



BURNSIDE

Functional Servicing and Stormwater Management (SWM) Report

**17 Ewen Road
Hamilton, ON**

17 Ewen (Hamilton) Corp.

**R.J. Burnside & Associates Limited
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Mississauga ON L5N 8R9 CANADA**

**October 3, 2022
300055092.0000**

Functional Servicing and Stormwater Management (SWM) Report
October 3, 2022

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R.J. Burnside & Associates Limited

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1.0 Introduction

1.1 Background

R.J. Burnside & Associates Limited (Burnside) has been retained by 17 Ewen (Hamilton) Corp. to prepare a Functional Servicing Report and Stormwater Management (SWM) Report for the proposed residential building at 17 Ewen Road in the City of Hamilton. This report is in support of the proposed Official Plan Amendment (OPA) and Zoning Bylaw- Amendment (ZBA), demonstrating that the subject lands can be developed in accordance with regulatory requirements and criteria.

The purpose of this report is to:

- Evaluate the existing municipal water system, including:
 - Calculate the proposed domestic water and firefighting supply needs.
 - Confirm that it has adequate flow to meet the additional required domestic and fire flow demands for the proposed development.
- Evaluate on a preliminary basis the stormwater management opportunities and constraints, including:
 - Calculate allowable and proposed runoff rates for the development.
 - Evaluate suitable methods for attenuation and treatment of stormwater runoff.
 - Develop and propose onsite control measures and examine theoretical performance.
 - Demonstrate compliance of the proposed stormwater control measures with the City of Hamilton Engineering Standards Manual.
- Identify sanitary servicing opportunities and constraints, including:
 - Calculate existing and proposed sanitary flows.
 - Evaluate the capacity of the existing sanitary service connections.
 - Ensure that there is enough capacity on the receiving municipal sewers to accommodate the additional sanitary flows from the proposed development.

All the above will be completed in accordance with accepted engineering practices and criteria from the governing approval agencies.

1.2 Site Description

The subject site is a 4,284 m² parcel of land within the City of Hamilton. The site is located south of Main Street West, just east of the intersection of Main Street West and Osler Drive. The site is bound by Ewen Road to the west, Rifle Range Road to the east and the Hamilton-Brantford rail trail to the south. Within the subject property is a recently demolished 1 storey brick and concrete block building that covered most of the site. Refer to Figure 1 for the site location in context to the surrounding area.



KEY MAP OF ONTARIO



Client

17 EWEN (HAMILTON) CORP.

Figure Title

17 EWEN ROAD, HAMILTON ON

SITE LOCATION PLAN

Drawn

BF

Scale
1:2500

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FG

Date

22/10/3

Project No.

055092

Figure No.

1

1.3 Proposed Development

The project proposes a student residence building with 359 units. The building tower is proposed to be 10 stories with one level of below grade parking. The building will cover most of the property and has a proposed height of 30.68m. There is a proposed drive aisle with surface parking along the north side of the building. The ramp to the underground parking is located along the western property line.

2.0 Water Servicing

2.1 Existing Water Supply

Based on GIS mapping and information provided from the City of Hamilton, the site has a 200 mm dia. watermain along Ewen Road and a 300 mm dia. watermain along Rifle Range Road. The previous building on the site was serviced from the Ewen Road watermain.

Refer to Figure 2 for the existing watermain servicing layout.

2.2 Proposed Water Supply

The proposed water service connection configuration will be as per City of Hamilton Detail PED-200.02. A 150 mm diameter fire service will connect to the existing 300 mm diameter watermain along Rifle Range Road with a 100 mm diameter domestic service connected off the fire service. Both fire and domestic watermain connections will be equipped with a valve and box at the property line. The 150 mm diameter fire connection will be equipped with a detector check assembly in the building and the 100 mm diameter domestic connections will be equipped with a water meter and premise isolation backflow preventor in the building.

Refer to Drawing S1 for the complete servicing layout.

2.3 Water Demand

The proposed fire demand for the development was calculated based on the criteria outlined by the Fire Underwriters Survey (FUS). The proposed domestic demands were calculated using the design standards outlined by the City of Hamilton. The City's guidelines specify an average demand of 360 L/cap/day based on a calculated population.

The anticipated domestic demand for the development has been calculated to be 2.27 L/s based on the City's design criteria. The max hourly demand peaking factor was calculated at 5.0 using the Babbitt formula which was also used for sanitary calculations. Therefore, this results in a peak domestic demand of 11.35 L/s and should be delivered at a pressure no less than 275 kPa (39.9 psi).

The required fire flow for the development was calculated to be 83.33 L/s (5000 L/min or 1321 USGPM). The total required fire flows and domestic demand should be delivered at a pressure no less than 140 kPa (20.3 psi).

The following criteria were applied during the calculation of fire flows:

- The proposed buildings will be classified as non-combustible, with low occupancy hazard, and a 25% occupancy reduction has been applied.

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October 3, 2022

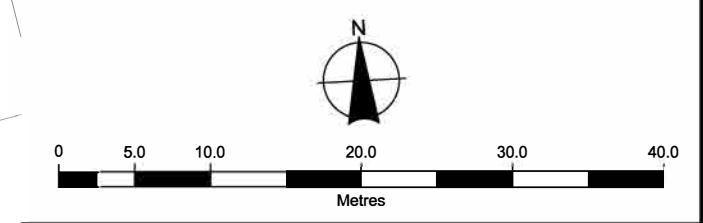
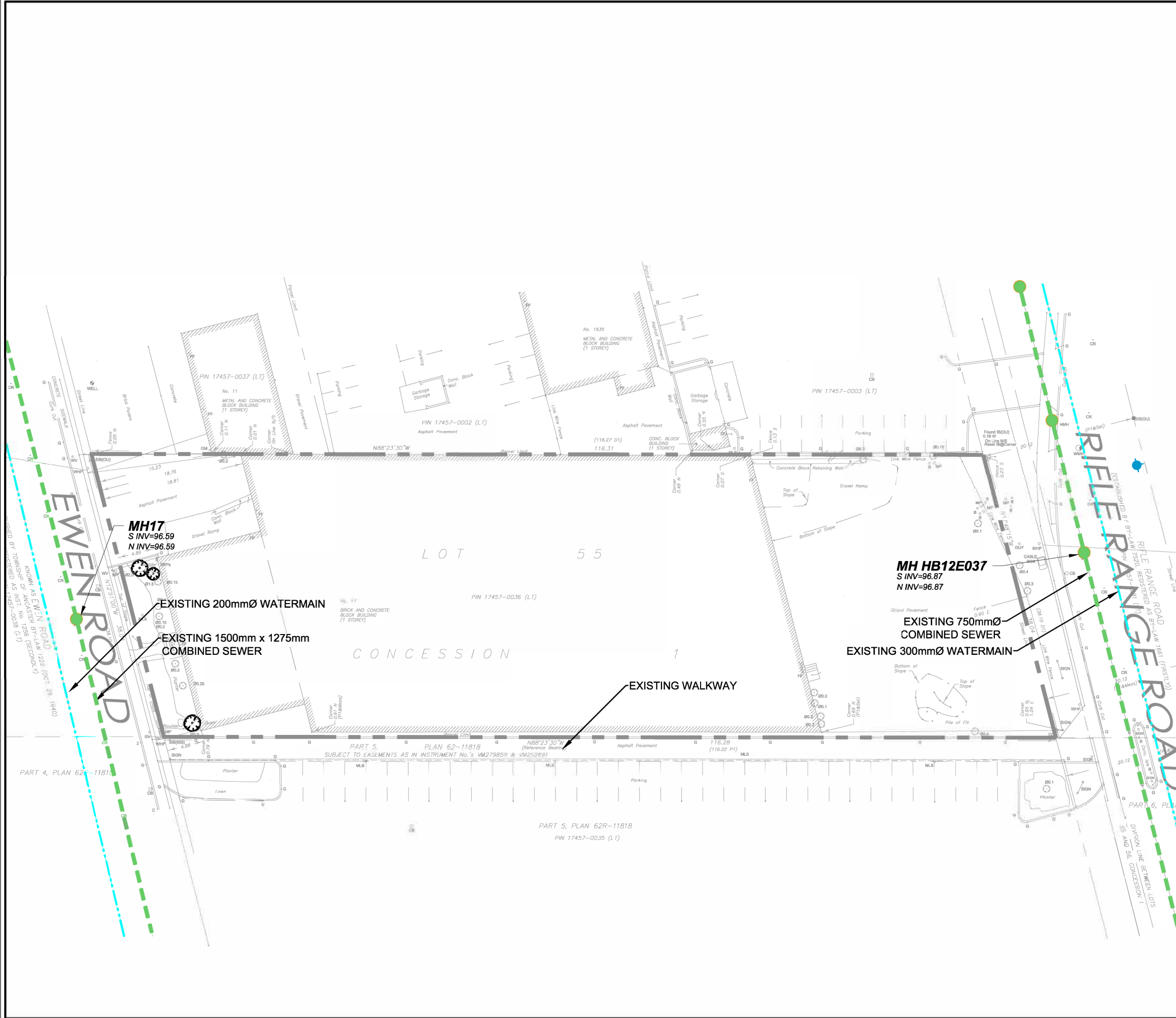
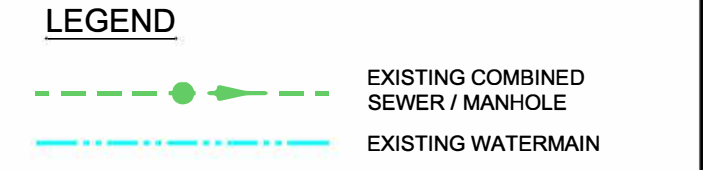
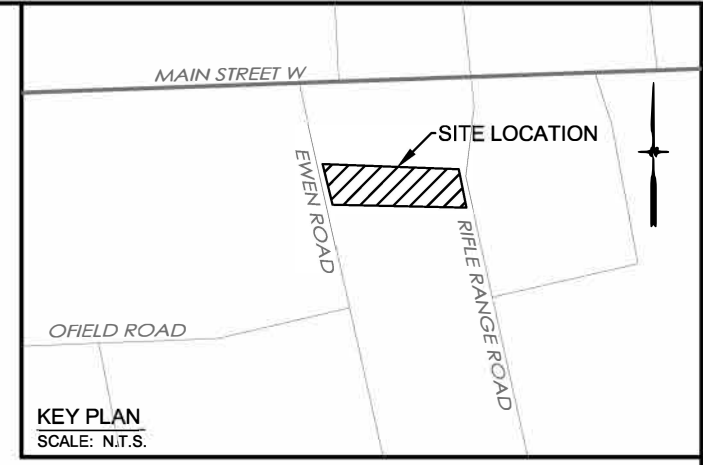
- The proposed buildings will be equipped with a NFPA sprinkler system conforming to NFPA 13 standards. A 30% sprinkler reduction has been applied.

