIOR 0.0m	1.52m INTERIOR 0.0m
MIN. REAR YARD	9.00m	9.44m
STREET SIDE YARD	4.00m	5.57m
MIN LENGTH FOR DRIVEWAY	5.50m	5.58m
MIN. WIDTH PARKING SPACE	2.75m	2.75m

LEGEND:

CPED DENOTES CABLE PEDESTAL
BPED DENOTES BELL PEDESTAL
CB DENOTES CATCH BASIN
WV DENOTES WATER VALVE
HYD DENOTES FIRE HYDRANT
CS DENOTES CURB STOP
LS DENOTES LIGHT STANDARD
CB DENOTES CATCH BASIN
400ø DENOTES TREE DIAMETER (mm)

DENOTES DECIDUOUS TREE

DENOTES TREE TO BE REMOVED

FEBRUARY 22, 2024
DATE

ASSOCIATION OF ONTARIO LAND SURVEYORS D. SZEREMETA 2131

BEARINGS NOTE:
BEARINGS ARE ASTRONOMIC AND ARE REFERRED TO THE NORTHERLY LIMIT OF PART 1 AS SHOWN ON PLAN 20R-5319, HAVING A BEARING OF N65°46'15"W

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

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R-4711D

NOTE:
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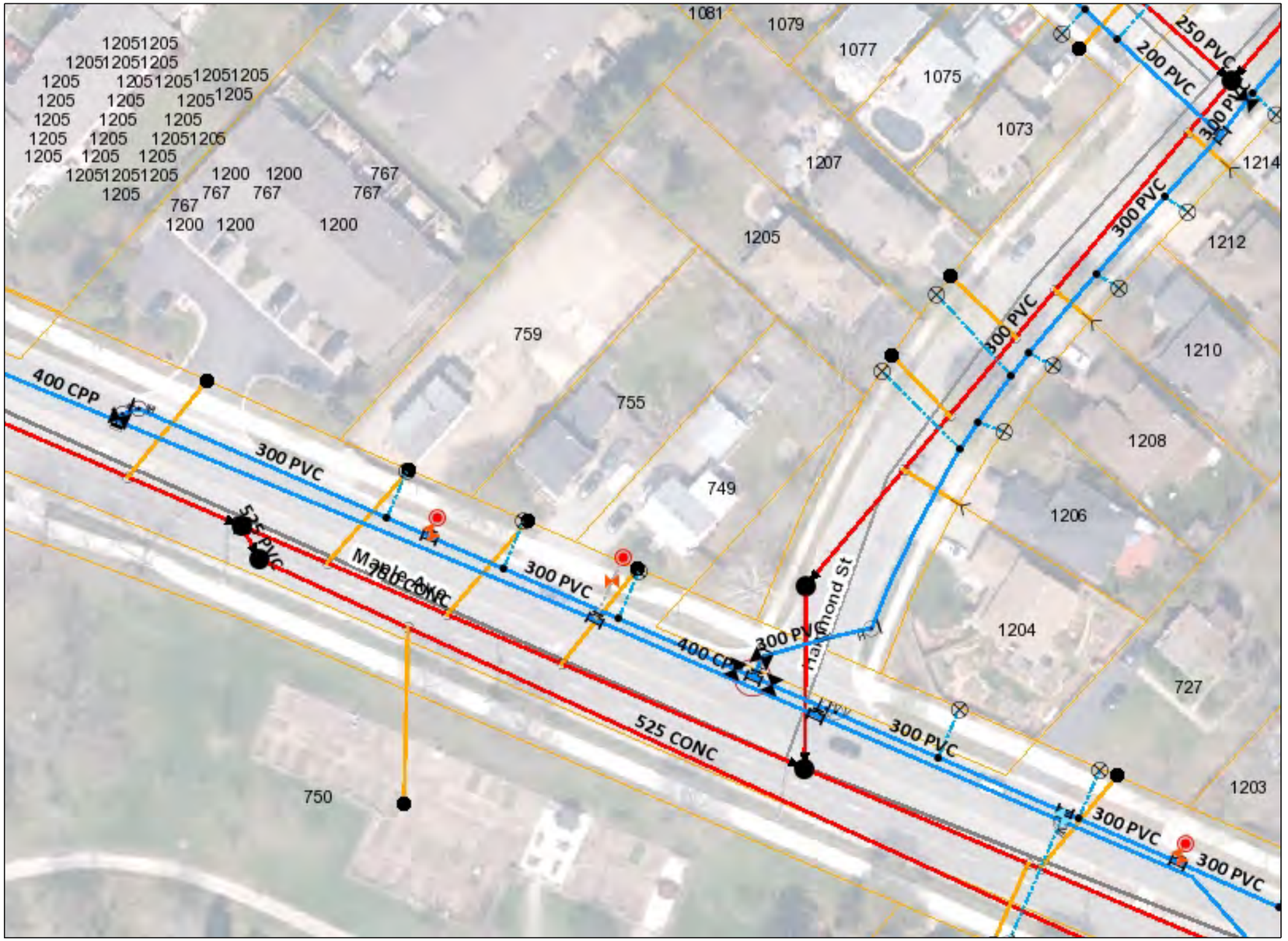
This REPORT reflects conditions at time of survey. UPDATING may be required to issue ADDITIONAL COPIES subsequent to DATE of the SURVEYOR'S CERTIFICATE.

A. J. Clarke and Associates Ltd.
SURVEYORS • ENGINEERS • PLANNERS
25 MAIN STREET WEST, SUITE 300
HAMILTON, ONTARIO, L8P 1H1
TEL. 905-528-8761 FAX 905-528-2289
email: ajc@ajclarke.com

DRAWN BY:	CHECKED BY:	PROJECT No.	INDEX No.
WS	DS	228185R	R-4711D

H:\20\RP\99\LOT50\759 Maple Avenue\Current\R-4711D.dwg

759 Maple Ave, Burlington



Legend

- Water Control Valve
  - System
  - SystemDP
  - Zone
  - ZoneDP
- Water Service Valve
  - CurbStop
  - PropertyLine
  - Secondary
  - TappingValve
- Water Hydrant
- Water Fitting
  - Cap
  - Cross
  - HBend
  - MainStop
  - Reducer
  - Sleeve
  - TappingSleeve
  - Tee
  - VBend
- Water Chamber
  - Chamber

Notes:

THIS MAP IS NOT TO BE USED FOR NAVIGATION

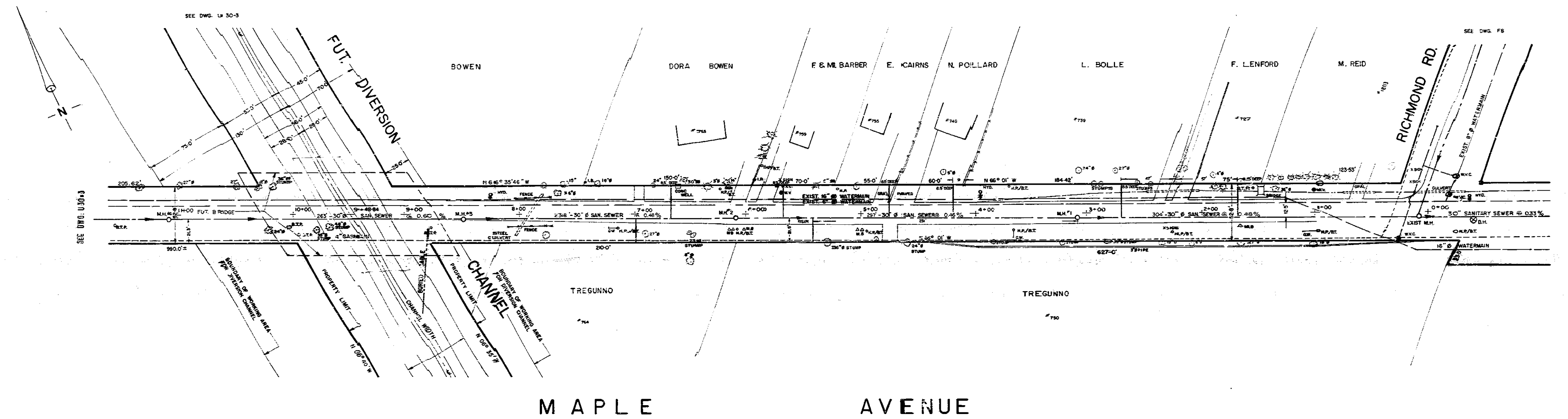
Information Valid as of: 3/6/2024

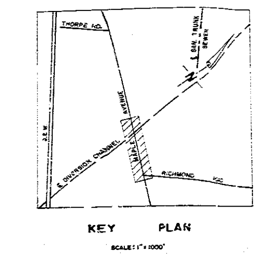
44.4 0 22.20 44.4 Metres

1: 888

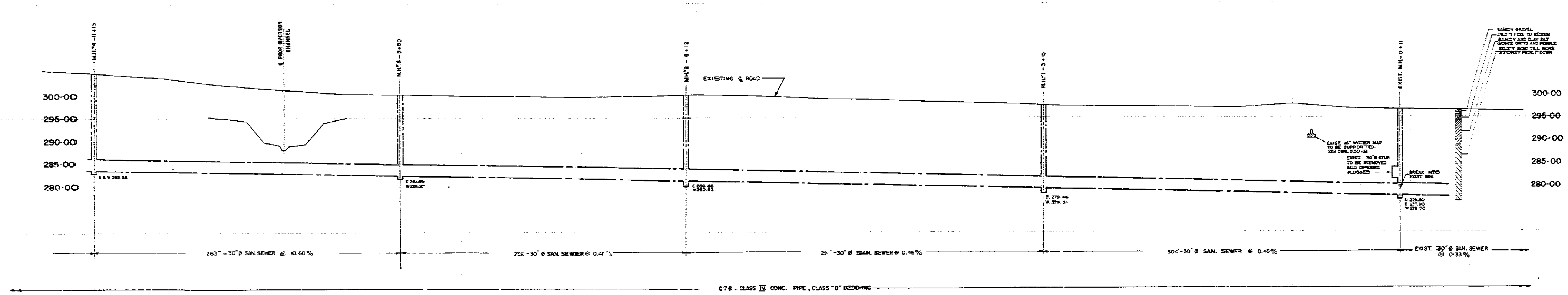
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B.M.: S/C. HYD. @ RICHMOND RD. & MAPLE AVE. — 298·00

OTHER MATERIAL WILL BE ACCEPTABLE PROVIDED APPROVAL HAS FIRST BEEN OBTAINED FROM THE ENGINEER

B2984

EXIST. ℄ ROAD	303.50	304.87	303.76	302.34	301.25	300.45	300.2	299.9	299.8	299.5	299.8	300.1	299.8	299.2	298.9	298.5	298.1	297.6	297.5	297.4	297.2	297.9	296.9	296.7
CHAINAGE	11+50	11+00	10+50	10+00	9+50	9+00	8+50	8+00	7+50	7+00	6+50	6+00	5+50	5+00	4+50	4+00	3+50	3+00	2+50	2+00	1+50	1+00	0+50	0+00

