1673 Huron Road

Functional Servicing and Stormwater Management Report

Project Location:
1673 Huron Road, Kitchener, ON

Prepared for:
Traine Construction & Development
1708 Dolphin Avenue #500, Kelowna, BC

Prepared by:
MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

June 15, 2021

MTE File No.: 48596-100

Engineers, Scientists, Surveyors.

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1.0 Introduction

MTE Consultants Inc. was retained by Traine Construction & Development to complete a Functional Servicing and Stormwater Management Report for a new residential development to be constructed at 1673 Huron Road (herein referred to as 'the Site') in the City of Kitchener. This report is required to support of the Zoning By-Law Amendment Application. Currently the property zoning is split between Medium Density Residential 1 - Residential Six and Mix Use 1 – Low Intensity Mixed Use Corridor MU-1 with Holding Provision 70H and Special Use Provision 43U. The portion of the property currently Zoned MU-1 is proposed to have a special regulation applied to increase the maximum permitted building height. The Zoning By-law Amendment application also proposes to remove the Holding Provision.

The overall property comprises of Parts 9, 10, 13, 18 and 19 on plane 58R-18664. Parts 13 and 19 will be dedicated to the City leaving a developable site area of approximately 2.07ha. The property is bounded to the north by West Oak Trail, to the east by a commercial development that includes Tepperman's furniture store, to the south by Huron Road, and to the west by the existing Trillium Community residential subdivision. For the exact location of the Site refer to Figure 1.0.

The Site is a block within the "Pumpkin Patch Subdivision" which was constructed starting in 2016. The proposed development for the Site involves one amenity building and three five-storey residential buildings, to be constructed at the north, east, and south sides of the Site, each with underground parking. Driveways, ramps, and surface parking are proposed in between the buildings.

The purpose of this study is to support the Zoning By-Law Amendment Application. This will be accomplished by reviewing the opportunities and constraints for the subject property with respect to servicing, grading, and stormwater management; reviewing the requirements of the reviewing agencies; describing the development concept; and demonstrating the functional serviceability of the property. Pending approval of the Amendment application, detailed design of the site will commence and be submitted to the City in support of Site Plan Approval.

2.0 Existing Conditions

2.1 Existing Topography

The Site encompasses an area of 2.19ha and currently includes open space and a single family house at the south west corner with a shed and a driveway. In the existing condition the Site is lower than the surrounding development and roads. The elevation difference is approximately 4.1 metres, with the lowest elevation within the Site at approximately 347.0 mASL and the higher surrounding perimeter elevations between 351.1 mASL (Huron Road) and 350.5 mASL (West Oak Trail). Surface runoff from Huron Road is currently draining into the Site