Therefore, the overall combined peak water demand for the site was determined to be 94.69 L/s. As per City of Hamilton requirements, detailed water modelling will be completed at the Site Plan Application stage to ensure that these design flows can be delivered at the required pressures.

Refer to Appendix A for complete water demand calculations.

2.4 Hydrant Coverage

There are three existing fire hydrants located within the development's proximity. One is located along the east side of Rifle Range Road and the other two are located along the west side Ewen Road. One additional hydrant is proposed to provide sufficient fire coverage. A Siamese connection will be proposed within 45 m of any of these hydrants to satisfy Ontario Building Code (OBC) requirements.



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17 EWEN (HAMILTON) CORP.			
Figure Title			
17 EWEN ROAD, HAMILTON ON			
EXISTING SERVICING PLAN			
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3.0 Sanitary Servicing

3.1 Existing Combined Sewer Infrastructure

Based on the information received from the City of Hamilton, and the online water and wastewater mapping, there are existing combined sewers adjacent to the site. The existing combined sewer infrastructure includes the following:

- A 1500mm x 1275mm combined sewer along Ewen Road.
- A 750mm diameter combined sewer along Rifle Range Road.

These existing combined sewers are on different legs, but eventually meet up at MH HB12E026 at the intersection of Rifle Range Road and Main Street. However, there appears to be a CSO point at the intersection of Main Street and Ewen Road at MH HB12E020. Refer to Figure 2 for existing servicing.

Refer to Figure 2, and Drawing S1 for the location of the existing sewers.

3.2 Existing Sanitary Sewer Flow

The existing site contributed sanitary flow to the 1500 mm x 1275 mm combined sewer along Ewen Road.

An equivalent population was calculated to determine the existing theoretical sanitary flow using the City of Hamilton's comprehensive Development Guidelines and Financial Policies Manual. The existing theoretical flow was calculated to be 1.27 L/s for the previous industrial site.

Refer to Appendix B for the sanitary sewer calculations.

3.3 Proposed Sanitary Servicing

3.3.1 New Connection

One new sanitary connection is proposed at the location indicated on the Site Servicing drawing (Drawing S1 included with this report). The connection will be provided in accordance with the City Standards noted on the drawing and at a minimum of 2% slope, as follows:

- One 200 mm diameter connection discharging into the existing 1500 mm x 1275 mm combined sewer along Ewen Road.

The connection will have a control manhole located as close to the property line as possible, while remaining entirely within the site.

3.3.2 Proposed Sanitary Flows

Calculations have been made based on the residential units of the proposed building. The total peak sanitary flow for the existing site (including the infiltration allowance) has been calculated as 1.27 L/s. The total peak sanitary flow for the proposed development (including infiltration allowance) has been calculated as 11.52 L/s, which represents an increase of 10.25 L/s [$11.52 \text{ L/s} - 1.27 \text{ L/s}$] when compared with the existing peak sanitary flows.

Refer to Appendix B for calculations.

4.0 Grading Design

4.1 Site Grading Criteria

The grading design for this site has been completed in compliance with the following requirements and constraints:

- Conformance of the grading and drainage criteria outlined within the City of Hamilton design criteria.
- Matching of existing grades along the development boundary as defined by the property boundary.
- Provision for adequate cover over proposed services.
- Control and conveyance of stormwater within the site and minimization of external runoff.
- Providing major overland flow routes to convey runoff.

4.2 Proposed Grading Design

The proposed development has been designed to control internal flows while maintaining cover above the underground parking level. Since the groundwater elevation is relatively high, a P1 level has been established by providing 0.1m of clearance from the bottom of slab to the groundwater elevation. The P1 level structural dimensions which play a key role in setting the grades for the site have been assumed to form a base for the preliminary grading design and will be confirmed during detailed design. There are some locations of the underground parking level that may have reduced overhead clearance due to the drive aisle connection to Rifle Range Road. Overall, the P1 level will be exposed around the perimeter of the site by up to 0.5m. The grades on top of the P1 level are designed to control drainage within the site by collecting flows using area drains.

5.0 Stormwater Management

5.1 Stormwater Management Criteria

The stormwater management criteria for this development are based on the City of Hamilton's *Comprehensive Development Guidelines and Financial Policies Manual (2016)* as well as the MECP's *Stormwater Management Planning and Design Manual (2003)*.

From these design criteria, the following stormwater management guidelines are to be applied:

Water Quantity: The total post-development 100-year storm and peak sanitary discharge rate from the site shall be controlled to the 2-year pre-development storm discharge rate (allowable discharge rate). The allowable storm discharge rate from the site shall be equal to the 2-year pre-development storm discharge rate minus the proposed peak sanitary flows calculated per the City Development Guidelines.

Water Quality: Level 1 - Enhanced protection corresponds to the end-of-pipe storage volumes required for the long-term removal of 80% of suspended solids.

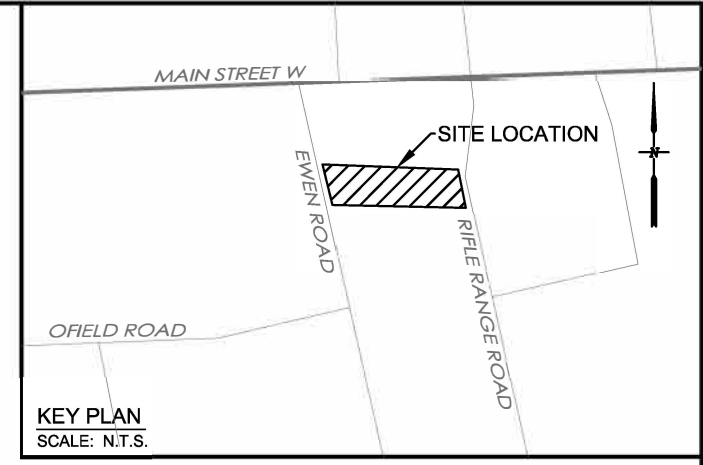
5.2 Existing Storm Drainage Conditions

Based on the information received from the City of Hamilton, there are existing combined sewers adjacent to the site. Runoff from the property currently discharges uncontrolled to these sewers. The existing combined sewer infrastructure includes the following:

- A 1500 mm x 1275 mm combined sewer along Ewen Road.
- A 750 mm diameter combined sewer along Rifle Range Road.