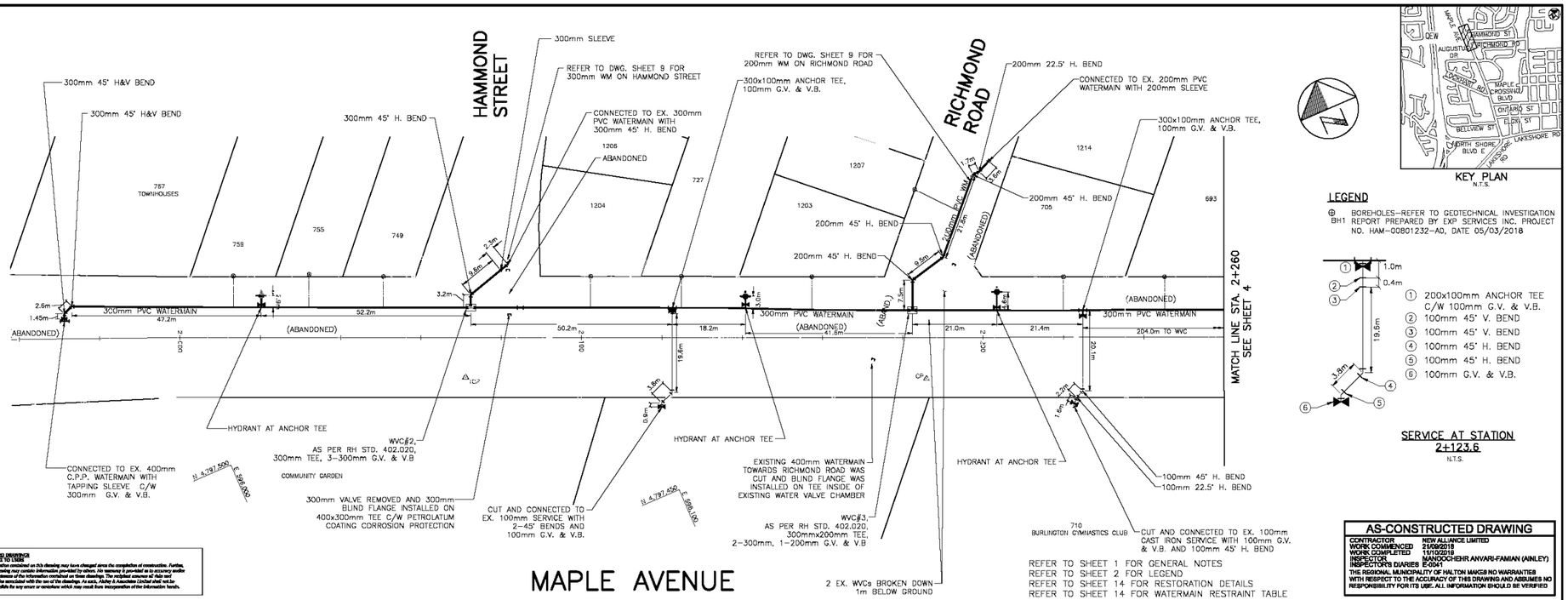
REVISION Nº	DESCRIPTION	DATE	BY
2	AS CONSTRUCTED FIELD NOTES M-96	JAN. 11/1971	R.M.
1	REVISED PROP. SAN. SEWER	SEPT. 25/69	Z.P.

CITY OF BURLINGTON
ENGINEERING DEPARTMENT

MAPLE AVENUE SANITARY TRUNK SEWER
RICHMOND ROAD TO FUT. DIVERSION CHANNEL

DESIGN	N.F.	CHK'D		FIELD NOTES	INDEX Nº
DRAWN BY	P. FERGUSON	CHK'D		M-35, M-63,	
SCALE	HOR. 1" = 40' VER. 1" = 10'	DATE	APRIL '69	REFERENCES	
APPROVED	[signature] DIRECTOR OF PUBLIC WORKS DATE - Dec 4, 1969				M 42-3

42-3



RECORD DRAWINGS
NOTICE TO USERS
Information contained on this drawing may have changed since the completion of construction. Further, this drawing may not take into account changes that occurred during construction. The contractor assumes all risks and responsibilities associated with the use of the drawings. As such, Ainley & Associates Limited shall not be responsible for any errors or omissions which may result from incorporation of the information hereon.

LEGEND

⊕ BH1 BOREHOLES–REFER TO GEOTECHNICAL INVESTIGATION REPORT PREPARED BY EXP SERVICES INC. PROJECT NO. HAM-00801232-A0, DATE 05/03/2018

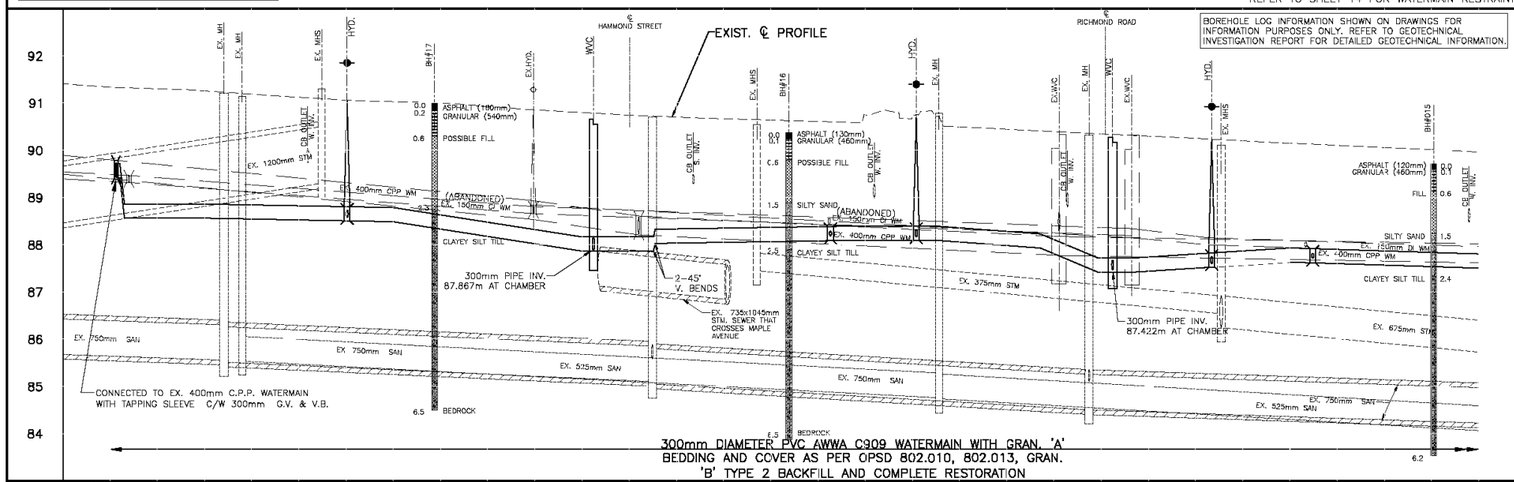
SERVICE AT STATION 2+123.6
N.T.S.

REFER TO SHEET 1 FOR GENERAL NOTES
REFER TO SHEET 2 FOR LEGEND
REFER TO SHEET 14 FOR RESTORATION DETAILS
REFER TO SHEET 14 FOR WATERMAIN RESTRAINT TABLE

AS-CONSTRUCTED DRAWING

CONTRACTOR	NEW ALLIANCE LIMITED
WORK COMMENCED	21/06/2019
WORK COMPLETED	11/10/2019
INSPECTOR'S	MANOOCHEHR ANVARI-FAMIAN (AINLEY)
INSPECTOR'S DIARIES	# 2042

THE REGIONAL MUNICIPALITY OF HALTON MAKES NO WARRANTIES WITH RESPECT TO THE ACCURACY OF THIS DRAWING AND ASSUMES NO RESPONSIBILITY FOR ITS USE. ALL INFORMATION SHOULD BE VERIFIED



℄ ELEVATIONS	91.30	91.19	91.05	91.00	90.85	90.74	90.67	90.61	90.74	90.44	90.34	90.25	90.15	90.08	89.95	℄ ELEVATIONS
WATERMAIN INVERTS																WATERMAIN INVERTS
CHAINAGE	1+980	2+000	2+020	2+040	2+060	2+080	2+100	2+120	2+140	2+160	2+180	2+200	2+220	2+240	2+260	CHAINAGE

NO	DATE	BY	REVISIONS	MANU	CAD
3	05/11/19	D.B.E.	AS CONSTRUCTED (AINLEY)		X
2	30/07/18	D.B.E.	ISSUED FOR CONSTRUCTION		X
1	18/06/18	D.B.E.	ISSUED FOR TENDER		X

DESIGN	D.B.E.	CH'KD	W.L.S.	DATE JANUARY 2018
DRAWN	T.L./J.M.M.	CH'KD	D.B.E.	

SCALE 1:500 HORIZ. 0 5 10 20
1:50 VERT. 0 0.5 1 2

REFERENCES

REGIONAL

ACCEPTED FOR CONSTRUCTION OF REGIONAL INFRASTRUCTURE

REVIEWED FOR COMPLIANCE WITH REGIONAL STANDARDS ONLY.

Director, Engineering and Construction

Manager, Capital Engineering and Construction

FIELD NOTES

STAMP

Ainley CONSULTING ENGINEERS PLANNERS

Halton Region

City of Burlington

300mm WATERMAIN INSTALLATION ON
MAPLE AVENUE
FROM 110m W OF HAMMOND ST. TO 80m E OF RICHMOND RD.
STA. 1+970 TO STA. 2+260
IN THE CITY OF BURLINGTON

CONSULTANT FILE NO. 117115

REGIONAL DRAWING NO.

CONTRACT NO.(W-3160A-18) CW-18-08

DRAWING NO. SHEET 3 OF 14

REGIONAL MUNICIPALITY OF HALTON, ITS EMPLOYEES, OFFICERS AND AGENTS ARE NOT RESPONSIBLE FOR ANY ERRORS, OMISSIONS OR INACCURACIES, WHETHER DUE TO THEIR NEGLIGENCE OR OTHERWISE. ALL INFORMATION SHOULD BE VERIFIED

CW-18-08 3 OF 14
Drawing: V:\117115\DRAWN\7 - RECORD DRAWINGS - NOVEMBER 5 2019\117115 - DPLAN.DWG
Layout: Tab: MAPLE AVE SHEET3
Date: 01/29/2020 Time: 12:56:00 PM

Appendix B

Storm Drainage Analysis

Storm Design Calculations

Pre-Development Drainage Area Plan

Post-Development Drainage Area Plan

Quality Control Sizing Report (OGS)

759 Maple Avenue

Burlie New Townhome Dev.