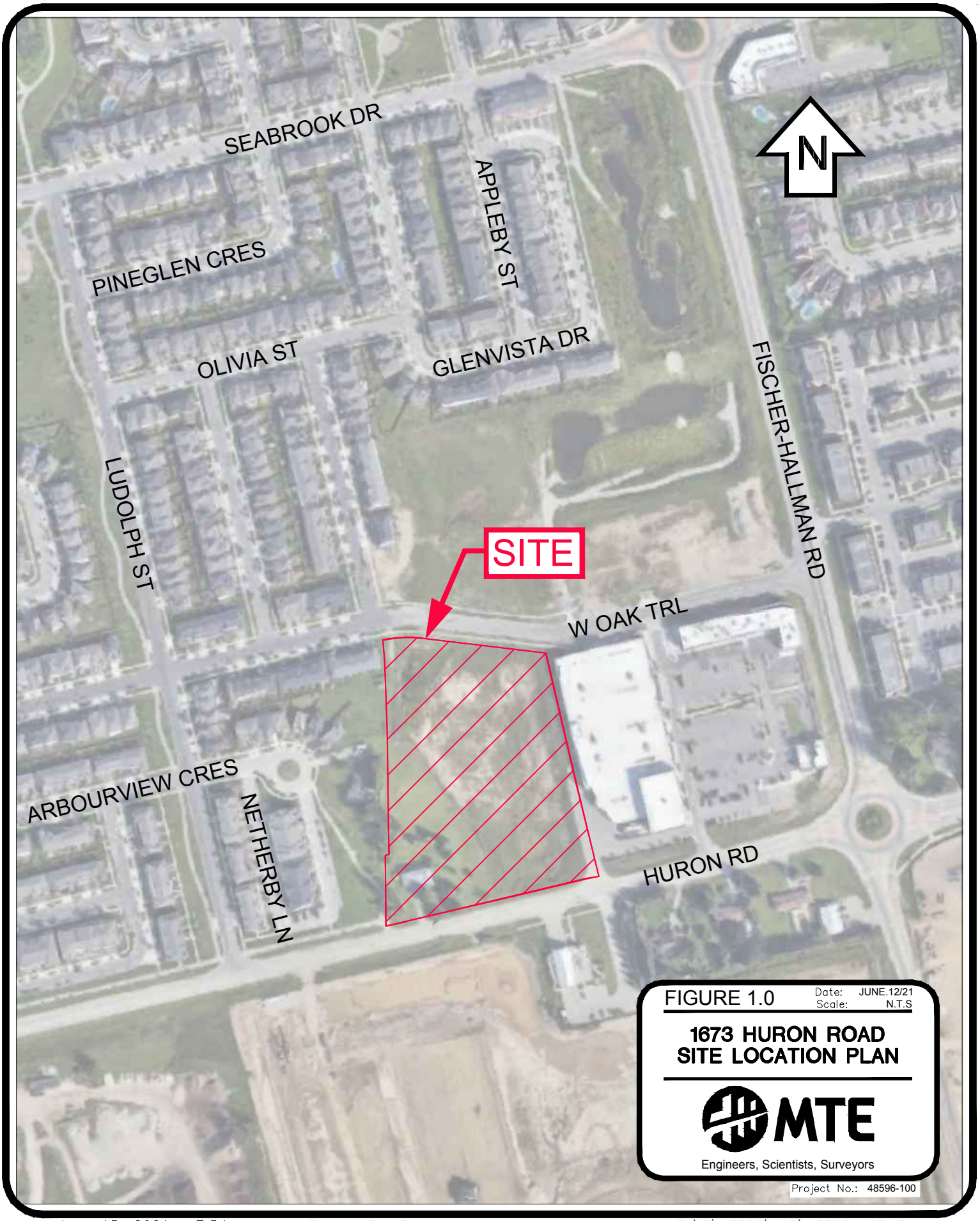

FIGURE 1.0

Date: JUNE.12/21
Scale: N.T.S

1673 HURON ROAD
SITE LOCATION PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 48596-100

June 15, 2021 — 7:54 p.m. — Plotted By: SWadi

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2.2 Existing Servicing

2.2.1 Water

There is an existing 200mm diameter PVC water service stubbed into the north end of the Site, which connects to the existing 300mm municipal watermain along West Oak Trail. There are two existing municipal fire hydrants in close proximity to the Site: one located on the far side of Huron Road and one located on the far side of West Oak Trail. A flow test was performed at the fire hydrant on West Oak Trail by FCFP on May 18, 2021. Refer to Table 2.1 below for a summary of flow test results.

Table 2.1 - Results Of Flow Tests

Results of Flow Tests Completed May 18, 2021 by FCFP					
Test #	**Outlet Inside Dia. (in.)**	**Number of Outlets**	**Pitot Pressure (PSI)**	**Residual Pressure (PSI)**	**Flow @ Residual (gal/min)**
1	n/a	n/a	n/a	78	0
2	2.5	1	52	68	1,210
3	2.5	2	34+38	62	2,013

Refer to Appendix A for further details.

The Site is located within the City of Kitchener's Zone 5 distribution system, which recently had a pressure drop of approximately 10m-head due to the addition of Pressure Zone 6 distribution system. The current hydraulic grade line of Zone 5 is 407 mASL; therefore, lands at finished elevations around 350.0 mASL may require pressure reducing valves.

2.2.2 Sanitary

There is a 200mm diameter PVC sanitary service stubbed into the north side of the Site. It is connected to the existing 200mm municipal sanitary sewer along West Oak Trail, which drains north via an easement through the development block on the north side of West Oak Trail. The closest manhole is located at the north side of the Site near the main driveway to West Oak Trail. At this manhole, the sewer is approximately 4 metres below the top grate elevation.

The Site was included in the sanitary drainage design for the "Pumpkin Patch Subdivision" at a flow rate of 5.649 L/s for commercial use. The rate is provided on the Sanitary Drainage Area Plan for the Pumpkin Patch Lands, completed by Stantec and dated on July 24, 2015. Refer to Appendix B for Stantec's Sanitary Drainage Plan drawing.

2.2.3 Storm

The Site was included in the overall stormwater management scheme for the "Pumpkin Patch Subdivision". There is a 750mm diameter concrete storm service stubbed into the north end of the Site from West Oak Trail, connecting to the municipal storm sewer that drains north to the existing SWM facility. The closest existing manhole is located near the main driveway to West Oak Trail. The sewer is approximately 3.2 metres below the top grate elevation at this location.

There is no formal municipal storm sewer along Huron Road, however there are two culverts which drain to a low point at the south east corner of the Site: a 500mm diameter culvert that runs perpendicular to Huron Road that collects drainage from the south side of the right of way, as well as a 450mm diameter culvert that runs parallel to Huron Road and collects drainage from the north side of the right of way. It is understood that the drainage from the south side of Huron Road, west of the existing Fire Hall, is now directed to the SWM facility in the City park. The drainage along the south side of Huron Road, east of the existing Fire Hall, drains through the existing 500mm diameter culvert to the low area within the Site. The runoff entering the Site infiltrates as there is currently no piped outlet at the existing elevation at the low area.