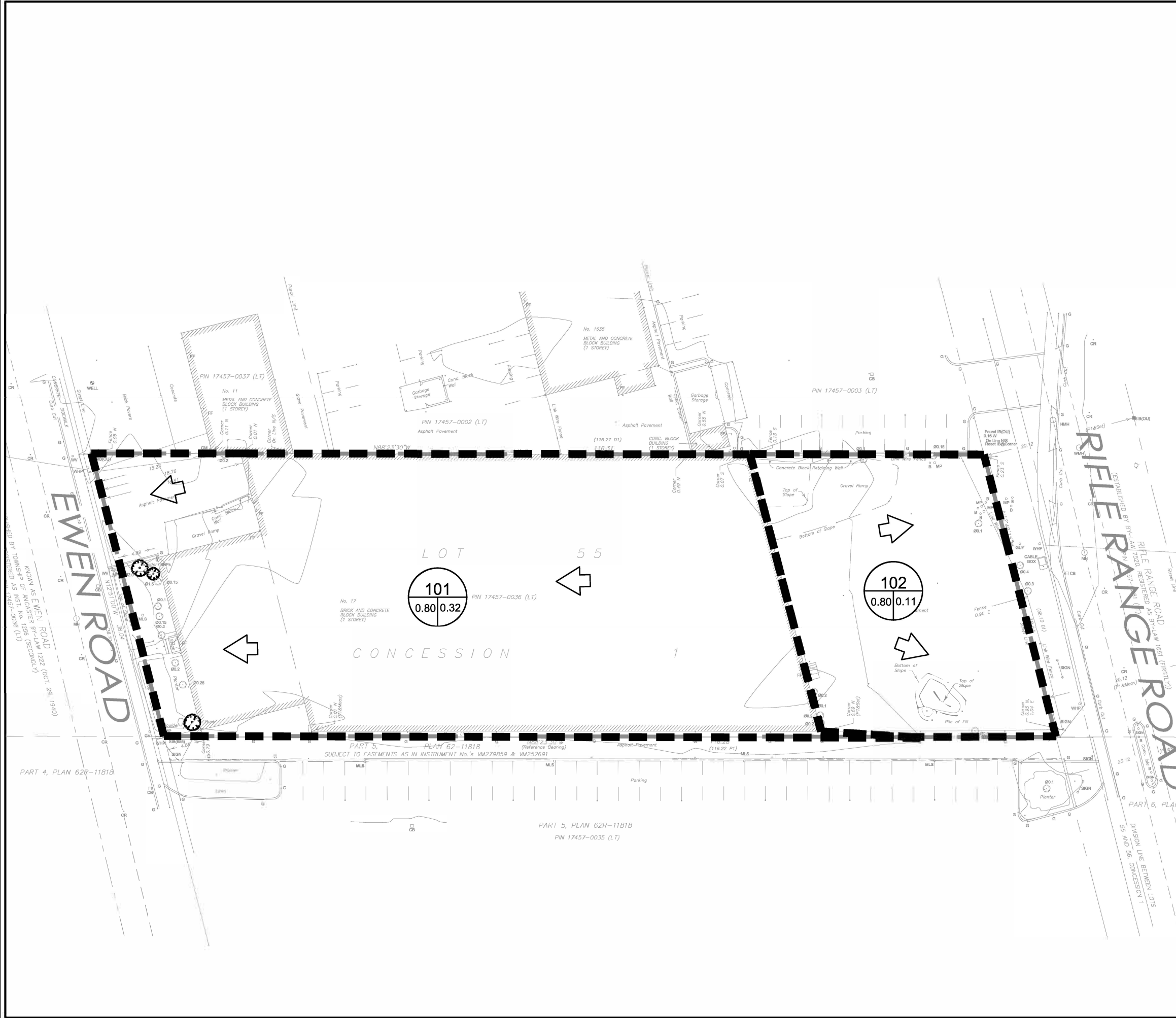
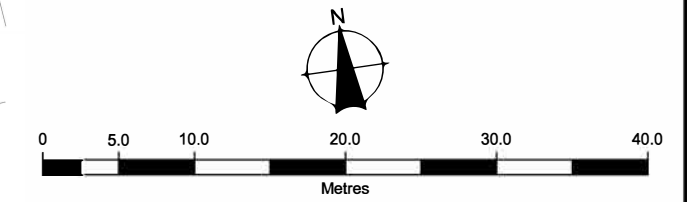
These existing combined sewers are on different legs, but eventually meet at MHHB12E026 at the intersection of Rifle Range Road and Main Street. However, there appears to be a CSO point at the intersection of Main Street and Ewen Road at MH HB12E020. Refer to Figure 2 for existing servicing.

Based on received topographic information for the site, the existing property is graded such that a portion (Drainage area 1) drains to Ewen Road (Catchments 101, 102, 103) and the remainder (Drainage area 2) drains to Rifle Range Road (Catchments 104 and 105). The existing storm drainage has been analyzed based on a runoff coefficient of 0.8 for an industrial area as per City of Hamilton guidelines. Refer to Figure 3 for the pre-development drainage plan.



LEGEND

- PROPERTY BOUNDARY
- EXISTING DRAINAGE BOUNDARY
- EXISTING CONTOUR
- EXISTING OVERLAND FLOW DIRECTION
- CATCHMENT No.
CATCHMENT AREA
- RUNOFF COEFFICIENT



Client
17 EWEN (HAMILTON) CORP.

Figure Title
**17 EWEN ROAD, HAMILTON ON
PRE-DEVELOPMENT DRAINAGE PLAN**

Drawn BF	Checked FG	Date 22/10/3	Figure No. 3
Scale 1:500	Project No. 055092		

Drainage Area 1 consists of the former building area properties fronting Ewen Road and asphalt, gravel, and landscape areas draining to the Ewan Road right of way (ROW). The frontage of the former building drains to Ewen Road. Reviewing old service lateral information, it appears there was a storm lateral taking drainage from the building and discharging to Ewen Road. A runoff coefficient of 0.8 for Industrial / Central Business District has been used, as the site was formerly industrial. This 3,278 m² drainage area discharges to the existing 1500 mm x 1275 mm combined sewer in Ewen Road with an existing 2-year flow of 52.2 L/s and a 100-year flow of 128.1 L/s.

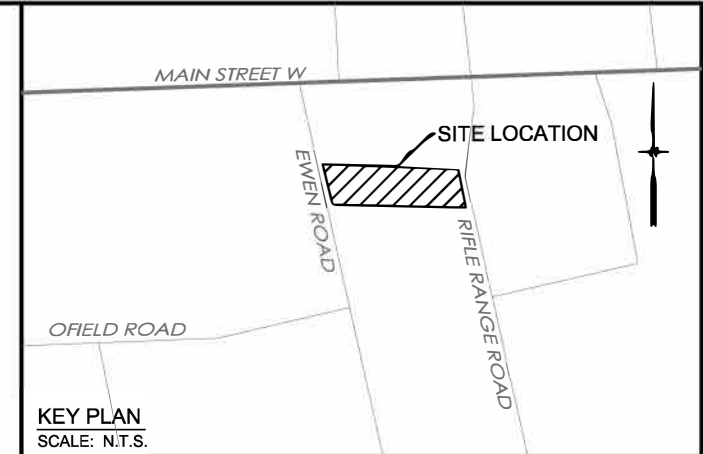
Drainage Area 2 consists of the former gravel area fronting onto Rifle Range Road. This area drains from the former building to the Rifle Range ROW. A runoff coefficient of 0.8 for Industrial / Central Business District has been used as the site was formerly industrial. This 1,119 m² drainage area discharges to the existing 750 mm diameter combined sewer in Rifle Range Road with an existing 2-year flow of 18.4 L/s and 100-year flow of 45.2 L/s.

5.3 Proposed Storm Drainage Condition

The proposed grading design has been completed with the site drainage split between two underground chambers located within the P1 level. Two chambers are required as the existing condition has a drainage split to both Ewen Road and Rifle Range Road combined sewers. Site flows will be captured and conveyed to these tanks using a series of area drains.