ARCADIS

Post-Development Runoff Coefficients

Project Name: 759 Maple Avenue
Project Number: 145252
Date: 20-Sep-24
Designed By: Sadia Kamil, B.Eng

Pre-Development (A1 - To Maple Avenue)				
Conventional Roof	74	16.3%	0.95	0.15
Green Roof:	0	0.0%	0.50	0.00
Landscaping:	297	65.4%	0.25	0.16
Permeable Pavers:	0	0.0%	0.55	0.00
Impervious:	83	18.3%	0.95	0.17
Total Area:	**454**	100%		**0.49**

Pre-Development (A2)				
Conventional Roof	13	2.0%	0.95	0.02
Green Roof:	0	0.0%	0.50	0.00
Landscaping:	532	86.0%	0.25	0.22
Permeable Pavers:	0	0.0%	0.55	0.00
Impervious:	74	12.0%	0.95	0.11
Total Area:	**619**	100%		**0.35**

Post-Development				
Conventional Roof	322	30.0%	0.90	0.27
Green Roof:	0	0.0%	0.50	0.00
Landscaping:	286	26.7%	0.25	0.07
Permeable Pavers:	0	0.0%	0.55	0.00
Impervious:	464	43.3%	0.95	0.41
Total Area:	**1,073**	100%		**0.75**
Max Rc (Rc*1.25):				**0.94**

759 Maple Avenue

Burlie New Townhome Dev.

ARCADIS

ALLOWABLE RELEASE RATE

5 - 100 -YEAR STORM SEWER DESIGN SHEET

$$I_{5\text{-year}} = \frac{802.0}{(T+5)^{0.764}} = 101.31 \text{ mm/hr}$$

$$I_{100\text{-year}} = \frac{1281.3}{(T+5)^{0.761}} = 163.18 \text{ mm/hr}$$

Project Name: 759 Maple Avenue
Project Number: 145252
Date: 20-Sep-24
Designed By: Sadia Kamil, B.Eng

	From MH	To MH	DESIGN FLOW CALCULATIONS							SEWER DESIGN & ANALYSIS									Notes
			A (ha)	R	A x R	Accum. A x R	T_c (min)	I (mm/hr)	Q_{act} (L/s)	Pipe Size (mm)	Slope (%)	Nominal Capacity Q_{cap} (L/s)	Full Flow Velocity (m/s)	Actual Velocity (m/s)	Length (m)	Time in Sect. (min)	Time (min)	Percent of Full Flow (%)	
Allowable Release Rate																			
Pre-Development 100-Year (To Maple Avenue)			0.045	0.49	0.022	0.022	10.0	163.2	**10.1**										
Post-Development Flows																			
Un-attenuated 100-Year			0.107	0.94	0.100	0.100	10.0	163.2	**45.5**										
Storm Sewer Design Sheet ***5 Year Storm***					Orifice (mm)	Area (m2)	Depth (m)	Head (m)	Q (L/s)										
				k=0.6	69	0.00374	1.07	1.03	**10.1**	200	2.00%	46.4	1.5	1.2	20.1	0.2	10.2	21.8%	Storm Service

759 Maple Avenue **Rational Method - 100 Year Storm**

759 Maple Avenue

Site Flow and Storage Summary

Burlie New Townhome Dev.

ARCADIS

$$I_{100\text{-year}} = \frac{1281.34}{(10+5)^{0.761}} = 163.18 \text{ mm/hr}$$

Project Name:	759 Maple Avenue	Area of Site =	0.107 ha
Project Number:	145252	Weighed Runoff Coefficient =	0.94
Date:	2024-09-20	Orifice Discharge (L/s) =	10.1

Time (min)	Intensity (mm/hr)	Q-100 (L/s)	Q-stored (L/s)	Storage Vol. (m³)
0	0.0	0.000	0.000	0.000
10	163.2	45.486	35.391	21.235
20	110.6	30.835	20.741	24.889
30	85.6	23.870	13.775	24.795
40	70.7	19.715	9.620	23.088
50	60.7	16.923	6.828	20.484
60	53.5	14.902	4.808	17.308
70	47.9	13.365	3.270	13.735
80	43.6	12.151	2.056	9.869
90	40.1	11.164	1.070	5.777
100	37.1	10.346	0.251	1.507
110	34.6	9.654	0.000	0.000
120	32.5	9.060	0.000	0.000
130	30.7	8.545	0.000	0.000
140	29.0	8.092	0.000	0.000
150	27.6	7.692	0.000	0.000
160	26.3	7.335	0.000	0.000
170	25.2	7.013	0.000	0.000
180	24.1	6.723	0.000	0.000
190	23.2	6.459	0.000	0.000
200	22.3	6.218	0.000	0.000
210	21.5	5.996	0.000	0.000
220	20.8	5.793	0.000	0.000
230	20.1	5.604	0.000	0.000
240	19.5	5.429	0.000	0.000
250	18.9	5.266	0.000	0.000
260	18.3	5.114	0.000	0.000
270	17.8	4.972	0.000	0.000
280	17.4	4.839	0.000	0.000
290	16.9	4.714	0.000	0.000
300	16.5	4.595	0.000	0.000
310	16.1	4.484	0.000	0.000
320	15.7	4.379	0.000	0.000
330	15.3	4.279	0.000	0.000
340	15.0	4.184	0.000	0.000
350	14.7	4.094	0.000	0.000
360	14.4	4.008	0.000	0.000

Storage Volume Required (cu.m) =	**24.9**
Storage Volume Provided (cu.m) =	**24.9**
HGL Depth (m) =	1.07
Orifice Diameter (mm) =	69

759 Maple Avenue

Burlie New Townhome Dev.

ARCADIS

Water Quality Calculations

Project Name: 759 Maple Avenue
Project Number: 145252
Date: 20-Sep-24
Designed By: Sadia Kamil, B.Eng

Manhole Storage			
Diam MH	No. MH's	Area (m2)	Volume
1.200	4.000	4.524	4.82
1.500	1.000	1.767	1.88

CB Storage			
CB Dim	No. CB's	Area (m2)	Volume
0.600	4.000	1.440	6.14

Pipe Storage				
Dia. (m)	Radius (m)	Length	Area (m2)	Volume
0.375	0.1875	109.000	0.110	12.04

Stormtech Chambers			
			Volume
			0.00

100-YEAR STORAGE CALCULATED = 24.89

759 Maple Avenue

Burlie New Townhome Dev.

ARCADIS

Water Quality Calculations

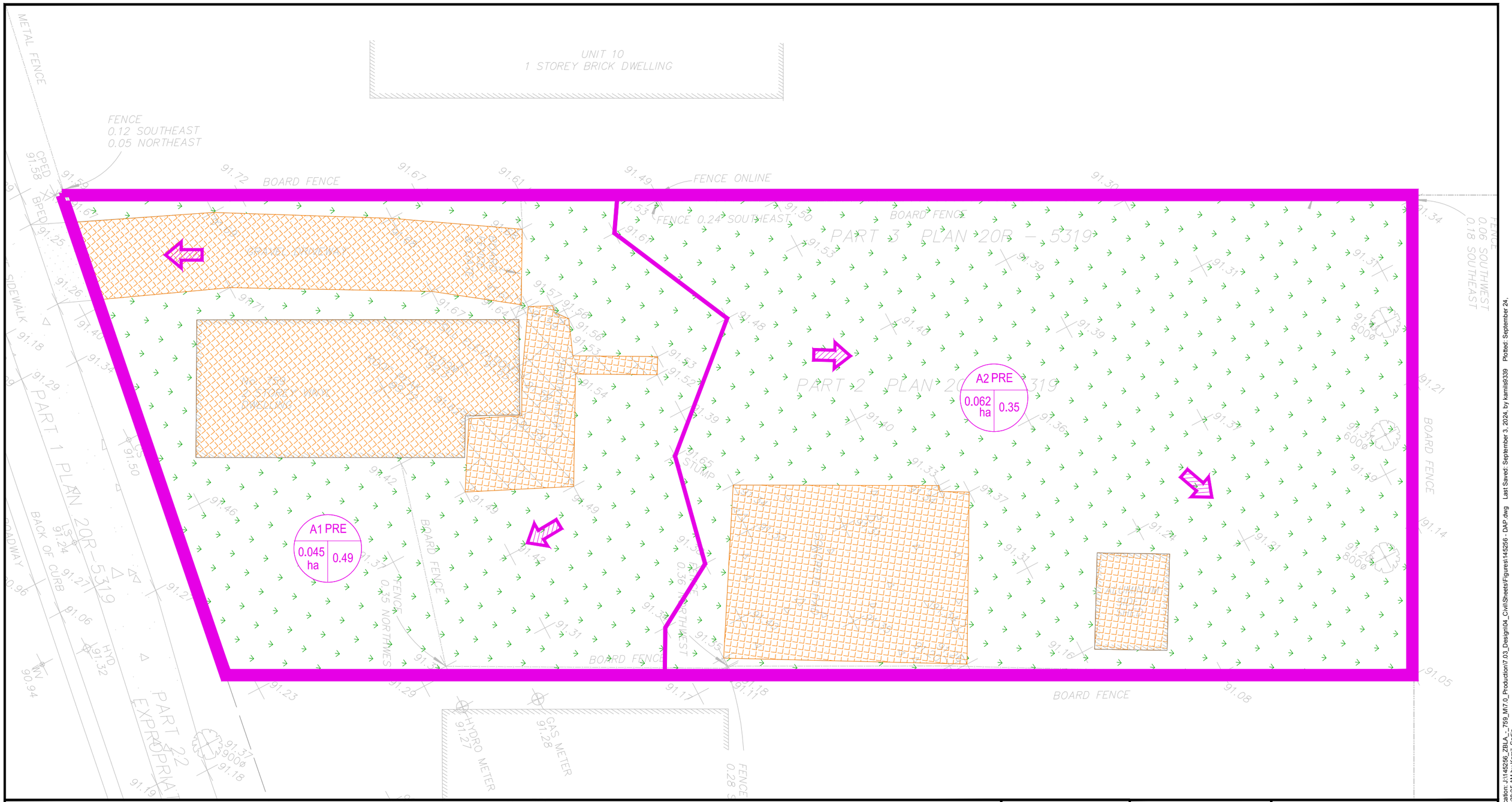
Project Name: 759 Maple Avenue
Project Number: 145252
Date: 20-Sep-24
Designed By: Sadia Kamil, B.Eng

TSS Removal (Without Treatment)

Surface	Area (m^2)		Effective TSS Removal	Overall TSS Removal
Conventional Roof	322	30.0%	80	24.0
Green Roof:	0	0.0%	80	0.0
Landscaping:	286	26.7%	80	21.3
Permeable Pavers:	0	0.0%	80	0.0
Impervious:	464	43.3%	0	0.0
Total Area:	**1,073**	100%		**45.4**

TSS Removal (With Treatment)

Surface	Area (m^2)		Effective TSS Removal	Overall TSS Removal
Conventional Roof	322	30.0%	80	24.0
Green Roof:	0	0.0%	80	0.0
Landscaping:	286	26.7%	80	21.3
Permeable Pavers:	0	0.0%	80	0.0
Impervious:	464	43.3%	0	0.0
OGS EFO4				66.0
Total Area:	**1,073**	100%		**111.4**



LEGEND

- PROPERTY LINE
- EXISTING OVERLAND FLOW ROUTE
- DRAINAGE AREA BOUNDARY
- A1 PRE / 4.157 ha / 0.20 — STORM DRAINAGE AREA NUMBER; DRAINAGE AREA (ha); ALLOWABLE RUNOFF COEFFICIENT
- LANDSCAPING (RUNOFF COEFF = 0.25)
- HARD SURFACE (RUNOFF COEFF. = 0.90)

BURLIE NEW TOWNHOME DEV.