2.3 Existing Soils Information

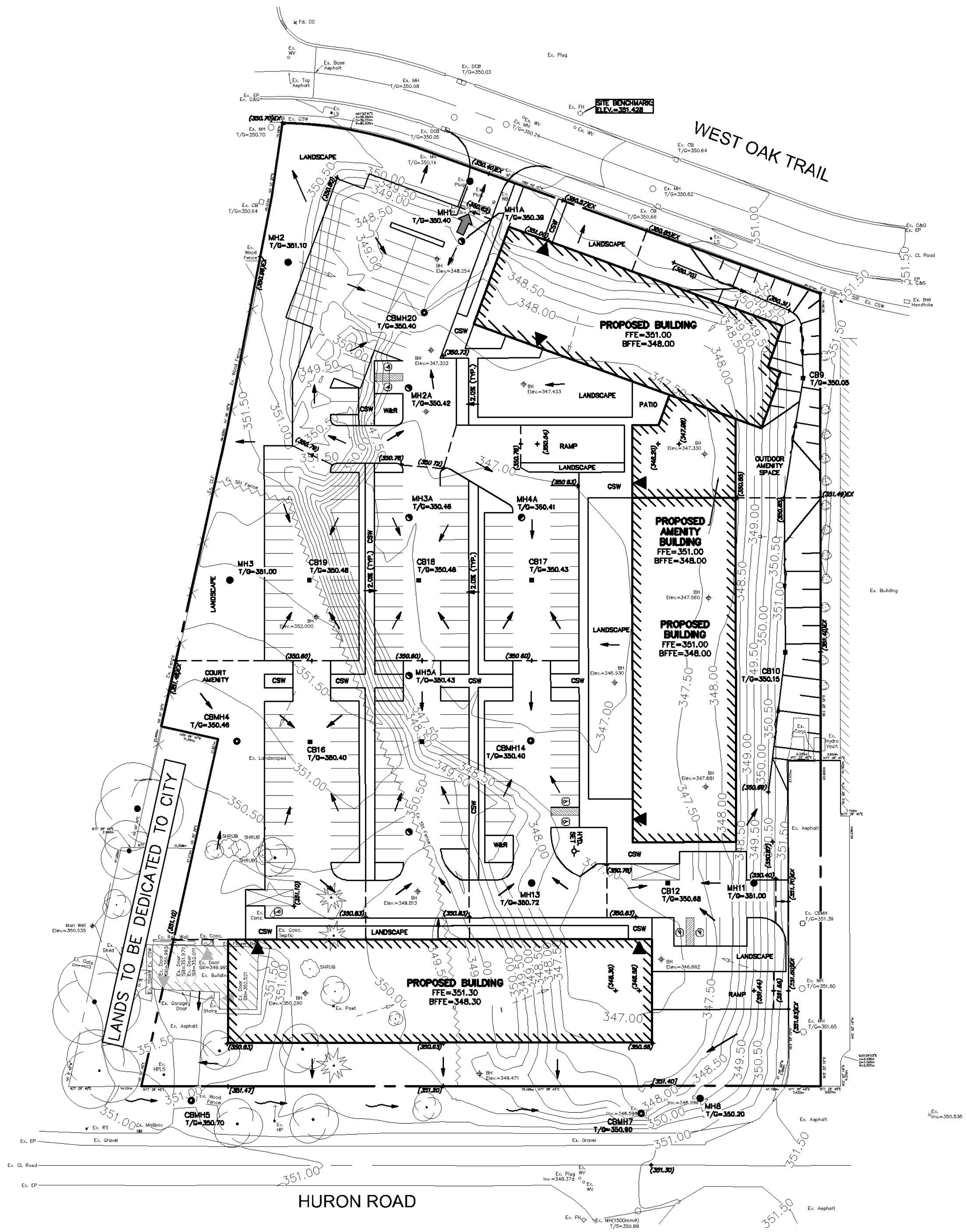
A geotechnical investigation was completed by MTE Consultants Inc. on January 26th, 2021. Twelve boreholes were advanced to depths between 3.05 m and 3.95 m below the existing grade to determine the underlying soil conditions on the Site. The subsurface stratigraphy at the site comprises topsoil and/or fill with overlying native granular, silt, and glacial till deposits. Groundwater was contacted at five out of twelve boreholes on-site at the time of fieldwork. Saturated soil conditions were encountered within the native granular deposits at the north-west corner, south west corner, and the east side of the site with depth elevation ranging from 340.9 mASLto 349.4 mASL. The topsoil, fill, and loose native soils were encountered within the north of the site. The preliminary infiltration rate of the subsurface soils was estimated to vary between less than 1 and 98 mm/hr, depending on location. For additional details, refer to the complete Geotechnical Investigation prepared by MTE Consultants Inc. included in the submission package.

2.4 Reviewing Agencies

Grading, servicing and stormwater management designs as well as this Functional Servicing and Stormwater Management Report will be required for submission to the City of Kitchener in support of the Zoning By-Law Amendment and the Site Plan Application. The City will also be responsible for the review and approval of site plans, lighting and landscape design and ultimately issuing building permits.

3.0 Proposed Grading and Servicing Strategy

Preliminary grading and servicing strategies for the proposed development have been developed based on the topographic survey, plan and profile information, Conceptual Site Plan prepared by Zeidler Architecture. The preliminary grading and servicing strategies are illustrated on Figures 2.0 and 3.0, respectively.



LEGEND OF EXISTING FEATURES

	SITE BOUNDARY
326.00	EXISTING CONTOURS
	EXISTING DIRECTION OF DRAINAGE
Ex. Drop Curb	EXISTING CURB
	EXISTING BUILDING
	EXISTING MAN DOOR
	EXISTING FENCE

LEGEND OF PROPOSED FEATURES

(326.00) T/G=326.00 FFE=326.00	PROPOSED SPOT ELEVATIONS EX =MAINTAIN EXISTING T/G =TOP OF CASTING/GRATE INV =INVERT ELEVATION FFE =FINISHED FLOOR ELEVATION
	DIRECTION OF DRAINAGE/SWALE
(TOP) 3:1 (BOTTOM)	EMBANKMENT (SLOPE AS NOTED)
	PROPOSED BUILDING
	MAN DOOR
(DROP CURB)	CONCRETE CURB
	OVERLAND FLOW ROUTE (MAJOR STORM)