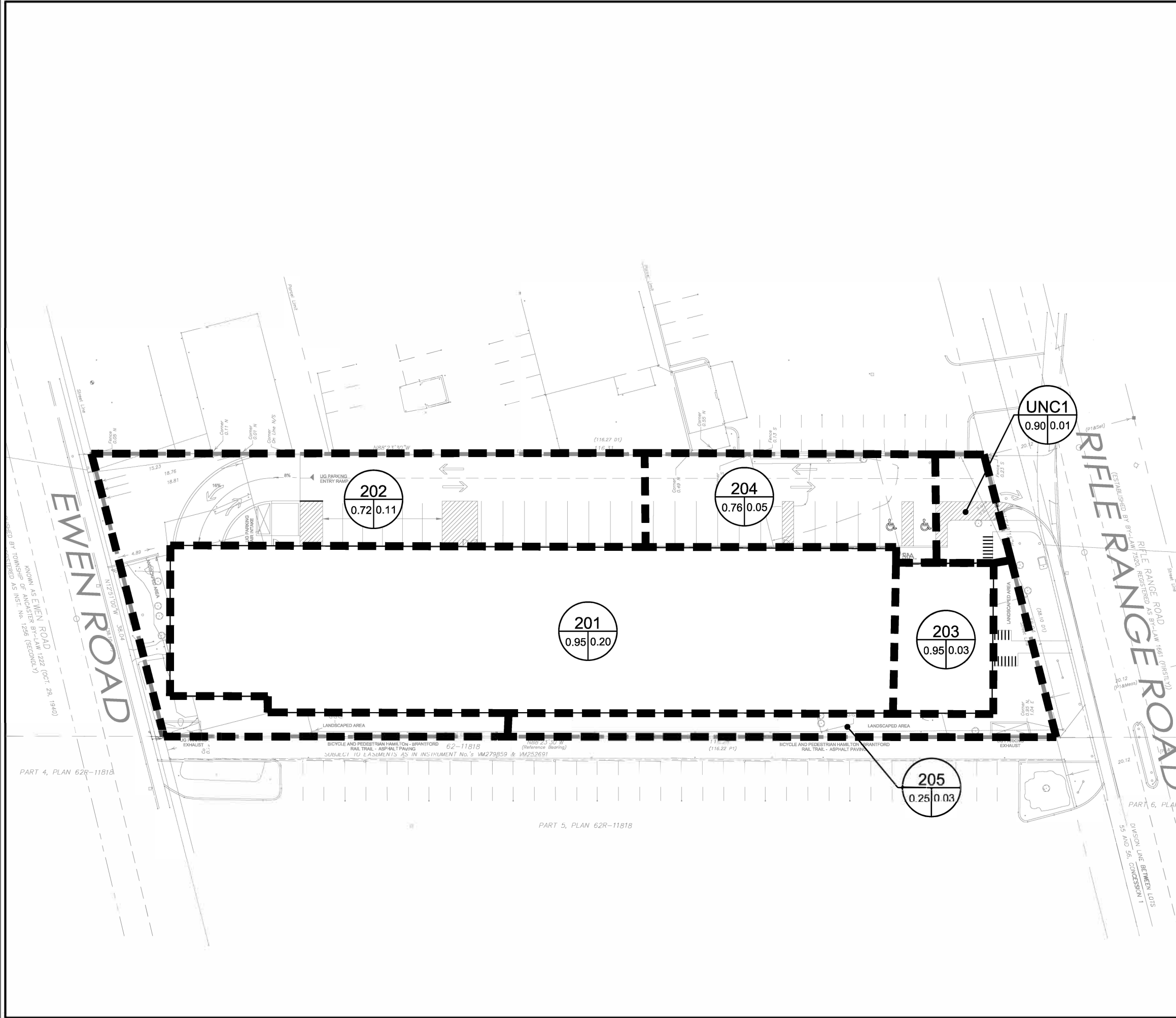
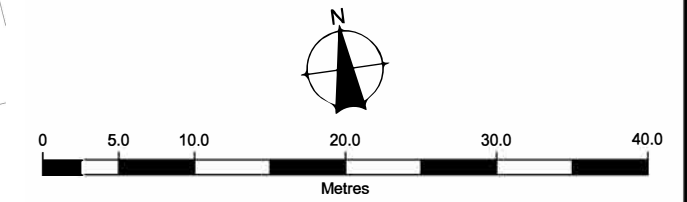
The first chamber is proposed to connect to the existing 1500 mm x 1275 mm sewer along Ewen Road. Catchments 201 and 202 will be directed to the Ewen Road chamber. An additional stormwater chamber and service will be connected to the 750 mm sewer along Rifle Range Road. This will collect flows from catchments 203, 204 and 205. Storm service and chamber locations are indicated on the Site Servicing Plan (S1). A control maintenance hole will be provided for the storm connections and located as close to the property line as possible. The storm service connections will consist of a 250 mm diameter pipe that will discharge flows from the stormwater quantity control vaults.

Refer to Figure 4 for the post-development drainage plan.



LEGEND

- PROPERTY BOUNDARY
- PROPOSED DRAINAGE BOUNDARY
- PROPOSED OVERLAND FLOW DIRECTION
- CATCHMENT No.
- CATCHMENT AREA
- RUNOFF COEFFICIENT



Client
17 EWEN (HAMILTON) CORP.

Figure title
**17 EWEN ROAD, HAMILTON ON
POST-DEVELOPMENT DRAINAGE PLAN**

Drawn BF	Checked FG	Date 22/10/3	Figure No. 4
Scale 1:500	Project No. 055092		

5.4 Proposed Stormwater Quantity Controls

The proposed development has been designed to capture roof runoff and control flows within two stormwater vaults located within the P1 level. The remainder of the property will be graded to a series of area drains which will collect in the quantity control vaults. The perimeter of the site will match existing elevations. Refer to Figure 4 for the proposed drainage conditions and drawing G1 for the grading plan.

5.4.1 Allowable Release Rates

As required within the City of Hamilton design guidelines, the total post-development 100-year peak storm and peak sanitary discharge rate from the site shall be controlled to the 2-year pre-development storm discharge rate. Using the City of Hamilton current IDF parameters and the calculated sanitary design flows, the allowable release rates are calculated to be 39.2 L/s to Ewen Road, and 18.4 L/s to Rifle Range Road. Refer to Table 1, and Table 2 below for the calculation of the allowable release rates.

In accordance with City of Hamilton requirements, the allowable release rate of the proposed development is the 2-year pre-development storm discharge rate minus the proposed peak sanitary flows calculated per the City Development Guidelines.

Table 1: Allowable Release Rate to Ewen Road

Pre-Development	Flow (L/s)
Pre-Development 2 Year Storm Flows	52.2
Less	
Post Development Sanitary Flows	11.5
Allowable Post Development 100 Year Storm Release =	40.7

Table 2: Allowable Release Rate to Rifle Range Road

Pre-Development	Flow (L/s)
Pre-Development 2 Year Storm Flows	18.4
Less	
Post Development Sanitary Flows	0
Allowable Post Development 100 Year Storm Release =	18.4

5.4.2 Quantity Control Summary

Table 3 summarizes the controlled post-development peak flows with regards to the allowable release rate and storage requirements.

Table 3: Stormwater Quantity Control Summary

Outlet	Catchment ID	100-Year Release Rate (L/s)	Allowable Release Rate (L/s)	Required Storage (m ³)	Provided Storage (m ³)
Ewen Road	201	35.0	40.7	102.5	160.7
	202				
Rifle Range Road	203	13.2	18.4	31.9	48.3
	204				
	205				

To ensure that the outlet from the proposed storm system discharges at, or below the target release rates, an orifice tube is proposed for both quantity control cells. A 100 mm orifice tube will be required for the Ewen Road outlet and an 50 mm orifice tube is required for the Rifle Range Road outlet. These orifice tubes will be installed within the control maintenance structure prior to the property line. These orifices will control flows from the storm vaults such that the 100-year release rates for both outlets will meet the respective allowable rates.

The stormwater vaults will be located on the P1 level. The Ewen Road vault has a footprint of 71.4 m² (effective area) and will provide a volume of 160.7 m³. The Rifle Range Road vault has a footprint of 26.1 m² (effective area) and will provide a volume of 48.3 m³. Refer to Appendix C for stormwater calculations.

5.5 Proposed Stormwater Quality

Based on the requirements of the City of Hamilton, an “Enhanced” Protection Level stormwater quality control is required to provide long-term average removal of 80% of suspended solids.

The site coverage consists of 53.0% rooftop, 16.8% landscape and 30.1% hardscape. The runoff generated from the impervious roof, green roof, hardscape, and landscape surfaces has an untreated TSS removal efficiency of 57.4%. Refer to Table 4 for the proposed TSS removal breakdown.

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Table 4: Water Quality Site Area Breakdown

Surface Type	Effective TSS Removal	Effective Area (m2)	% Of Total Area	TSS Removal Over Total Site
Roof Coverage	80%	2,269	53.0%	42.4%
Hardscape	5%	1,290	30.1%	1.5%
Uncontrolled Hardscape	0%	0	0.0%	0.0%
Landscape	80%	721	16.8%	13.5%
Total		4,280		57.4%

Through the implementation of a 'treatment train' approach using jellyfish filtration units, the TSS removal target will be met. Additional details related to the filtration units will be provided at the Site Plan Approval stage.

6.0 Groundwater

A hydrogeological study has not been completed yet. As per City of Hamilton requirements and the pre-consultation notes, this study will be a requirement of site plan approval. Only short-term construction dewatering will be required as permanent discharge is not permitted for this site.