759 MAPLE AVENUE
BURLINGTON, ON

PROJECT NAME
COMMERCIAL DEVELOPMENT
759 MAPLE, BURLINGTON, ON

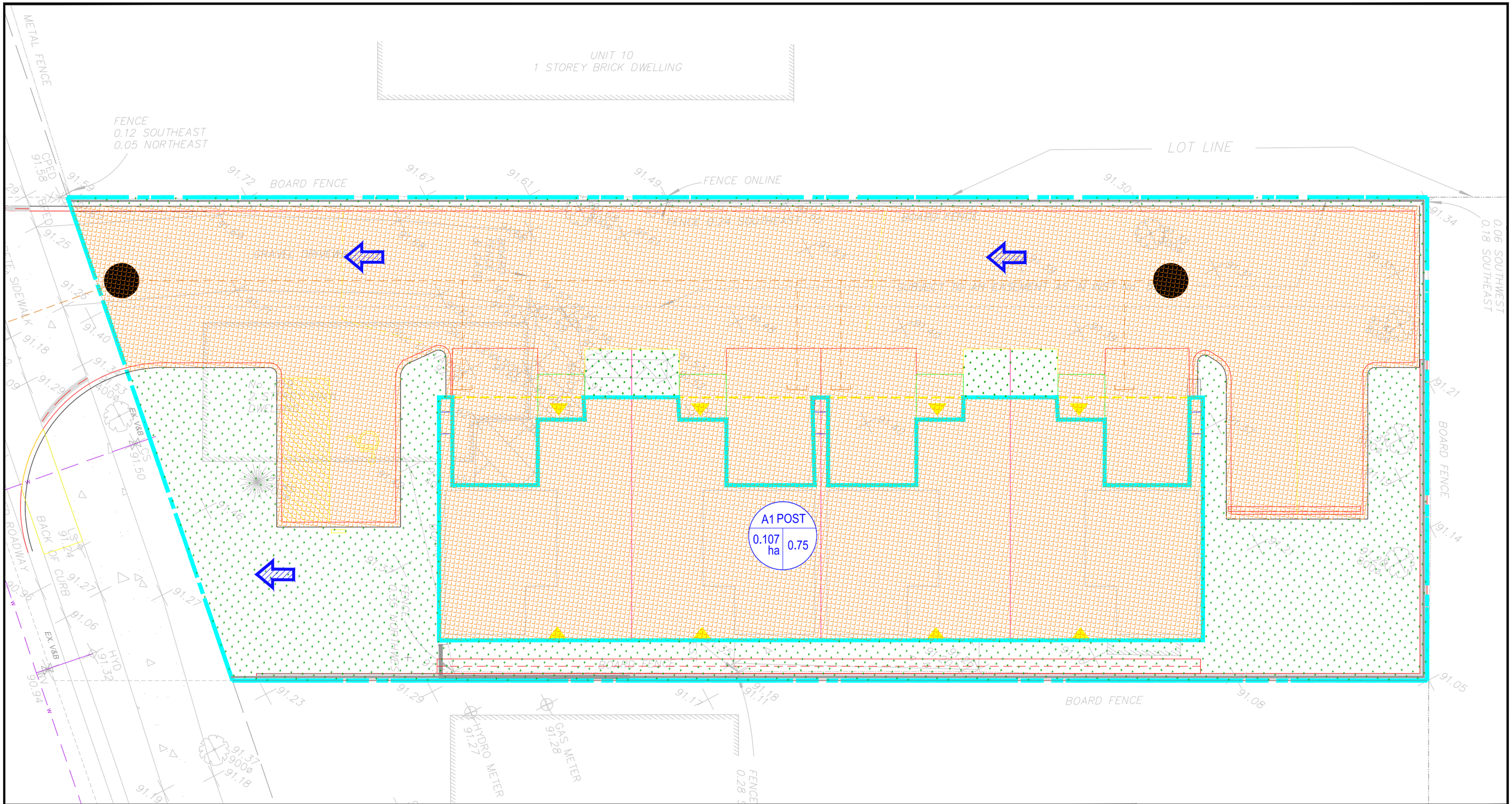
ARCADIS
360 James Street North - Suite 200
Hamilton ON L8L 1H5 Canada
tel 905 546 1010
www.arcadis.com

SCALE:	DATE:
NTS	AUG 2024
PROJECT ENG:	DRAWN BY:
SK	SK
CHECKED BY:	APPROVED BY:
SK	IQ
PROJECT NO:	
145256	

FIGURE NAME: PRE-DEVELOPMENT DRAINAGE AREA PLAN
FIGURE NO.: DAP-01
REVISION: 01

SCALE CHECK 1 in 10mm

File Location: J:\145256_ZBLA_-_759_M\7.0_Production\7.03_Design\04_Civil\Sheets\Figures\145256 - DAP.dwg Last Saved: September 3, 2024, by kamils9339 Plotted: September 24, 2024 9:38:35 AM by Kamil, Sadia



LEGEND

- PROPERTY LINE
- PROPOSED OVERLAND FLOW ROUTE
- DRAINAGE AREA BOUNDARY
- A1 POST (4.157 ha | 0.20) — STORM DRAINAGE AREA NUMBER; DRAINAGE AREA (ha); ALLOWABLE RUNOFF COEFFICIENT
- LANDSCAPING (RUNOFF COEFF = 0.25)
- HARD SURFACE (RUNOFF COEFF. = 0.90)

BURLIE NEW TOWNHOME DEV.

759 MAPLE AVENUE
BURLINGTON, ON

PROJECT NAME
COMMERCIAL DEVELOPMENT
759 MAPLE, BURLINGTON, ON

ARCADIS
360 James Street North - Suite 200
Hamilton ON L8L 1H5 Canada
tel 905 546 1010
www.arcadis.com

SCALE:	DATE:
NTS	AUG 2024
PROJECT ENG:	DRAWN BY:
SK	SK
CHECKED BY:	APPROVED BY:
SK	IQ
PROJECT NO:	
145256	

FIGURE NAME: POST-DEVELOPMENT DRAINAGE AREA PLAN

FIGURE NO.: DAP-02

REVISION: 01

SCALE CHECK 1 in 10mm

File Location: J:\145256_ZBLA_-_759_MI7.0_Production\7.03_Design\04_Civil\Sheets\Figures\145256 - DAP.dwg Last Saved: August 30, 2024, by kamils9339 Plotted: August 30, 2024 3:50:54 PM by Kamil Sadia

Stormceptor®

Rinker MATERIALS™

Stormceptor® EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

03/26/2024

Province:	Ontario
City:	Burlington
Nearest Rainfall Station:	HAMILTON RBG CS
Climate Station Id:	6153301
Years of Rainfall Data:	20

Site Name:	

Drainage Area (ha):	0.11
Runoff Coefficient 'c':	0.95

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	3.27
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	12.10
Peak Conveyance (maximum) Flow Rate (L/s):	12.30
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	99
Estimated Average Annual Sediment Volume (L/yr):	80

Project Name:	759 Maple Avenue
Project Number:	145252
Designer Name:	Sadia Kamil
Designer Company:	Arcadis
Designer Email:	sadia.kamil@arcadis.com
Designer Phone:	416-206-8077
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	66
EFO6	69
EFO8	70
EFO10	70
EFO12	70

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 66

Water Quality Runoff Volume Capture (%): > 90

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THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

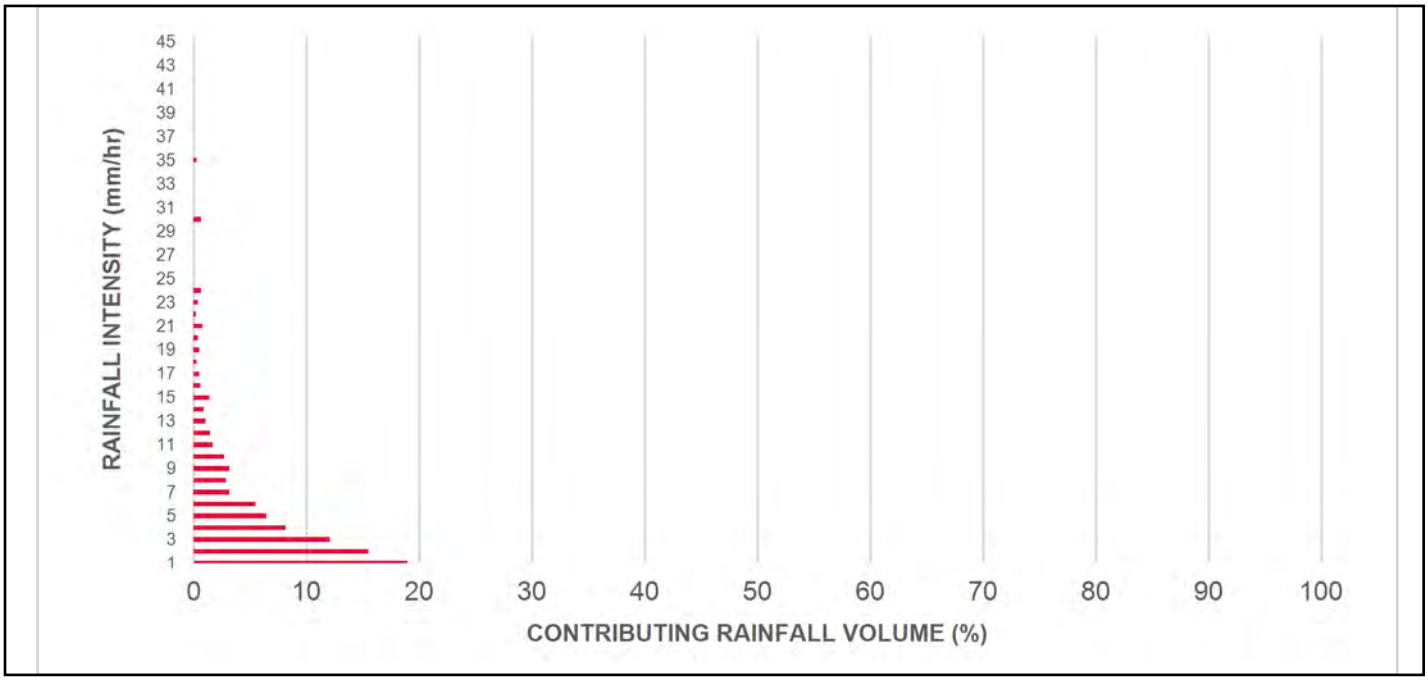
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Upstream Flow Controlled Results