FIGURE 2.0

Date: JUNE.11/21
Scale: 1:1000

CONCEPTUAL SITE GRADING PLAN

MTE

Engineers, Scientists, Surveyors

Project No.: 48596-100

June 15, 2021 — 8:00 p.m. — Plotted By: SWadi

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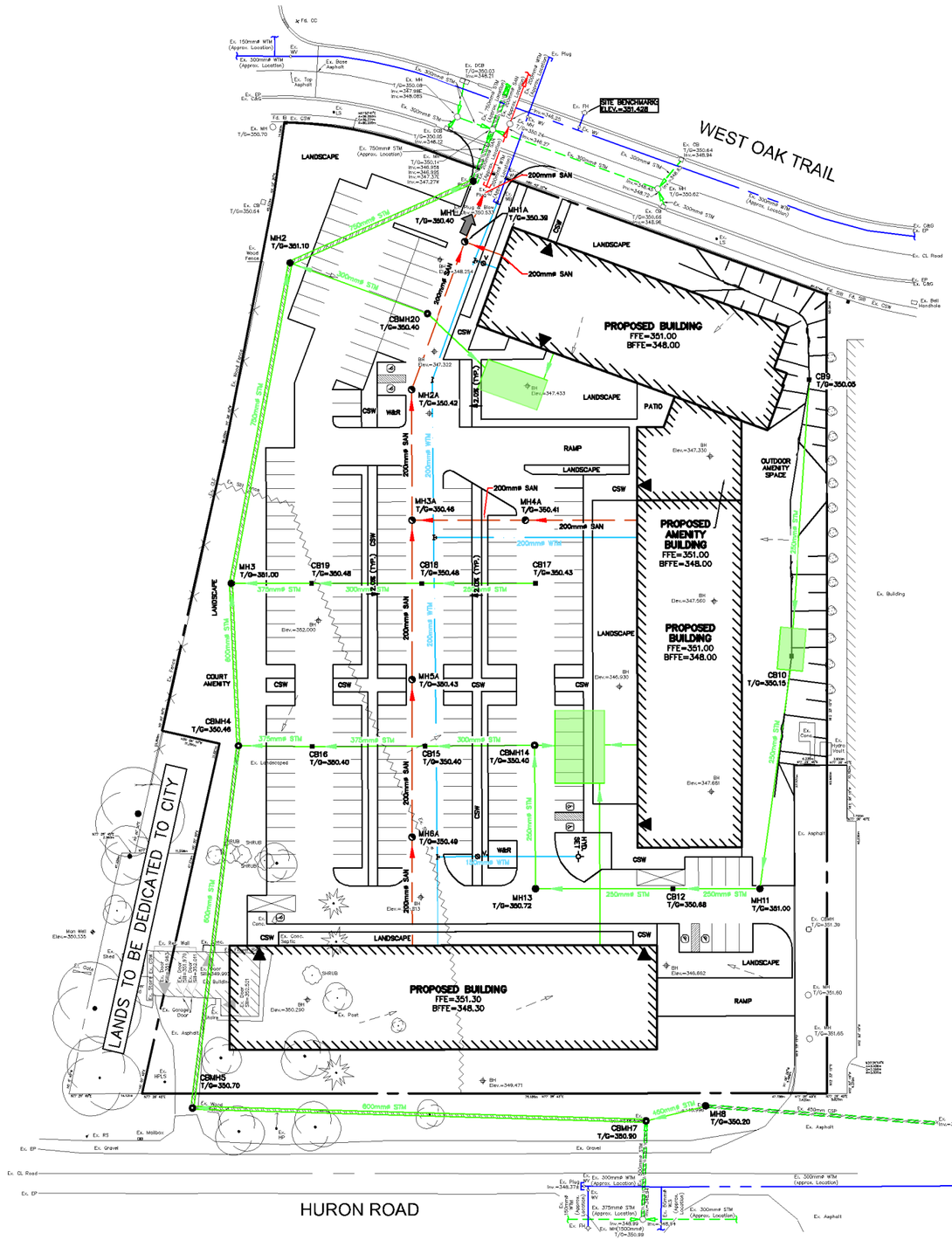

LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING DIRECTION OF DRAINAGE
- Ex. 300mmø SAN / Ex. MH — EXISTING SANITARY SEWER
- Ex. 200mmø WTM / Ex. HYD. SET — EXISTING WATERMAIN
- Ex. 375mmø STM / Ex. MH — EXISTING STORM SEWER
- Ex. Drop Curb — EXISTING CURB
- EXISTING BUILDING
- EXISTING MAN DOOR
- EXISTING FENCE

LEGEND OF PROPOSED FEATURES

- (TOP) 3:1 (BOTTOM) — EMBANKMENT (SLOPE AS NOTED)
- MH — 14.6m–200mmø SAN @ 1.5% — SANITARY SEWER
- MH — 21.3m–300mmø STM @ 1.3% — STORM SEWER
- 200mmø WTM — HYD. SET — V. — TEE — WATERMAIN
- PROPOSED BUILDING
- MAN DOOR
- INFILTRATION GALLERY

FIGURE 3.0 — Date: JUNE.11/21 — Scale: 1:1000

CONCEPTUAL SITE SERVICING PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 48596-100

3.1 Proposed Grading

The proposed development will have three buildings with one driveway access on Huron Road shared with the commercial plaza to the east, and one entrance from West Oak Trail. The proposed grading strategy will respect the existing grades along West Oak Trail, the commercial development to the east, and the existing residential development to the west. The grades at property line along Huron Road will be raised to accommodate the future urbanization of Huron Road. Since the Site currently sits lower than all abutting properties and rights of way, grading will involve raising the whole Site. The northern and eastern buildings will have a finished floor elevation around 351.00 mASL, with basement finished floor elevation of 348.00 mASL. The southern building will have a finished floor elevation around 351.30 mASL, with basement finished floor elevation of 348.30 mASL. All finished floor elevations are subject to change during detailed design. The grading strategy has been developed to ensure that the drainage is directed to a series of storm structures throughout the Site, with a major storm overland flow route towards West Oak Trail and existing SWM facility to the North.

3.2 Proposed Servicing

3.2.1 Water

A new connection to the 200mm diameter municipal watermain along West Oak Trail will be required in order to service the proposed development. The required private water service size will be determined during detailed design, but will likely be 200mm diameter. The water service will run through the parking lot and branch out to service each building.

Water Demand

It is expected that the existing municipal fire hydrant across from the Site on West Oak Trail will provide fire protection for the northern most building. One new on-site hydrant is required to provide fire protection for the eastern and southern buildings. The proposed fire hydrant will be serviced with a 150mm watermain. The location of the proposed hydrant will be finalized once the locations of building's fire department connections are determined.

The pressures and flows at the on-site hydrant must also be sufficient for firefighting conditions as established by the Ontario Building Code (2012). The minimum residual pressure permitted under fire fighting conditions is 140.0 kPa (20.3 psi) per OBC 2012 A-3.2.5.7 3(b).

For this design, information obtained from hydrant flow testing on the municipal hydrant located on West Oak Trail, as detailed in Section 2.2.1, was utilized.

All of the proposed buildings will be sprinklered. Section A-3.2.5.7.2 of the OBC relates to water supply for firefighting in sprinklered buildings. For sprinklered buildings, water supply additional to that required by the sprinkler systems should be provided for firefighting using fire hoses in accordance with the hose stream demands and water supply durations for different hazard classifications as specified in National Fire Protection Association's (NFPA) NFPA 13, "Standard for the Installation of Sprinkler Systems".