The short-term construction dewatering will either be discharged into the 1500 mm x 1275 mm combined sewer along Ewen Road, or the 750 mm combined sewer along Rifle Range Road.

6.1 Groundwater Quality

When the hydrogeological study is completed, the temporary dewatering will need to be discharged in accordance with the City of Hamilton Sewer Use By-law standards and a Temporary Sewer Discharge Permit will be required.

6.2 Permanent Groundwater Discharge

As stated above permanent groundwater dewatering will not be permitted for this site. The underground wall and foundation must be designed and constructed to be completely sealed and leak-proof (bath-tub design) to avoid any permanent groundwater dewatering if located below the groundwater table.

6.3 Short-Term Construction Groundwater Discharge

Temporary dewatering will be required during construction and will need to be discharged in accordance with the City of Hamilton Sewer Use By-law standards and a Temporary Sewer Discharge Permit will be required.

7.0 MECP F-5-5 Compliance and Combined Sewer Capacity Analysis

The subject property is proposing an increase in the sanitary flow discharging to the existing combined sewer in Ewen Road. As such, the development must comply with the Ministry of the Environment, Conservation and Parks (MECP) F-5-5 Determination of treatment requirements for municipal and private combined sewage systems.

As per the MECP F-5-5 requirements, no increase in combined sewer overflows to the storm sewer system is permitted. The increase in sanitary flow to the combined sewer must be offset with improvements to the existing site or using offsite improvements.

City of Hamilton requires that for a combined sewer the total post-development 100-year storm and peak sanitary discharge rate from the site shall be controlled to the 2-year pre-development storm discharge rate (allowable discharge rate). The allowable storm discharge rate from the site shall be equal to the 2-year pre-development storm discharge rate minus the proposed peak sanitary flows calculated per the City Development Guidelines. Given this requirement, F-5-5 will be met.

Since there are no onsite stormwater controls and the site is only serviced by combined sewers, all existing storm water flows are conveyed uncontrolled into the combined sewer. In accordance with Figure 2 and Section 3.2, the existing flows draining to each combined sewer is as follows:

- 45.2 L/s in the 100-year event to the combined sewer on Rifle Range Road.
- 130.3 L/s in the 100-year event to the combined sewer on Ewen Road.

A summary of the existing and proposed flows to the existing combined sewer can be found in Table 5.

Table 5: Pre-Development Combined Sewer Flows

Pre-Development		Flow (L/s)
Ewen Road (1500x1275 mm Combined)	Sanitary Flows (L/s)	1.3
	Groundwater (L/s)	0.0
	100-year Storm Flows (L/s)	128.1
Total =		129.4
Rifle Range Road (750 mm Combined)	Sanitary Flows (L/s)	0.0
	Groundwater (L/s)	0.0
	100-year Storm Flows (L/s)	45.2
Total =		45.2
Total Pre-Development 100 Year Flow to Combined		174.6

Table 6 Post Development Flows to Combined

Post-Development		Flow (L/s)
Ewen Road (1500x1275 mm Combined)	Sanitary Flows (L/s)	11.5
	Groundwater (L/s)	0.0
	100-year Storm Flows (L/s)	35.0
Total =		46.5
Rifle Range Road (750 mm Combined)	Sanitary Flows (L/s)	0.0
	Groundwater (L/s)	0.0
	100-year Storm Flows (L/s)	13.2
Total =		13.2
Total Post-Development 100 Year Flow to Combined		59.7
Total Reduction to combined sewers =		114.9 L/s

The total existing 100-year flow of 174.6 L/s to both combined sewers will be reduced to 59.7 L/s in the post development 100-year storm. This results in a benefit to the combined system of 114.9 L/s. Therefore, the site is compliant with F-5-5 and there is capacity within the combined sewer with no upgrades required as the proposed flow is less than the existing.

8.0 Utilities

Utilities will be installed in a joint utility trench, and design will be provided by the individual utility companies. It appears that there is a possibility for a hydro connection along both Ewen Road and Rifle Range Road. Coordination with utility companies will be completed during the detailed design stage of this project.

9.0 Conclusions and Recommendations

The preceding report provides an investigation of the existing servicing with a design for the proposed servicing and stormwater management of this development. The functional level analysis and design that has been completed in preparation for this re-zoning application demonstrates that the proposed development can be sufficiently serviced with a wastewater connection, a supply of water, and to meet the necessary domestic and fire flow requirements. The design also meets requirements for site grading and stormwater management. The existing municipal infrastructure is sufficient and capable of supporting the proposed development, and therefore, no external upgrades to the existing infrastructure will be required.

Accordingly, we propose that this Functional Servicing and Stormwater Management Report be accepted for review and approval to facilitate the site plan application for the subject property.



BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

Water Calculations



Project:
17 Ewen Road
Hamilton, ON
Water Demand

Prepared by: BF
 Checked by: FG
 Project No: 300055092
 Date: October 3, 2022

I. Fire Flow Calculation

*Based on Fire Underwriters Survey

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

Where F= Fire flow in Lpm

C= construction type coefficient

= 0.6 For fire-resistive construction (fully protected frame, floors, roof)

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

Floor	Area (sq.m)	%
1st Floor	2287 m ²	100%
2nd Floor	2009 m ²	25%
N/A	m ²	25%

*Largest floor area + 25% of adjoining floor areas, assuming vertical opening are properly protected (one hour rating)

Largest Area = 2,789 sq.m.

F = 6,971.36 L/min

Round to nearest 1000 l/min

F = 7,000 L/min

2 Occupancy Reduction

25% low fire hazard occupancy

F = 5250 L/min

3 Sprinkler Reduction

30% Reduction for NFPA Sprinkler System

F = 3675 l/min

4 Separation Charge

15% North 11m

10% West 30m

5% South 31m

0% East 45m+

30% Total Separation Charge 1575 L/min

75% MAX Separation Charge

F = 5,000.00 L/min

83.33 L/s

F = 1321 US GPM

*Total percentage equals the sum of the 4 sides, but shall not exceed 75%

Fire Flow Required = 83.33 L/s
Fire Flow Required = 5000.0 L/min 1321 US GPM

II. Domestic Flow Calculations - Residential

Population = 545

*From Sanitary Design Sheet

Average Day Demand = 360 L/cap/day

*From MECP Design Criteria

= 2.27 L/s

= 36 US GPM

Max. Daily Demand Peaking Factor =

Max. Daily Demand = 0.00 L/s

= 0 US GPM

or

Max. Hourly Demand Peaking Factor = 5.00 *From Sanitary Calculations

Max. Hourly Demand = 11.35 L/s

= 180 US GPM

Residential Domestic Flow = 11.35 L/s 180 US GPM

Total Domestic Flow = 11.35 L/s

Fire Flow = 83.33 L/s

Peak Domestic + Fire Demand = 94.69 L/s

5681.25 L/min



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Appendix B

Sanitary Calculations

Appendix B



Project: **17 Ewen Road**
Hamilton, ON
 Sanitary Servicing Analysis

Prepared by: BF
 Checked by: FG
 Project No: 300055092
 Date: 10/03/2022

Previous Site Flows to 1500mm x 1275 Combined Sewer on Ewen Rd

$$Q = \frac{P \times Q \times M}{86400} + (A \times I)$$

Commercial Flow

Building Address	Stories	Building Area (m ²)	Site Area (ha)	P/ha	Population
17 Ewen Rd	1	2714	0.424	125	53
Total					53

*125 to 750 ppha from City of Hamilton

$Q_{(ICI)} = 360$ L/cap/day

$M = \frac{5}{P^{0.2}}$

$M = 5.00$

Babbitt Formula as per City of Hamilton Standards
 M= 2<M<5

$Q_{(ICI)} = 1.1$ L/s

Site Area = 0.42 ha

Infiltration Allowance = 0.4 L/s/ha

from City of Hamilton Guidelines

$Q_{infiltration} = 0.17$ L/s

$Q_{Existing} = 1.27$ L/s



Project: **17 Ewen Road**
Hamilton, ON
 Sanitary Servicing Analysis

Prepared by: BF
 Checked by: FG
 Project No: 300055092
 Date: October 3, 2022

Proposed Site Flows: Podium and Tower to McGuire Sanitary

Residential

	Total	PPU	Population
J Bedroom=	189	1	189
1 Bedroom =	16	1	16
2 Bedroom=	122	2	244
3 Bedroom=	32	3	96
Total=	359		545

Q= 360 L/cap/day

$$Q = \frac{P \times Q \times M}{86400} + (A \times I)$$

$$M = \frac{5}{P^{0.2}}$$

Babbitt Formula as per City of Hamilton Standards
 M= 2<M<5

M= 5.00

Q_(residential)	11.4	L/s
----------------------------------	-------------	------------