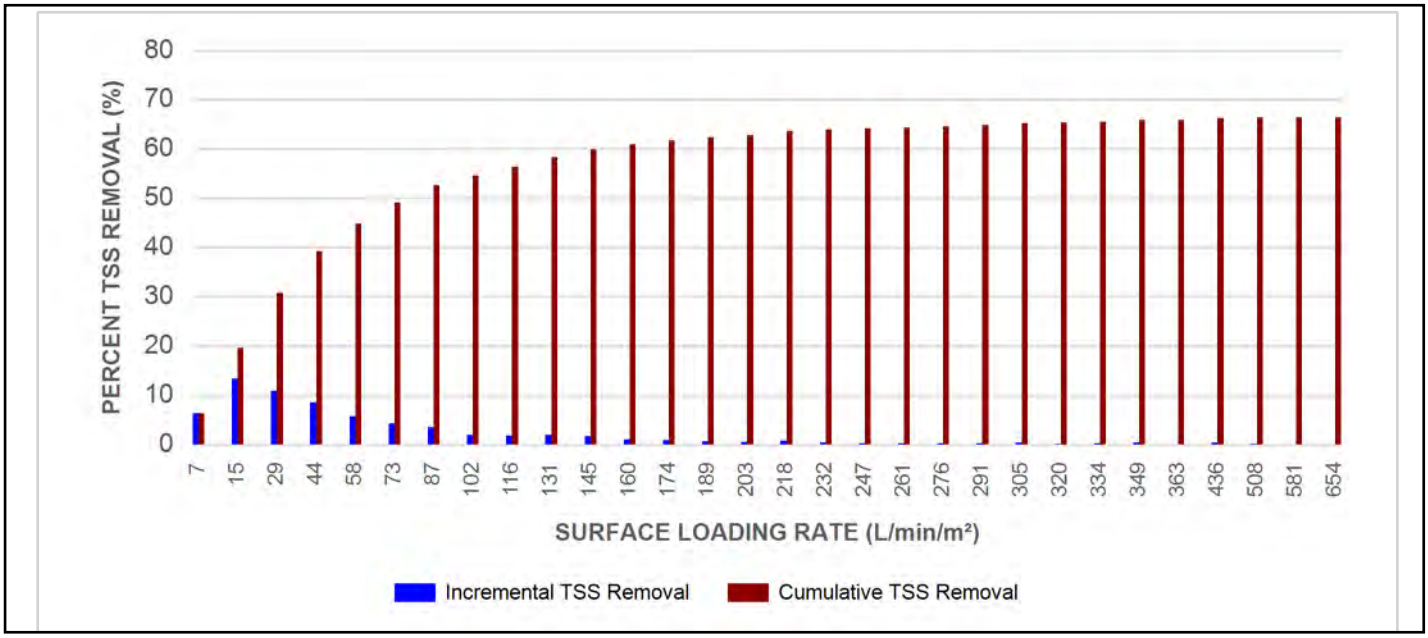
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	9.1	9.1	0.15	9.0	7.0	70	6.4	6.4
1.00	19.0	28.0	0.29	17.0	15.0	70	13.4	19.7
2.00	15.5	43.5	0.58	35.0	29.0	70	10.9	30.7
3.00	12.1	55.6	0.87	52.0	44.0	70	8.5	39.2
4.00	8.2	63.8	1.16	70.0	58.0	69	5.6	44.8
5.00	6.5	70.4	1.45	87.0	73.0	66	4.3	49.1
6.00	5.5	75.9	1.74	105.0	87.0	64	3.5	52.6
7.00	3.2	79.0	2.03	122.0	102.0	62	2.0	54.6
8.00	2.9	81.9	2.32	139.0	116.0	62	1.8	56.4
9.00	3.2	85.2	2.61	157.0	131.0	60	1.9	58.3
10.00	2.7	87.9	2.91	174.0	145.0	59	1.6	59.9
11.00	1.7	89.6	3.20	192.0	160.0	57	1.0	60.9
12.00	1.5	91.1	3.49	209.0	174.0	57	0.8	61.7
13.00	1.1	92.2	3.78	227.0	189.0	56	0.6	62.3
14.00	0.9	93.1	4.07	244.0	203.0	54	0.5	62.8
15.00	1.4	94.5	4.36	261.0	218.0	54	0.8	63.6
16.00	0.6	95.1	4.65	279.0	232.0	53	0.3	63.9
17.00	0.5	95.6	4.94	296.0	247.0	53	0.3	64.2
18.00	0.3	95.9	5.23	314.0	261.0	52	0.2	64.3
19.00	0.5	96.4	5.52	331.0	276.0	52	0.3	64.6
20.00	0.4	96.8	5.81	349.0	291.0	51	0.2	64.8
21.00	0.8	97.6	6.10	366.0	305.0	51	0.4	65.2
22.00	0.2	97.8	6.39	383.0	320.0	50	0.1	65.3
23.00	0.4	98.2	6.68	401.0	334.0	50	0.2	65.5
24.00	0.7	98.9	6.97	418.0	349.0	50	0.3	65.9
25.00	1.1	100.0	7.26	436.0	363.0	49	0.5	66.4
30.00	0.7	100.7	8.72	523.0	436.0	47	0.4	66.7
35.00	0.3	101.1	10.17	610.0	508.0	45	0.2	66.9
40.00	-1.1	100.0	11.62	697.0	581.0	43	N/A	66.4
45.00	0.0	100.0	12.00	720.0	600.0	42	0.0	66.4
Estimated Net Annual Sediment (TSS) Load Reduction =								**66 %**

Climate Station ID: 6153301 *Years of Rainfall Data*: 20

RAINFALL DATA FROM HAMILTON RBG CS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

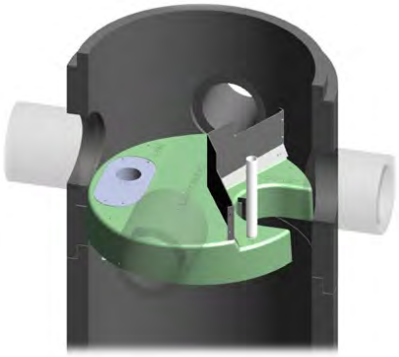
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

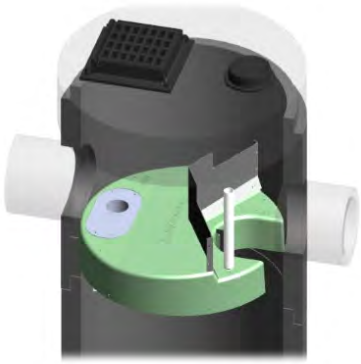
DESIGN FLEXIBILITY

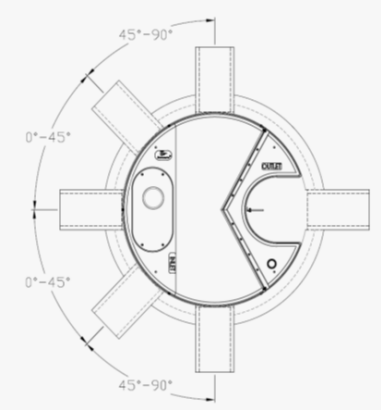
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit** S**eparators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

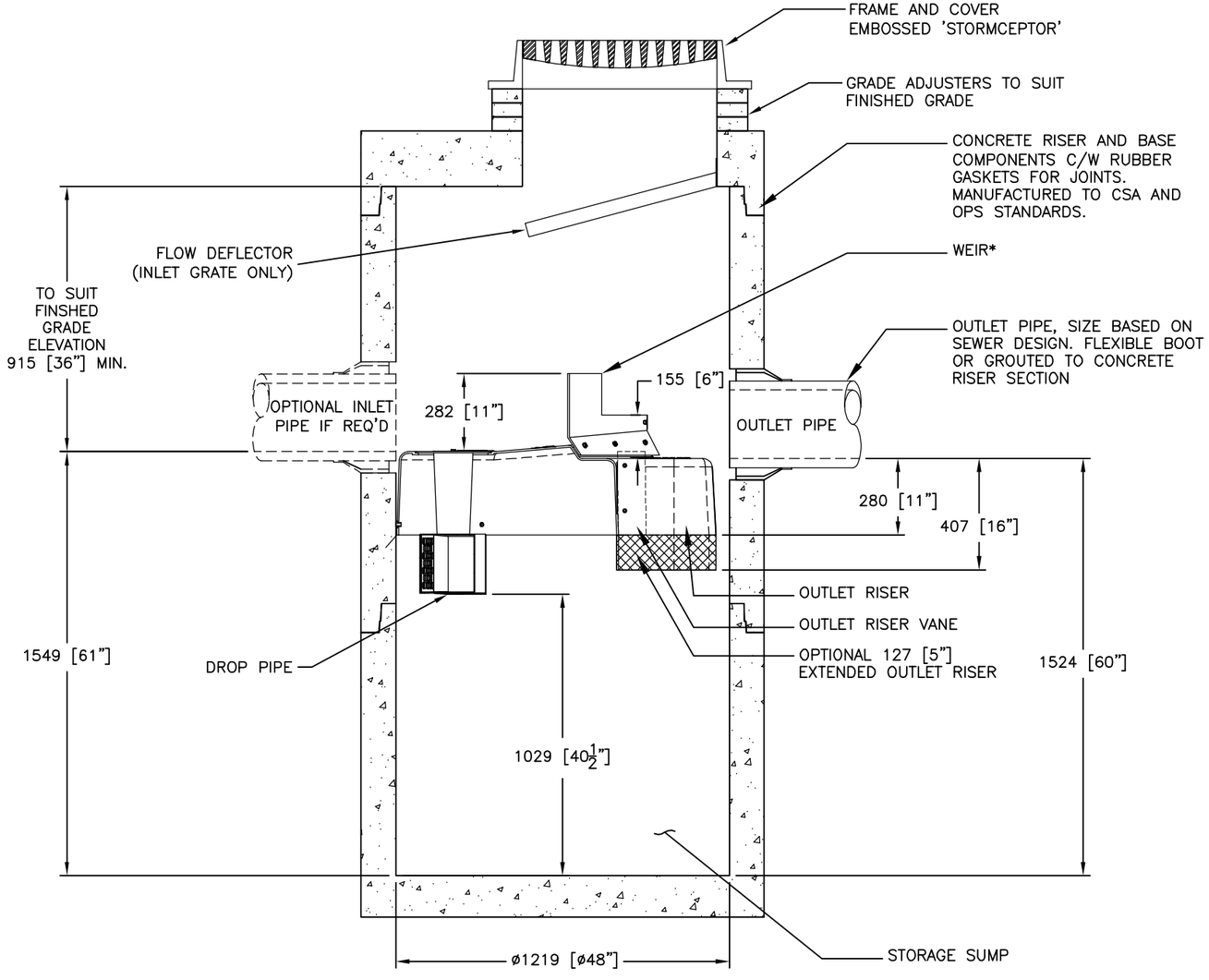
3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