The site-specific system demand for the proposed sprinkler systems is not known at this point. Based on past experience, an assumed demand of 40 L/s was used to represent the fire demand for the largest proposed building. The actual sprinkler demand will be provided by a qualified contractor during detailed design and this calculation will be confirmed.

The OBC and FUS requirements were calculated for the worst case scenario (eastern building plus amenity area) for reference and can be found in Appendix C. However, the analysis has been completed using the assumed sprinkler demand only, since it governs for sprinklered buildings.

The residual pressure for proposed hydrant at the worst case building was calculated to be 143 kPa at flow rate of 150 L/s, which is greater than the minimum allowable pressure of 140 kPa per OBC 2012. Therefore, the proposed watermain configuration is expected to be sufficient.

Based on a maximum day domestic demand of 3.31 L/s and the sprinkler system demand of 40 L/s, the total water demand for the Site is expected to be 43.3 L/s. This will be confirmed at detailed design once the sprinkler system demand is confirmed for each building.

3.2.2 Sanitary

A sanitary flow design sheet has been prepared to determine the flows anticipated to be generated by the proposed development. Based on the proposed 261 units and area of 2.19ha, the resulting peak flow rate from the Site is expected to be 5.87 L/sec. Refer to Appendix D for sanitary flow rate calculations. This is slightly higher than the sanitary flow rate of 5.649 L/s allotted in the Sanitary Drainage Area Plan for the Pumpkin Patch Lands, so City verification of adequate downstream capacity is required.

The Site will be serviced by a 200mm diameter sanitary sewer running from south to north through the Site, connecting to the existing 200mm diameter stub along West Oak Trail. The stub was installed at a slope of 1%, corresponding to a full flow pipe capacity of 37.8 L/sec. Therefore, the sanitary stub can adequately convey the anticipated flow rate from the Site. The remainder of the proposed internal sanitary sewer will also be installed at a slope that provides adequate capacity for the proposed development. The service sizes and inverts will be confirmed at detailed design. Sanitary drainage from the basement levels of all buildings may need to be pumped due to the depth of the existing sanitary stub, coupled with grading constraints.

3.2.3 Storm

A private storm sewer system will be installed on-site to collect rooftop runoff from the buildings and runoff from the common driveways and parking areas. No additional on-site SWM quantity or quality controls are required on-site. As mentioned, the major overland flow route for the Site will be towards West Oak Trail.

Upon review of the surrounding drainage patterns and subsequent conversations with the Design Engineer for the neighbouring Trillium Subdivision, it would appear that the right-of-way drainage along Huron Road has no official outlet. This area extends from the roundabout at Fischer-Hallman Road to Ludolph Street. It is expected that the drainage along the south side of Huron Road, west of the existing Fire Hall is directed into the City's park. This leaves approximately 1.03ha of land without a formal drainage outlet. Since the Site will be filled to accommodate the proposed development, a municipal storm sewer system will be required to provide an outlet for drainage from the right of way.
It is proposed that this storm sewer extend from the existing culvert, along the southern property line and on towards the north, connecting to the existing 750mm diameter stub from West Oak Trail. An easement in favour of the City of Kitchener will be required over the storm sewer.

Refer to Appendix E for preliminary storm sewer sizing details for the municipal storm sewer extension. Required pipe sizes and slopes will be confirmed during detailed design.

4.0 Preliminary Storm Water Management Design

4.1 SWM Criteria

The Site was included in the catchment area for the Pumpkin Patch Lands SWM facility, as detailed in the Pumpkin Patch Lands Final Stormwater Management Design Report, completed by Stantec and dated September, 2014, with a C value of 0.9 (nearly 100% impervious). The Site is currently 69% impervious.

Therefore, the stormwater management design criteria for the subject site, as established by the City of Kitchener, are as follows:

i) Provide on-site volume retention per the City's ISWM-MP; and,
ii) Implementation of Erosion and Sediment Control measures.

4.2 Infiltration

The existing SWM facility for the Pumpkin Patch Lands incorporates 5mm of runoff retention for the contributing drainage area in order to achieve a water balance per the sub-watershed requirements. The ISWM-MP criteria requires that the development retains 12.5mm of runoff; therefore, additional retention of 7.5mm of runoff depth across the Site area is required. Based on a Site area of 2.19ha, 164.3m^3 will need to be retained on-site through the implementation of infiltration galleries.

A separate storm sewer network will be installed to convey runoff from rooftops of the buildings and part of the landscape area to three proposed infiltration galleries. Refer to Figure 3.0 for intended approximate gallery locations. The infiltration facilities will be sized to collect 30mm of runoff from the proposed building roofs and contributing landscaped area, equating to a total volume retention of approximately 189m^3. The infiltration galleries are intended to be ADS Stormtech systems and will be sized with a 15% safety factor. An overflow connection will also be provided for each infiltration gallery to the on-site storm sewer system. Based on groundwater elevations provided in the Geotechnical Investigation prepared by MTE Consultants, at least 1.0m of vertical separation can be provided between underside of gallery and groundwater. Details of the galleries will be prepared during detailed design.

4.3 Erosion & Sediment Control

Precautions will need to be taken during construction to limit erosion and sedimentation. Typically, the following measures are recommended during construction for erosion and sedimentation control:

i) Erosion and sedimentation facilities are to be installed prior to any area grading operations;
ii) All erosion control measures are to be inspected and monitored by the contractor and repairs are to be completed as required;

iii) All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance from leaving the site;

iv) To minimize the amount of mud being tracked onto the road way, a mud mat should be installed at the primary construction entrance.

5.0 Conclusions

Based on the foregoing analysis, it is concluded that:

- The grade inside property limits will be raised, and grades along surrounding property lines will be respected;
- Existing municipal infrastructure for water, sanitary and storm is available along West Oak Trail;
- The proposed sanitary flow rate is 5.87 L/sec, which slightly exceeds the flow rate attributed to the Site during design of the Pumpkin Patch Lands;
- A municipal storm sewer will need to be extended from Huron Road through the Site, connecting to West Oak Trail, in order to intercept existing drainage flowing onto the property from Huron Road; and,
- Volume retention criteria can be achieved through the installation of infiltration galleries on-site.