Permanent Groundwater

0.00 L/s

*Long-Term Dewatering Not permitted
 as per Pre-Consultation Document

Infiltration

Infiltration Allowance= 0.4 L/s/ha

from City of Hamilton Guidelines

A= 0.42 ha

Q_{infiltration}= 0.17 L/s

Q_{proposed}	11.52	L/s
-----------------------------	--------------	------------

Service Connection					
Diameter	Slope	Velocity	Capacity	Spare Capacity	Capacity
(mm)	(%)	(m/s)	(L/s)	(L/s)	(%)
250	0.18	0.51	25.23	13.71	45.66%

Q_{increase total}	10.2	L/s
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Service Connection					
Diameter	Slope	Velocity	Capacity	Spare Capacity	Capacity
(mm)	(%)	(m/s)	(L/s)	(L/s)	(%)
200	2.00	1.48	46.38	31.86	31.30%



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Appendix C

Stormwater Calculations



RATIONAL METHOD
PRE-DEVELOPMENT SITE FLOWS

DISCHARGE TO EWEN ROAD

Runoff Equation $Q = 2.78CIA$ (l/s)

where, C = runoff coefficient
I = rainfall intensity (mm/hr)
A = area (ha)
2.78= conversion factor

Catchment 101

Area = 3171 m²
C = 0.80

Return Period	A	B	C	T	I	Q
2 year	646.0	6.00	0.781	10	min 74.1	mm/hr 52.2 L/s
5 year	1049.5	8.00	0.803	10	min 103.0	mm/hr 72.6 L/s
10 year	1343.7	9.00	0.814	10	min 122.3	mm/hr 86.2 L/s
25 year	1719.5	10.00	0.823	10	min 146.1	mm/hr 103.0 L/s
50 year	1954.8	10.00	0.826	10	min 164.6	mm/hr 116.0 L/s
100 year	2317.4	11.00	0.836	10	min 181.8	mm/hr 128.1 L/s

Allowable Flows = 2 Year Pre-Development Flows 52.2



RATIONAL METHOD
PRE-DEVELOPMENT SITE FLOWS

DISCHARGE TO EWEN ROAD

Runoff Equation $Q = 2.78CIA$ (l/s)

where, C = runoff coefficient
I = rainfall intensity (mm/hr)
A = area (ha)
2.78= conversion factor

Catchment 101

Area = 1119 m²
C = 0.80

Return Period	A	B	C	T	I	Q
2 year	646.0	6.00	0.781	10 min	74.1 mm/hr	18.4 L/s
5 year	1049.5	8.00	0.803	10 min	103.0 mm/hr	25.6 L/s
10 year	1343.7	9.00	0.814	10 min	122.3 mm/hr	30.4 L/s
25 year	1719.5	10.00	0.823	10 min	146.1 mm/hr	36.3 L/s
50 year	1954.8	10.00	0.826	10 min	164.6 mm/hr	40.9 L/s
100 year	2317.4	11.00	0.836	10 min	181.8 mm/hr	45.2 L/s

Allowable Flows = 2 Year Pre-Development Flows 18.4



Project: 17 Ewen Road
 Project No.: 300055092
 Modelled By: BF
 Date: 10/3/2022

POST-DEVELOPMENT CONTROLLED FLOWS - EWEN RD

Rainfall IDF Coefficients 100 -year

A = 2317.400
 B = 11.000
 C = 0.836

Ex 2-yr Peak Flow = 52.2 L/s
 Ex Peak SAN Flow = 0.00 L/s
 Proposed Peak SAN Flow = 11.5 L/s
Allowable Release Rate = 40.7 L/s

Catchments 201 & 202 - Controlled

Modified Rational Method Calculation

Area = 0.31 ha
 Runoff Coefficient, C = 0.85
 C*A = 0.27
 Time of Concentration, t_c = 10.0 min
 Storm Duration Increment = 5.0 min
 Allowable Release Rate = 40.7 L/s
 Constant Inflow = 0 L/s
 Uncontrolled Flows = 0.00 L/s
 Target Release Rate = 40.7 L/s
 Actual Outflow = **35.0 L/s**

Storm	Rainfall	Max.	Runoff	Released	Storage	Max. Storage	Drawdown
10.0	181.81	134.57	81	21	60		
15.0	152.08	112.56	101	26	75		
20.0	131.29	97.17	117	32	85		
25.0	115.86	85.75	129	37	92		
30.0	103.92	76.92	138	42	96		
35.0	94.39	69.86	147	47	99		
40.0	86.59	64.09	154	53	101		
45.0	80.08	59.27	160	58	102		
50.0	74.55	55.18	166	63	103	103	1.77
55.0	69.80	51.66	170	68	102		
60.0	65.67	48.60	175	74	101		
65.0	62.04	45.91	179	79	100		
70.0	58.82	43.53	183	84	99		
75.0	55.94	41.41	186	89	97		
80.0	53.36	39.50	190	95	95		
85.0	51.03	37.77	193	100	93		
90.0	48.91	36.20	195	105	90		
95.0	46.97	34.77	198	110	88		
100.0	45.20	33.45	201	116	85		
105.0	43.56	32.24	203	121	82		
110.0	42.05	31.12	205	126	79		
115.0	40.65	30.09	208	131	76		
120.0	39.35	29.13	210	137	73		

Orifice Calculations

Inside Dia = 100 mm
 Area = 0.008 m²
 Outlet Invert = 97.8 masl
 Head = 1.44 m
 HWL = 99.24 masl
 C = 0.84 (orifice tube)
 Max Q = 35.0 L/s

Chamber Sizing

Storage Area = 71.4 m²
 Total Vol Provided = 160.7 m³
 Vol Required = 102.5 m³
 Top Elev = 100.05 masl
 Bottom Elev = 97.75 masl
 HWL = 99.24 masl
 Outlet Inv = 97.8 masl
 Active Storage Depth = 1.44 m
 Tank Height = 2.30 m

Allowable Release Rate = 40.7 L/s

Actual Release Rate = 35.0 L/s

Service Connection					
Diameter	Slope	Velocity	Capacity	Spare Capacity	Capacity
(mm)	(%)	(m/s)	(L/s)	(L/s)	(%)
250	2.00	1.71	84.10	49.08	41.64%



Project: 17 Ewen Road
 Project No.: 300055092
 Modelled By: BF
 Date: 10/3/2022

POST-DEVELOPMENT CONTROLLED FLOWS - RIFLE RANGE RD

Rainfall IDF Coefficients 100 -year

A = 2317.400
 B = 11.000
 C = 0.836

Ex 2-yr Peak Flow = 18.43 L/s
 Ex Peak SAN Flow = 0.00 L/s
 Proposed Peak SAN Flow = 0.00 L/s
Allowable Release Rate = 18.43 L/s

Catchment UNC1 - Uncontrolled

Rational Method Calculation $Q = 2.78CIA$ (L/s)

Area = 0.01 ha
 Runoff Coefficient, C = 0.90
 Time of Concentration, t_c = 10.00
 Intensity, I = 181.81 mm/hr
 Uncontrolled Outflow, Q = 5.2 L/s

Catchments 203, 204 & 205 - Controlled

Modified Rational Method Calculation

Area = 0.10 ha
 Runoff Coefficient, C = 0.72
 C*A = 0.07
 Time of Concentration, t_c = 10.0 min
 Storm Duration Increment = 5.0 min
 Allowable Release Rate = 18.4 L/s
 Constant Inflow = 0.0 L/s
 Uncontrolled Flows = 0.0 L/s
 Target Release Rate = 18.4 L/s
 Actual Outflow = 8.1 L/s

Storm	Rainfall	Max.	Runoff	Released	Storage	Max. Storage	Drawdown
10.0	181.81	37.53	23	5	18		
15.0	152.08	31.40	28	6	22		
20.0	131.29	27.10	33	7	25		
25.0	115.86	23.92	36	8	27		
30.0	103.92	21.45	39	10	29		
35.0	94.39	19.49	41	11	30		
40.0	86.59	17.88	43	12	31		
45.0	80.08	16.53	45	13	31		
50.0	74.55	15.39	46	15	32		
55.0	69.80	14.41	48	16	32		
60.0	65.67	13.56	49	17	32	32	2.72
65.0	62.04	12.81	50	18	32		
70.0	58.82	12.14	51	19	32		
75.0	55.94	11.55	52	21	31		
80.0	53.36	11.02	53	22	31		

85.0	51.03	10.53	54	23	31		
90.0	48.91	10.10	55	24	30		
95.0	46.97	9.70	55	25	30		
100.0	45.20	9.33	56	27	29		
105.0	43.56	8.99	57	28	29		
110.0	42.05	8.68	57	29	28		
115.0	40.65	8.39	58	30	28		
120.0	39.35	8.12	58	31	27		