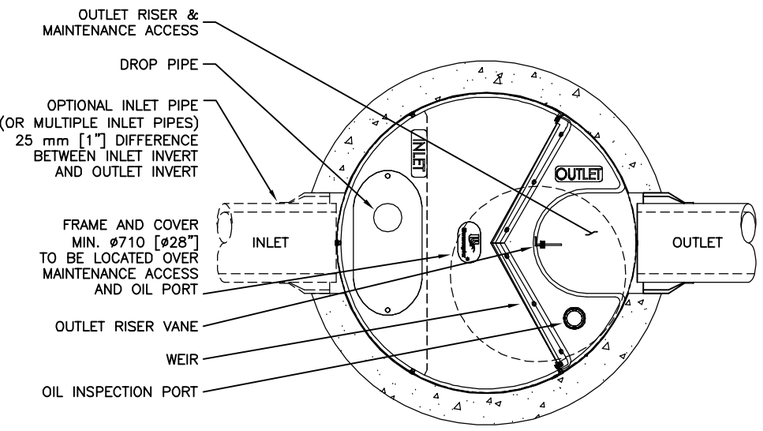
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

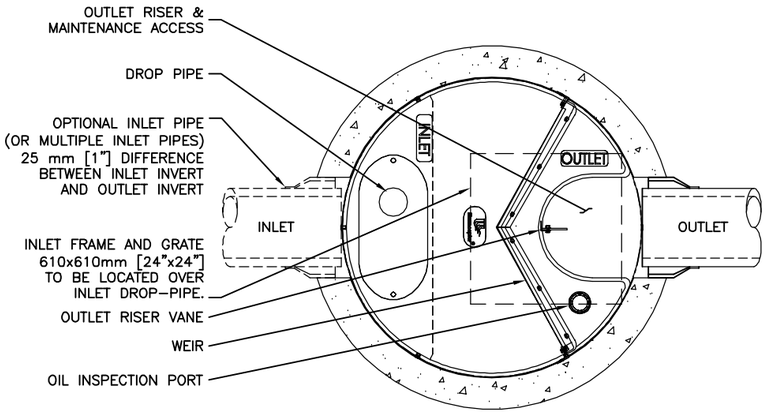
3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF4 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO4 (OIL CAPTURE CONFIGURATION). WEIR HEIGHT IS 150 mm (6 INCH) FOR EF04.

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO4
STRUCTURE ID	*
HYDROCARBON STORAGE REQ'D (L)	*
WATER QUALITY FLOW RATE (L/s)	*
PEAK FLOW RATE (L/s)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
DRAINAGE AREA (HA)	*
DRAINAGE AREA IMPERVIOUSNESS (%)	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

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MARK	DATE	REVISION DESCRIPTION	BY
1	6/8/18	UPDATES	JSK
0	5/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

SCALE = NTS

imbrium®
407 FAIRVIEW DRIVE, WHITBY, ON, L1N 9A9
TF 800-565-4501 CA 416-800-9000 INTL +1-416-800-9000

DATE: 10/13/2017

DESIGNED:	DRAWN:
JSK	JSK
CHECKED:	APPROVED:
BSF	SP
PROJECT No.:	SEQUENCE No.:
EFO4	*

SHEET: 1 OF 1

Appendix C

Sanitary Analysis

Sanitary Design Calculations

759 Maple Avenue

Burlie New Townhome Dev.

ARCADIS

Sanitary Sewer Design Sheet

Post-development San. Flow =	275 L/c/d	Mannings=	0.013
Infiltration (dry weather) =	0.286 L/s/ha	Minimum flow velocity =	0.60 m/s
		Maximum flow velocity =	3.00 m/s

Project Name: 759 Maple Avenue
Project Number: 145252
Date: 22-Mar-24
Designed By: Sadia Kamil, B.Eng

	DESIGN FLOW CALCULATIONS										SEWER DESIGN & ANALYSIS							
	Area (ha)	Density	Population	Cumulative Area (ha)	Cumulative Population	Peaking Factor (raw)	Peaking Factor (adjusted)	Sewage Flow (L/s) *(1)*	Infiltration Flow (L/s) *(2)*	Total Flow, Qd (L/s)	Nominal Diameter (mm)	Pipe Slope (%)	Pipe Length (m)	Full Flow Capacity, Qf (L/s)	Full Flow Velocity (m/s)	Actual Velocity V (m/s)	Percent of Full Flow (%)	Notes
Pre-Development																		
	0.107	100.0 pp/ha	11	0.107	11	12	4	0.136	0.031	0.17								
Post-Development																		
Townhouse Dwellings	0.107	135.0 pp/ha	14	0.107	14	12	4	0.184		0.18								
Infiltration	0.107			0.107					0.03	0.03								
		Total	**14**						**Total**	**0.21**	100	4.00%	17.9	10.8	1.33	0.52	**1.9%**	

Number of Units	
Townhouse Dwellings	4

Appendix D

Water Analysis

Water Demand Calculations

Hydrant Flow Test

759 Maple Avenue

Burlie New Townhome Dev.

ARCADIS

DOMESTIC DEMAND CALCULATIONS

Project Name: 759 Maple Avenue
Project Number: 145252
Date: 22-Mar-24
Designed By: Sadia Kamil, B.Eng

1. Based on the City of Burlington Standards
2. OBC, Part 8 "Sewage Systems", OBC Table 8.2.1.3.A and 8.2.1.3.B
3. 275 L/cap/day based on Halton Region Engineering Standards
4. Population Density based on 55 pp/ha

Peaking Factors		
Land Use	Peak Hour	Maximum Day
Residential	4.00	2.25

Component	Area (ha)	Density	Population	ADD (L/s)	*(ADDxP.F.)* PHD (L/s)	*(ADDxP.F.)* MDD (L/s)
Semi-Detached Dwellings	0.107	135.0 pp/ha	14	0.06	0.24	0.14
		Totals	**14**	**0.06**	**0.24**	**0.14**

FIRE FLOW DEMAND CALCULATIONS

Based on the Water Supply for Public Fire Protecetion Manual, 1999 by the Fire Underwriters Survey

Step 1: Calculate Fire Flow (based on area)

Construction Coefficient =	1.0	
Third Floor =	266	m2
Second Floor =	266	m2
First Floor =	266	m2
Area =	797	m2
Fire Flow (F) =	**6,000**	L/min

$$F = 220C\sqrt{A}$$

F = required fire flow (L/min)
C = coefficient related to type of construction
0.6 for fire resistive (fully protected, 3-hr ratings)
0.8 for non combustable (i.e. unprotected metal buildings)
1.0 for ordinary construction
1.5 for wood frame construction
A = total floor area excluding basements 50% below grade

** If vertical openings are inadequately protected, consider two largest two largest adjoining floors plus 50% of each of any floors above up to eight floors.*
** If vertical openings are adequately protected (one hour rating), consider largest floor area + 25% of two immediately floors.*

Step 2: Adjustment for Building Occupancy (shall not be less than 2000 L/s)

Occupancy Adjustment =	-0.15				
F_1 = Fire Flow x Adjustment =	**5,100**	L/min			
			Non-Combustable	-25%	Free Burning	15%
			Limited (Combustable)	-15%	Rapid Burning	25%
				No change		

Step 3: Adjust F1 for Fire Supression System

Sprinkler Adjustment =	0%			
$F_2 = F_1$ x Adjustment =	**0**	L/min		
			Automatic Sprinklers (monitored)	-50%
			Adequately Designed System	-30%

Step 4: Adjust F1 for Exposure / Proximity (shall not exceed 75%)

Proximity Adjustment =	40%	(max 75%)
$F_3 = F_1$ x Factor =	**2,040**	L/min

Separation	Adjustment	Separation	Adjustment
0m to 3m	25%	20.1m to 30m	10%
3.1m to 10m	20%	30.1m to 45m	5%
10.1m to 20m	15%		

Step 5: Calculate Adjusted Fire Flow (shall not be less than 2000 L/min or greater than 45,000 L/min)

F_1 =	5,100	L/min
- F_2 =	0	L/min
+ F3 =	2,040	L/min
Fire Flow =	7,000	L/min
Fire Flow =	**116.7**	L/s
Total Demand (Fire Flow + MDD) =	**116.8**	L/s

$$\text{Fire Flow} = F_1 - F_2 + F_3$$

Checks:
Fire Flow greater than 2000 L/min
Fire Flow less than 45,000 L/min

759 Maple Avenue

Burlie New Townhome Dev.

ARCADIS

Head Loss Calculations

Project Name: 759 Maple Avenue
Project Number: 145252
Date: 2024-03-22
Designed By: Sadia Kamil, B.Eng

Hydrant Flow Test Results

Flow (gpm)	Flow (L/s)	Flow (L/min)	Pressure (psi)	Pressure (kPa)
0	0.00	0	62	427
1,087	68.58	4,115	60	414
1,744	110.03	6,602	59	407

(1 gal = 3.785 L)

Residual Pressure at Main

Source: Walski, Thomas M. (2007): Advanced Water Distribution Modeling and Management

$$Q_R = Q_F \times \frac{hr^{0.54}}{hf^{0.54}}$$

where: Q_R = flow predicted at desired residual pressure
Q_F = total flow measured during test
h_r = pressure drop to desired residual pressure
h_f = pressure drop to measured during test

	Flow (gpm)	Flow (L/s)	Flow (L/min)	Residual Pressure @ Main (psi)	Residual Pressure @ Main (kPa)
Domestic	4	0.24	14	**62.0**	**427**
Fire	2,380	150.14	9,008	**56.7**	**391**

Residual Pressure at Building

$$h_L = \frac{10.675 * L * Q^{1.85}}{C^{1.85} * D^{4.8655}}$$

where: h_L = Pressure Drop (m)
L = Length of Service (m)
Q = Flow Rate (m^3/s)
C = Roughness Coefficient
D = Pipe Diameter (m)

	Domestic	
L=	47.7	m
Q=	0.000	m^3/s
C=	100	
D=	150	mm
h_L=	**0.0**	m
h_L=	**0.0**	in
h_L=	**0.0**	psi
h_L=	**0.0**	kPa

	Fire	
L=	47.7	m
Q=	0.150	m^3/s
C=	120	
D=	300	mm
h_L=	**0.8**	m
h_L=	**29.9**	in
h_L=	**1.1**	psi
h_L=	**7.5**	kPa

	Flow (gpm)	Flow (L/s)	Flow (L/min)	Residual Pressure @ Bldg. (psi)	Residual Pressure @ Bldg. (kPa)
Domestic	4	0.2	14	**62.0**	**427**
Fire	2,380	150.1	9,008	**55.6**	**383**

Residual Pressure (DOMESTIC) at building is greater than 40 psi (275 kPa).

Residual Pressure (FIRE) at building is greater than 20 psi (140 kPa).

Hydrant Flow Testing

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

Date of Testing	01-Dec-2023
Project Number:	145256
Test ID	H2023-062
Site Location / Address:	759 Maple Ave
Region / Municipality	Burlington
Hydrants Opened By:	Halton
Tested by:	Daniel S Linda P

HYDRANT TEST LOCATION - RESIDUAL HYDRANT=R, FLOW HYDRANT=F (NORTH AT TOP)

.