Additional grading, servicing and stormwater management details will be provided during detailed design.

All of which is respectfully submitted,

MTE Consultants Inc.

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Rebecca Kerr, P.Eng.
Design Engineer
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JHN:scm
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Appendix A

Flow Test Report

FLOW TEST REPORT

Form SD-003 RevDate: Sep 25, 2020

PROJECT INFORMATION			
Project Name:	1673 Huron Road Kitchener Flow	Const. Project #:	LD-21-048
Site Address:	1673 Huron Road Kitchener	Design Project #:	2021-FCFP-208
City Contact:	Kitchener Utilities	Phone #:	519-741-2529 x3
FCFP Contact:	Dan Smaglinski	Phone #:	226-971-0170
Technical Contact:	Andrew Peach	Phone #:	226-448-3436

SITE INFORMATION

SITE MAP

Note: If the main is a dead end, the flowing hydrant shall be closest to the dead end

ITEMS TO LABEL ON MAP	HYDRANTS USED	MAIN SIZE
☑ Static / Residual & Flow Hydrants	☑ City Hydrant(s)	City: 300mm (12")
☐ Flow Direction (if the main is dead end)	☐ Site Hydrant(s)	Site:

SITE NOTES

HEAD OFFICE
LONDON GTA CAMBRIDGE WINDSOR WINNIPEG
1.800.755.0962 fcfp.ca

FCFP
Making Life Safety Simple™

FLOW TEST REPORT

Form SD-003 RevDate: Sep 25, 2020

TEST INFORMATION			
Minimum Required Flow:	N/A	Min Ports:	2
FCFP Personnel Present:	Dan Smaglinski	Test Date:	2021-05-18
City / External Company:	Kitchener Utilities	Test Time:	9:00am

TEST EQUIPMENT	
☐ Hose Monsters with built in Pitot	Hose length used:
☐ Hand held pitot gauge	☐ Pollard diffuser elbow with built in Pitot
☐ Other:	

TEST RESULTS

Number of Ports	Outlet Size (IN)	Discharge Coefficient	Pitot Reading (PSI)				Total Flow (GPM)	Static / Residual Pressure (PSI)
0 Ports	**STATIC**							78
1 Port	2.5	0.9	52				1,210	68
2 Ports	2.5	0.9	34	38			2,013	62
3 Ports	2.5	0.9					0	
4 Ports	2.5	0.9					0	
0 Ports	**STATIC RE-CHECK**							

TEST NOTES

HYDRAULIC ADJUSTMENTS (FOR OFFICE USE ONLY)			
ADJUSTMENTS FOR HYDRAULIC GRADE LINE (HGL)			
Reservoir HGL (m):		Site Elevation (m):	
Theoretical Static Head (PSI):	0	PSI to subtract from test pressures:	0
OTHER HYDRAULIC ADJUSTMENTS			
Other adjustment as required by the City / AHJ:			

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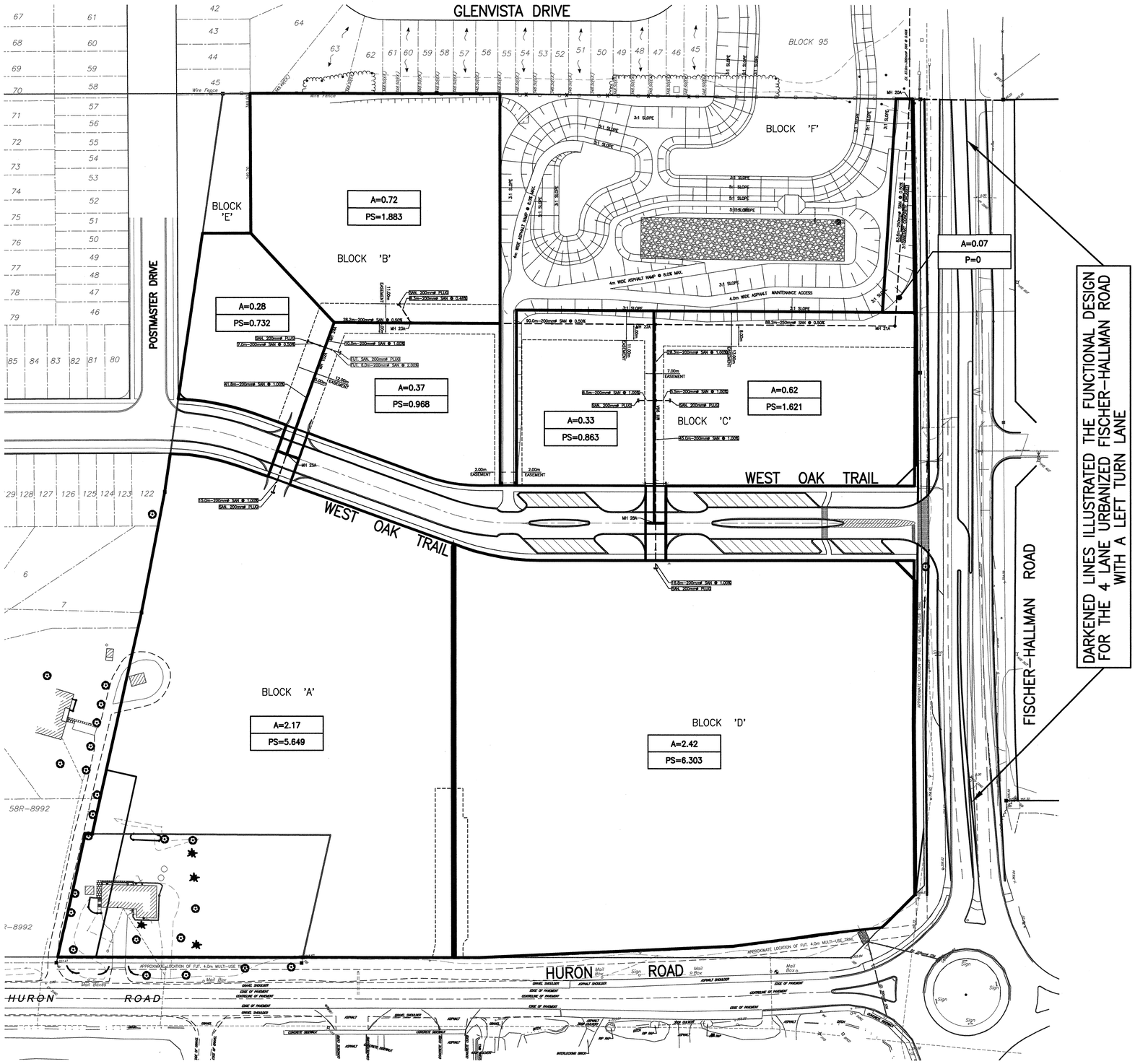
Appendix B