Orifice Calculations

Inside Dia = 50 mm
Area = 0.002 m²
Outlet Invert = 97.8 masl
Head = 1.22 m
HWL = 99.02 masl
C = 0.84 (orifice tube)
Max Q = 8.1 L/s

Chamber Sizing

Storage Area = 26.1 m²
Total Vol Provided = 48.3 m³
Vol Required = 31.9 m³
Top Elev = 99.95 masl
Bottom Elev = 97.75 masl
HWL = 99.02 masl
Outlet Inv = 97.8 masl
Active Storage Depth = 1.22 m
Tank Height = 2.20 m

Allowable Release Rate = 18.4 L/s
Actual Release Rate = 13.2 L/s

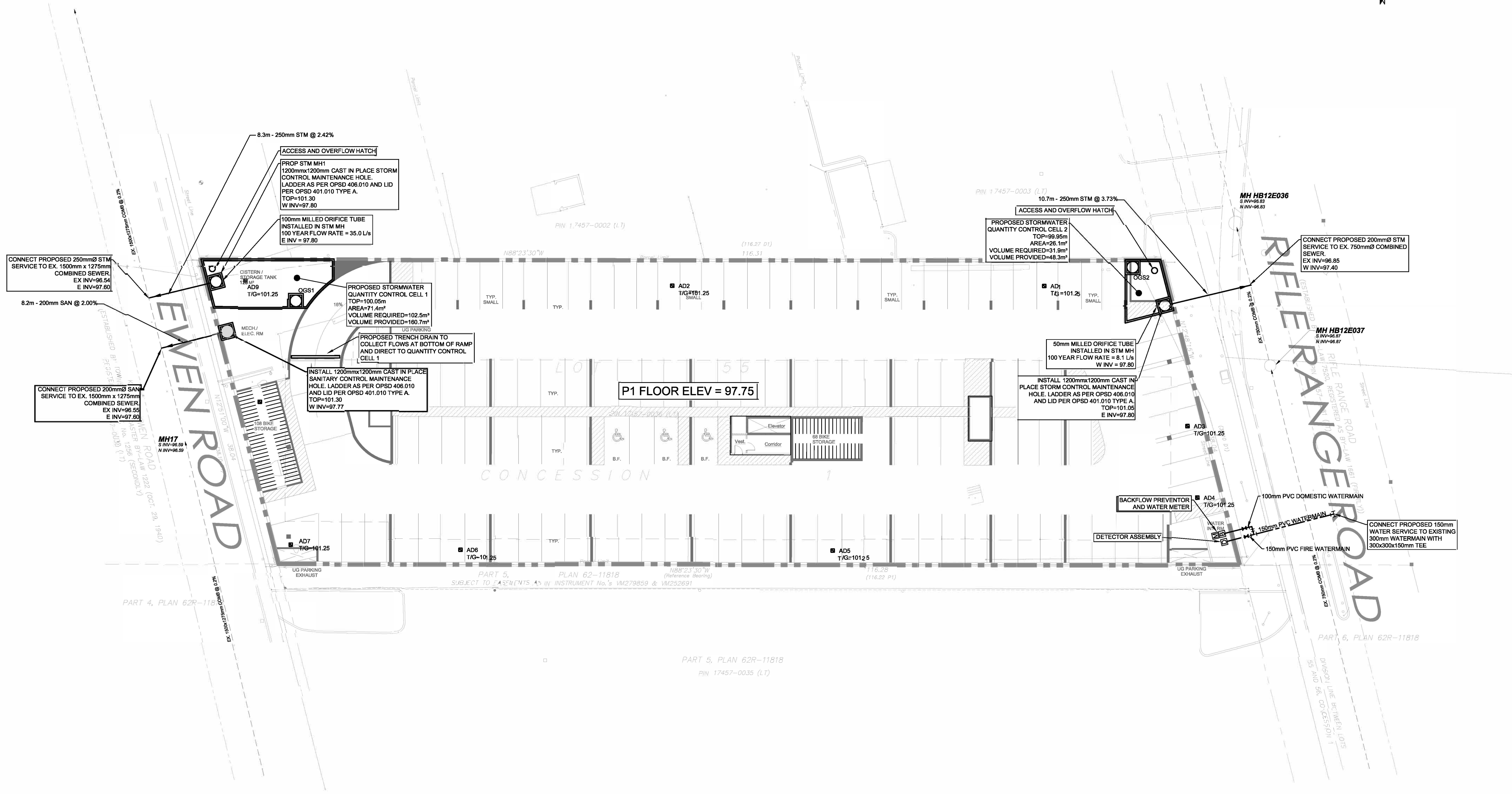
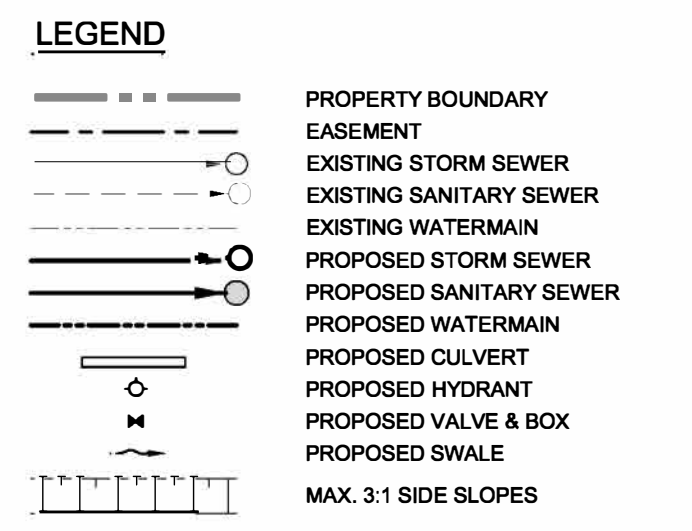
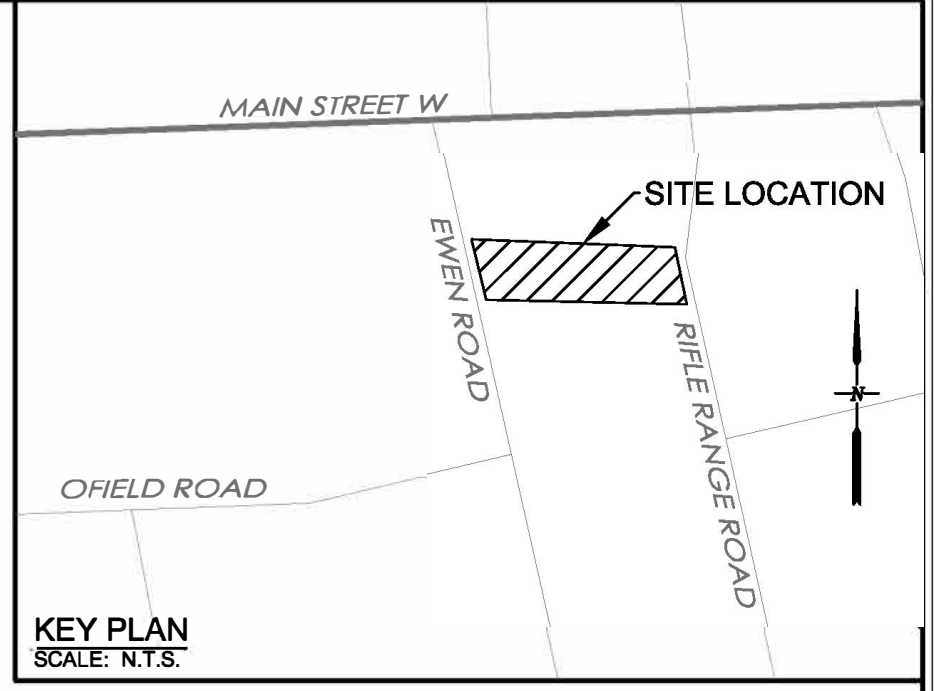
Service Connection					
Diameter	Slope	Velocity	Capacity	Spare Capacity	Capacity
(mm)	(%)	(m/s)	(L/s)	(L/s)	(%)
250	2.00	1.71	84.10	70.86	15.75%