Test Data

Time of Test	1:25 PM
Pipe Size (mm)	-
Flow Hydrant Test Location (description)	767 Maple Ave and 2nd hydrant west of Hammond
Residual Hydrant Test Location (description)	759 Maple Ave and 3rd hydrant west of Hammond
Static Pressure(PSIG)	62

Q1 Test Data (1 Orifice)

# OUTLETS	ORIFICE SIZE(IN)	PITOT PRESSURE(PSIG)	FLOW(USGPM)	RESIDUAL PRESSURE(PSIG)
1	2.5	42	1087	60

QT Test Data (2 Orifices)

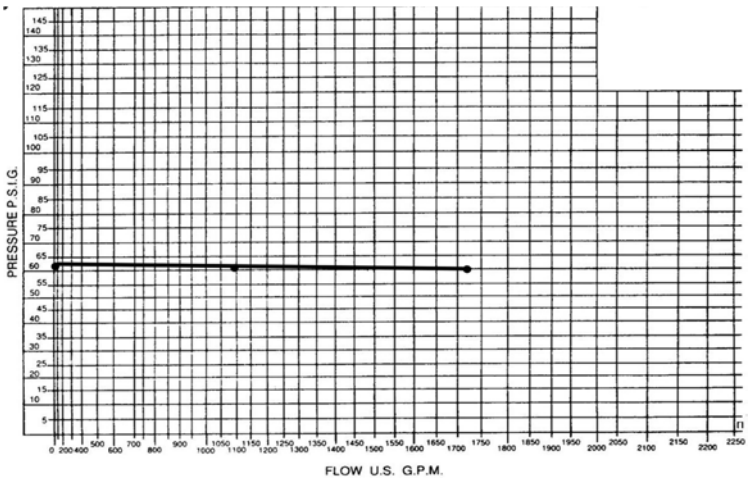
# OUTLETS	ORIFICE SIZE(IN)	PITOT PRESSURE(PSIG)	FLOW(USGPM)	RESIDUAL PRESSURE(PSIG)
2	2.5	27	1744	59

Calculations

FORMULA: Q= 29.83 cd^2√p.....Where: c- coefficient of discharge (1 in smooth pipe)
..... d- pipe diameter (inches)
.....p- pitot reading (psig)

Q1 - 1 Orifice(s)	Q1= (29.83)(0.9)(2.5)^2 √42=1087
QT - 2 Orifice(s)	QT= 2(29.83)(0.9)(2.5)^2 √27=1744
Static Pressure(PSIG)	62

Test Results Plot



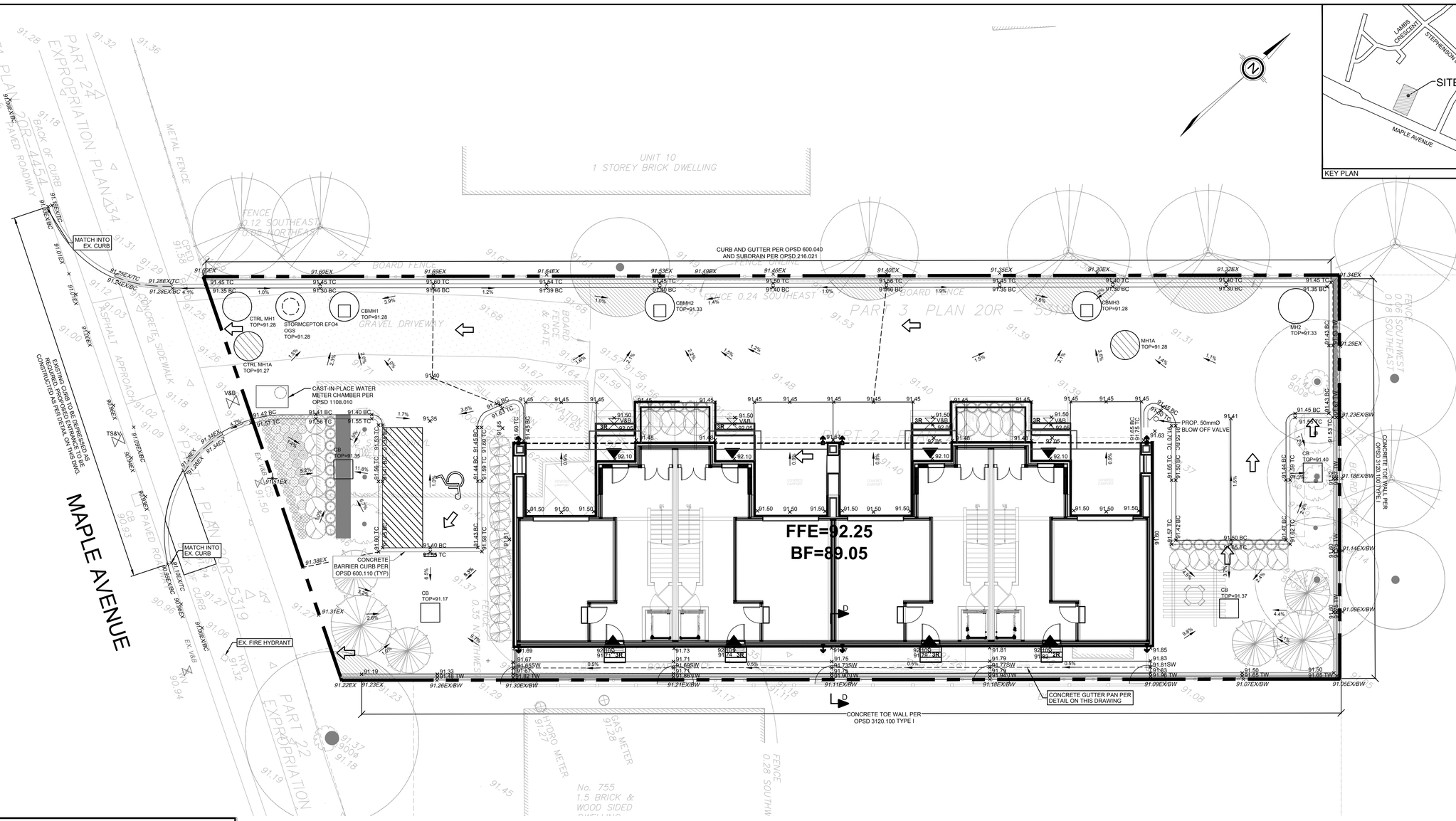
Appendix E

Engineering Exhibits

Site Grading Exhibit (SG-01)

Site Servicing Exhibit (SS-01)

Arcadis Professional Services (Canada) Inc.
Suite 200, East Wing – 360 James Street North
Hamilton, ON, L8L 1H5
Canada
Phone: 1 905 546 1010
www.arcadis.com



KEY PLAN

CLIENT

BURLIE NEW TOWNHOME DEV.

759 Maple Avenue, Burlington, ON

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ISSUES

No.	DESCRIPTION	DATE
1	ISSUED FOR ZBA	2024-03-28
2	ISSUED FOR DRAFT	2024-09-26

LEGEND

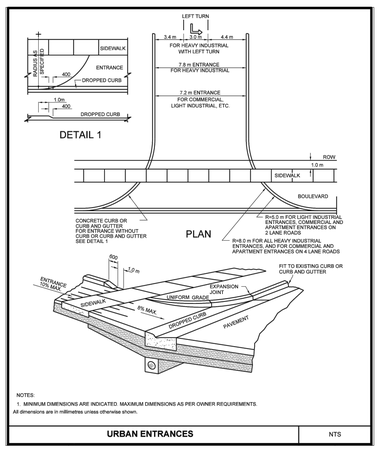
- PROPERTY LINE
- PROPOSED GRADE ×149.50
- EXISTING GRADE ×149.33EX
- EXISTING GRADE (BOTTOM OF WALL) ×149.33EX/BW
- EXISTING GRADE (BOTTOM OF CURB) ×149.33EX/BC
- EXISTING GRADE (TOP OF CURB) ×149.33EX/TC
- PROPOSED GRADE (TOP OF WALL) ×149.89TW
- PROPOSED GRADE (BOTTOM OF WALL) ×147.58BW
- PROPOSED GRADE (TOP OF CURB) ×149.65TC
- PROPOSED GRADE (BOTTOM OF CURB) ×149.50BC
- PROPOSED GRADE (TOP OF CURB CUT) ×149.65TCC
- PROPOSED GRADE (BOTTOM OF CURB CUT) ×149.50BCC
- PROPOSED STORM MANHOLE
- PROPOSED CATCH BASIN
- HIGH POINT RIDGE
- LIMIT OF ROOF
- PROPOSED SANITARY MANHOLE
- PROPOSED VALVE AND BOX ⋈ V&B
- PROPOSED SIAMESE CONNECTION
- PROPOSED BLOW OFF VALVE
- EXISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE
- EXISTING CATCH BASIN
- EXISTING FIRE HYDRANT EX.FH
- EMERGENCY OVERLAND FLOW ROUTE
- EXISTING OVERLAND FLOW ROUTE
- FFE (FINISHED FLOOR ELEVATION) FFE=104.50
- DOORS
- CURB (DEPR., H=0.05m)
- CURB (FLUSH, H=0m)

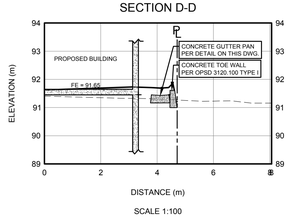
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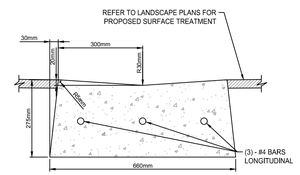
ARCADIS
360 James Street North - Suite 200
Hamilton ON L8L 1H5 Canada
tel 905 546 1010
www.arcadis.com

PROJECT
RESIDENTIAL DEVELOPMENT

759 MAPLE, BURLINGTON, ON







LIST OF DRAWINGS
SG-01 - SITE GRADING PLAN
SS-01 - SITE SERVICING PLAN

PROJECT NO: 145256	
DRAWN BY: KP	CHECKED BY: SK
PROJECT MGR: IQ	APPROVED BY: IQ

SITE PLAN INFORMATION
ARCADIS
55 ST.CLAIRE AVENUE WEST,
TORONTO, ON M4V 2Y7, CANADA
PHONE: (416) 596-1930
WEBSITE: www.arcadis.com

SURVEYOR INFORMATION
A.J. CLARKE AND ASSOCIATES LTD.
25 MAIN STREET WEST, SUITE 300
HAMILTON, ON. L8P 1H1
PHONE: (905) 528-8761
WEBSITE: www.jclarkes.ca

BENCHMARK INFORMATION:

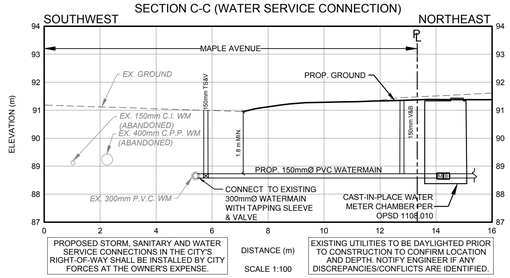
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SHEET TITLE
SITE GRADING EXHIBIT