Pumpkin Patch Lands – Sanitary Drainage Plan



Stantec

49 Frederick Street
Kitchener, ON, N2H 6M7
Tel. 519.579.4410
www.stantec.com

Notes

1. BENCHMARK:
   CONCRETE MONUMENT No. 13-151 ELEVATION = 348.73
   EAST SIDE OF APPLE HILL CRESCENT APPROXIMATELY 124.0m NORTH OF SEABROOK DRIVE AND 105.0m WEST OF FISCHER-HALLMAN ROAD.
   UTM ZONE 17, NAD83 (CSRS) (1997.0)
   NORTHING 4,804,021.41 EASTING 541,110.37
2. TOPOGRAPHICAL INFORMATION FROM FIELD SURVEY BY SPEIGHT, VAN NOSTRAND & GIBSON LIMITED DATED NOVEMBER 14, 2007 AND SUPPLEMENTED BY STANTEC CONSULTING LTD IN 2013 & 2014

Legend

A=0.62 PS=1.621	AREA IN HECTARES POINT SOURCE SANITARY FLOWS INCLUDING INFILTRATION IN LITRES PER SECOND
A=0.07 P=0	AREA IN HECTARES POPULATION

Revision	By	Appd.	YY.MM.DD
3. ADDITIONAL CITY COMMENTS	A.F.	J.L.G.	15.07.24
2. SECOND SUBMISSION	A.F.	J.L.G.	15.06.25
1. FIRST SUBMISSION	A.F.	J.L.G.	15.03.18
File Name: 160311364_C-SS.dwg	M.A.R. Dwn.	J.L.G. Chkd.	M.A.R. Dsgn.	15.01.26 YY.MM.DD

Permit-Seal

Professional Engineers Ontario
Limited Licensee
Name: JEROME LEO GRUBB
Number: 100116512
Category: CIVIL ROADS
Limitations:
This licence is subject to the limitations as detailed on the certificate.
Association of Professional Engineers of Ontario
Jul 29 2015

Client/Project

1271395 ONTARIO LIMITED

PUMPKIN PATCH LANDS

KITCHENER, ONTARIO

Title

SANITARY DRAINAGE AREA PLAN

Project No.	Scale	Revision
160311364	1:750 (0 7.5 22.5 37.5m)	
Drawing No.	Sheet	
C-120	of 3	

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2015/07/28 P:\4 PM By: Figliomeni, Adele

ORIGINAL SHEET - ARCH D

Appendix C

Water Demand Calculations

1673 Huron Road
FIRE FLOW DEMANDS
Kitchener, ON
Project #: 48596-100
Date: June 15th, 2021
Date Printed: 6/14/2021
By: JHN

Development Information[1]								Fire Flow[2]															Domestic Flow[3,4]					
								Ontario Building Code						Fire Underwriters Survey														
Node ID / Area ID / Building #	F.F.E. (m.a.s.l.)	Description	# of Units	Population	Bldg Area (1st Floor)	Total Bldg Area	Building Volume	K	V	S_{tot}	Q	F	F	C	A	F	(2) Occupancy Reduction	(3) Sprinkler Protection	(4) Building Exposure	F	F	Fire Flow (Max OBC/FUS)	MOE Guidelines	Average Day	Max Day	Peak Hour	Minimum Hour	Max Day + Fire Flow
				# of people	m^2	m^2	m^3		m^3		*L*	*L/min*	*L/s*		m^2	*L/min*				*L/min*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*
North	350.00	Apartment	73	129	1,158	5,790	17,370	16	17,370	1.90	528,048	9,000	150	1.00	5,790	16,740	-25%	-30%	45%	14,000	233	233	0.336	0.336	0.925	1.390	0.135	237
East	350.00	Apartment + Amenity	89	158	1,864	9,653	28,959	16	28,959	1.50	695,016	9,000	150	1.00	9,653	21,615	-25%	-30%	60%	21,000	350	350	0.410	0.410	1.128	1.694	0.164	353
South	350.30	Apartment	99	175	1,666	8,330	24,990	16	24,990	1.25	499,800	9,000	150	1.00	8,330	20,079	-25%	-30%	65%	20,000	333	333	0.456	0.456	1.255	1.885	0.183	337
TOTALS FOR SITE			**261**	**462**	**4688**	**23773**	**71319**				**Max Fire Flow =**		**150**							**Max Fire Flow =**	**350**	**350**	**1.20**	**1.20**	**3.31**	**4.97**	**0.48**	**353**
																						Sum of Maximum Day Flows + Largest Fire Flow (L/s) =						**353**

Assumptions:

1 All building areas and populations are based on the Site Plan by GSP Design Group Inc. Assumed 1.77 persons per unit as per Region of Waterloo Water and Wastewater Monitoring Report 2017

2 All buildings are classified as occupancy group C (Residential Occupancy)

3 Average Daily Demands for each building are based on "*Tri City Water Distribution Master Plan Final Report" by AECOM, Dated May 2009* :