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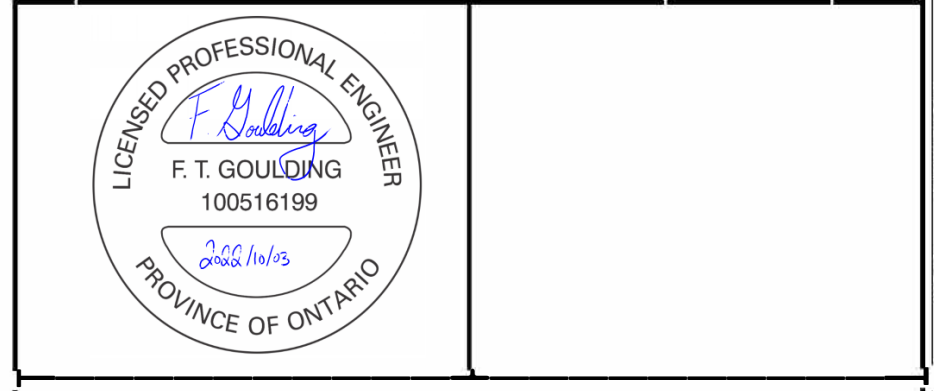
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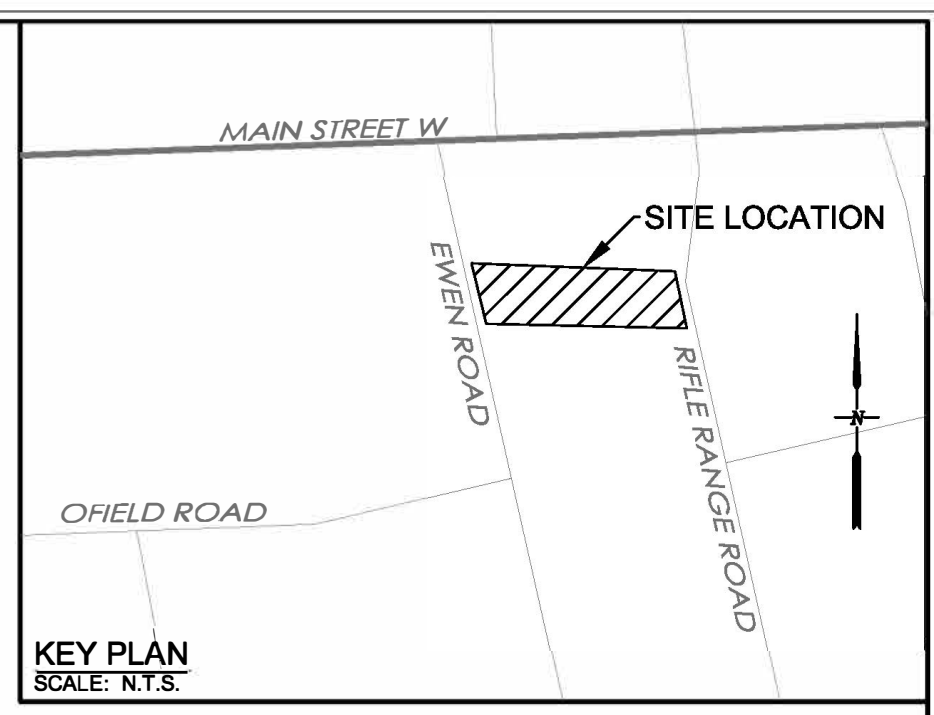
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 1418 ONTARIO STREET
 BURLINGTON, ON
 L7S 1G5

Drawing Title
17 EWEN ROAD, HAMILTON ON
 SERVICING PLAN

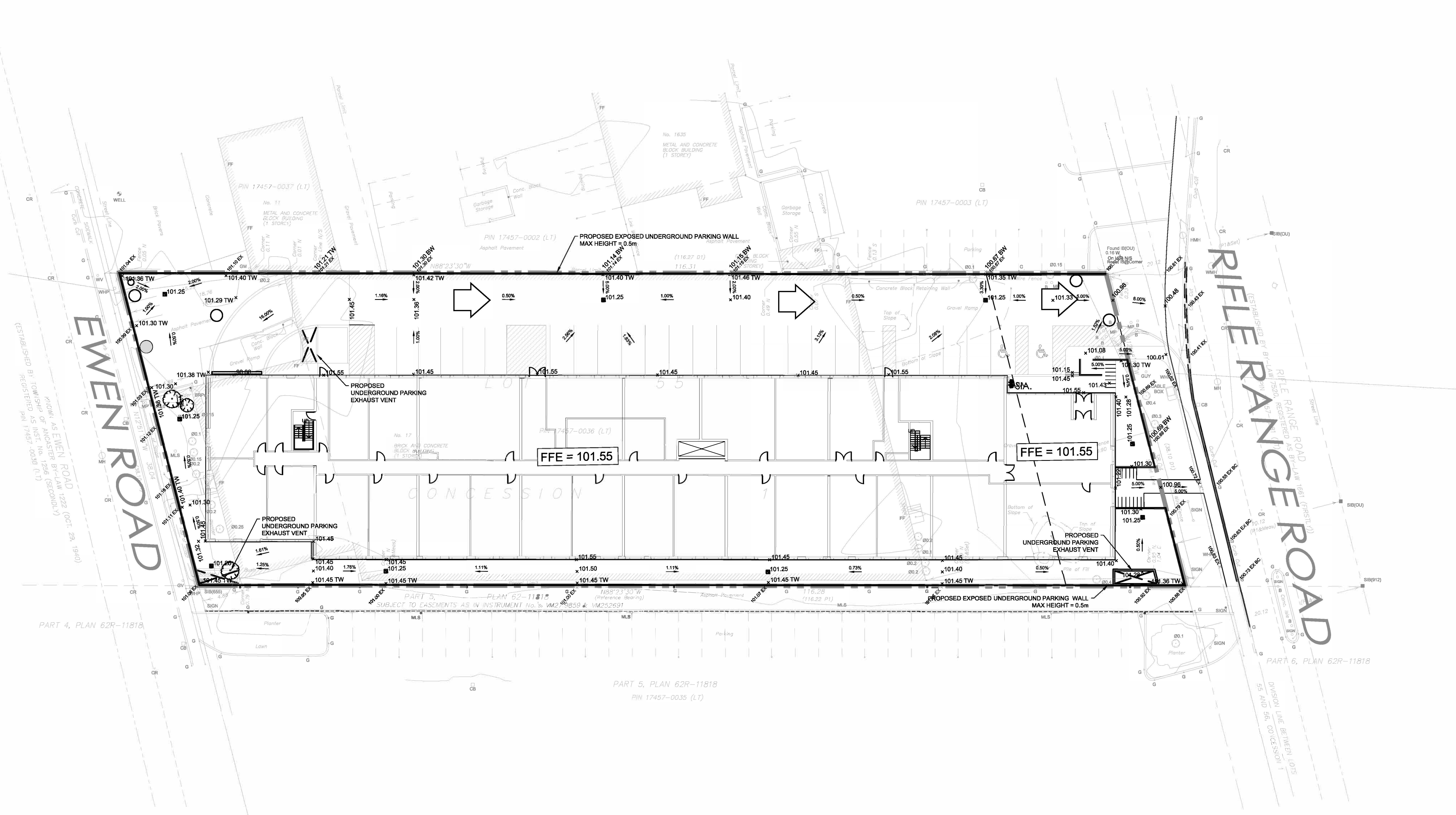
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Project No. 055092	Contract No. 300055092	Revision No. 0			S1





LEGEND

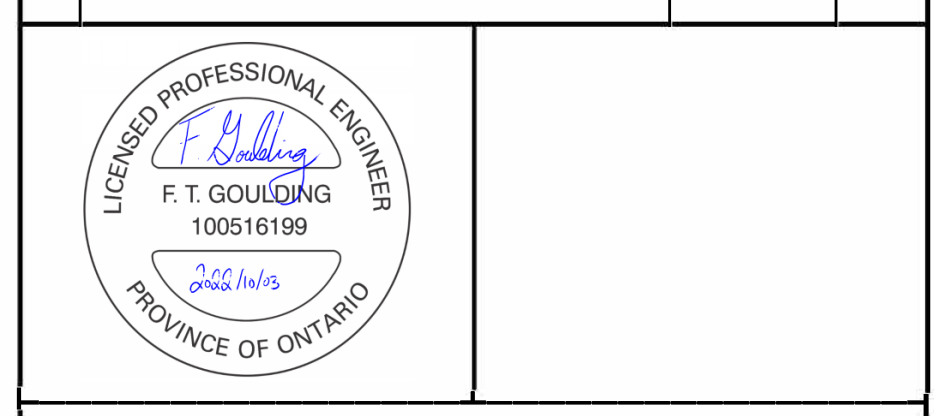
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2.00%	PROPOSED SLOPE
→	PROPOSED OVERLAND FLOW DIRECTION
▨	MAX. 3:1 SIDE SLOPES
▬	PROPOSED RETAINING WALL
~	PROPOSED SWALE



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Drawing Title
17 EWEN ROAD, HAMILTON ON
 GRADING PLAN

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Project No. 055092	Contract No. 300055092	Revision No. 0			
Scale 1:250	0 5.0 10.0 15.0m				G1

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