SHEET NUMBER SG-01 | ISSUE 1

File Location: J:\145256_ZBLA_-_759_MT_0_Production\1 03_Design\04_Civil\Sheets\145256-SHEET-GRAD.dwg Last Saved: September 26, 2024 by kamis8339 Plotted: September 26, 2024 3:45:27 PM by Kamil, Siasia

SECTION C-C (WATER SERVICE CONNECTION)

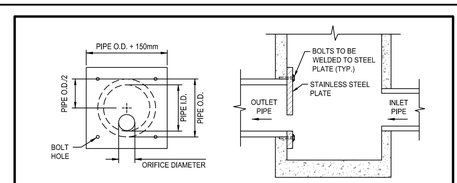


STORM SEWER STRUCTURE INVENTORY

MH #	MH DIAMETER	MH OPSD	FRAME OPSD	TOP ELEV.	INVERTS
CBMH1	1200mmø	701.010	400.010	91.28	NE 89.77 (375mmØ) SE 89.78 (375mmØ) SW 89.74 (375mmØ)
CBMH2	1200mmø	701.010	400.010	91.33	NE 89.96 (375mmØ) SW 89.93 (375mmØ)
CBMH3	1200mmø	701.010	400.010	91.88	NE 90.20 (375mmØ) SW 90.17 (375mmØ)
CTRL MH1	1200mmø	701.010	401.010	91.28	NE 89.82 (200mmØ) SW 89.80 (200mmØ)
MH1	1200mmø	701.010	401.010	91.22	NE 89.40 (200mmØ)
MH2	1500mmø	701.011	401.010	91.33	SE 90.36 (375mmØ) SW 90.30 (375mmØ)
OGS	AS PER MANUFACTURER	AS PER MANUFACTURER	AS PER MANUFACTURER	91.28	NE 89.68 (375mmØ) SW 89.85 (200mmØ)

SANITARY SEWER STRUCTURE INVENTORY

MH #	MH DIAMETER	MH OPSD	FRAME OPSD	TOP ELEV.	INVERTS
CTRL MH1A	1200mmø	701.010	401.010	91.27	NE 86.99 (200mmØ) SW 86.96 (200mmØ)
MH1A	1200mmø	701.010	401.010	91.28	SW 88.74 (200mmØ)



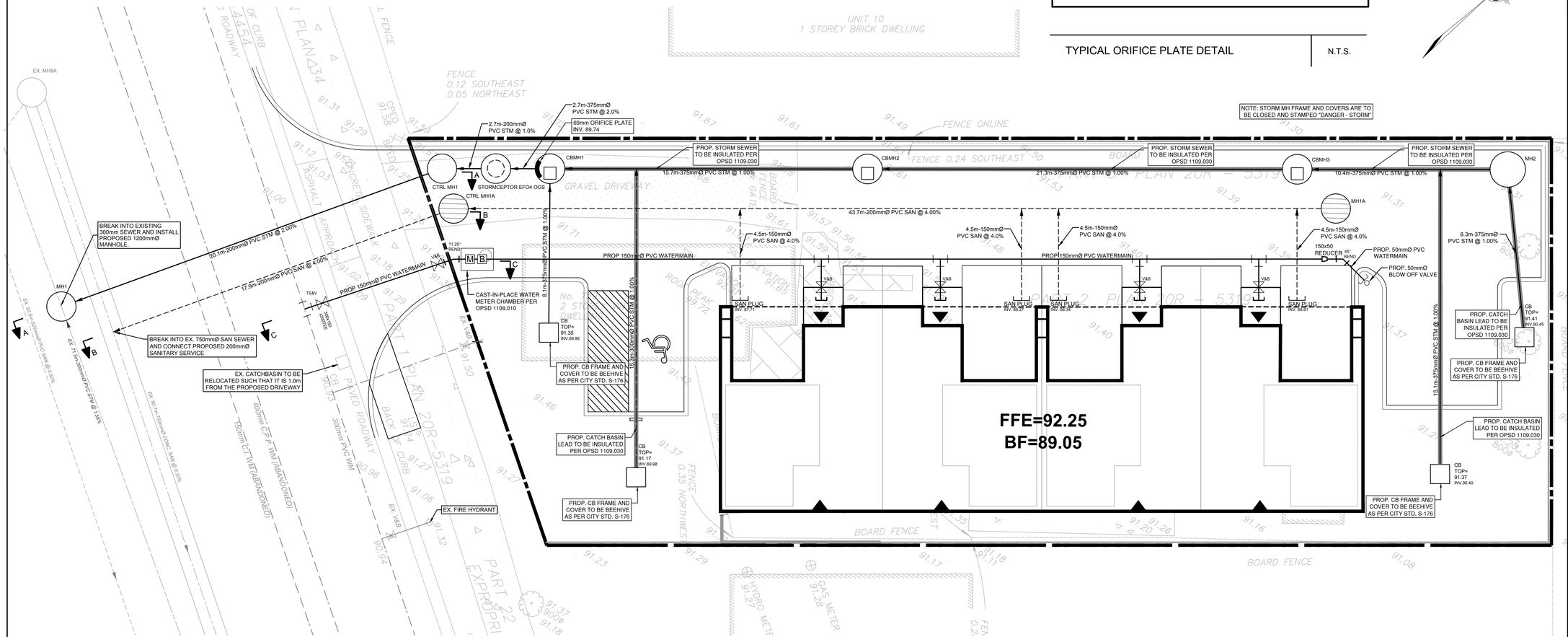
ORIFICE PLATE DETAIL

MANHOLE

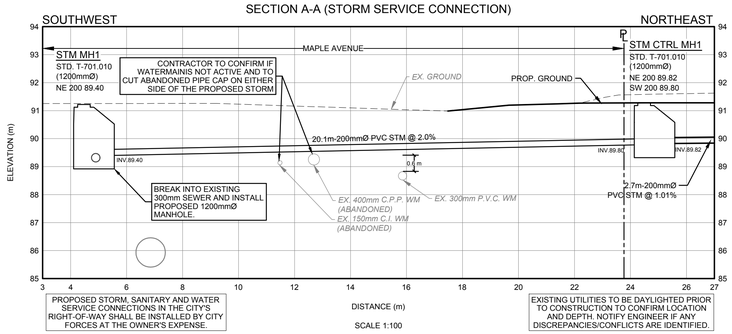
NOTES:

1. THE ORIFICE SHALL CONSIST OF A CIRCULAR HOLE CUT IN THE CENTRE OF A 12.5mm THICK STEEL PLATE.
2. THE PLATE SHALL BE BOLTED AND WELDED SECURELY OVER THE OUTLET PIPE SUCH THAT THE ORIFICE IS CENTERED ON THE PIPE AND THE PLATE EXTENDS A MINIMUM OF 75mm BEYOND THE OUTSIDE DIAMETER OF THE PIPE.
3. BOLTS TO BE 12mm S.S. WITH S.S. WASHERS AND CONCRETE ANCHORS.
4. BOLT HOLES TO BE 50mm MINIMUM FROM THE EDGE OF THE PLATE.
5. THE PLATE MAY HAVE ROUNDED CORNERS.
6. NO BENCHING

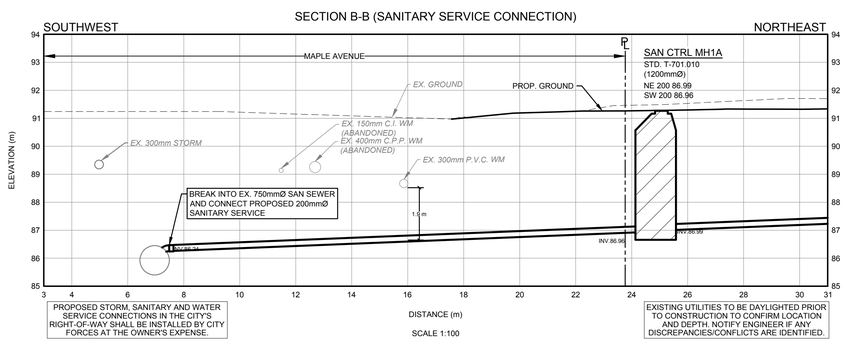
TYPICAL ORIFICE PLATE DETAIL — N.T.S.

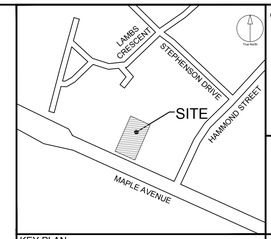


SECTION A-A (STORM SERVICE CONNECTION)



SECTION B-B (SANITARY SERVICE CONNECTION)





KEY PLAN

CLIENT

BURLIE NEW TOWNHOME DEV.

759 Maple Avenue, Burlington, ON

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ISSUES

No.	DESCRIPTION	DATE
1	ISSUED FOR ZBA	2024-03-28
2	ISSUED FOR DRAFT	2024-09-26

LEGEND

- PROPERTY LINE
- PROPOSED STORM
- PROPOSED SANITARY
- PROPOSED WATER
- EXISTING STORM
- EXISTING SANITARY
- EXISTING WATERMAIN
- EXISTING BELL LINE
- EXISTING CONDUIT
- PROPOSED STORM MANHOLE
- PROPOSED OGS
- PROPOSED SANITARY MANHOLE
- PROPOSED CATCH BASIN
- PROPOSED FIRE HYDRANT
- PROPOSED VALVE AND BOX
- PROPOSED DOMESTIC WATER METER (M)
- PROPOSED BACKFLOW PREVENTER (B)
- PROPOSED BLOW OFF VALVE

SEAL

ARCADIS
360 James Street North - Suite 200
Hamilton ON L8L 1H5 Canada
tel 905 546 1010
www.arcadis.com

PROJECT

RESIDENTIAL DEVELOPMENT

759 MAPLE, BURLINGTON, ON

LIST OF DRAWINGS

SG-01 - SITE GRADING PLAN
SS-01 - SITE SERVICING PLAN

PROJECT NO: 145256	
DRAWN BY: KP	CHECKED BY: SK
PROJECT MGR: IQ	APPROVED BY: IQ

SITE PLAN INFORMATION

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55 ST.CLAIRE AVENUE WEST,
TORONTO, ON, M4V 2Y7, CANADA
PHONE: (416) 596-1930
WEBSITE: www.arcadis.com

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A.J. CLARKE AND ASSOCIATES LTD.
25 MAIN STREET WEST, SUITE 300
HAMILTON, ON, L8P 1H1
PHONE: (905) 528-8761
WEBSITE: www.jtbarnes.ca

BENCHMARK INFORMATION:

SCALE: 1:100 (1.0 0 1.0m 2.0m 3.0m 4.0m 5.0m)

SHEET TITLE

SITE SERVICING EXHIBIT

SHEET NUMBER: SS-01

ISSUE: 1

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