Residential = 225 L/cap/day

4 Peaking Factors based on "*Design Guidelines for Drinking-Water Systems* " (MOE, 2008):

Average Day =	1
Maximum Day =	2.75
Peak Hour =	4.13
Minimum Hour =	0.4

5 All buildings will be sprinklered and the assumed demand is 40 L/s

Appendix D

Sanitary Design Calculations

1673 Huron Road
CITY OF KITCHENER

SANITARY SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Project Number: 48596-100
Date: June 15, 2021
Design By: JHN
Checked By: LEI, RCK
File: Q:\48596\100\48596 Sanitary Sewer Design Sheet Kitchener (SSMS)_Rev9.xls

Drainage Area Plan No: 160311364 by Stantec

Design Parameters

Average Daily Flow

Residential	0.00318	L/s/c
Commercial	2.38	L/s/ha
Industrial	0.40	L/s/ha
Inst. / School	2.50	L/s/ha

Mannings "*n*"	0.013	
Min. Velocity	0.8	m/sec
Max. Velocity	3.0	m/sec

Residential Harmon Peaking Factor $F = 1 + 14/(4 + P^{0.5})$

Residential Area Infiltration 0.25 L/s/ha

LOCATION				RESIDENTIAL AREAS and POPULATION										SCHOOL, INSTITUTIONAL			COMMERCIAL			INDUSTRIAL				INFILTRATION			DESIGN						
STREET	AREA NO.	MANHOLE LOCATION		HECTARES OF EACH DENSITY							POPUL.	CUMUL POPUL.	PEAK FACTOR "F"	PEAK RES. FLOW	HECTARES AND FLOW OF EACH ZONING										TOTALS-C-I FLOW	AREA	CUMUL AREA	INFIL FLOW	TOTAL VOLUME FLOW	LENGTH	SLOPE	PIPE SIZE	CAPACITY	FULL FLOW VELOCITY
		FROM MH	TO MH	R2	R3	R4/R5	R6	R7	R8	R9					2.50 *L/s/ha*			2.38 *L/s/ha*			0.40 *L/s/ha*											
				36	**72**	**143**	**196**	**312**	**387**	**775**					AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW									
				ha	*ha*	*ha*	*ha*	*ha*	*ha*	*ha*	*1000s*	*1000s*		*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*m*	*%*	*mm*	*L/sec*	*m/s*
		Plug	Ex. MH									0.462	[1] 3.991641	5.8697											2.07	2.07	0.5175	6.3872	13.0	1.00	200	32.7818	1.044

Assumption:
(1) All building areas and populations are based on the Site Plan by GSP Design Group Inc. Assumed 1.77 persons per unit as per Region of Waterloo Water and Wastewater Monitoring Report 2017
Cumulative population = 1.77 p/u x 261 units / 1000s = 0.462

Appendix E

Storm Sewer Design Calculations

1673 Huron Road

CITY OF KITCHENER

STORM SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Project Number: 48596-100
Date: June 15, 2021
Design By: JHN
Checked By: LEI, RCK
File: Q:\48596\100\Storm Sewer Design Sheet Kitchener.xlsx

Drainage Area Plan No: 160340782 by Stantec

Design Parameters

5 YEAR STORM

Q=kAIC, k=0.00278
Intensity (I) = $a/(tc+b)^c$
a = 1593
b = 11
c = 0.8789

Manning's "n" 0.013
Min. Velocity 0.800 m/s
Max. Velocity 6.000 m/s

LOCATION				STORMWATER FLOW								DESIGN					
STREET	AREA NUMBER	MANHOLE LOCATION FROM MH	MANHOLE LOCATION TO MH	AREA (A)	RUNOFF COEFF. (C)	A x C	CUMUL. A x C	CONCENTRATION TIME TOTAL	CONCENTRATION TIME IN PIPE	RAIN INTENSITY (I)	FLOW (Q)	PIPE SIZE	LENGTH	SLOPE	CAPACITY	FULL FLOW VELOCITY	PIPE FULL
				ha		*ha*	*ha*	*min*	*min*	*mm/hr*	*L/s*	*mm*	*m*	*%*	*L/s*	*m/s*	*%*
		MH8	CBMH7	1.300[1]	0.60	0.7800	0.7800	10.0000	0.0628	109.67742	237.82452	450	12.0	3.30	517.92102	3.2565	45.92
		CBMH7	CBMH5	0.102	0.20	0.0204	0.8004	10.0628	1.1318	109.39017	243.40538	600	88.0	0.30	336.30797	1.1894	72.38
		CBMH5	CBMH4	0.016	0.20	0.0032	0.8036	11.1946	0.8045	104.47189	233.37943	600	62.0	0.30	336.30797	1.1894	69.39
		CB16	CBMH4	0.108	0.88	0.0950	0.3893	13.8606	0.1861	94.55862	102.34118	375	14.0	0.50	123.97713	1.1225	82.55
		CBMH4	MH3	0.066	0.20	0.0131	1.2060	13.8606	0.8164	94.55862	317.01901	600	75.0	0.40	388.33500	1.3735	81.64
		CB19	MH3	0.108	0.88	0.0950	0.2902	10.7146	0.2063	106.49865	85.92790	375	15.0	0.50	123.97713	1.1225	69.31
		MH3	MH2				1.4962	13.8606	0.7046	94.55862	393.31316	750	62.0	0.30	609.76693	1.3802	64.50
		CBMH20	MH2	0.276	0.78	0.2156	0.2156	10.0000	0.3660	109.67742	65.73470	300	28.0	0.70	80.90566	1.1446	81.25
		MH2	MH1				1.7118	13.8606	0.3747	94.55862	449.98647	750	38.0	0.40	704.09820	1.5938	63.91

1. Contributing drainage area coming from West side of Site is estimated street drainage from the West on Huron Rd, refer to map from Pumpkin Patch Lands - 1271395 Ontario Limited, dated July, 2016. Imperviousness estimated.